

COST ACCOUNTING

STUDY TEXT

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P.O. Box 59857, 00200,

Nairobi, Kenya.

Tel: +254 (0) 20 606155 Fax: +254 (0) 20 607498



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Table of Contents

■ Acknowledgment.....	iii
■ Table of Contents	v
■ CHAPTER ONE	1
■ NATURE AND PURPOSE OF COST ACCOUNTING	3
■ CHAPTER TWO.....	21
■ COST CLASSIFICATION.....	23
■ CHAPTER THREE.....	41
■ COST ESTIMATION.....	43
■ CHAPTER FOUR.....	65
■ MATERIAL COSTS.....	67
■ CHAPTER FIVE	101
■ LABOUR COSTS.....	103
■ CHAPTER SIX	129
■ OVERHEAD COSTS.....	131
■ CHAPTER SEVEN	165
■ COST BOOK KEEPING.....	167
■ CHAPTER EIGHT	193
■ MARGINAL AND ABSORPTION COSTING	195
■ CHAPTER NINE.....	253
■ COSTING SYSTEMS	255
■ CHAPTER TEN	315
■ BUDGETING AND BUDGETARY CONTROL	317
■ CHAPTER ELEVEN.....	355
■ STANDARD COSTING	357
■ CHAPTER TWELVE	373
■ VARIANCE ANALYSIS	375
■ CHAPTER THIRTEEN	411
■ COST MANAGEMENT	413
■ ANSWERS TO EXAM & REVIEW QUESTIONS.....	433
■ REFERENCES	483
■ GLOSSARY.....	487
■ INDEX.....	495



CHAPTER ONE



NATURE AND PURPOSE OF COST ACCOUNTING



CHAPTER ONE

NATURE AND PURPOSE OF COST ACCOUNTING

► OBJECTIVES

After studying this chapter, you should be able to:

- Define cost accounting
- Distinguish between cost accounting and other accounting subjects such as financial accounting and management accounting based on various aspects
- Define the various cost accounting terminologies
- Explain the role of a cost accounting department in an organization
- Explain the design and operation of a Cost and Management Accounting system
- Explain the relationship between nature of business enterprise and cost accounting
- Distinguish between qualitative and quantitative information
- Explain the features of an effective cost center framework

► INTRODUCTION

The purpose of this chapter is to introduce the basic concepts of cost accounting, terminologies and distinguish cost accounting from financial accounting. It is aimed at making it clear on what cost accounting is all about and introduce some of the terminologies used in the chapters that follow.

First, we will discuss the nature of cost accounting and budgeting and then introduce the key cost accounting terminologies, which will act as the base for other discussions.

► DEFINITION OF KEY TERMS

Cost: Cost is simply a quantification or measurement of the economic sacrifice made to achieve a given objective. It is, therefore, a measurement of the amount of resources sacrificed in attaining a specified goal

Cost object or cost unit: This is an activity for which a separate measure of cost is desired.

Cost Accountant: He/she is a member of the accounting department responsible for collecting product costs and preparing accurate and timely reports to evaluate and control company operations.

Cost Analysis: This is an activity that uses engineering, time and motion studies, timekeeper's records and planning schedules from production supervisors.

Cost center: This may be defined as any point at which costs are gathered in order to control cost, fix responsibility and enable costs to be recharged on an equitable basis

► EXAM CONTEXT

You must be prepared to answer questions touching on definition of cost accounting terminologies and distinguish cost accounting from other disciplines of accounting such as management and tax accounting. Questions normally set from this section are theoretical and thus you need to understand the theory to be able to answer them well.

► INDUSTRY CONTEXT

The applicability of this topic comes in handy when holding discussions with other managers in a firm or during meetings. You need to understand the cost accounting terminologies and how it relates to other disciplines for effective relay of the messages intended for managers of other fields.

DEFINITION OF COST ACCOUNTING

In general, cost accounting is a field of accounting that measures, records and reports information about costs. It involves the comprehensive set of principles, methods and techniques to determine an appropriate analysis of costs to suit the various parts of organizational structure within the enterprise.

There is, however, no watertight definition for cost accounting. Various authorities and scholars have gone ahead to give their definitions. Some of the definitions include:

“That part of management accounting, which establishes budgets and standard costs and actual costs of operations, processes, departments or products and the analysis of variances, profitability or social use of funds.” (Chartered Institute of Management Accountants - CIMA).

“That which identifies, defines, measures, reports and analyzes the various elements of direct and indirect costs associated with producing and marketing goods and services. Cost accounting also measures performance, product quality and productivity.” (Letricia Gayle Rayburn).



“A systematic process of collecting, summarizing and recording data regarding the various resources and activities in a firm so as to calculate the basis of production costs used in financial accounting or making other relevant decisions in a firm.” (Horngren C.T)

Cost accounting is broad and extends beyond calculating production costs for inventory valuation, which government-reporting requirements largely dictate. However, accountants do not allow external reporting requirements to determine how they measure and control internal organization's activities. In fact, the focus of cost accounting is shifting from inventory valuation for financial reporting to costing for decision-making.

The main objective of cost accounting is communicating financial information to management for planning, evaluating and controlling performance, and to assist management to make decisions that are more informed. Its data are used by managers to guide their decisions.

From the definitions above, we can generally say that cost accounting is concerned with:

- Cost planning and cost control of activities of operations since it aims at improving efficiency by controlling and reducing costs
- Resource allocation decisions, for instance, production, pricing and product costing
- Performance measurement and evaluation of managerial performance; this is done through variance analysis, comparing actual output with the standard or budgeted output.
- Formulation of overall strategies and long range plans; Cost accounting will be useful in forecasting

Cost accounting aims at providing useful information to decision makers to enable them make better decisions. It helps them in preparing various statements such as cash budgets and performance reports, cost data collection and application of costs to products and services.



Cost Accounting Terms

a) Cost

A cost is simply a quantification or measurement of the economic sacrifice made to achieve a given objective. It is, therefore, a measurement of the amount of resources sacrificed in attaining a specified goal. For a product, cost represents the monetary measurement of resources used such as materials, labor and overheads. For a service, cost is the monetary sacrifice made to provide the service. Accountants generally use cost with other descriptive terms, for example, historical, product, prime, labour or material. Each of these terms defines some characteristic of the cost measurement process or an aspect of the object being measured.

b) Cost object or cost unit

This is an activity for which a separate measure of costs is desired. Examples include cost of providing a service to a client or cost of manufacturing a specific product or undertaking a specific assignment, and cost of running an organizational segment. In other words, a cost object/cost unit is the quantitative unit of the product or service in relation to which costs are ascertained. It is determined by the nature of the business enterprise.

c) Cost accountant

He/she is a member of the accounting department responsible for collecting product costs and preparing accurate and timely reports to evaluate and control company operations. He/she assembles, classifies and summarizes financial and economic data on the production and pricing of goods and services. Some of the roles that he plays in the various aspects of the organization include:

- Material cost control: this includes tracing materials issued to departments, reporting of the cost of material wasted (variance analysis) and provision of information about ordering and holding costs of stocks.
- Labour cost control: this includes time keeping and payroll operation, establishing of standard labour cost for various products, monitoring productivity of labour and analysis of hours worked
- Overhead cost planning and control: understanding the cost behavior of cost items, identifying the expenditure on overheads by various departments and establishing the absorption rate guides.
- Operational efficiency: this includes ensuring that maximum output is achieved at minimum cost.

d) Cost analysis

This is an activity that uses engineering, time and motion studies, timekeeper's records and planning schedules from production supervisors. Cost analysis techniques include break-even analysis, comparative cost analysis, capital expenditure analysis and budgeting techniques. After determining what is actually happening, accountants should identify available alternatives. Professional judgment is then needed to apply and interpret the results of each costing technique.

e) Cost benefit approach

This is the primary criterion for choosing among alternative accounting approaches. In a company, there is a direct relationship between the amount of time and the funds that management is willing to spend on cost analysis and the degree of reliability desired. If a company wants detailed records with a high degree of accuracy, managers should provide additional time and money for compiling and maintaining cost information. Managers should only use cost analysis and control techniques when anticipated benefits in helping achieve management *goals exceed the cost*.

f) Responsibility center

This is a part of the organization in which a manager who has a budget is made responsible for the plans and the resulting information on the performance of the plans.



Responsibility accounting is the use of budgeting with standard costing. Responsibility center makes it necessary for the organization to be organized with clear statements of the responsibilities of each manager who has a budget. The process of responsibility center enables management by exception principle to be practised. This is where a subordinate is given a clearly defined role with the requisite authority and resources to carry out that part of the overall plan assigned, and if activities do not proceed according to plan, the variations are reported to a higher authority. There are various types of responsibility centers, namely, cost center, revenue center, profit center and investment center, among others.



This refers to a production or service department in an organization where costs are incurred for the production of goods and services. Cost centers accumulate costs directly incurred and apportioned in order to ascertain the total cost of a department or center for a particular period. Cost centers ascertain costs and relate to cost units for control purposes. They help in ascertaining the total cost incurred in each center, determining whether the cost centers are working efficiently, controlling costs effectively, allocating costs to appropriate departments or cost units and, planning the activities of a particular department and improving their performance.

ROLE OF COST ACCOUNTING IN MANAGEMENT

Fast forward:

Cost accounting is useful and applicable in business organizations and its environment in many ways.

Cost accounting is utilized for a number of purposes, some of which are briefly described in the following points:

- a) **Accounting for costs**
This may be seen as a record keeping or score-keeping role. Information must be gathered and analyzed in a manner which will help in planning, controlling and decision making
- b) **Planning and budgeting**
This involves the quantification of plans for future operations of the enterprise; such plans may be for the long or short term, for the enterprise as a whole or for the individual aspects of the enterprise.
- c) **Control of operations of the enterprise**
Control may be assisted by the comparison of actual cost information with that included in the plan. Any differences between planned and actual events can be investigated and corrective action implemented as appropriate

d) Decision making

Cost accounting information assists in the making of decisions about future operations of the enterprise; such decisions making may be assisted by the information from cost techniques and cost-volume-profit analysis.

e) Resource allocation decisions

For example product pricing in determining whether to accept or reject jobs. This is based on cost and revenue implications of the relevant decisions

f) Performance evaluation

Cost accounting information is used to measure and evaluate actual performance so as to make a decision of the degree of optimality or efficiency of resource utilization.

SCOPE OF COST ACCOUNTING

As part of their jobs, cost accountants interpret results, report them to management and provide analyses that assist decision-making in the following departments:

a) Manufacturing

Cost accountants work closely with production personnel to measure and report manufacturing costs. The efficiency of the production departments in scheduling and transforming materials into finished units is evaluated for improvements.

b) Engineering

Cost accountants and engineers translate specifications for new products into estimated costs; by comparing estimated costs with projected sales prices, they help management decide whether manufacturing a product will be profitable.

c) Systems design

Cost accountants are becoming more involved in designing computer integrated manufacturing (CIM) systems and databases corresponding to cost accounting needs. The idea is for cost accountants, engineers and system designers to develop a flexible production process responding swiftly to market needs

d) Treasury

The treasurer uses budgets and related accounting reports developed by cost accountants to forecast cash and working capital requirements. Detailed cash reports indicate where there are excess funds to invest or where cash deficits exist and need to be financed.

e) Financial accounting

Cost accountants work closely with financial accountants who use cost information in valuing inventory for external reporting and income determination purposes.

**f) Marketing**

Marketing involves the cost accountant during the product innovation stage, the manufacturing planning stage and the sales process. The marketing department develops sales forecast to facilitate preparing a products manufacturing schedule. Cost estimates, competition, supply, demand, environmental influences and the state of technology determines the sales price that the product will be offered and will command in the market.

g) Personnel

Personnel department administers the wage rate and pay methods used in calculating each employees pay. This department maintains adequate labour records for legal and cost analysis purposes.

At this point, it cannot be over-emphasized that cost accounting is simply an information system designed to produce information to assist the management of an organization in planning and controlling the organization's activities. It also assists the management to make informed decisions so as to enable the organization to operate at maximum effectiveness and efficiency.

ROLE OF COST ACCOUNTING DEPARTMENT

The cost accounting department is responsible for keeping cost accounting records. This includes gathering, compiling and communicating a variety of information regarding an organization's cost activities. For the records kept to be of proper use for the managerial functions, they should

- analyze production, administration, selling and distribution costs in such a way as to help management reach decisions required.
- be used to produce periodic performance statements or control reports which are necessary to the management for control purposes.
- the cost accounting system should be capable of analyzing
 - past costs for profit measurement and stock valuation purposes
 - future costs of planning and decision making

Information obtained may be non-mutually exclusive in nature. This means that information gathered as part of the management information system may be used in two or more subsystems for differing purposes. An example of this information is with regard to the amount and location of work in progress: (work in progress refers to partly completed units of products where a product passes through a number of operations and processes before being passed into finished goods store or to the customer). Work in progress information may be used by:

- a) **Production planning department;** in order to monitor the progress of parts of an order through the production process and to instigate action to speed up the completion of slow moving parts of an order.

- b) **Quality control department;** in comparing one batch of product with another in highlighting the incidences of process losses and their location.
- c) **Cost management department;** in the quantification and valuation of actual losses as compared to the level originally allowed for in the business plan.
- d) **Financial accounting department;** in the valuation of work in progress for balance sheet purposes and for purposes of determining the cost of sales in the income statement.

Tutorial note:

Business Management involves planning, organizing, staffing, directing and controlling an organization's activities so as to meet a specified objective, usually profit maximization. The function of managing a business' activities is entrusted to the managers of the business. For the managers to maximize profits, they must minimize the entire business' costs. They, therefore, need to track all costs as they are incurred and recovered via the organization's activities. To get this information as it happens (LIVE), they need an effective an efficient 'information system' referred to as cost accounting. It will, therefore, be appreciated that if an organization's cost accounting information system fails, managers cannot manage it efficiently and effectively.

COST ACCOUNTING AND OTHER ACCOUNTING SUBJECTS

Accounting can be described as a specialized information system that is used for purposes of decision making by the management of the organization and other users such as tax authorities, investors, creditors and the public. Accounting is broadly divided into Financial Accounting and Management Accounting.

Cost accounting and Management accounting distinguished

CIMA defines management accounting as "provision of information required by the management for such purposes as formulation of policies, planning and controlling the activities of the enterprise, decision making on the alternative courses of action, disclosure to those external to the entity (shareholders and others), disclosure to employees and safeguarding assets. Cost accounting and management accounting have basically the same functions.

Management accounting is part of accounting that relates to the provision of financial information to people and managers within the organization to aid in the execution of management functions: planning, organizing, controlling, evaluation of performance and decision making such as make/buy decisions. It involves professional skills and knowledge. In particular, it involves preparation



and presentation of information to all levels of management in the organization. The information generated by management accounting is, therefore, for internal uses and is not guided by any standards or legal requirements.

Management Accounting, unlike financial accounting, is proactive i.e. it is future-oriented. In a nutshell, cost accounting enables a business to, not only find out what various jobs or processes have cost, but also what they should have cost. It indicates where losses are occurring before the work is finished and therefore corrective action can be undertaken. However, there is a very slim distinction between Cost accounting and Management accounting. In fact, cost accounting is part of management accounting.

Cost accounting and Financial accounting distinguished

Fast forward:

Cost accounting and financial accounting have been distinguished under various subtopics. Starting with their definition to the mode of accounting, regulation and information used.

Financial Accounting is concerned with provision of information to parties outside the organization. This is the analysis, classification and recording of financial transactions and the ascertainment of how such information will be reported to the various users. It involves the development of general-purpose financial statements largely for external reporting. It requires that costs should be matched with revenues in order to calculate the profits for the period under consideration.

These statements are developed in accordance with standards imposed by the public (through the professional accounting bodies such as the Institute of Certified Public Accountants of Kenya (ICPAK) and the International Accounting Standards Board (IASB) as well as the requirements of the Companies Act Chapter 486.

Cost accounting and financial accounting are distinguishable in various aspects. The major differences between the two branches of accounting are:

a) **Generally accepted accounting principles**

There are a number of accounting standards that are followed in producing accounting information. Financial statements must be prepared in accordance with the Generally Accepted Accounting Principles applicable in the industry in which the firm operates. The statements produced are intended for use by external users. Such users require assurance that the information they are receiving has been prepared with some common set of ground rules. Otherwise, there could exist an opportunity of fraud or misinterpretation which would destroy their confidence in the financial statements.

However, in cost accounting, managers are not governed by any standards or principles. They use a number of techniques, which include budgeting, standard costing, marginal costing and cost-volume-profit analysis. They set their own ground rules.

b) **Statutory requirement**

Financial accounting is mandatory. It is governed by the Companies Act Cap 486, which requires that a number of accounting records be kept and made available, for instance,

a summary of cash flows. For limited companies, audited financial statements must be produced, which in the opinion of the auditor, portray a true and fair view.

Cost and management accounting is not mandatory. It is entirely optional. Information prepared by the managers may or may not be produced depending on the managers' intention. In addition, managers may or may fail to create a cost accounting department.

c) Focus on segments of the organization

Financial accounting focuses on the organization as a whole. It is primarily concerned with the reporting of business activities for the company as a whole.

On the contrary, cost accounting focuses less on the whole and more on the parts or segments of the company. It lays emphasis on segments of the business while conducting analysis; examination of job, process, product or service. Examples of segments include departments, product lines and company divisions.

d) Emphasis on non-monetary measures

Non-monetary measures are used in the interpretation of accounting statements, for example, expressing gross profit as a percentage of sales revenue to obtain the markup. Thus, monetary base is predominant in financial accounting. However, in cost accounting, there will be greater use of non-monetary measures. Managers lay more emphasis on non-monetary measures. These include areas like materials requirement and labour input, material losses, machine efficiency, e.t.c.

e) Futuristic cost accounting versus historical financial accounting

Cost accounting is futuristic in that it focuses on the future thus necessitating managers to have a strong future orientation. Managers concentrate more on planning, as it is the key to success. Without proper plans, most of the activities of the company may be bound to fail. Nevertheless, historical information is crucial in the planning process. Managers analyze historical information and use it in the planning process. Use of historical information in forecasting poses a great challenge since managers cannot simply assume that the future will be simply a reflection of the past. Changes taking place, however, demand managers planning framework be built in large part of estimated data that may or may not be a reflection of past experience.

In financial accounting, there is the statutory requirement for provision of historical data from which accounting statements may be prepared. Such statements may be used in the forecasting of future trends for use by potential investors or investment analysts.

f) Precision and accuracy of information provided

Financial accounting lays more emphasis on precision and accuracy of data to the nearest cent except in subjective areas such as determination of depreciation and other allowances.

On the contrary, in cost accounting, accuracy of information will tend to vary with the circumstances. For instance, Management Reports may summarize figures to the nearest thousand shilling whereas the material cost per unit of a product may be expressed to four decimal places. At times, cost accounting recognizes the need for good estimates and approximations rather than for numbers, which are accurate to the last, penny. When information is needed, speed becomes more important than



precision. The faster the information is obtained, the faster the problems are attended to and resolved. Thus, the manager is often willing to trade off some accuracy for information that is immediately available.

g) Is accounting a means to an end or an end in itself?

Financial accounting is an end in itself in so far as it fulfils the statutory requirements in relation to accounting records and the publication of financial accounting statements. It is also a means to an end in that it provides an overview of the business, which may be interpreted by the various users of accounting information, which the Companies Act seeks to protect. Cost and management accounting is a means to an end. It may be used to assist management in future planning, control and decision-making required for the efficient implementation of the objectives of the enterprise and the strategies, which will best lead to achievement of these objects.

h) To what extent does the discipline draw from other disciplines?

Cost and Management accounting draw heavily from other disciplines for instance finance, statistics, operation research and organizational behavior. This forms a strong interdisciplinary network. Cost accounting extends beyond the boundaries of traditional accounting. The external sources give managerial accounting a strong interdisciplinary flavor.

i) For what use is information generated intended?

Cost accounting system provides information to be used internally in an organization. That means much of the information that a manager needs would be confusing or valueless to external stakeholders. The manager uses information derived from the cost and management accounting system to direct day-to-day operations, plan the future, solve problems and make decisions.

On the other hand, financial accounting provides information for external use. Users of financial accounting information include stockbrokers, the government, potential and existing investors and customers.

j) What are the pertinent qualities of the information generated from the system?

Financial accounting data are expected to be objectively determined and verifiable since they are intended for external use.

The manager is more concerned about receiving relevant and flexible information than completely objective and verifiable information. In cost accounting, relevance and objectivity may be viewed as a matter of secondary importance.

In summary, the comparison and contrast can be summarized in the table below:

	Cost and management accounting	Financial accounting
1	Cost accounting is not governed by any principles or concepts.	Financial Accounting is highly regulated and is governed by the Generally Accepted Accounting Principles.
2	Cost accounting is not mandatory, the management may practice it or not	Financial management is a statutory requirement. It is mandatory.

3.	Cost accounting looks at segments of the organization and the organization as a whole.	Financial accounting looks at the organization as a whole. It is less concerned with segmental performance.
4.	Cost accounting is futuristic; it places more emphasis on the future.	Financial accounting is historical in that it reports what has already taken place.
5.	Cost accounting places less emphasis on precision and more emphasis on non-monetary data.	Financial accounting places more emphasis on monetary data and precision
6.	Cost accounting draws heavily from other disciplines such as economics, finance, statistics and operation research.	Financial accounting draws little if any from other disciplines. It is governed by the statutes and the Generally Accepted Accounting Principles
7.	Cost and management accounting provides data for internal use by management.	Financial accounting provides data for external uses.
8.	Cost accounting emphasizes the relevance and flexibility of data.	Financial accounting emphasizes more on objectivity and verifiability of data.

SELECTION OF AN IDEAL ACCOUNTING SYSTEM

A system is a set of interdependent parts, which together form a unitary whole that performs certain functions. A number of sub systems make up the whole. In this context of an organization, a management information system may be seen as the overall system with a number of sub-systems including the cost and management accounting system that provide the information to management for purposes of planning, organizing, directing and controlling the organization's activities so as to achieve corporate goals, including profit maximization.

A number of features and factors must be taken into account when designing a cost and management accounting system. These are:

- Preliminary investigations must be made before a system is installed. This helps to disclose weaknesses and inefficiencies.
- For accuracy of cost records, a system of material cost, labour cost and production overheads cost is essential
- Nature of the business enterprise must be put into consideration when designing the cost accounting system. The system developed should be practical and must suit the business
- The system should be cost effective in that the benefits derived from the system must be greater than the cost of running it.



The following factors must be taken into account before finalizing the cost accounting system design

- a) The system must be designed in such a way as to meet the managerial information needs. There should be no duplication in reporting. Only relevant management information should be provided. Information is relevant if it has an impact on the decision made by the management.
- b) The factory layout and production sequence. This is important for the identification of the sequence of production i.e. the starting and the ending points.
- c) Control exercised over production; the cost data must focus on specific areas of control so that the responsibility of any variances between the actual and the standard costs can be identified with an individual manager or department.
- d) Nature of raw materials used affect the system adopted. This is because it affects the recording and issuance of raw materials and the method of pricing
- e) The deployment of workers, who may work as a team or as individuals. This affects the method of remuneration and the analysis of time worked. For instance, where employees work as a team, there may be group bonus awards, which do not exist in situations where employees work individually.
- f) Key personnel and office staff; their cooperation is vital for the success of the system. In addition, the system needs to be simple and easy to understand to enhance acceptability
- g) Relative size of cost element; it is only reasonable to analyze cost elements with a significant value. Cost elements of insignificant value may be left out of the analysis depending on the composition of the cost items
- h) Need for uniformity; a business needs to observe the industrial norms and thus follow the industrial practices as regards the accounting. If the business, for instance, belongs to a trade association, it will need to follow the association's recommendation on cost accounting principles and in order to facilitate comparison of its data with that of other businesses in the industry.
- i) The cost benefit analysis should be carried out and it is only reasonable to run a system whose benefits are more than the costs incurred in terms of money, time spent in designing, installing, testing, running and maintaining the cost accounting system.
- j) The system should be capable of adapting to changing conditions. It should be logical and simple. Flexibility is vital to any accounting system bearing in mind that the organization exists in an open system. It is only a subsystem of a larger system.
- k) Periodical upgrade of the system is crucial to avoid the danger of going obsolete as the world is rapidly changing.

THE RELATIONSHIP BETWEEN THE NATURE OF THE BUSINESS ENTERPRISE AND COST ACCOUNTING

Fast forward:

Cost accounting method used depends on the nature of the business besides other factors.

The relationship between cost accounting and the nature of the business stems from the fact that the accumulation of costs into cost centers is fully dependent on the nature of the business enterprise. What is a cost center in one business enterprise may not be a cost center in another business enterprise.

The business enterprise may be such that:

- (a) Individual orders are received from customers for work which is undertaken according to the specific requests of the customer (specific order costing).
- (b) Output is the result of a series of continuous operations or processes (process costing)
- (c) A service is provided to the customer (operation/service costing).

The costing and management accounting system is designed and operated such that costs can be identified and accumulated for each unit of output. The costs are then accumulated for the various cost centers and further analysis done to produce useful information for planning, controlling, decision-making and performance evaluation.

A Cost Center Framework/Approach in Cost Accounting

Cost accounting is based on the concept or framework of cost centers, i.e. all the costs incurred during the production process have to be identified and accumulated around certain points of the production process, referred to as cost centers.

A **cost center** may be defined as 'any point at which costs are gathered in order to control cost, fix responsibility and enable costs to be recharged on an equitable basis. Each cost will be the responsibility of one management member and will have costs charged to it and also costs recharged from it if such costs are incurred for purposes of offering a service to other cost centers.



□ Summary of features of an effective cost center framework

In establishing cost centers, an organization should consider the following points:

- (a) Clear definition of the cost center boundaries: This should ensure that there is no overlapping of the boundaries defined in two or more centers and that no gaps exist where some aspect of the business, which incurs cost, is not contained in a cost center.
- (b) A clear link with the manager responsible so as to hold someone responsible for the costs incurred in a cost centre.
- (c) Costs should be analyzed into clearly defined categories in order to ensure that planned and actual expenditure may be analyzed in the same way.
- (d) The cost centers should enable the effective and efficient planning, directing and control of the organization's activities, thereby enabling it achieve its objectives.

CHAPTER SUMMARY

There is no watertight definition of cost accounting. CIMA defines cost accounting as that part of management accounting which establishes budgets and standard costs and actual costs of operations, processes, departments or products and the analysis of variances, profitability or social use of funds”

Cost accounting is broad and extends beyond calculating production costs for inventory valuation, which government-reporting requirements largely dictate.

Cost accounting is applicable in types of activities, manufacturing and non-manufacturing, in which monetary value is involved. It enhances efficient operations in various sectors.

CHAPTER QUIZ

1. State two definitions of cost accounting.
2. Highlight the various distinctions between cost accounting and financial accounting
3. Distinguish between qualitative and quantitative information.
4. Highlight the areas in which cost accounting may be useful in an organization
5. Define a cost center

ANSWERS TO THE CHAPTER QUIZ

1. Some of the definitions include.

“That part of management accounting which establishes budgets and standard costs and actual costs of operations, processes, departments or products and the analysis of variances, profitability or social use of funds” (Chartered Institute of Management Accountants - CIMA)”

“That which identifies, defines, measures, reports and analyses the various elements of direct and indirect costs associated with producing and marketing goods and services. Cost accounting also measures performance, product quality and productivity” (Letricia Gayle Rayburn)”

“A systematic process of collecting, summarizing and recording data regarding the various resources and activities in a firm so as to calculate the basis of production costs used in financial accounting or making other relevant decisions in a firm (Horngren C.T)

2. Differences between cost accounting and financial accounting can be summarized under the following:
- Restriction by GAAP
 - Statutory requirement
 - Focus on segments of the organization
 - Emphasis on non-monetary measure
 - Futuristic versus historical accounting
 - Precision and accuracy of information provided
 - Intended use
 - Pertinent qualities of information generated from the system
3. Quantitative is that which may be measured in monetary terms or other physical units e.g. material may be expressed as Shs.1000 or 250 kilos. It is easily objectively expressed. Qualitative information is that information that cannot be objectively expressed
4. Areas where cost accounting may be useful in an organization include product pricing, sensitivity analysis, analysis of performance, and production planning and decision-making.
5. A cost center is any point at which costs are gathered in order to control cost, fix responsibility and enable costs to be recharged on an equitable basis.

PAST PAPER ANALYSIS

12/02 Q6; 12/01 Q7(a); 12/00 Q6; 05/99 Q7(a); 12/97 Q7; 12/95 Q6; 06/93 Q7(d), 11/92 Q6;



EXAM QUESTIONS

Question one

Explain the areas in which cost accounting may be useful in an organization (10 marks)

Question two

Identify the types of responsibility centers used in responsibility accounting and discuss how the performance of each responsibility centre type might be measured. (20 marks)

Question three

Discuss controllable and non-controllable factors (10 marks)

CASE STUDY

Coordination between operational and strategic planning is very essential in any organization, but lack of it may result in unrealistic plans, inconsistent goals, poor communication and inadequate performance measurement.

In the context of strategic planning goal of sustaining competitive advantage at minimum cost through speedy delivery of quality products to clients, key features or characteristics, which a company Y should incorporate in each of strategic planning and operational planning include:

1. Unrealistic operational plan will force staff to try hard with few resources. Mistakes and failure are almost inevitable. This means poor quality products; costs include lost sales, arranging for returns, and time wasted dealing with complaints and rectification work. Over-ambitions plan may also mean that more stocks are produced than an organization could realistically expect to sell (meaning the costs of written-offs, opportunity costs of wasted production resources and unnecessary stock holding cost are incurred).
2. Inconsistent strategic planning and operational planning goals may mean that additional cost is incurred. For example, an operational plan may require additional inspection point in a production process so as to ensure that quality products are delivered to customers. The resulting extra costs will be at odds with the strategic planning goal of minimum costs.
3. Poor communication between the senior management who set strategic goals and lower level operational management could mean that operational managers are unaware of the strategic planning goal of sustaining competitive advantage at minimum cost

through speedy delivery of quality products to customers. Some operational managers may, therefore, choose to focus on quality of products while others attempt to produce as many product as possible as quickly as they can; still others will simply keep their heads down and do as little as possible. This will lead to lack of co-ordination; there will be bottlenecks in some operational areas, needing expensive extra resources in the short term, and wasteful idle time in other areas.

4. Inadequate performance measurement will mean that the organization has little idea of which area is performing well and that which needs attention. If quality of products and speed of delivery are the main source of competitive advantage, a business needs to know how good it is in the two. For example, if an organization measures only conventional accounting results it will know how much stock it has and how much it has spent on 'carried out'. It will not know the opportunity cost of cancelled sales though not having stock available when needed or not being able to deliver it on time. Otherwise, repairs and maintenance costs of machinery would vary with the level of activity. But machines would still need a certain level of maintenance even if they were not being used,(the company might, on the other hand, be considering selling the machinery, accounts of which may not have been taken). Finally, the costs of buying in may also be highly subjective. Accounts may not have been taken of costs such as increases or decreases in time spent delivering the components (from abroad perhaps) or complaints or costs resulting from badly made component. It is, therefore, obvious that the behavior of costs associated with a decision must be fully understood and their relevance to that decision ascertained before the decision is finally made.

CHAPTER TWO



COST CLASSIFICATION



CHAPTER TWO

COST CLASSIFICATION

► OBJECTIVES

After studying this chapter, you should be able to:

- Define cost classification and understand the basis of cost classification, especially the cost objectives
- Classify a specific cost as either manufacturing or non-manufacturing and whether direct or indirect.
- Understand the behavioral classification of costs and be able to classify various costs according to their behavior, either variable or fixed, and draw cost graphs for the various costs
- Understand the controllable and non-controllable costs and their relevance in cost decision making.
- Classify costs according to their functions.
- Explain the difference between product and period costs.

► INTRODUCTION

This chapter is aimed at introducing the most important concepts applicable in all the other chapters. We look at the various cost classifications based on the various basis of classification.

► DEFINITION OF KEY TERMS

Prime cost: this is a summation of all direct costs incurred in production. It comprises direct material and direct labour costs and direct expenses.

Variable cost: a cost that changes in direct proportion to changes in the level of activity.

Fixed cost: a cost that does not change with the level of output - also called autonomous cost

Direct costs: are costs that can be traced specifically and identified to the end product of the production process without any extra cost or inconvenience

Indirect costs: are costs that will not be directly attributable to a specific product. They are regarded as overheads.

Marginal cost: it represents the additional cost of producing an extra unit of output.

► EXAM CONTEXT

This topic is normally examined because it is the basis on which flexible budgets, among other statements, are prepared. It provides the ground on which to understand various costing techniques. The examiner may not set questions directly from this topic but from topics that borrow significantly from cost classification topic.

► INDUSTRY CONTEXT

Cost classification is important as management accountants apply it when preparing budgets and carrying out sensitivity analysis. The above are just but a few applications.

Fast forward:

Costs are classified for various purposes or reasons. There is an objective for each classification. A cost can fall into more than one classification based on the objective.

Cost classification may be defined as 'the arrangement of cost items in a logical sequence having regard to their nature and purpose to be fulfilled'. Costs are classified according to the cost objectives. Cost objective is the activity for which a separate measure of cost is desired. They include, cost stock valuation, cost for decision-making and cost for control purposes. The table below shows a summary of cost classifications given cost objectives:

	Cost objective	Possible classification
1.	Stock valuation	<ul style="list-style-type: none"> Manufacturing and non-manufacturing costs Period and product costs Direct and indirect costs
2.	Decision making	<ul style="list-style-type: none"> Cost behavior: Variable, fixed, semi variable, Relevance: opportunity, sunk cost, historical cost, standard costs
3.	Control purposes	<ul style="list-style-type: none"> Controllable and non-controllable Avoidable and non avoidable



MANUFACTURING AND NON-MANUFACTURING COSTS:

Manufacturing costs

These are the costs incurred to produce a product. Remember that a product refers to both goods and services. The elements of manufacturing costs are: direct material costs, direct labour costs; and overhead costs. The elements make up the total cost of a product, as shown below:

Note; direct expenses are expenses incurred for a particular job, project or service e.g. royalties, franchise, hire of special equipment, materials, labour, e.t.c. they are traceable to that specific job.

These costs are discussed further in the following sections.

(a) Material costs:

Material refers to all the physical inputs into the production process. They do not only refer to purely unprocessed materials or natural resources but refers to any material input in the manufacturing process. Finished goods for one company can be raw materials for another for instance, packed wheat flour is a finished good for the milling industry but a raw material to the banking industry.

Raw materials can be classified as direct or indirect

Direct materials are those materials that can be easily traced to a product without any extra cost or inconvenience. Examples include leather and sole for a shoe making industry.

Direct expenses are expenses incurred for a particular job, project or service e.g.

- Royalties
- Franchise
- Hire of special equipment

Indirect materials are materials that become an integral part of the finished product but may be traceable into the product only at great cost or inconvenience. Examples include glue and thread for a shoe making industry.

An analysis of the various materials input into a production process is as follows

- Raw material
- Components and subassemblies
- Consumable materials
- Maintenance materials

■ (b) Labour

Labour is the physical and mental human input in a production process. Labour costs can be divided into direct labour costs and indirect labour costs.

Direct labour cost refers to wages paid to workers who are directly involved in the production of each item produced. Such labour cost can be physically traced to the creation of product without undue cost. The cost can be readily identified with specific product or unit. For instance, wages paid to factory supervisors, forklift truck drivers, factory store room clerks, etc.

Indirect labor costs refer to the wages paid to workers whose efforts cannot be readily identified with specific product units or batches e.g. laborers paid to maintain all the premises utilized for production of goods and services.

■ (c) Overhead costs

They are also called indirect production costs. They include all costs of manufacturing except direct materials and direct labour. They are incurred for the benefit of all products thus the amount of overhead allocated can only be an estimate. They include indirect materials, indirect labour and other indirect expenses that cannot be traced directly to a product. They are at times referred to as factory burden, factory overheads or manufacturing expense.

■ Functional classification

Non-manufacturing costs are costs incurred by all activities that support the production of goods and services. They are administration costs, selling costs and distribution costs. These are explained as follows:

- (a) **Production costs:** these are costs incurred in the manufacturing process. They include material costs, labour costs and overhead costs as discussed above.
- (b) **Administrations cost:** Is the sum of costs associated with the overall management of the enterprise, which cannot be readily identified with one of the major functional areas e.g. salary of the factory manager would be seen as a production cost but the salary of the personnel officer will be viewed as administrative cost since the personnel function does work for all other functions of the enterprise.



- (c) **Selling Cost:** this is the sum of costs associated with the securing of orders from customers. Included in this area will be items such as the salaries paid to the salesmen and expenditure on advertising.
- (d) **Distribution costs:** these are costs associated with warehousing the products and their delivery to customers. They are incurred in getting the finished product to customers for instance, depreciation of the distribution van.
- (e) **Finance costs:** These are costs incurred to secure funds to finance the organization's activities. These include interests on loans and overdrafts, dividends to shareholders, interests on debentures etc.
- (f) **Research and development costs:** These are costs that are incurred to invent new products or to modify the existing ones, as well as costs incurred to acquire more information on such products.

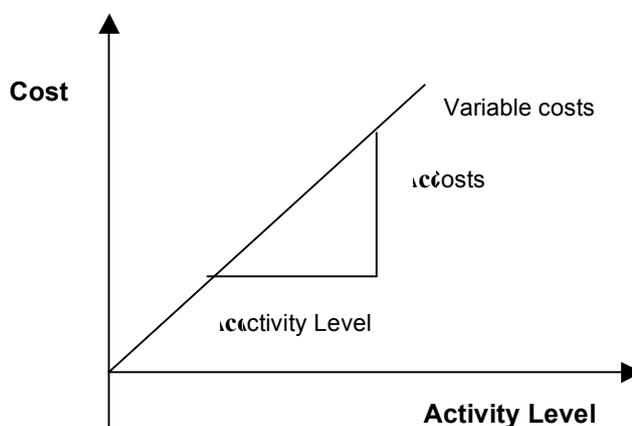
Classification according to behavior

□ Definition

Cost behavior means how costs will respond or react to changes in the activity level. i.e. as we increase output or sales, are the costs rising, dropping or remaining the same. Cost Behavior can be used to produce various classifications of costs such as:

■ Variable costs

These are costs that increase or decrease, in total, in direct proportion to changes in the total level of activity or number of units produced i.e. that portion of the cost of an activity that change with the level of output. Examples of variable costs include wages paid to casual employees paid on an hourly basis and fuel cost based on mileage.



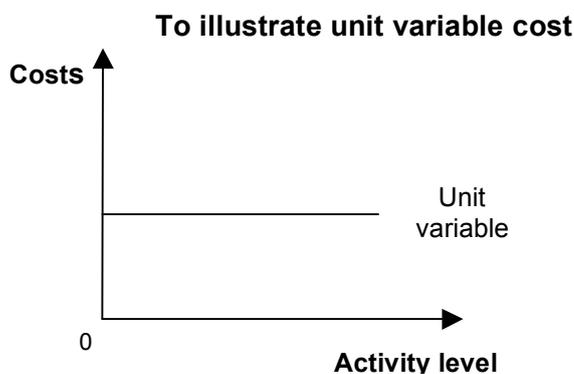
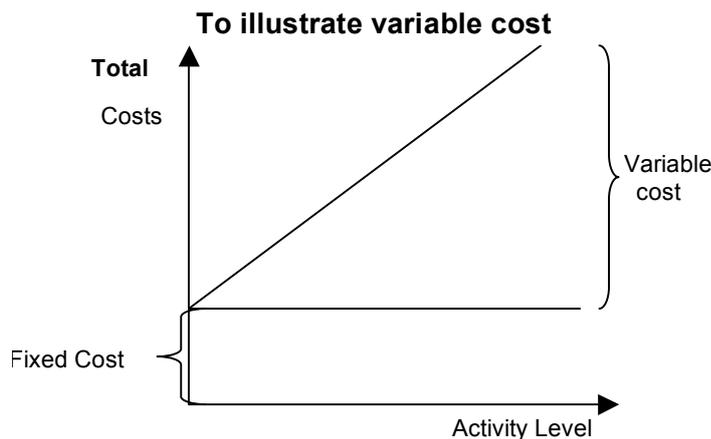
$$\text{Variable Cost per Unit} = \frac{\Delta \text{costs}}{\Delta \text{Activity level}}$$

With variable costs, the cost level is zero when production is zero. The cost increases in proportion to the increase in the activity level because variable cost per unit of activity level is constant, thus the variable cost function is represented by a straight line from the origin. The gradient of the function indicates the variable cost per unit.

For a cost to be variable, there should be an activity base which drives it. This activity base is a measure of effort that operates as a casual factor in the incurrence of variable costs. Thus to control these costs, cost accountants should be well acquainted with the various cost drivers (activity bases) within the organization.

■ Semi variable costs

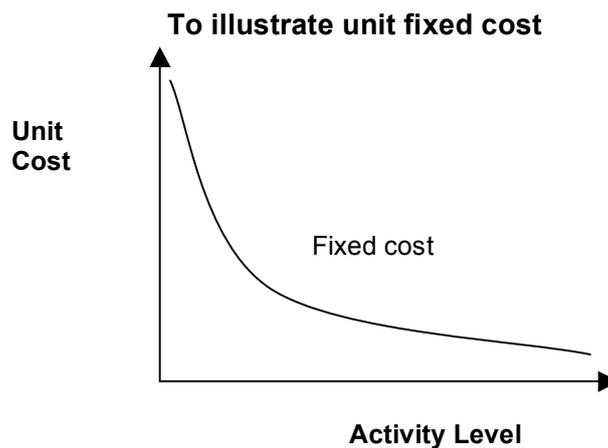
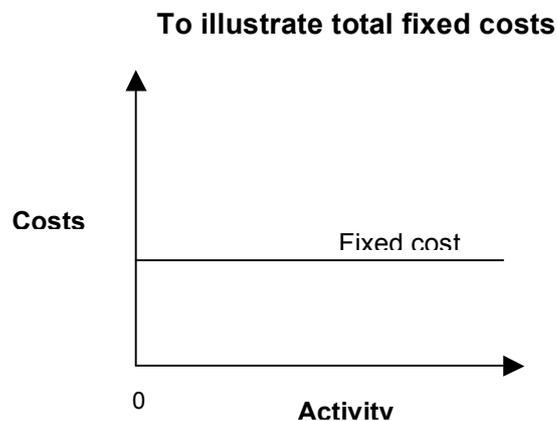
These are costs with both a fixed and variable cost component. The fixed component is that portion which is constant irrespective of the level of activity. They are variable within certain activity levels but are fixed within other activity levels, as shown below: examples include salesmen salaries (salary plus commission, telephone charges, water bills, etc.





Fixed Costs

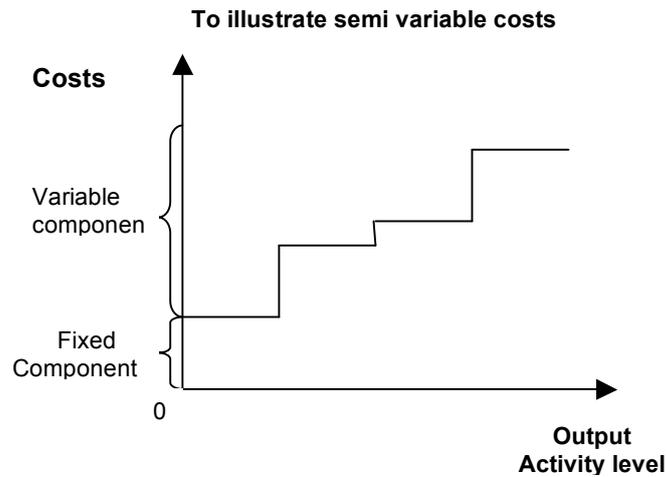
These are costs that do not change with the level of output. They are also called autonomous costs, as they remain the same irrespective of the activity level as shown below.



The classification of cost into fixed and variable costs would only hold within a relevant range beyond which all costs are variable. The relevant range is the activity limits within which the cost behavior can be predicted.

Semi Fixed Costs or stepped costs

These are costs which are constant within a certain production band but eventually increase at some critical point by a constant amount to another fixed level once the output band changes. This is a clear illustration of how fixed costs behave in the long run. For instance, managers' salaries are increased from time to time. Each time there is an increase, the costs increase by the amount added at that critical point.

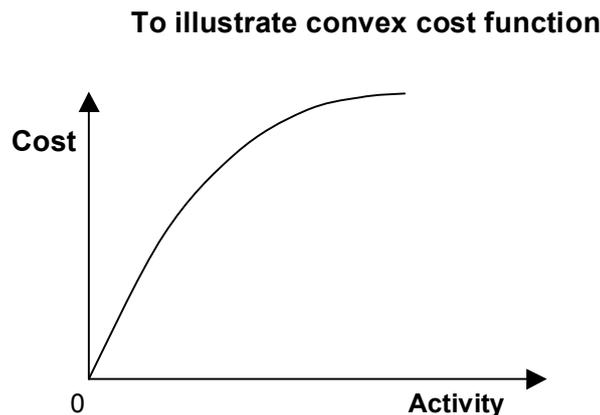


■ Curvilinear

Curvilinear cost functions exist where costs do not vary in direct proportion to the level of activity thus giving a non linear function.

(i) Convex cost function

Convex direct costs are said to occur where each and extra unit of output causes a less than proportionate increase in cost. This is especially the case where economies of scale are in operation. For instance, the more you buy, the more quantity discounts you secure. Though there is an increase in total material cost, the unit material cost continues to decrease for each and every additional material unit purchased. The cost function will appear as follows:

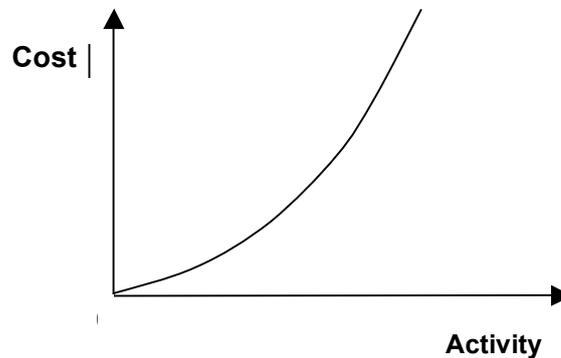


(ii) Concave cost function

Concave cost functions exist where an increase in activity level causes a more than proportionate increase in costs. For instance, where the rate of variability increases between two points e.g. wages paid under a bonus scheme. The cost function will be as shown on the opposite page;



To illustrate concave cost function



Assuming that bonus is awarded at an increasing rate on the following basis

Output	Bonus per unit
0 to 100	500
101 to 200	1000
201 to 300	1500

Note that the labour cost is increasing at a more than proportionate increase in output. When the relationship is plotted on a graph, a concave cost function will be derived.

DIRECT COSTS AND INDIRECT COSTS

Direct costs are costs that can be traced specifically and identified to the end product of the production process without any extra cost or inconvenience. Direct costs consist of costs that can be directly attributed to a specific output, product or level of activity. Direct costs include direct raw materials and direct labour also called prime costs in aggregate.

PRIME COST = Direct Material Cost + Direct Labour Cost + Direct expenses

Indirect costs are costs that will not be directly attributable to a specific product. They are regarded as overheads. Identification of overheads to specific products is done through cost allocation and apportionment. They include supervisors' salaries, rent, electricity, depreciation of building etc.

In order to trace a cost, it must first be possible, i.e. practical, to measure the service or supply and then determine the related cost. Note that it is not the nature of the cost but its traceability that determines whether the cost is direct or indirect.

■ Classification according to controllability

Controllable cost: Refers to the cost, which can be influenced by the actions of a person in whom authority for such control is vested. Cost is said to be controllable at a particular level of management if that level has the power to authorize its incurrence. In other words, controllable costs are costs that are reasonably subject to regulations by the manager with whose responsibility those costs are being identified. For instance, a decision to hire more personnel to an organization at affordable rates can be controlled.

Non controllable cost: is a cost which cannot be influenced by a person in whom authority for such control is vested. They are costs, which cannot be adjusted without affecting the long-term objective of the firm. For example if the trade union demands an increase in wages, the increment is a non controllable cost. Similarly, the depreciation of a building is a non-controllable cost to a manager as he does not have authority over depreciation.

In decision making, only controllable costs are relevant because they can be changed by the decision maker. There is little or nothing that the decision maker can do about the non-controllable costs thus they are irrelevant in decision making.

■ Classification according to normality

Normal costs: these are costs that are expected to be incurred given a specific level of production. They may also be referred to as standard costs.

Abnormal costs: abnormal costs are costs above the normal costs given a specific level of activity. For instance, abnormal costs may be incurred in production where the prices of materials have significantly and adversely varied from the standard.

■ Classification according to time

Historical costs: these are costs that were incurred at a given time in the past. They are irrelevant for decision making. An example is acquisition cost of an asset.

Predetermined costs: these are estimated costs that have been estimated for purposes of decision making. An example of such costs include overheads which are absorbed on a given predetermined overhead absorption rate. They are not always accurate.

■ Classification based on identification with inventory

Under this classification, costs are classified according to the function they perform in an organization. Costs can functionally be classified as:



- (a) **Product costs:** are all the costs incurred in production of units during a time period e.g. raw material costs, direct labour costs and production overheads. Such costs are capitalized and expensed (charged to the profit and loss account) only when the manufacturer sells inventory. These costs may be carried from one period to the other.
- (b) **Period costs:** these are costs mainly incurred in the ordinary running of the business enterprise. They include costs like electricity bill paid, salaries and allowances and rent payments. They are referred to as period costs since they are expensed in the period they are incurred.

■ Classification for decision making

- (a) **Sunk costs:** these are costs, which have already been incurred. They cannot be changed by any decision made after incurrence. Such costs are irrelevant for decision making. For example, cost of a delivery van already acquired by the organization shall be irrelevant as it cannot be changed by any course of action taken by management.
- (b) **Marginal cost:** is the additional cost of producing an extra unit of output.
- (c) **Opportunity cost:** is defined as the cost of the next best foregone alternative or the potential benefit that is lost by taking one course of action and giving up the other. For instance, by deciding to take on a leave and forego wages, the opportunity cost of the decision shall be the foregone wages.
- (d) **Differential cost/incremental cost:** these are costs that differ among alternatives. They are costs relevant for decision making. They may be either variable or fixed. For instance, if taking up a different business apartment amounts to an extra Shs.2,000 rent expense, the differential (incremental) cost of the decision shall be the Sh.2,000.
- (e) **Imputed cost**
Is an expense not incurred directly, but actually borne. For example, a person who owns a home debt-free has an imputed rent expense equal to the amount of interest that could be earned on the proceeds from the sale of the home if the home were sold.
- (f) **Replacement cost**
The amount it would cost to replace an asset at current prices. If the cost of replacing an asset in its current physical condition is lower than the cost of replacing the asset so as to obtain the level of services enjoyed when the asset was bought, then the asset is in poor condition and the firm would probably not want to replace it
- (g) **Standard cost**
A management tool used to estimate the overall cost of production, assuming normal operations.
- (h) **Budgeted cost**
This is the cost estimated to be incurred and used for budgeting purposes. It is a cost included in the budget representing cost expected. Most of the times, budgeted cost will be derived from standard cost.

CHAPTER SUMMARY

Costs can be broadly categorized into two: Manufacturing costs and Non manufacturing costs

Manufacturing costs comprise direct materials, direct labour and manufacturing overheads.

The total of manufacturing overheads and direct labour gives conversion cost.

The total of direct materials and direct labour gives Prime cost.

Non manufacturing costs comprise selling and administrative and selling expenses.

This chapter primarily focuses on classification of costs. The following table will help analyze the various objectives of classification and categories, which fall under them.

	Cost objective	Possible classification
1.	Stock valuation	<ul style="list-style-type: none"> • Manufacturing and non-manufacturing costs • Period and product costs • Direct and indirect costs
2.	Decision making	<ul style="list-style-type: none"> • Cost behavior: Variable, fixed, semi variable, • Relevance: opportunity, sunk cost, historical cost, standard costs
3.	Control purposes	<ul style="list-style-type: none"> • Controllable and non-controllable • Avoidable and non avoidable

- i) Manufacturing cost; cost incurred to produce a product. It comprises of material cost, labour cost and overhead cost
- ii) Non-Manufacturing costs are costs incurred by all activities that support the production of goods and services. They are administration costs, selling costs and distribution costs.
- iii) Period costs are costs mainly incurred in the ordinary running of the business enterprise. They include examples like electricity bill paid, salaries and allowances and rent payments. They are referred to as period costs since they are expensed in the period they are incurred.



- iv) Product costs are all the costs incurred in production of units during a time period e.g. raw material costs, direct labour costs and production overheads. Such costs are capitalized and expensed (charged to the profit and loss account) only when the manufacturer sells inventory.
- v) Variable costs change proportionate to the change in the level of activity which fixed costs remain constant over the relevant range.
- vi) Controllable cost refers to the cost which can be influenced by the actions of a person in whom authority for such control is vested while uncontrollable cost refers to cost which cannot be influenced by a person in whom authority for such control is vested. They are costs which cannot be adjusted without affecting the long-term objective of the firm
- vii) Avoidable costs refer to costs that will not be incurred if an activity is suspended; also called escapable cost while unavoidable costs refer to costs that are incurred regardless of the decision to make or buy a certain part or keep or drop a certain product line; these costs cannot be recovered or saved
- viii) Sunk costs and historical costs are irrelevant for decision making.

CHAPTER QUIZ

- a) Identify and give examples of each of the three basic cost elements involved in the manufacture of a product.
- b) Product costs are sometimes called inventorable costs. Why?
- c) It is possible for costs such as salaries and depreciation to end up as assets on the balance sheet. Explain
- d) Classify the following costs as either fixed or variable
 - i. Depreciation on a straight line basis
 - ii. Wages paid to casual workers – on piece rate basis
 - iii. Salary paid to stores manager
- e) Are fixed costs always fixed?

ANSWERS TO CHAPTER QUIZ

- a) Basic cost elements:
 - a. materials such as leather and sole used to make a shoe
 - b. Labour such as the cobblers
- b) Product costs are inventorable costs because they are costs incurred to manufacture inventory units. Inventory is normally valued based on the production cost.
- c) It is possible, when such costs are treated as product costs and then there exists inventory at the end of the period (ending inventory) then such costs will indirectly appear in the balance sheet
- d) Classification of costs
 - a. Fixed cost
 - b. Variable cost
 - c. Fixed cost
- e) Fixed costs are only fixed in the short run and within the relevant range. Beyond the relevant range, they may assume a different behavior.

PAST PAPER ANALYSIS

05/06 Q6(d); 05/06 Q7(a); 12/05 Q2; 11/04 Q7; 06/04 Q7(c,d,e); 12/03 Q6; 05/01 Q6; 05/01 Q7(b); 11/99 Q6(a); 06/97 Q6; 06/92 Q6(b); 06/92 Q7

EXAM QUESTIONS

QUESTION ONE

Identify and give examples of each of the three basic cost elements involved in the manufacture of a product. (10 marks)

QUESTION TWO

Explain the difference between the following terms

- i. Product cost and period cost
- ii. Sunk cost and relevant cost
- iii. Fixed and variable cost
- iv. Avoidable and unavoidable costs



- v. Controllable and uncontrollable costs
 - vi. Direct and indirect costs
 - vii. prime cost and Conversion cost
- (3 marks each)

QUESTION THREE

Discuss the behavioral classification of costs, explaining all the terms used therein (20 marks)

CASE STUDY

Decision-making situations under short-term conditions require consideration of:

- i. The cost classifications which the management accountant should use or ignore, and
- ii. Factors which may affect the behavior of costs and hence the accuracy of the cost analysis and the relevance of the decision making.

A company X may decide to make quantities of a component used in a manufacture of a product or buy the component from an outside supplier or out source.

Only relevant cash flows are used for decision making. These are future, incremental cash flows, which arise as a consequence of choosing a particular course of action

Future Costs

Any cost that was incurred in the past and cannot now be recovered in a cost and is, therefore, not relevant to decision making. Only costs that will be incurred in the future if a particular course of action is taken are relevant.

Incremental Costs

Incremental costs are the additional costs incurred as a result of a decision and are, therefore, relevant. Any costs will be incurred in the future regardless of whether or not the decision is taken (committed costs) are not relevant.

Cash Flow

It is assumed that a decision is taken to maximize 'satisfaction' of the person or organization in question. Although the time value of money affects the worth of cash flow from a project over a longer period, all short-run decisions are assumed to improve, 'satisfaction' if they increase net cash inflow. Depreciation is not, therefore, a relevant cost and it is only information pertaining to a cash flow, which is relevant to decision making.

In general, variable costs are relevant costs because they are only incurred if a decision to do something is taken, whereas fixed costs are irrelevant to decision because they will be incurred regardless of the course of action taken. There is, however, a school of thought that argues that fixed costs are not always irrelevant. They have put forward the idea of the attributed cost which is made up of the following:

- (a) **Short run visible costs**
- (b) **Divisible fixed costs.** A fixed cost is divisible if significant shifts in the level of activity will require increases in the total amount of that cost.
- (c) **Indivisible traceable costs.** This is an indivisible fixed costs that can be traced directly to a product or function.

Finally, opportunity costs (the benefit forgone by choosing one option instead of the next best alternative) are relevant. Historic costs are not. One area in which the concept of relevant costs is needed is the make or buy situation.

A make or buy problem involves a decision by an organization about whether it should make a product with its own internal resources, or whether it should buy the product from an outside supplier. If an organization has the choice of whether to manufacture a component internally or buy in from outside and it has no source resources that put a restriction on what it can do itself, the principal relevant costs are the differential costs between the two options.

Costs behavior and decision-making

Although it is easy to generalize and to state that, for example, variable costs are relevant to a decision and fixed costs are not a proper understanding of the behavior of costs is vital to ensure that the cost analysis is accurate. Consider the simple example in part (a) of the answer.

Strategic planning is the process of setting or changing the long-term objectives or strategic target of an organization. These would include such matters as the selection of products and markets, the required level of company profitability, the purchases and disposal of subsidiary companies or a major fixed asset and so on. A notable characteristic of strategic planning is as follows:

- a. It will generally be formulated in writing, and only after much discussion by committee (the board).
- b. It will be (or should be) circulated to all interested parties within the organization and perhaps even to the press.
- c. It will trigger the production not of direct action but of a series of lesser plan for sales, production, marketing, and so on.

Operational planning works out what specific tasks need to be carried out in order to achieve the



strategic plan. For example, a strategy may be to increase sales by 5% per annum for at least five years, and an operational plan to achieve this would be sales representatives' weekly sales target. (Note: we use the word 'strategic' and 'operational' in the sense implied in the well-known work of Robert Anthony).

Notable characteristic of operational planning are the speed of response to changing conditions and the use and understanding of non-financial information such as data about customer orders or raw material input

CHAPTER THREE



COST ESTIMATION



CHAPTER THREE

COST ESTIMATION

► OBJECTIVES

After studying this chapter, you should be able to:

- Define cost estimation and understand the relationship between cost classification and estimation and why cost estimation is important.
- Explain the various methods of cost estimation, their advantages and disadvantages and conclude on which method is the best under what circumstances
- Predict costs using the high low method and visual fit method.
- Understand regression analysis and be able to predict costs through linear regression
- Determine the degree of association between the dependent and independent variables by computing coefficient of determination

► INTRODUCTION

Cost estimation is a measurement of past costs for the purpose of predicting future costs for decision-making purposes. This chapter will primarily aim at using past data to predict future costs. Various methods of cost estimation, their advantages and limitations will be discussed. The methods of cost estimation include, High Low Activity method, account analysis, engineering analysis, visual fit (scatter graph) method, simple linear regression analysis and learning curve theory.

► DEFINITION OF KEY TERMS

Cost driver is any activity that causes a cost to be incurred e.g. labor hours, level of output, etc.

Correlation is the degree of association between variables

Coefficient of determination measures how much of the variation in the dependent variable is explained by the variation in the independent variable.

Regression line is a line fitted to an array of plotted points; may also be referred to as line of best fit

► EXAM CONTEXT

Exam questions from this chapter are likely to be a mixture of calculations and discussions. You may be required to discuss the advantages and limitations of a particular cost estimation method or compare two or more cost estimation methods.

For calculations, the examiner will normally focus on practical questions applicable in the industry. You, therefore, need to understand the theory comprehensively and practise to solve questions set on the various cost estimation methods.

► INDUSTRY CONTEXT

Cost estimation may be used to predict the relationship between a specific cost and a factor affecting the cost. The strength of the relationship, correlation, will be significant in deciding the cost determining factor. Practically in the industry, costs are normally driven by more than one factor. Therefore, the single factor cost estimation models discussed here will act as a base of comprehending the multifactor models.

INTRODUCTION

Cost estimation may be defined as a study which attempts to predict the relationship between costs and the activity level or cost driver¹ that causes those costs based on an analysis of historical costs. In other words, cost estimation occurs when an individual attempts to measure historical costs in order to predict future costs.

To achieve the measurement, it is necessary to separate cost into their fixed and variable cost elements. Semi variable costs can be separated into their fixed and variable components using scatter diagram approach, high-low method or regression analysis.

In this topic, we shall deal with linear cost relationships and equations. A linear equation is an expression of the relationship between variables, the independent and the dependent variables. The cost estimating function for linear relationships is

$$Y = a + bX$$

Analyzed as **Total cost = Fixed cost + Variable cost**



Where

- Y represents the dependent variable or the total cost
- a represents fixed cost component of the total cost (Constant amount)
- bX represents the variable costs component of the total cost
- b represents the unit variable cost (this is the gradient of the equation)
- x represents independent variable or the output level

This is the usual straight line equation you have been encountering in elementary mathematics.

PURPOSE OF ESTIMATION

It assists in estimating the future expenditure (cost prediction) as the expenditure will depend on the cost of the respective activities

It assists in determining the net benefits anticipated in a specific activity based on the relationship between projected costs and projected revenue (profit prediction).

Cost estimation is useful in the execution of managerial functions: business planning, cost control, performance evaluation and decision making.

METHODS OF COST ESTIMATION

Fast forward:

Cost estimation can be done using different methods based on the available data, the analyst's expertise and the level of desired accuracy.

We will consider following cost estimation methods commonly utilized, namely:

- (a) High Low Activity method
- (b) Account Analysis
- (c) Engineering Analysis
- (d) Visual Fit (Scatter graph) method
- (e) Simple linear regression analysis
- (f) Learning curve theory

□ High-Low method

Here, cost estimation is based on the relationship between past cost and past level of activity. Variable cost is based on the relationship between costs at the highest level of activity and the lowest level of activity. The difference in cost between high and low activity level is taken to be the total variable cost from which the unit variable cost can be computed by dividing it by the change in output level. This is indicated below:

$$\text{Total Variable Cost} = \text{Cost at high activity level} - \text{Cost at low activity level}$$

Therefore,

$$\text{Unit variable cost} = \frac{\text{Variable Costs}}{\text{Output units}} = \frac{\text{Cost at high level activity} - \text{Cost at low level activity}}{\text{Units at high level activity} - \text{Units at low level activity}}$$

The variable cost per unit so calculated forms the 'b' of the straight line equation mentioned earlier. By substituting 'b' into the equation, we can obtain 'a', the fixed cost.

>>> Illustration I

Based on performance, you have been provided with the following information regarding ABC Ltd for the year ended 31 December 2004:

Labour hours (Activity level)	Service costs (Shs)
300	150,000
400	155,000
350	153,000
600	192,000
310	145,000
800	200,000

Required

Develop a total cost function based on the above data using the high-low method.

Solution

	Labour hours	Service costs (Shs)
Highest activity level	800	200,000
Lowest activity level	300	150,000



$$\text{Unit variable cost} = \frac{\text{Variable Costs}}{\text{Output units}} = \frac{\text{Cost at high level activity} - \text{Cost at low level activity}}{\text{Units at high level activity} - \text{Units at low level activity}}$$

$$\begin{aligned}\text{Variable cost per Unit} &= \frac{\text{Shs.200,000}}{800\text{hrs}} - \frac{\text{Shs.150,000}}{300 \text{ hrs}} \\ &= \frac{\text{Shs.50,000}}{500\text{hrs}} \\ &= \text{Shs.100 per hr}\end{aligned}$$

Therefore, $b = 100$

To get the fixed cost a , substitute 'b' into the straight line equation as follows:

When labour hours (X) = 800, service cost (total cost, Y) = shs.200,000

Therefore, from the Straight Line equation, $Y = a + bX$

$$\begin{aligned}200,000 &= a + (100) 800 \\ 200,000 &= a + 80,000 \\ a &= 200,000 - 80,000 \\ a &= 120,000\end{aligned}$$

Therefore, fixed costs = Shs.120,000

NB: Even if we used the 2nd set of labour hours and service costs, we would still get the same answer i.e.

When labour hours (X) = 300, service cost (total cost, Y) = Shs.150,000.

Therefore,

$$\begin{aligned}50,000 &= a + 100(300) \\ a &= 150,000 - 30,000 \\ &= \text{Shs.120,000}\end{aligned}$$

Therefore, the cost equation is:

$$Y = 120,000 + 100X$$

This equation can be used to estimate or predict the total costs: For example, when the activity level is, say, at 1000 labour hours, then the total cost would be:

$$\begin{aligned} y &= 120,000 + 1000(100) \\ &= 120,000 + 100,000 \\ &= \text{Shs.}220,000 \end{aligned}$$

>>> Illustration II

Evans, the Managing Director of Mambo Company, has asked for information about the cost behavior of manufacturing overhead costs. Specifically, he wants to know how much overhead cost is fixed and how much is variable. The following data are the only records available.

Month	Machine-hours	Overhead Costs
February	1,700	Shs.20,500
March	2,800	Shs.22,250
April	1,000	Shs.19,950
May	2,500	Shs.21,500
June	3,500	Shs.23,950

Required:

Using the high-low method, determine the overhead cost equation. Use machine-hours as your cost driver

Solution:

Note that in most cases, you are required to identify the cost driver. For instance, in our case, the cost driver is the machine hours and not overhead cost. Overhead cost cannot be a cost driver. It is a cost by itself.

$$\text{Unit variable cost} = \frac{\text{Variable Costs}}{\text{Output units}} = \frac{\text{Cost at high level activity} - \text{Cost at low level activity}}{\text{Units at high level activity} - \text{Units at low level activity}}$$

$$\begin{aligned} \text{Variable cost per unit} &= \frac{\text{Shs.}23,950 - \text{Shs.}19,950}{3,500\text{hrs} - 1000\text{hrs}} \\ &= \frac{\text{Shs.}4000}{2,500\text{hrs}} \\ &= \text{Shs.}1.6 \text{ per hr} \end{aligned}$$

Therefore, $b = 1.6$



To get the fixed cost a , substitute 'b' into the straight line equation as follows:

When machine hours (Y) = Shs.1,000, Overhead cost (total cost, Y) = shs.19,950

Therefore from the Straight Line equation, $Y = a + bX$

$$\begin{aligned}19,950 &= a + (1.6)1000 \\19,950 &= a + 1,600 \\a &= 19,950 - 1,600 \\a &= 18,350\end{aligned}$$

Therefore fixed costs = shs.18,350

Therefore, the cost equation is $Y = 18,350 + 1.6X$

High low method of cost estimation is easy to use and is liked by many as it is handy when a quick rough estimate is required. However, it does not consider all observations and thus outlier cases may distort the model. It is only suitable with a single predictor and, in addition, it assumes that the relationship between the X and Y variables is linear and exists. The probable error of estimation can not be measured.



Account analysis (inspection of accounts)

Using account analysis, the accountant examines and classifies each ledger account as variable, fixed or mixed. Mixed accounts are broken down into their variable and fixed components. They base these classifications on experience, inspection of cost behavior for several past periods or intuitive feelings of the manager.

>>> Illustration

Management has estimated Shs.1,090 variable costs, Shs.1,430 fixed costs to make 100 units using 500 machine hours. Since machine hours drives variable costs in our example, the variable cost stated as $2.18(1090/500)$

Then we get the total cost equation as

$$Y = 1,430 + 2.18X$$

Where, Y = total cost

x = number of machine hours

For 550 machine hours

$$\begin{aligned} \text{Total cost, } Y &= 1,430 + 2.18(550) \\ &= 1,430 + 1,199 \\ &= \text{Shs.}2,629 \end{aligned}$$

This analysis should determine whether any factors apart from output machine hours are influencing total cost.

Advantages and disadvantages of accounts analysis (inspection) method

The accounts analysis method is easy to use and useful when a quick cost forecast is required. However, it assumes that what occurred in the past will be reflected in the future. This calls for further analysis.

The model's reliability and validity cannot be determined as we cannot measure the size of probable error in forecasts made i.e. it lacks statistical vigor. The method is highly subjective as different managers will classify some costs differently.

Engineering method

This method is based on a detailed study of each operation where careful specification is made for materials, labour and equipment necessary to produce a product. It involves identifying the level of input required of an activity in form of raw material and labour while total cost is based on the cost of each input. This approach is applicable where no past data exists.

Disadvantage: The main setback of the approach is that it requires a complex analysis of all the constituents of an activity and the requirements of an activity in terms of costs detailed into materials, labour, overheads and time.

Visual fit (scatter graph method)

Cost estimation is based on past data regarding the dependent variable and the cost driver. The past data on cost levels and the output levels is plotted on a graph (called a **scatter graph**) and a line of best fit is drawn as shown in the diagram. A line of best fit is a line drawn so as to cover the most points possible on a scatter graph. It can also be defined as 'a straight line used as a best approximation of a summary of all the points in a scatter-plot'. Its intersection with the vertical axis indicates the fixed cost while the gradient indicates the variable cost per unit.

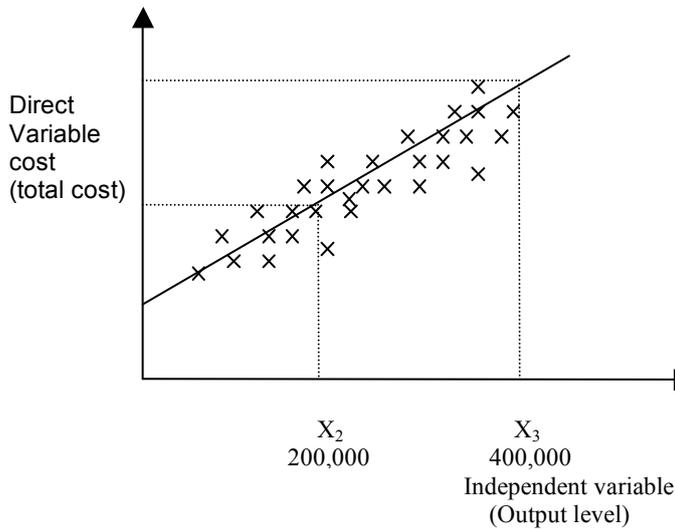
This method takes into account all observations and is easy to apply. However, it cannot be used with two or more independent variables and is subjective to some extent as different lines of best fit may be drawn by different analysts.



(See the diagram in the illustration below)

>>> Illustration IV

Assume a firm has total costs of 8m, 4m and 1m respectively when the output units are 400,000, 200,000 and 0 respectively. Estimate its cost equation using the visual fit method.



$$\text{Note} \left\{ \begin{array}{l} \text{fixed cost} = X_0 = 1m \\ \text{Gradient} = \frac{\text{Change in Y}}{\text{Change in X}} = \frac{Y_3 - Y_2}{X_3 - X_2} = \text{Variable cost per Unit} \end{array} \right.$$

$$\text{Variable cost per Unit} = \frac{\text{Change in cost}}{\text{Change in activity level}} = \frac{8m - 4m}{400,000 - 200,000} = 20$$

$$\therefore \text{Total cost equation, } Y = 1m + 20X$$

On the basis of the existing data, fixed cost is Shs 1m and the variable cost per unit is 20. On the basis of the developed model, estimates can be made regarding future cost. When the activity level is 600,000 units, total cost will be estimated as:

$$TC = 1m + 20(600,000) = 1m + 12m = 13m$$

REGRESSION ANALYSIS

Fast forward:

Regression analysis is more reliable than other methods of cost estimation since it uses all the data available and establishes the relationship and the degree of relationship between the variables.

Regression analysis has a mathematical base of all regression lines that could be drawn to represent the data. The least square regression line of Y on X is that line for which the sum of squares of vertical deviations of all the points from the line is least. It involves estimating the cost function using past data or the dependent and the independent variables. The dependent variable will constitute the relevant cost, which may be service, variable cost, overhead cost, etc.. The independent variable will be the cost drivers where the cost drivers will be labour hours, units of labour or raw materials, units of output, etc..

In regression analysis, a regression model of the form $Y = a + bX$ for a simple regression is obtained. This formal model measures the average amount of deviation of the dependent variable that is associated with unit changes in the amount of the independent variable. For a multiple regression, a regression model of the form $Y = a + b_1X_1 + b_2X_2 + \dots + b_nX_n$ is obtained

Where a is fixed cost,

X_1, X_2, X_n are cost drivers X_1, X_2, X_3 up to X_n _

b_1, b_2, b_n are changes in cost with the change in value of cost driver i.e. variable cost per unit of change in X_1, X_2, X_3

Y is the dependant variable (total cost)

Note that a simple regression produces a cost function of the form $Y = a + bX$ so that we only have only one variable cost per unit (b) and only one independent variable (cost driver) x.

However, a multiple regression produces a cost function of the form $Y = a + b_1X_1 + b_2X_2 + \dots + b_nX_n$ so that we have several variable costs per unit (b_1, b_2, b_n) and several independent variables (X_1, X_2, X_3)

The general formulas used to compute a and b are as listed below. The equations are solved simultaneously to obtain the values.

$$(i) \quad \sum Y = na + b \sum X$$

$$(ii) \quad \sum YX = a \sum X + b \sum X^2$$



Alternatively, we can use the general formulas obtained through calculus.

$$b = \frac{n \sum XY - \sum X \sum Y}{n \sum X^2 - (\sum X)^2}$$

$$a = \frac{\sum Y}{n} - b \frac{\sum X}{n}$$

A table, such as the one below, will help you summarize the data and easily obtain the figures for the computation of a and b values.

	Independent variable (X)	Dependent variable (Y)	X ²	XY
1	x ₁	y ₁	x ₁ ²	x ₁ y ₁
2	x ₂	y ₂	x ₂ ²	x ₂ y ₂
.
.
n	x _n	y _n	x _n ²	x _n y _n
n	ΣX	ΣY	ΣX ²	ΣXY



Assumptions of the regression analysis

- There exists a cause and effect relationship between the variables. That is, a change in the independent variable causes a change in the dependent variable.
- There is good evidence of correlation. In this case, linearity of costs exists. Correlation is the degree of relationship between variables which seek to determine how well linear or other equations, explain or describe, the relationship between variables
- The historical data used covers a large level of activity level
- Only one independent variable or activity base affects costs. This is in the case of simple regression analysis where only one independent variable exists.

>>> Illustration

The following data relates to MAKB Company limited for the half year period just ended.

Month	Output (Units)	Total Cost (Shs)
January	40	5,100
February	45	5,450
March	50	6,050
April	40	5,400
May	60	6,850
June	55	6,250

Required:

Determine the business fixed and variable costs for its manufacturing overheads and thus write down the cost equation in the form of Y=a + bX.

Month	Output (Units)	Total Cost (Shs)	X ²	XY
January	40	5,100	1600	204,000
February	45	5,450	2025	245,250
March	50	6,050	2500	302,500
April	40	5,400	1600	216,000
May	60	6,850	3600	411,000
June	55	6,250	3025	343,750
Total	290	35,100	14,350	1,722,500

Approach I

$$(i) \quad \sum Y = na + b \sum X$$

$$(i) \quad 35,100 = 6a + 290b$$

$$(ii) \quad \sum YX = a \sum X + b \sum X^2$$

$$(ii) \quad 1,362,500 = 290a + 14,350b$$

Multiply equation (i) by 290 and (ii) by 6 to get equations (iii) and (iv) respectively

$$(iii) \quad 10,179,000 = 1740a + 84100b$$

$$(iv) \quad 8,175,000 = 1740a + 86100b$$

Subtract equation (iv) from equation (iii) to obtain equation (v)

$$(v) \quad 156,000 = 2,000b$$

$$\therefore b = \frac{156,000}{2,000} = \text{Sh.}78$$

To obtain a, substitute b in equation (i)

$$(v) \quad 35,100 = 6a + 290(78)$$

$$-6a = 22620 - 35100$$

$$-6a = -12,480$$

$$a = \frac{-12,480}{-6} = \text{Sh.}2,080$$

Approach II (substituting the figures obtained from the table in the formula)

$$b = \frac{n \sum XY - \sum X \sum Y}{n \sum X^2 - (\sum X)^2}$$

$$b = \frac{6(1,722,500) - (290)(35,100)}{6(14,350) - (290)^2} = \frac{156,000}{2,000} = \text{Sh.}78$$

$$a = \frac{\sum Y}{n} - b \frac{\sum X}{n}$$

$$a = \frac{35,100}{6} - 78 \frac{(290)}{6} = 5,850 - 3770 = \text{Sh.} 2,080$$

The cost equation shall, therefore, be:

$$Y = 2,080 + 78X$$



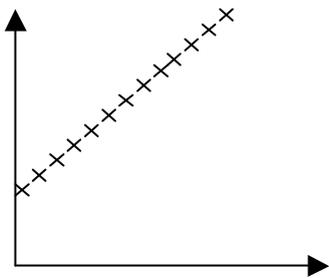
CORRELATION AND COEFFICIENT OF CORRELATION

Correlation is the degree of association between variables. It is measured using Pearson's coefficient of correlation or Product Moment coefficient. This coefficient is defined as;

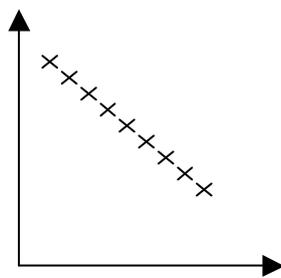
$$r = \frac{n\sum XY - \sum X \sum Y}{\left\{ n\sum X^2 - (\sum X)^2 \right\} \left\{ n\sum Y^2 - (\sum Y)^2 \right\}}$$

Where $-1 \leq r \leq 1$

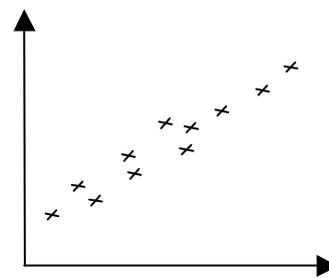
Perfect correlation occurs when all the values of the variables satisfy the equation exactly. However, in real life situation, perfect correlation rarely exists. This is because the independent variable is affected by multiple dependent variables. The graphs below show the possible degrees of correlation.



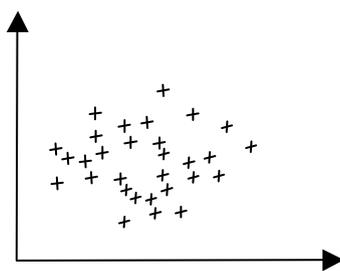
Positive perfect correlation



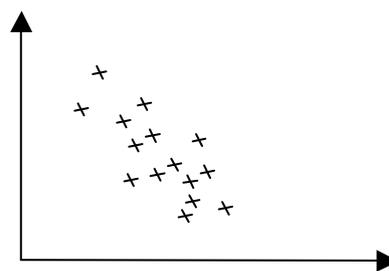
Negative perfect correlation



High positive correlation



No correlation



Moderate negative correlation

If r is ± 1 it implies perfect positive and perfect negative correlation respectively.

If $r = 0$ then there is no correlation

A high correlation above ± 0.9 only shows a strong association between the two variables. It may be an indicator that there is a causal relationship: a change in one variable causes change in the other. However, two variables may have a high calculated r value yet they have no causal relationship. In such a situation, **spurious or nonsense correlation** is said to exist.

Note: Coefficient of correlation is the square root of the coefficient of determination.

□ Coefficient of determination

Coefficient of determination measures how much of the variation in the dependent variable is explained by the variation in the independent variable. Variation not accounted for by the variation in the independent variable will result from the random variations and other specific factors not identified in considering the two variables.

Coefficient of variation is the ratio of the explained variation to total variation. It is derived as

$$r^2 = \pm \sqrt{\frac{\text{Explained variation}}{\text{Total variation}}} = \sqrt{\frac{\sum (\hat{Y} - Y)^2}{\sum (\bar{Y} - Y)^2}}$$

Alternatively, it can be derived by squaring the coefficient of correlation.

$$\begin{aligned} \text{Coefficient of determination} &= (\text{Coefficient of correlation})^2 \\ &= r \end{aligned}$$

CHAPTER SUMMARY

Cost estimation may be defined as a study which attempts to predict the relationship between costs and the activity level or cost driver that causes those costs based on an analysis of historical costs.

There are various methods of cost estimation. They include

- (a) High Low Activity method
- (b) Account Analysis
- (c) Engineering Analysis
- (d) Visual Fit (Scatter graph) method
- (e) Simple linear regression analysis
- (f) Learning curve theory



Unit variable cost under high low method is calculated as

$$\text{Unit variable cost} = \frac{\text{Variable Costs}}{\text{Output units}} = \frac{\text{Cost at high level activity} - \text{Cost at low level activity}}{\text{Units at high level activity} - \text{Units at low level activity}}$$

Regression analysis has a mathematical base of all regression lines that could be drawn to represent the data. The least square regression line of Y on X is that line for which the sum of squares of vertical deviations of all the points from the line is least

Coefficient of correlation (r) is calculated as;

$$r = \frac{n\sum XY - \sum X \sum Y}{\sqrt{\{n\sum X^2 - (\sum X)^2\} \{n\sum Y^2 - (\sum Y)^2\}}} \quad \text{Where } -1 \leq r \leq 1$$

Coefficient of variation (coefficient of determination) is calculated as

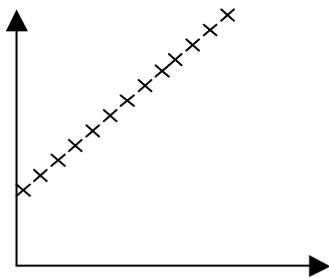
$$r^2 = \pm \sqrt{\frac{\text{Explained variation}}{\text{Total variation}}} = \sqrt{\frac{\sum (\hat{Y} - Y)^2}{\sum (\bar{Y} - Y)^2}}$$

CHAPTER QUIZ

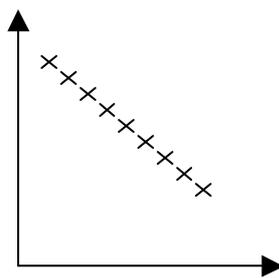
1. What is cost estimation?
2. State the cost estimating function discussed in this chapter
3. Highlight the assumptions of regression analysis.
4. Draw the graphs for the following levels of correlation; perfectly positive correlation; perfectly negative correlation and highly positive correlation.
5. Draw a scatter graph.

ANSWERS TO CHAPTER QUIZ

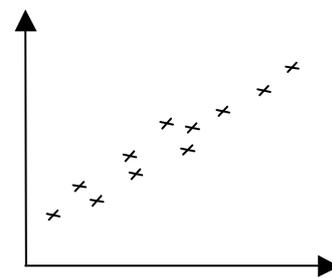
1. Cost estimation is a study which attempts to predict the relationship between costs and the activity level or cost driver that causes those costs
2. $y = a + bx$
3. Assumptions of regression analysis
 - (a) There exists a cause and effect relationship between the variables, that is, a change in the independent variable causes a change in the dependent variable.
 - (b) There is good evidence of correlation. In this case, linearity of costs exists.
 - (c) The historical data used covers a large level of activity level
 - (d) Only one independent variable or activity base affects costs. This is in the case of simple regression analysis where only one independent variable exists
4. **Graphs for various correlations**



Positive perfect correlation

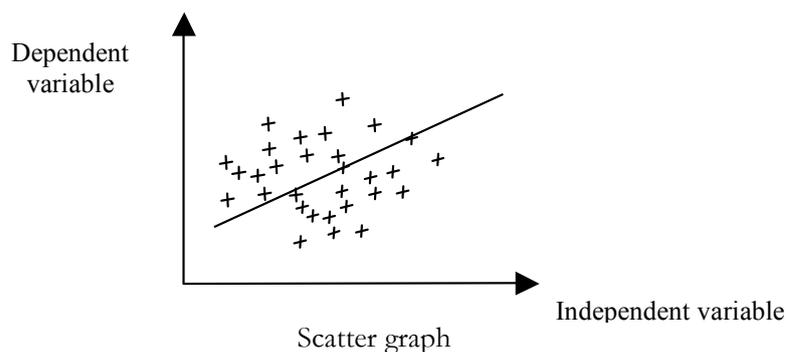


Negative perfect correlation



High positive correlation

5. Scatter graph





PAST PAPER ANALYSIS

Questions from this chapter have been tested in the following exam sittings

06/07 Q7; 12/06 Q7; 05/05 Q7; 12/06 Q4; 05/06 Q7(b); 05/05 Q5; 06/04 Q2; 12/03 Q3(b); 12/02 Q5; 06/93 Q5; 11/92 Q5;

EXAM QUESTIONS

Question one

A company has just purchased a new machine, costing Sh150,000, for a contract. It has an installation cost of Sh25,000 and is expected to have a scrap value of Sh10,000 in five years' time. The machine will be depreciated on a straight line basis over five years.

What is the relevant cost of the machine for the contract? (10 marks)

- A Sh140,000
- B Sh150,000
- C Sh165,000
- D Sh175,000

Question two

Briefly discuss any two methods of cost estimation clearly highlighting their advantages and disadvantages. (20 marks)

Question three

Jamleck Ltd has been asked to quote a price for a one-off contract. The company's management accountant has asked for your advice on the relevant costs for the contract. The following information is available:

Materials

The contract requires 3,000 kg of material K, which is a material used regularly by the company in other production. The company has 2,000 kg of material K currently in stock which had been purchased last month for a total cost of Sh19,600. Since then the price per kilogram for material K has increased by 5%. The contract also requires 200 kg of material L. There are 250 kg of material L in stock which are not required for normal production. This material originally cost a total of Sh3,125. If not used on this contract, the stock of material L would be sold for Sh11 per kg.

Labour

The contract requires 800 hours of skilled labour. Skilled labour is paid Sh9.50 per hour. There is a shortage of skilled labour and all the available skilled labour is fully employed in the company in the manufacture of product P.

Required:

Explain how you would decide which overhead costs would be relevant in the financial appraisal of the contract. **(20 marks)**

Question four

Jamline Ltd, which manufactures and sells a single product, is currently producing and selling 102,000 units per month, which represents 85% of its full capacity. Total monthly costs are £619,000 but at full capacity these would be £700,000. Total fixed costs would remain unchanged at all activity levels up to full capacity. The normal selling price of the product results in a contribution to sales ratio of 40%.

A new customer has offered to take a monthly delivery of 15,000 units at a price per unit 20% below the normal selling price. If this new business is accepted, existing sales are expected to fall by one unit for every six units sold to this new customer.

Required:

- (a) For the current production and sales level, calculate:
 - (i) the variable cost per unit;
 - (ii) the total monthly fixed costs;
 - (iii) the selling price per unit;
 - (iv) the contribution per unit. **(6 marks)**

- (b) Calculate the net increase or decrease in monthly profit which would result from acceptance of the new business. **(4 marks)**

- (c) In the context of decision making, explain the term 'opportunity cost' and illustrate your answer by reference to Jamline Ltd. **(2 marks)**

Question five

Define stock out cost

Jackie Plc had been suffering losses due to increasing stock out costs. Advise the management appropriately.



CASE STUDY

High-tex Engineering Company Limited wishes to set flexible budgets for each of its operating departments. A separate maintenance department performs all routine and major repair works on the company's equipment and facilities. The company has determined that the maintenance department performs all routine and major repair works on the company's equipment and facilities. The company has determined that maintenance cost is primarily a function of machine hours worked in the various production departments.

The maintenance cost incurred and the actual machine hours worked during the months of January, February, March and April 2003 were as follows:

Month	Machine hrs in production department	Maintenance department's cost
January	800	350
February	1,200	350
March	400	150
April	1,600	550

The cost estimating equation using high low and regression methods are as follows

Month	Machine Hours	Maintenance cost (Y)	XY	X ²	Y ²
1	800	350	280,000	640,000	122,500
2	1,200	350	420,000	1,440,000	122,500
3	400	150	60,000	160,000	22,500
4	1,600	550	880,000	2,560,000	302,500
Sum	4,000	1,400	1,640,000	4,800,000	570,000

High Low method

	X	Y
Highest point	1,600	550
Lowest point	<u>400</u>	<u>150</u>
Difference	<u>1,200</u>	<u>400</u>

$$b = \frac{400}{1200} = 0.33$$

$$Y = a + bx$$

Substitute Highest point

$$550 = a + 0.33(1,600)$$

$$a = 17$$

The cost function is $Y = 17 + 0.33X$.

Regression analysis

(ii)

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2} = \frac{4(1,640,000) - 4,000(1,400)}{4(4,800,000) - (4,000)^2}$$

$$= 0.3$$

$$a = \frac{\sum Y}{n} - b \frac{\sum x}{n} = \frac{1,400}{4} - 0.3 \left(\frac{4,000}{4} \right) = 50$$

The function is $\hat{Y} = 50 + 0.3x$

OVERVIEW OF COST ACCUMULATION

Introduction

The topic 'Cost accumulation' focuses on constituents of manufacturing cost. That is material cost, labour cost and overhead costs. The three above are vital in determining the cost and hence the price of a product or service of a company.

The objective of most firms is profit maximization. This can only be achieved by either maximizing revenue or minimizing costs as profit is a function of both revenue and expenditure. Profit maximization through revenue maximization can only be achieved by firms whose output can be varied. In addition, firms maximizing revenue must ensure that at that level, the incremental revenue per unit (marginal revenue) is equal to the incremental cost per unit (Marginal cost) in order to maximize profit. On the other hand, firms with predefined activity levels, for instance firms working on contracts can only maximize profits through cost minimization since contract amounts (revenue) are fixed; and if they vary, they do so by a very small proportion.

Various questions may be raised regarding material costs valuation, labour cost determination and determination of appropriate overhead rate for absorption of manufacturing overheads among others. By the end of this topic, one shall be able to understand the above.



Determination of costs in manufacturing industry

In a manufacturing firm, the main elements of cost are material costs, labor costs and overheads. These are used in the determination of production cost. Other costs incurred in a manufacturing firm, though not unique from services and retail firms are administration, selling and distribution costs.

To determine the cost of a product manufactured, the cost accountant accumulates the direct materials, indirect materials and overheads associated with the production of the product. This gives the total production cost. Additionally, selling and distribution costs are identified and accounted for as non manufacturing costs.

The manufacturer adds a markup on the total manufacturing and non manufacturing costs in order to determine the price at which the product will be sold.

Determination of cost in retail industry

In retail industry, besides the administration and selling costs, the main element of cost is the purchase price of the item procured. The retailer basically adds a markup on the purchase price of the product bought from the wholesaler which covers the administration, selling and distribution costs or adds the estimated cost of selling, distribution and administration to the purchase price and then adds a mark up. The latter is not common though.

Determination of cost in service industry

It is difficult to determine the cost of offering a service since services cannot be quantified. Neither can the value or benefit enjoyed by the customer be measured. Thus, the service providers come up with different ways of valuing their services. They set a price that prevails over a specific range. For instance, the fares charged by matatu operators vary with distance. But there is a minimum that a customer can pay. The prices also vary with the demand. There are off peak prices and peak prices with the later being higher than the earlier.

Some operators may adopt a method that charges the customer per unit of consumption. For instance, some bus operators charge the customers per mileage covered by the bus, therefore, allowing them to pay proportionately.

Service costing can be so arbitrary sometimes. There is no one specific way that can be adopted in valuing services but costs can be allocated based on the level of service such as dividing the travel and fuel costs of a bus by the mileage.

CHAPTER FOUR



MATERIAL COSTS



CHAPTER FOUR

MATERIAL COSTS

► OBJECTIVES

After studying this chapter, you should be able to:

- Understand why firms keep inventory and explain the various inventory decisions.
- Describe the material cost control procedure and the various persons involved in material cost control.
- Understand the stock level and its control; the minimum and maximum stock determination; reorder level and reorder quantity determination.
- Identify costs associated with materials and how they arise.
- Compute the order quantity that minimizes a company's costs (economic order quantity or economic batch quantity).
- Determine the total costs associated with inventories for a specific duration; say a year or month.
- Calculate the optimal amount of stock to order each time given various prices, where the supplier offer discounts with an increase in quantity purchased.
- Understand the stock control system and which system is more appropriate in what circumstances: whether continuous perpetual, periodic or just in time.
- Value inventory based on the different methods of inventory valuation: First in First Out, Last in First Out and Weighted average method, among others.

► INTRODUCTION

Materials refer to the tangible inputs into the process of producing useful output. Materials are only found in manufacturing firms. Material costs form a large percentage of the cost of production. There is, therefore, need to exercise maximum care so that this cost is minimized and at the same time to avoid shortages and excessive stocks.

Materials could be broadly classified into direct materials or indirect materials (overheads) to the production process. For instance, to produce a pair of leather shoes, then shoe laces and a pair

of soles are the direct materials whose total value constitute total direct material cost. The cost of all indirect materials such as glue and thread constitute total indirect material costs. Note that indirect material cost is treated as overheads.

Material costs comprise of the purchase cost, material holding cost, material ordering costs and shortage costs.

► DEFINITION OF KEY TERMS

Materials: materials are physical substances used as inputs to production or manufacturing; they can also be defined as any substance used in construction such as building bricks, cement and concrete.

Purchase cost: This is the price charged by the supplier on an item of inventory.

Maximum stock level: This is the upper limit above which stock should not be allowed to exceed.

Re-order level: It is a point that lies between minimum and maximum stock levels at which purchase orders must be placed to ensure that goods ordered are received before the minimum stock level is reached.

► EXAM CONTEXT

The ability to understand how to accumulate cost and the behavior of those costs is key in passing exams set from this topic. You need to understand how the various costs interrelate and use the same knowledge to arrive at correct values.

► INDUSTRY CONTEXT

Cost accumulation is the basis of price determination. Without knowledge of costs incurred in coming up with a complete product, ineffective pricing decision may be arrived at, which may portray a different objective other than profit maximization.



WHY FIRMS KEEP INVENTORY

Fast forward:

Firms don't just keep inventory. They do so with reasons with the main reasons being to make gains, minimize on costs and smoothen operations.

Firms hold inventories despite incurring holding costs, which vary with the size of inventory. There are three general kinds of stocks kept by firms due to various reasons:

(i) Buffer inventories

Firms keep these inventories to protect themselves against the uncertainties of demand and supply. To meet these uncertainties, firms normally hold inventories in excess of average or expected demand. They may also keep excess stocks to meet requirements during the time for which lead-time goes beyond normal.

(ii) Anticipation inventory

Firms keep some items of stock in anticipation that future demand for the item will happen. The whole idea underlying anticipation inventory is to smoothen the production process. This is attained by producing for a longer duration for continuous basis rather than operating with excessive overtime in one period leaving the system to be idle or close down for reason of inadequate or no demand.

(iii) Appreciation inventory

Firms hold inventory in anticipation of an increase in price. Some items of inventory such as wines and spirits and jewellery appreciate in value the longer they are kept in the warehouse. However, quantitative models do not take into account the appreciation inventory.

Inventory decisions

Inventory management is important since in most organizations (the merchandising and manufacturing firms), inventory represents the largest single investment. The major types of inventory are raw materials, work in progress and finished goods

Various decisions regarding the inventory are made by the manager in charge of inventory control and management. These decisions include:

- The optimal quantity to order in order to minimize the inventory total costs.
- When to make each order.
- What commodities to stock.
- The amount of safety stock to be kept in anticipation of variation in demand and supply among others.

The overall objective of inventory control is to maintain stock levels that minimize the total costs. These costs include the holding costs, acquisition or purchase costs, stock out costs and ordering costs.

MATERIAL COST CONTROL PROCEDURE

Fast forward:

Material control procedure helps prevent material losses and minimize on unnecessary material costs.

Materials form a significant cost of output units and, therefore, should be controlled. Material control is more than simply recording the accounting transactions relating to material cost. Control should be implemented to ensure that material is available:

- a) In appropriate quantities
- b) In appropriate quality
- c) In appropriate location
- d) At an appropriate time
- e) At the most economic cost.

An effective material cost control system has the following features among others:

- (i) **Adequate perpetual inventory records:** there needs to be maintained records for each item of inventory held in store. Some form of stock record card will be required for each stock item recording, in addition to a specific materials the debt and quantity of receipts, issues and consequent balancing figure.



- (ii) **Checking of perpetual inventory records:** perpetual inventory records should be subjected to some form of check. This may be a form of continuous or periodic stock taking.
- (iii) **Maintenance of target stock levels:** appropriate stock level and stock management practices should be exercised. The stock level management involves knowing the minimum stock level, maximum stock level and the reorder quantity level.
- (iv) **Authorization of orders:** orders passed to purchasing officer for replenishment of stock items should be signed by designated staff in the store. Issues from the store should be made only on receipt of signed material requisition forms.
- (v) **Responsibility and authority relationships:** responsibility and authority of material stores should be clearly delegated to specific individual(s). If more than one individual is required to operate the store, then personnel should be given the responsibility of clearing the designated tasks.
- (vi) **Reporting:** Quantity or value of items held in store should be reported regularly to the organization's management.
- (vii) **Control:** the store personnel should on a regular basis compare targets with actual stock levels and take appropriate action indicated by that comparison to investigate the deviation e.g. why a particular stock has fallen below minimum and immediately informing those responsible to take appropriate action. Controls can be exercised in many areas or points in the business cycle, not only the stores. These include:
 - a) When the choice is made as to the type and quality of material to be used.
 - b) When the purchase order is being placed with the chosen supplier.
 - c) On receipt of the material from supplier, check the appropriateness of quality and quantity of materials received.
 - d) Where the material is held in store before use: It must be safe from theft and damage.
 - e) Where the material is issued from the store: It must be issued to the correct department.
 - f) Where the material is being used for intended purposes e.g. the material must be utilized to produce the desired output.

The material control system must attempt to ensure that the company does not incur costs in excess of an agreed efficient level of expenditure. Lack of adequate control routines will result in the incidence of costs in excess of an acceptable level, reduced profitability of production and increased operational costs.

STOCK LEVEL AND ITS CONTROL

Management must make decisions about the control of stock levels with a view to minimizing the cost of the company while achieving more efficiency in the availability of material to fulfill planned usage requirements. Consideration should be given to the following control levels:

- a) Minimum stock level
- b) Maximum stock level
- c) Re-order level
- d) Re order-quantity (Note the re-order quantity is not necessary the Economic Order Quantity (EOQ))

Minimum stock level

This is the level below which stocks should not be allowed fall. It is essentially a base (buffer) stock level. If stock falls below this point, there is a danger of stock-out and firms will incur shortage costs. This may also be referred to as safety stock. It can be expressed as:

Minimum Stock Level = Reorder level - (Normal consumption x normal reorder period)

Stock out may be caused by various factors such as delay on the part of the supplier, an increase in material usage due to a change in the pattern of production and increase in scrap levels in the production process and delays in placing orders due to scarcity of suppliers.

Note: reorder period or lead time is the period of time in days, weeks or months that elapse before an order made is received and ready for use.

Maximum stock level

This is the upper limit above which stock should not be allowed to exceed. Each material to be kept in store must have a maximum level and stock should not be allowed to go beyond this level. If stock level goes beyond this point, then the firm will be overstocking hence incur high holding costs. It is computed as follows.

Maximum Stock level = Reorder level + Reorder Quantity - (Minimum Consumption x Minimum reorder period)



In setting the maximum stock level, the cost accountant must take into account various other factors that may act as a constraint. This may include the nature of the materials being stocked, rate of consumption of materials, lead time or re-order period, availability of adequate storage space and the cost of storing versus the benefits derived from advantageous purchasing.

■ Re-order level

It is a point that lies between minimum and maximum stock levels at which purchase orders must be placed to ensure that goods ordered are received before the minimum stock level is reached. It is the level of stocks if and when approached; orders for stock replenishment must be made to cater for the unused stocks. This level is normally higher than the minimum stock level to cover for emergencies such as abnormal usage or unexpected delay in the delivery of new supplies. It can be expressed as follows:

Reorder Level - Maximum Consumption X Maximum Re-order Period

■ Re-Order quantity

This is the quantity of stock ordered once the re-order point is reached. The quantity is such as to minimize stock costs taking into consideration the cost of holding stocks and making an order.

The EOQ is an example of a re-order quantity. However, reorder quantity must not be the EOQ. Given the maximum stock level, the reorder level, minimum usage and the minimum reorder level, it may be computed as follows:

Re-order quantity = Maximum Stock - Re-order level + (Minimum Usage X Minimum Re-order Period)

■ >>> Illustration

The following information was extracted from the books of Danex Holdings regarding its stocks:

Reorder quantity	1,800
Reorder period	4 weeks
Maximum consumption	450 units/week
Normal consumption	300 units/week
Minimum consumption	150 Units/week
Maximum reorder period	5 weeks
Minimum reorder period	3 weeks

Required

Determine the following stock levels for Danex Holdings:

- Re-order level
- Maximum stock level
- Minimum stock level

Solution**(i) Reorder level**

$$\begin{aligned} \text{Re - order level} &= \text{maximum consumption} \times \text{maximum re - order period} \\ &= 450 \text{ units/week} \times 5 \text{ weeks} \\ &= 2,250 \text{ Units} \end{aligned}$$

(ii) Maximum stock level

$$\begin{aligned} \text{Maximum stock level} &= \text{Reorder level} + \text{reorder Quantity} - (\text{Minimum Consumption} \times \text{minimum reorder period}) \\ \text{Maximum stock level} &= 2,250 \text{ Units} + 1,800 \text{ Units} - (150 \text{ units/week} \times 3 \text{ Weeks}) \\ &= (2,250 + 1800 - 450) \text{ Units} \\ &= 3,600 \text{ Units} \end{aligned}$$

(iii) Minimum stock level

$$\begin{aligned} \text{Minimum stock level} &= \text{Reorder level} - (\text{Normal consumption} \times \text{normal reorder period}) \\ \text{Minimum stock level} &= 2,250 \text{ Units} - (300 \text{ Units/week} \times 4 \text{ weeks}) \\ &= 2,250 \text{ Units} - 1200 \text{ Units} \\ &= 1,050 \text{ Units} \end{aligned}$$

**Costs associated with materials****■ Purchase cost**

This is the price charged by the supplier on an item of inventory. Purchase price will remain irrelevant, where prices are fixed and no discounts are offered or no advantageous purchasing exists. However, if there exists discounts associated with quantity purchased, they remain relevant for decision making.

$$\text{Purchase cost} = \text{Acquisition price per unit} \times \text{Number of units}$$

■ Holding or carrying cost

These are costs incurred because firms own or maintain inventories. They are associated with high stock levels and include opportunity cost of funds tied up in stock, incremental in insurance costs, incremental warehousing and storage costs, incremental material handling costs and cost of obsolescence and theft of stock. The relevant holding cost should include those items which vary with the level of stock. Costs unaffected by changes in the inventory levels are irrelevant in decision making and thus not included in carrying costs, for instance, rent, depreciation of equipment and salaries for storekeepers. Costs such as insurance costs should be included only when premiums are charged on the fluctuating value of stocks. Therefore, fixed annual insurance cost is irrelevant and thus should not be included in the ordering cost.

$$\text{Carrying costs} = \text{Holding cost per unit per annum} \times \text{Average stock}$$



Ordering and procurement costs

This is the cost of getting an item into the firm's inventory. It usually consists of clerical costs of preparing a purchase order, receiving deliveries and paying invoices. Ordering costs that are common to all stock decisions are irrelevant, and only incremental ordering costs are used. Note that ordering costs are incurred each time an order is made and are associated with low stock levels.

Stock out costs; they are costs incurred as a result of an item not being in stock. They include loss of future sales due to disappointed customers, loss of goodwill, lost contribution or profit from lost sales, extra costs of speeding up orders, etc.

Ordering costs = number of orders made per year x cost per order

Where number of orders per year = $\frac{\text{Annual Demand}}{\text{Number of Units Ordered each time}}$

THE ECONOMIC ORDER QUANTITY (EOQ) MODEL

Fast forward;

The EOQ model minimizes the total of holding and ordering costs thus minimizing the total stock costs.

The EOQ Model is a simple model that helps the manager to determine the optimum quantity of stock to order so as to keep total costs at a minimum. The main costs of inventory are: Holding or carrying costs, Ordering or set up costs, Shortage costs

This model is based on various assumptions:

- (i) It assumes that the annual demand is certain, constant and continuous over time.
- (ii) Holding costs are known and constant
- (iii) Ordering costs are known and constant
- (iv) The same quantity is ordered every time an order is made since demand as assumed is not to fluctuate significantly.

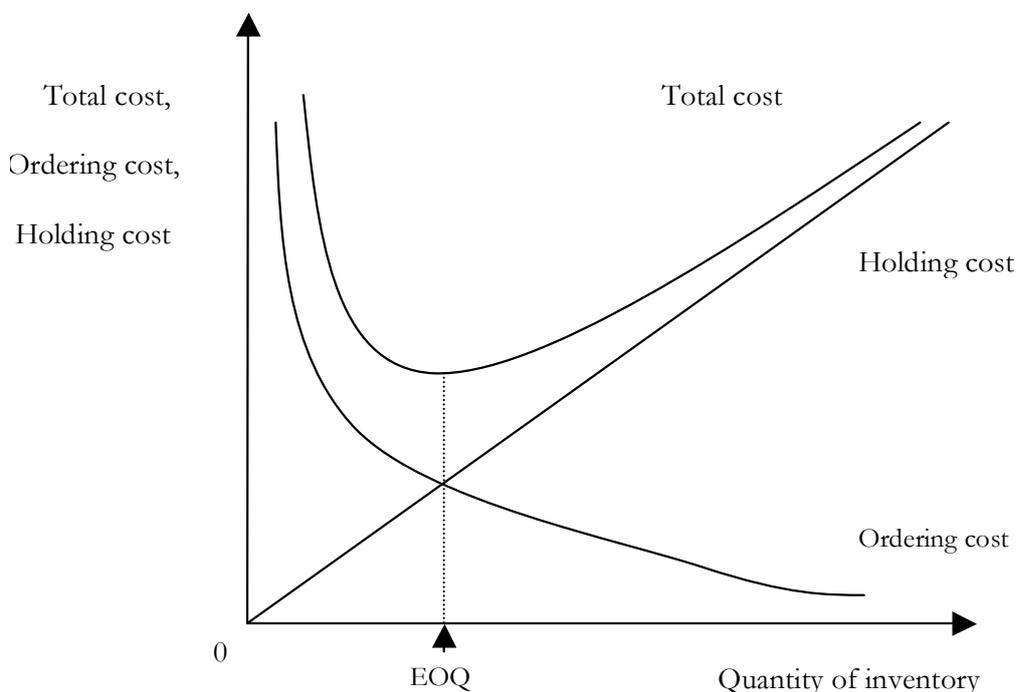
- (v) The supply lead time is known and constant
- (vi) Price and cost per unit is constant
- (vii) No stock outs are permitted and delivery is instantaneous
- (viii) Customers' orders cannot be held while fresh orders are awaited.

□ **EOQ as determined by the model**

EOQ constitutes the quantity purchased of either stocks or raw materials that is considered most optimum. This is the quantity that minimizes both holding costs and ordering costs. The EOQ will change if either the cost of placing an order or the cost of carrying inventory in stock (holding cost) changes. *(Since total cost constitutes ordering cost and holding cost which the EOQ model targets to minimize.)*

As the quantity of purchase increases, there is a reduction in ordering costs, but an increase in holding costs as illustrated in the graph below:

GRAPHICAL ILLUSTRATION OF THE EOQ



EOQ graph 1

The aggregate stock cost is lowest at the EOQ; at this point, the total cost is at minimum. Note that the total cost in this case comprises the holding and ordering costs only.



The various costs are determined as follows:

$$\text{Total Cost} = \text{Total Ordering cost} + \text{Total Holding Cost}$$

$$\text{Total Ordering Cost} = \text{Cost per Order} \times \text{No. of Orders in a Period}$$

$$\text{Where, No. of orders in a period} = \frac{\text{Annual Demand}}{\text{Quantity per Order}}$$

$$\text{Total Holding Cost} = \text{Average stock Quantity} \times \text{Holding cost Per Unit}$$

$$\text{Where, Average stock Quantity} = \frac{\text{beginning Inventory} + \text{Ending Inventory}}{2}$$

The cost of the goods procured is not taken into account while determining the EOQ where the price quoted is fixed and no discounts are offered.

Mathematically, the EOQ can be determined by the following formula

$$\text{EOQ} = \frac{\sqrt{2DC_0}}{C_h}$$

Where D is the annual demand

C_0 is the cost of making one order

C_h is the holding cost per unit per annum

To derive this formula, you need to understand the relationship between the various elements.

$$\text{Total Cost} = \text{Total Ordering cost} \left(\frac{D}{Q} C_0 \right) + \text{Total Holding Cost} \left(\frac{1}{2} Q C_h \right).$$

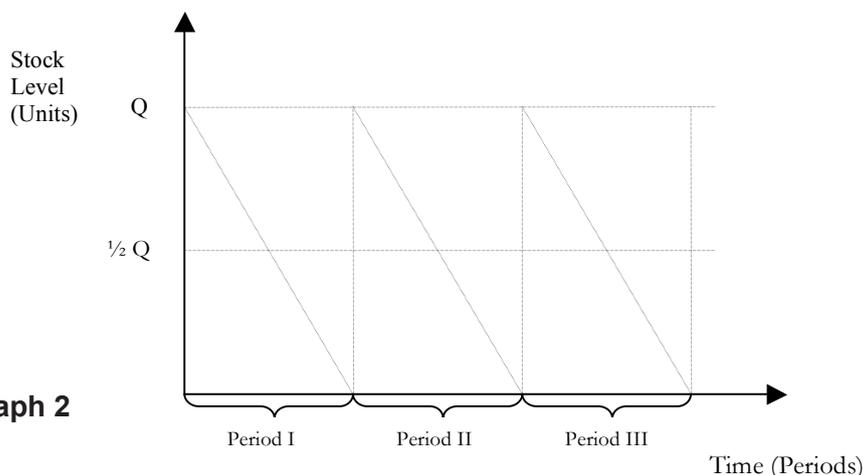
$$\text{Total Ordering Cost} = \text{Cost per Order} (C_0) \times \text{No. of Orders in a Period} \left(\frac{D}{Q} \right)$$

$$\text{Total Holding Cost} = \text{Average stock Quantity} \frac{1}{2} Q \times \text{Holding cost Per Unit} (C_h)$$

The number of orders in a period is equal to the total annual demand (D) divided by the quantity purchased per order (Q).

The average stock is equivalent to half the quantity procured (beginning inventory) since the ending inventory is zero (we assume that the firm exhausts the entire stock before reordering and that there is no safety stock) as illustrated in the graph below.

To illustrate stock level variation with time



EOQ graph 2

Stock purchased is sold at a constant rate until it is exhausted. An instantaneous replenishment is done to bring the stock back to the initial amount. There is certainty in the behavior of consumption.

At the optimum stock level, the holding and the ordering costs are equal. Take a look at the **EOQ Graph 1** on page 76; optimum stock level, EOQ, is at the point where:

$$\text{Total Holding Cost} = \text{Total Ordering cost}$$

$$\frac{1}{2}QC_h = D/QC_0$$

Make Q the subject of the formula.

Multiply both sides of the equation by Q to get

$$\frac{1}{2}Q^2C_h = DC_0$$

Multiply both sides of the equation by 2 to get

$$Q^2C_h = 2DC_0$$

Divide both sides of the equation by C_h to get

$$Q^2 = \frac{2DC_0}{C_h}$$

Obtain Q by taking the square root of both sides of the equation

$$Q = \sqrt{\frac{2DC_0}{C_h}}$$

therefore $EOQ = \sqrt{\frac{2DC}{C_h}}$

Illustration

ABC Ltd has an aggregate demand of 1.2 million units. Each time they place an order, there is an ordering cost of Shs.1,000, holding cost is Shs.100 per unit. Determine:

- i. EOQ
- ii. No. of order to be made based on EOQ
- iii. Total cost of stocks based on the EOQ

Solution

Data Provided; $D=1.2$ million units, $C_0 = \text{Shs.}1,000$, $C_h = \text{Shs.}100$

(i)

$$EOQ = \sqrt{\frac{2DC}{C_h}}$$

$$EOQ = \sqrt{\frac{2 \times 1,200,000 \times 1,000}{100}} = \sqrt{\frac{2,400,000,000}{100}} = \frac{48989}{10}$$

$$= 4,899 \text{ Units}$$

(ii)

$$\text{Number of orders} = \frac{\text{Annual demand}}{\text{Quantity Per order}} = \frac{1,200,000}{489}$$

$$= 244.94$$

.....

(Approx) 245 **Orders**



(iii)

$$\begin{aligned} \text{Total cost} &= \left(\frac{1}{2} QC_h\right) + \left(\frac{D}{Q} C_o\right) \\ &= \left(\frac{1}{2} \times 4,899 \times 100\right) + \left(\frac{1,200,000}{4,899} \times 1,000\right) \\ &= 489,900 \end{aligned}$$

>>> Illustration

Aries' Jewelers Inc. purchases 15,000 one-quarter-carat diamonds each year for various mountings. The following information relating to the diamonds is available.

Purchase cost per diamond	Shs.200
Cost to carry one diamond in inventory for one year	5
Cost of placing one order to the company's supplier	40

The maximum order that the insurance company will permit is 750 diamonds. The minimum order that the supplier will permit is 150 diamonds, with all orders required to be in multiples of 150 diamonds. The company has been purchasing in the maximum allowable volume of 750 diamonds per order.

Required:

- i. Determine the volume the company should be placing its orders.

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2DC_o}{C_h}} \\ &= \sqrt{\frac{2 \times 60,000 \times 40}{5}} = \sqrt{960,000} \\ &= 979.79 \text{ Units (Approx. 980 Units)} \end{aligned}$$

The orders must be in multiples of 150 units. Therefore, total number to be ordered should be either 900 units or 1050 units. By computing the total cost of holding and ordering the diamonds, we obtain the following summaries.

Ordering 900 Units

$$\begin{aligned} \text{Total cost} &= \left(\frac{1}{2} \times 900 \times 5\right) + \left(\frac{15,000}{900} \times 40\right) \\ &= 2,250 + 667 \\ &= 2,917 \end{aligned}$$

Ordering 1050 Units

$$\begin{aligned} \text{Total cost} &= \left(\frac{1}{2} \times 1050 \times 5\right) + \left(\frac{15,000}{1050} \times 40\right) \\ &= 2,625 + 571 \\ &= 3,196 \end{aligned}$$

Therefore, the cost accountant should recommend the purchase of 900 units as it is more economical.

>>> Illustration

A company uses 50,000 widgets per annum, which are acquired at Shs100 each. The ordering and handling costs are Shs150 per order and carrying costs are 15% of the cost of inventory per annum.

Required:

Calculate the economic order quantity.

Solution

Annual demand, $D = 50,000$, Cost of ordering $C_o = \text{Shs}150$

Holding costs per unit per year, $C_h = \text{Shs} (15\% \times 100) = \text{Shs}15$

$$Q = \sqrt{\frac{2DC}{C_h}} = \sqrt{\frac{2 \times 50,000 \times 150}{15}} = \sqrt{\frac{15,000,000}{15}} = \sqrt{1,000,000} = 1,000 \text{ units}$$

ECONOMIC BATCH QUANTITY (EBQ)

Fast forward

Economic batch quantity is similar to Economic order quantity except that it is only applicable in a manufacturing entity where production and consumption occur simultaneously with production rate being higher than the consumption one.

This applies to manufacturing industries. Most companies producing a number of different products organize their production on a batch basis rather than on a continuous one. Stock replenishment is gradual rather than instantaneous as for EOQ. There are no ordering costs but set up costs such as incremental labour, incremental overheads, machine down time and other costs for setting up facilities for production e.g. heating time is required.

The challenge here lies in determining the optimum amount to produce per batch. The EOQ formula can be modified in order to determine the optimum length of a production run and more so determine the optimum number of units that should be manufactured in each production run. This involves balancing set up costs and stock holding costs.

The EBQ formula for a manufacturing firm is a modification of the EOQ model formula for a merchandizing firm. Set up costs substitute ordering costs in the EBQ formula.



The formula can be expressed as follows:

$$Q = \sqrt{\frac{2DS}{C_h \left(1 - \frac{d}{p}\right)}}$$

Where,

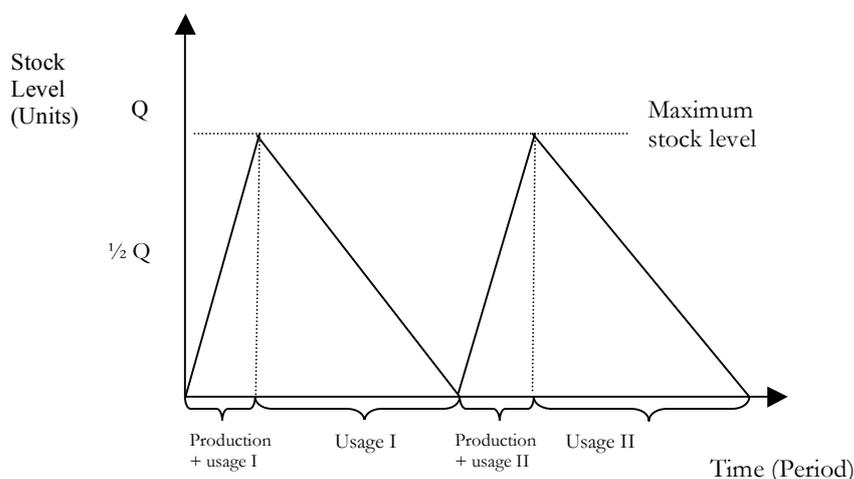
- D = Annual demand for the product
- S = Set up costs per batch (costs incurred in making preparation for production run)
- C_h = Cost of holding a unit per year
- Q = Economic batch quantity
- d = Consumption rate, for instance daily demand
- p = Production rate i.e. quantity produced per unit of time say, a day, month or year. It is the quantity which would be produced in one time period by continuous production. In our case $\left(1 - \frac{d}{p}\right)$ = An adjustment factor to the Holding cost since during production, consumption of the product is still on. This only applies where there is gradual replenishment. Where the replenishment is instantaneous, the factor $\left(1 - \frac{d}{p}\right)$ is not included.

The EBQ formula can be derived on the same principles as the EOQ formula. It aims at minimizing the total costs. The total costs are minimized at the point where set up cost equals the holding cost.

It takes time for the entire Q to be produced. During this time $\left(\frac{d}{p} \times D\right)$ units have been used. Hence the units available at the highest point (maximum stock level) will be equal to $\left(Q - \frac{d}{p} D\right)$. Therefore, the holding cost per unit shall be based on the average inventory

$$\frac{\left(Q - \frac{d}{p} D\right)}{2} = \frac{Q \left(1 - \frac{d}{p}\right)}{2}$$

A graphical representation of the gradual replenishment is as illustrated below;



To illustrate EBQ stock level variation with time

The change from C_h to $C_h \left(1 - \frac{d}{p}\right)$ reflect the fact that average stock will be $\frac{Q}{2} \left(1 - \frac{d}{p}\right)$ instead of $\frac{Q}{2}$. The reduction is caused by the fact that some units will be taken out of stock for use even as stock is being replenished by fresh production. If the production is very fast, so p is very high in relation to d , periods of production will be very short so this will have little effect on $\frac{Q}{2}$. $\frac{p}{d}$ will be small and $\left(1 - \frac{d}{p}\right)$ will be nearly 1.

>>> Illustration

Assume the constant annual sales demand for a product is 4500 unit; set up costs amounting to Shs450. The holding cost is Shs20 per unit per year. Assume 250 working days throughout the course of the year. The company produces 200 units per day during the production period.

Required:

Calculate the Economic Batch Quantity (EBQ)

Solution

Given: $D=4500$, $C_h=\text{Shs}20$, $S=\text{Shs}450$, $p=200$ units

$$d = \frac{\text{Annual demand}}{\text{Number of days}} = \frac{4500}{250} = 18 \text{ units per day}$$

$$Q = \sqrt{\frac{2DS}{C_h \left(1 - \frac{d}{p}\right)}}$$

$$\begin{aligned} Q &= \sqrt{\frac{2 \times 4500 \times 450}{20 \left(1 - \frac{18}{200}\right)}} = \sqrt{\frac{4,050,000}{18.2}} \\ &= \sqrt{222,527.47} \\ &= 471.72 \approx 472 \text{ units} \end{aligned}$$

>>> Illustration

A firm manufactures a product AC169 for sale in the market. The firm has a capacity of producing 250,000 units per annum. The annual demand for the product is 50,000 units, annual carrying costs per unit per annum is Shs15. Labour and other cost incurred every time in setting the machine for production equals Shs1,500.

Required: Calculate the Economic batch quantity.

**Solution**

Given: Annual demand, $D = 50,000$ units; Set up costs, $S = \text{Shs}150$;
Holding costs, $C_h = \text{Shs}15$; Production rate, $P = 250,000$ per annum

$$Q = \sqrt{\frac{2DS}{C_h \left(1 - \frac{d}{p}\right)}}$$
$$Q = \sqrt{\frac{2 \times 50,000 \times 150}{15 \left(1 - \frac{50,000}{250,000}\right)}} = \sqrt{\frac{15,000,000}{12}}$$
$$= \sqrt{1,250,000}$$
$$= \underline{\underline{1,118 \text{ units}}}$$

EOQ SITUATION WHERE DISCOUNTS ARE OFFERED**Fast forward:**

Discounts offered by suppliers may change the optimal stock level that minimizes costs under a no discount situation.

Ordinarily, manufacturers offer discounts on bulk purchases. Quantity discounts are realized when a firm buys in larger quantities than the Economic Order Quantity (EOQ).

To evaluate whether to take the discount or not, two methods may be used. These are:

- a. One price level/cost comparison approach
- b. Multiple price break model

 a. One price level/cost comparison approach

In such situations, one should calculate the total costs for both EOQ situations and quantity discount situation and compare the two total costs. The components of the total cost are the purchase cost, holding costs and ordering costs.

Reject the discount offer if the total cost related to the quantity discount is more than the total cost related to the EOQ situation. But if the total cost related to discount situation is less than accepted.

□ b. Multiple Price Break Model

In here, there are several prices quoted for different batches. At each price, there is a discount offer. To determine the optimal EOQ for the firm, determine the EOQ at each price. If the EOQ calculated given the data of a specific class does not fall within that class, disregard the class and proceed to the next class with the higher price.

>>> Illustration

Tim's Solutions limited wishes to achieve excellent stock management so as to achieve a marvelous profit this year. Its management estimates the demand for its product to be 1000 units per annum with a purchase price of Shs10 per unit, a holding cost of Shs0.75 per unit (7.5 % of purchase costs) and ordering costs of Shs 15 per order. The supplier of the stock has presented Tim's Solutions with the following range of prices of stocks.

Order size (Units)	Quantity Discounts	Price per Units (Shs)
0-99	0	10.00
100-199	1	9.90
200-399	2	9.98
400-599	4	9.60
600-799	5	9.50
800-899	5	9.50
900-999	5.5	9.45

Due to its storage capacity, the Company can only purchase an amount of up to 600 units. Currently, the company is purchasing at optimum stock quantity to enable it achieve its objectives. The management is considering whether to shift from the current stock purchase policy to purchase the maximum stock.

Required:

- Calculate the current EOQ in units
- Determine the total cost of stock that arises due to the EOQ purchased (include the discount opportunity cost)
- Advise the company whether it should change its policy.

Solution

- Current EOQ
Data given: Cost of holding 0.75 per unit (7.5% of purchase cost)
Cost of ordering Shs15 per order
Purchase cost Shs10 per unit
Annual demand



$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2DC_0}{C_h}} \\ &= \sqrt{\frac{2 \times 1,000 \times 15}{0.75}} = \sqrt{40,000} \\ &= 200 \text{ units} \end{aligned}$$

- (b) Total costs of stocks that arise due to the EOQ purchased (before the discounts are offered)

Total cost = Purchase cost + Holding Cost + Ordering cost

$$\begin{aligned} \text{Total cost} &= PD + \left(\frac{1}{2}QC_h\right) + \left(\frac{D}{Q}C_o\right) \\ &= (10 \times 1000) + \left(\frac{1}{2} \times 200 \times 0.75\right) + \left(\frac{1,000}{200} \times 15\right) \\ &= 10,000 + 75 + 75 \\ &= 10,150 \end{aligned}$$

- (c) Disregard the classes above, the 600-799 units, since we are told that the firm's storage capacity is only 600 units. When calculating the other EOQ values, use the lower figure in the range (lower boundary)

Range	EOQ	Order quantity	Total Holding Cost	Total ordering Cost	Total purchase cost	Total cost
600-799	$\sqrt{\frac{2 \times 1000 \times 15}{7.5\% \times 9.50}} =$	600	213.75	25.00	9500	9,738.75
400-599	$\sqrt{\frac{2 \times 1000 \times 15}{7.5\% \times 9.60}} =$	400	144.00	37.50	9600	9,781.50
200-399	$\sqrt{\frac{2 \times 1000 \times 15}{7.5\% \times 9.80}} =$	202	73.50	75.00	9800	9,948.50
Current	$\sqrt{\frac{2 \times 1000 \times 15}{7.5\% \times 10.00}} =$	200	75.00	75.00	10000	10,150.00

The minimum total costs are incurred at the 600-799 bracket. Therefore, the company should take advantage of the discounts and procure 600 units each time it wants to buy. The company will save Shs411.25 each year by adopting the new policy.

STOCK CONTROL SYSTEMS

Fast forward:

Different organizations will adopt different stock control systems based on the type, value, ordering and issue of stocks.

ABC System or Pareto analysis

It is also called the 82/20 rule, control by importance/exception. It concentrates on high value items. In here, items are categorized into three classes as follows:

Class A: These are high cost, fast moving and high usage items. They are few accounting for only 20 percent of the total number of items yet account for 80 percent of the total inventory budget. These items are worth to be under highest control.

Class B: These are medium moving goods. They account for 15 percent of the total number of the budget. They are moderately controlled.

Class C: These are slow moving low value items. They are very many accounting for 65 percent of the total number of items and only 5 percent of the total inventory budget. These items might be under simple physical control

Periodic order system

The firm receives a new order of the amount specified by the order quantity at equal intervals of time. The order quantity is based on the likely demand (factors that affect demand of the firms product) and the current stock levels. The firm determines the maximum and minimum inventory, the safety stock and the reorder level. For instance, a firm may be supplied with fixed amount of stock every Monday of the week for the entire period under consideration. This is mostly the case where consumption is uniform throughout the period.

The stock levels are reviewed at fixed intervals and a replenishment order is issued where necessary. The reviewed is deemed beneficial as obsolete stock can be identified and eliminated at the earliest possible instance. Spreading of purchasing department load may yield economies in placing orders. Furthermore, because orders will be sequential, there may be production economies due to more efficient production planning and lower set up costs.

However, periodic order system requires larger stocks as reorder quantity must take into account the period between the reviews and lead times too. More so, the reorder levels are not always the EOQ. Where there arises a change in consumption habits and demand goes up significantly, stock out costs may result. In other words, to come up with an appropriate period of review, the demands must be reasonably consistent.



Continuous Review System

The firm places orders at regular intervals but the order quantity varies according to how much a firm requires to bring the level to some predetermined size or value. (To replenish the stock already consumed). This is common with most enterprises. This system exists where consumption fluctuates throughout the period.

Material Handling

The objective is to ensure that goods are delivered to the right places at the right time and in the right manner to avoid delays, congestion and unnecessary handling. A big percentage of production cost is taken up by material handling activities. A good material handling system should minimize these costs.

The manager needs to determine the type of equipment to be used to handle the material. The type of equipment that is most frequently used includes: Cranes, Lifts, Trucks and Conveyors

Various factors influence the type of materials to be used in handling the materials. They include the type of materials being moved, volume of materials, rate or frequency of movement, route of movement speed required, method of storage employed and safety or hazards involved.

Storage of Material; stores location and layout

Stores should be strategically located to minimize production costs. They should be located closest to the factory as possible and where possible. In some instances, materials in the same store may be needed at different locations, either in the same factory building or at different plants. This calls for a more strategic planning on the location of the store where a new one has to be constructed or looking for an alternative to minimize the costs e.g. contracting an external third party. This may be through renting a warehouse or hiring transporters. Instances such as hiring of transporters would only be economical where special storage equipment which necessitates an enormous initial capital outlay are used, for instance freezers.

The layout of stores should ensure:

- Ease of access for movement of material in and out of stores
- The issue of perishable materials on a first in first out (FIFO) basis
- The segregation of toxic and dangerous materials in a separate location
- Security of materials by restriction of access to authorized personnel only

☐ Valuation of Material inventory (Issues and closing stocks)

It aims at attaching a monetary value of material inventory in the stores or issued for production. This is useful in costing the output and pricing production, as well as decision making.

Methods most commonly used in valuing inventory include:

- i. First In First Out (FIFO)
- ii. Last In Last Out (LIFO)
- iii. Weighted Average method (WAM)

■ a) First in First Out (FIFO)

Advantages of the FIFO method

- i. It is a logical pricing method which probably represents what is happening in practice: oldest items are usually issued first out.
- ii. Unrealized profits or losses do not arise at the end of period. Materials are issued at the same price as that at which they were acquired hence no profit or loss arises out of the transaction.
- iii. It is easy to understand. It is also easy to calculate if prices of materials don't fluctuate
- iv. Closing stocks values reflect the latest costs thus tend to reflect the current market values.
- v. It is acceptable to many tax authorities and is also consistent with accounting practices for instance the International Financial Reporting Standards (IFRS) and International Accounting Standards (IAS).

Disadvantages

- i. It can be cumbersome to operate because of the need to identify each batch of materials separately
- ii. Product costs, based on the oldest material prices, lag behind current conditions especially in inflationary markets.
- iii. Managers may find it difficult to compare costs and make decisions where they are charged with varying prices for the same materials.



■ b) Last in first Out (LIFO)

It assumes that materials are issued out of stock in the reverse order to which they are delivered i.e. they are valued at the price of units received first. Stock valuation is, therefore, based on the prices ruling on the acquisition of the last stocks.

Advantages of the LIFO method

Product costs tend to be based on current market prices thus the method is realistic. Managers are continually aware of the recent costs when making decisions because the cost being charged to the department or products will be the current costs

Disadvantages

The LIFO method involves tedious calculations if the prices of materials fluctuate from time to time.

Comparison of one job with another may be unfair and difficult. Variation in prices may make the decision-making process difficult and unfair. This is because LIFO method is often the opposite of what is happening in reality (stocks are valued at the oldest prices) and thus becomes difficult to explain to managers.

■ c) Weighted Average Method (WAM)

Under this method, the issue price is recalculated after each receipt of stocks taking into account both quantities and money value of the stocks received (perpetual weighted average). In this case stock used or unused is based on the average price per unit where the average price per unit is calculated as follows:

$$\begin{aligned}\text{Average Price Per Unit} &= \frac{\text{Total value of stocks}}{\text{No. of units of stocks}} \\ &= \frac{(\text{Money value of old stocks} + \text{Money Value of New Stocks})}{(\text{Quantity of old stocks} + \text{Quantity of New Stocks})}\end{aligned}$$

At times, the inventory valuation may be done only once; at the end of the period. In such a situation, the WAM formula will still be used but we shall regard that as periodic WAM valuation.

Advantages of the WAM method

Fluctuations in prices are smoothed out making it easier to use the data for decision making. This method is easier to administer than the LIFO and FIFO methods of stock valuation.

Disadvantages of the WAM method

The resulting issue price is rarely the actual price that was paid and it can run into several decimal places. Prices tend to lag a little behind the current market value where there is gradual inflation

>>> Illustration

Assume the following purchases were made in ABC Ltd

Date of purchase Units purchased Price/unit

Date of purchase	Units Purchased	Price per Unit
1st January	500	100
2nd January	600	200
3rd January	800	400

Units used on 4th January are 900.

Required:

Determine the cost of units used by using and the value of the closing stocks by using FIFO, LIFO and Weighted Average Methods.

Solution

FIFO Method

Date	Purchased			Issued			Balance		
	Units	Price	Amount	Units	Price	Amount	Units	Price	Amount
1 st Jan	500	100	50,000				500	100	50,000
2 nd Jan	600	200	120,000				1,100		170,000
3 rd Jan	800	400	320,000				1,900		490,000
4 th Jan				900	***	130,000	1,000		360,000

- The 900 units issued comprised the first batch of 500 units @ Shs. 100 and 400 units from the second batch purchased on 2nd Jan @ Shs.200. *** Price for the materials used is different.



- Closing stock was valued at Shs.360,000 comprising 800 units @ Shs.400 and 200 units @ Shs.200.

LIFO Method

Date	Purchased			Issued (Deducted)			Balance		
	Units	Price	Amount	Units	Price	Amount	Units	Price	Amount
1 st Jan	500	100	50,000				500	100	50,000
2 nd Jan	600	200	120,000				1,100		170,000
3 rd Jan	800	400	320,000				1,900		490,000
4 th Jan				900	***	360,000	1,000		130,000

- The 900 units issued comprised of the first batch 800 units @ Shs. 400 Purchased on 3rd Jan and 200 units from the second batch purchased on 2nd Jan @ Shs.200. *** Price for the materials used is different.
- Closing stock was valued at Shs.130,000 comprising 500 units @ Shs.100 and 400 units @ Shs.200.

WAM

Date	Purchased			Issued(Deducted)			Balance		
	Units	Price	Amount	Units	Price	Amount	Units	Price	Amount
1 st Jan	500	100	50,000				500	100	50,000
2 nd Jan	600	200	120,000				1,100	154.545	170,000
3 rd Jan	800	400	320,000				1,900	257.895	490,000
4 th Jan	1,900	***	490,000	900	257.895	232,105	1,000	257.895	257,895

The 900 units are issued at a weighted average Price which is arrived at using the formula

$$\text{Average Price Per Unit} = \frac{\text{Total value of stocks}}{\text{No. of units of stocks}}$$

The issue price after every purchase is arrived at as:

$$= \frac{(\text{Money value of old stocks} + \text{Money Value of New Stocks})}{(\text{Quantity of old stocks} + \text{Quantity of New Stocks})}$$

For instance, the weighted average price after the 2nd Purchase shall be

$$\begin{aligned} &= \frac{(50,000 + 120,000)}{(500 + 600)} = \frac{170,000}{1,100} \\ &= 154.545 \end{aligned}$$

This is the case for **perpetual** weighted average method.

■ d) Standard cost methods of inventory valuation

Under this method, all issues are valued at a predetermined standard price which may not be the same as the actual price paid for the materials delivered. The standard price is based on management's estimate of the expected costs. Where the standard price and the actual price are different, a material price variance occurs.

Advantages of standard costing

All issues are made at the same price hence makes it easy to compare. It is easy and less tedious since it does not involve recalculation of prices at different stages. In addition, it acts as a standard, which can be used for management control reporting.

Disadvantages of standard costing

Determination of standards can be difficult and time consuming. It involves a lot of analysis. Issues may not be at current market value. In addition, where the price paid is different from the standard price, a variance will arise which calls for further analysis in order to determine the cause of the variance. Problems of inflation are difficult to manage especially where inflation rates change very often.

■ e) Replacement costing

Here, material issues and closing stock are valued at a cost at which identical materials can be bought. Replacement cost is the cost at which an identical asset could be purchased or manufactured.

Advantages of replacement costing

This method ensures that materials are issued at prices which are up to date. This enables managers to take recent trends into account while making decisions. This method is recommended in accounting for inflation. It is also easy to operate once the replacement cost has been determined.

Disadvantages of replacement costing

The replacement cost may not necessarily be the price at which the inventory was acquired. This will translate to a price variance. More so, it is difficult to determine the replacement cost



CHAPTER SUMMARY

Materials refer to the tangible inputs into the process of producing useful output.

There are three general kinds of stocks kept by firms due to various reasons:

- Buffer inventories
- Anticipation inventory
- Appreciation inventory

Elements of material cost are

- Purchase cost
- Ordering cost
- Holding cost
- Shortage cost

An effective material cost control system has the following features among others:

- Adequate perpetual inventory records
- Checking of perpetual inventory records
- Maintenance of target stock levels
- Authorization of orders.
- Responsibility and authority relationships
- Reporting
- Control.

Stock level and its control

Minimum stock level

Minimum stock level = Reorder level - (Normal consumption \times normal reorder period)

Maximum stock level

Maximum stock level = Reorder level + reorder Quantity - (Minimum Consumption × minimum reorder period)

Re-order level

Re - order level = maximum consumption X maximum re - order period

Re order quantity

Re - order quantity = maximum stock - re - order level + (Minimum Usage × Minimum reorder period)

$$\text{Economic order quantity} = \text{EOQ} = \frac{\sqrt{2DC_0}}{C_h}$$

$$\text{Economic batch quantity} = Q = \sqrt{\frac{2DS}{C_h \left(1 - \frac{d}{P}\right)}}$$



CHAPTER QUIZ

1. List four stock control systems
2. List the advantages of FIFO method
3. Write down the EOQ formula

ANSWERS TO CHAPTER QUIZ

1. Stock control systems

- ABC System
- Periodic order system
- Continuous review system
- Just in time inventory system

2. Advantages of FIFO method

- It is a logical pricing method which probably represents what is happening in practice: oldest items are usually issued first out.
- Unrealized profits or losses do not arise at the end of period. Materials are issued at the same price as that at which they were acquired hence no profit or loss arises out of the transaction.
- It is easy to understand. It is also easy to calculate if prices of materials don't fluctuate
- Closing stocks values reflect the latest costs thus tend to reflect the current market values.
- It is acceptable to many tax authorities and is also consistent with accounting practices for instance the International Financial Reporting Standards (IFRS) and International Accounting Standards (IAS)

3. Economic order quantity = $EOQ = \frac{\sqrt{2DC_0}}{C_h}$

PAST PAPER ANALYSIS

Questions in this chapter have been tested in the following exam sittings.

12/06/ Q1(a); 06/04 Q4; 06/03 Q5; 06/03 Q6; 05/02 Q7; 12/01 Q2; 12/00 Q1; 06/00 Q2; 05/00 Q4; 06/98 Q5; 12/96 Q1; 06/97 Q5; 12/94 Q6; 06/94 Q2; 06/93 Q4;



EXAM QUESTIONS

Question One

Highlight the essential requirements of an effective material control system (10 mark)

Question Two

Mwaura uses the EOQ formula to establish its optimal reorder quantity for its single new material. The following data relates to the stock costs

$P = \text{Shs } 15$ per item

$C_h = \text{Shs } 50$ per order

$C_o = \text{Shs } 5$ per order

Storage costs = 10% of P + Shs0.20 per unit p.a.

$D = 4,000$ units

Required

Calculate the economic order quantity (10 marks)

Question Three

H limited wishes to minimize its stock costs. At the moment, its reorder quantity is 1000 units. Order costs are £10 per order and annual holding costs are £1.2. H estimates the annual demand to be 15,000 units.

Required:

Calculate the EOQ to the nearest 1000 units(10 marks)

Question Four

Jitahidi Company is located in Kariobangi Light industries area in Nairobi. The company manufactures a product 'Comex', which is used in the building industry. The main are materials used in the manufacture of 'Comex'is material B42000.

The following information relates to the material B42000

Annual requirements: 144,000

Ordering costs: Shs12,500 per order

Annual holding costs: 20% of the purchase price

Purchase price per unit: Shs500

Safety stock requirement: None

Required:

- (i) The economic order quantity (7 marks)
- (ii) The number of orders needed per year (7 marks)
- (iii) Total costs of ordering and holding material B42000 per year (6 marks)

Question Five

- a) Explain the advantages of centralized system of maintaining stores. (5 marks)
- b) Explain the assumptions behind the determination of Economic Order Quantity (EOQ). (5 marks)
- c) The following information is given for material Y-20.

Consumption:

Annual	360,000 units
Maximum	1,200 units/day
Minimum	800 units/day
Normal	900 units/day
Re-order period	12 – 24 days
Re-order quantity	32,000 units

Required: Work out

- i) Re-order level. (4 marks)
- ii) Minimum stock level. (3 marks)
- iii) Maximum stock level (3 marks)

(CPA 07/00)**CASE STUDY**

Nyali Ltd. is a distributor of an industrial chemical in the South Coast. The chemical is supplied in drums, which have to be stored at a controlled temperature. The company's objective is to maximize profits, however the management team disagrees on the stock control policy and holds the following different views:

The Managing Director's view:

The company's managing director (MD) wishes to improve the stock holding policy by applying the economic order quantity (EOQ) model. Each drum of the chemical costs Shs. 5,000 from a supplier and is sold for Shs. 6,000. The annual demand is estimated to be 10,000 drums, which the MD assumes to be evenly distributed over the 300 working days in a year. The cost of delivery is estimated at Shs. 2,500 per order and the annual variable holding cost per drum at Shs. 4,500 plus 10% of the purchase price.



Using these data, the MD calculated the EOQ and proposes that it should be used as the basis for future purchasing decisions of the industrial chemical.

The Purchasing Manager's view:

Provided in the employment contract of the company's purchasing manager (PM) is a clause stating that he will receive a bonus (rounded at the nearest Shs. 100) calculate as follows:

$$b = [1,000,000 - (O_c + H_c)] \times 0.1$$

where: b is the annual bonus.

O_c is the annual ordering cost.

H_c is the annual holding cost.

Using the same assumption as the MD, the PM points out that in making his calculation, the MD has not only ignored the bonus but also the fact that suppliers offer quantity discounts on purchase orders, where if the order size is 200 drums or above, the price per drum for an entire consignment is only Shs. 4,990 compared to Shs. 5,000 when the order is between 100 and 199 drums and Shs. 5,010 when an order is between 50 and 99 drums.

The Finance Director's view:

The company's finance director (FD) accepts the need to consider quantity discounts and pay a bonus, but he also holds the view that the MD's approach is too simplistic. He points out that there is a three days lead time for an order and that demand has not been entirely even over the past year. Moreover, if the company has no drums of the chemical in stock, it will lose specific orders as potential customers will source the chemical from competitors. He gives the frequency of lead time demand over the last year as follows:

Demand during lead time	Frequency (No. of drums)
106	4
104	10
102	16
100	40
98	14
96	14
94	2

Under the circumstances, the MD decided that he would seek further advice on the course of action to be taken by the company.

The EOQ as originally determined by the company's managing director

$$\text{EOQ} = \frac{\sqrt{2DC_0}}{C_h} = \sqrt{\frac{2 \times 10,000 \times 2,500}{4,500 + 10\% (5000)}} = 100 \text{ units}$$

The optimum order quantity, taking into consideration the MD's assumptions and after allowing for the purchasing manager's bonus and supplier quantity discount was calculated as follows;

To ascertain whether it is worth increasing the purchase quantity to 200 units, we must compare the total costs at each of these quantities.

Total costs with a reorder quantity of 100 units Shs.

$$\text{Annual holding costs} = \frac{1}{2} QC_h = \frac{1}{2} (100) \times 5000 = 250,000$$

$$\text{Annual ordering costs} = \frac{D}{Q} C_o = \frac{10,000}{100} \times 2,500 = \frac{250,000}{500,000}$$

$$\text{Purchase manager's bonus} = 10\% \times (1,000,000 - 500,000) = 50,000$$

$$\text{Annual purchase costs} = 10,000 \times 5,000 = \underline{50,000,000}$$

$$\text{Total annual costs} \quad \underline{50,550,000}$$

Total costs with a reorder quantity of 200 units Shs.

$$\text{Annual holding costs} = \frac{200}{2} \times 4,999 (4500 + 499) = 499,900$$

$$\text{Annual ordering costs} = \frac{10,000}{200} \times 2,500 = \underline{125,000}$$

$$624,900$$

$$\text{Purchase manager's bonus} = 10\% \times (1,000,000 - 624,900) = 37,500$$

$$\text{Annual purchase costs} = 10,000 \times 4,990 = \underline{49,900,000}$$

$$\text{Total annual costs} \quad \underline{50,562,400}$$

The optimal order quantity is still 100 units

CHAPTER FIVE



LABOUR COSTS



CHAPTER FIVE

LABOUR COSTS

► OBJECTIVES

After studying chapter five, you should be able to

- Define labour costs and classify labour costs on the various available basis; whether manufacturing, non-manufacturing, product or period
- Identify and define the elements of labour costs and the methods by which labour costs can be paid out
- Explain the importance of time keeping and time analysis in determination of labour costs
- Calculate overtime premium and distinguish overtime premium from shift premium
- Calculate the bonus payments and total labour costs.
- Explain why labour turnover exists and point out costs associated with high labour turnover.
- Explain the importance of group bonus schemes and co-ownership schemes as incentives to employees
- Identify the departments involved in accumulation of labour costs.

► INTRODUCTION

In here, we look at elements of labour costs and learn to accumulate labour cost.

This chapter also looks at labour cost control and group remuneration and incentive schemes

► DEFINITION OF KEY TERMS

Labour turnover is the number of employees leaving or being recruited in a period of time.

Basic wages is the amount contracted for

Idle time is non-predictive time paid for

Allowances are payments in addition to an employee's wage or salary, and are paid as compensation for a particular feature of work, inconvenience or discomfort incurred as part of your position

Overtime premium is compensation paid to employees in addition to normal wages for hours worked in excess of normal working hours

Shift premium is the payment of labour over and above the standard rate when they work on shifts especially during the nights

► EXAM CONTEXT

This chapter is usually examined together with others. However, this does not mean that the examiner cannot set an entire question from this chapter. You therefore need to understand the various concepts and terminologies used in order to give correct solutions.

► INDUSTRY CONTEXT

This chapter is crucial and is applicable in the real life situation in determination of labour costs in the various industries. In manufacturing industries, it is applied in determining how much of the labour cost is to be charged in the various departments such as manufacturing and service departments. In merchandising firms, it is applicable in determining how much of labour cost is incurred (as operating cost) in terms of salaries, wages and commissions.

■ ■ ■ LABOUR COSTS

Fast forward;

The main cost of labour is the basic wages or salary. It may be fixed or variable; pegged to performance. Other costs such as bonus and commissions may not always be incurred.

Labour costs refer to all the costs incurred in compensating the human resources employed to provide a useful service in the production process. Just like material costs, labour costs form a large percentage of the total cost of production. There is, therefore, need to exercise maximum care so that this cost is minimized. Correct determination of labour costs is important for various purposes including correct determination of gross and net pay for each individual employee, for financial accounting and managerial accounting purposes. Managerial accounting purposes include stock valuation decision making and labour cost control.



Labour costs can either be direct or indirect. They include;

- **Basic salary or wages:** this is the amount contracted for. A wage is the amount of money paid for some specified quantity of labour. When expressed with respect to time (usually per hour), it is typically called the wage rate, and is specified in pre-tax amounts. It is often the main monetary item upon which the worker and the employer focus when negotiating an employment contract.
- **Overtime premium:** compensation paid to employees in addition to normal wages for hours worked in excess of normal working hours. Normal hours refer to the time pre-specified in the employment contract to be the official working hours. In most organizations in Kenya, the normal working hours is between 8.00 am and 5.00 pm.
- **Bonus payment:** this is a payment in addition to the amount contracted for, in most cases based on the level of performance or profitability.
- **Allowances:** allowances are payments in addition to an employee's wage or salary, and are paid as compensation for a particular feature of work, inconvenience or discomfort incurred as part of your position. For instance, sitting allowance, traveling allowance and hardship allowance.
- **Idle time:** this is the non productive time paid for. For instance, workers are still paid though no production is continuing due to power failure or machine breakdown
- **Labour turnover:** this includes the cost of recruiting new employees who come in to replace the outgoing employees.

Elements of Labour Costs

■ Basic wages

Basic wages is the amount contracted for. There are various methods by which basic wages can be paid out. They include

- (a) Fixed rate or fixed salary per month or per annum**
Here, the employees earn a fixed amount despite the amount of work done. For instance, a production manager may be allowed a salary of Shs500,000 per month, whether the company production is at peak or off-peak.
- b) Piece rate or piece work**
Under this method, the earnings depend on the level of activity or output achieved and it is expressed as

$$\text{Earnings} = \text{Output (units)} \times \text{basic rate per unit}$$

Under the piece rate system, there are three schemes of remuneration. These are straight piece rate, straight piece rate with a guaranteed minimum pay and a differential piece rate.

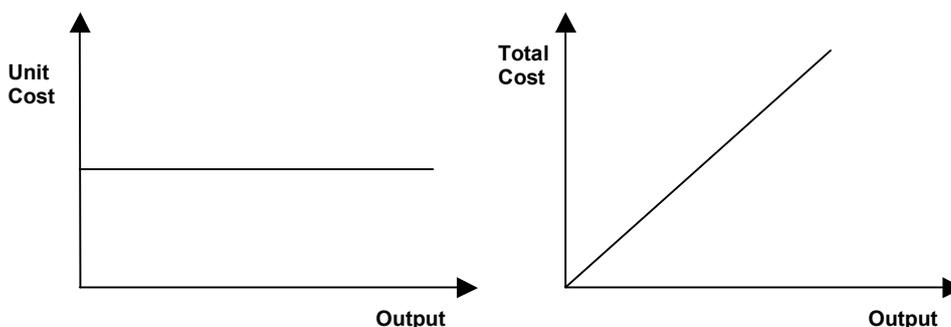
■ Straight piece rate

Here, the basic rate per unit remains constant irrespective of the number of units produced. For instance, if 200 units are produced at a basic rate of Shs1000 per units, then the earnings will be

$$= \text{Shs.1,000 per unit} \times 200 \text{ units}$$

$$= \text{Shs.200,000}$$

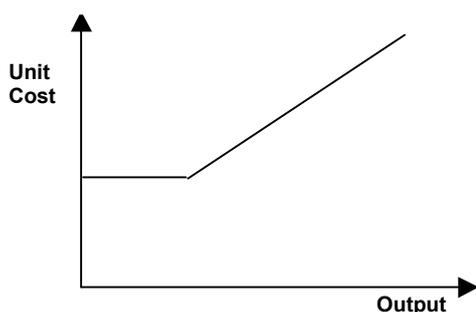
The graphs below illustrate the straight piecework remuneration method



■ Straight piece rate with a guaranteed minimum pay

Under this scheme, although the employee is paid on the number of units produced, one is guaranteed of some main wage since there are occasions when production does not take place due to power failures, machine breakdowns, etc. Therefore, a standard rate is agreed upon for the production of each unit based upon an expected time to produce one unit and the normal rate per hour.

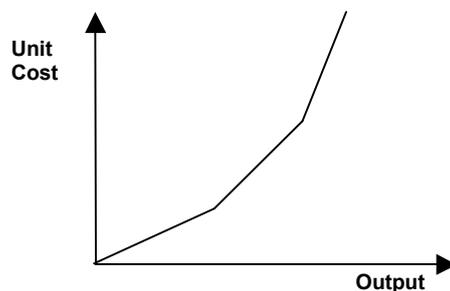
The total wages graph for this scheme would appear as shown below





■ Differential piece rate

Here, employees' basic rate of pay per unit changed as the level of activity changes. Under differential rate system, the workers time rate is fixed at a higher level than the usual rate of payment if the output exceeds the expected (usually set) level. The objective of this system is to provide an incentive to the workers while retaining the simplicity of the system. It is most appropriate for easily measurable output to which groups of workers contribute e.g. car assembly lines. The low piece rate is applicable where a worker is not able to achieve the standard (normal) output and the highest piece rate is for those above standard. It does not provide the security of a guaranteed minimum wage but has the enhanced incentive of increased rates for higher production. The graphical illustration of the scheme will be as follows;



If it does not guarantee minimum wages on time basis, this may lead to high wage differential in the company and consequently demotivation. For this reason, the differential price rate system as well as many variations of the piece rate system contain a minimum (guaranteed) pay.

(c) Time rate or time work

Under this method, employees earnings depend on the time spent on the job. Total wages can be expressed as;

$$\text{Total earnings} = \text{Basic rate per hour} \times \text{total hours worked}$$

Under this system there are various schemes that may be applied. They include

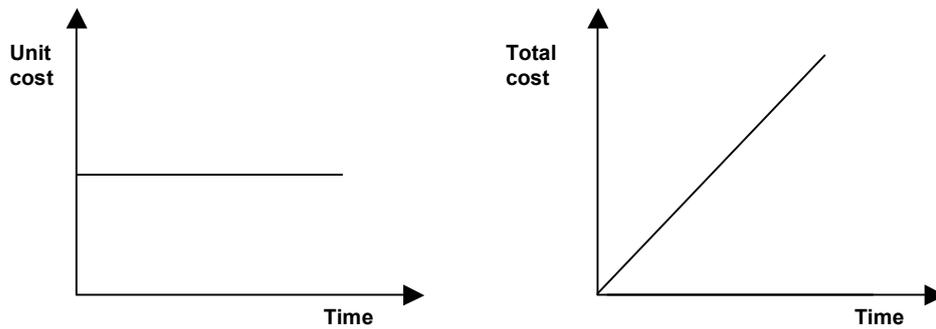
■ Flat time rate

Under flat time rate, each worker is paid for the time spent without considering the volume of production during that period. The basic rate per hour remains constant irrespective of the number of hours worked. For instance, assume that an employee worked for 200 hours on a specific assignment. Assume further that the basic rate per hour is Shs100. The total earnings under flat time rate will be

$$= \text{Shs}100 \text{ per hour} \times 200 \text{ hours}$$

$$= \text{Shs}20,000$$

The graphical illustration of labour cost behavior under flat time rate is as shown;



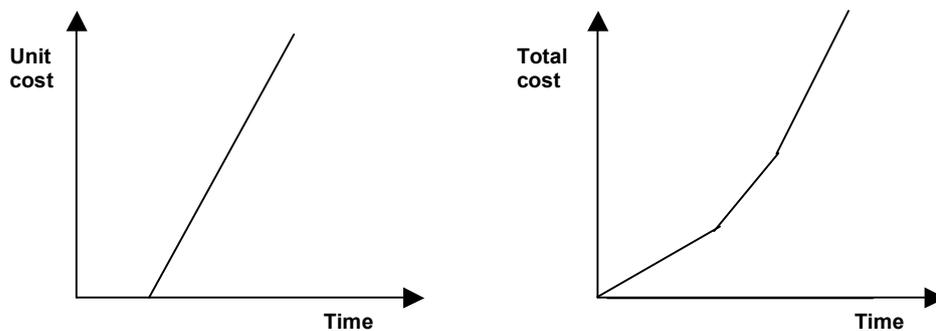
■ Measured day rate

This is where although the employee is paid on the basis of the number of hours worked, before such payment is made, one must have completed a given piece of assignment.

■ Graduated time rate

Under this scheme, the rate of pay is adjusted to reflect changes in the cost of living

Graphical illustrations of the two schemes above; measured day rate and graduated day rate are as follows;



To illustrate measured day rate

To illustrate graduated time rate

Time Keeping

A labour cost control routine should ensure that payments are paid only to employees who have spent time at the work place and that payments are at agreed rates of pay including overtime premium and shift premium payments where relevant. Where an employee is paid a fixed sum for an agreed length of working week, it may be decided by a check by the supervisor that the employee is at work is all that is necessary.



Where the employee is being paid at the rate per hour for the time spent at work together with premium rates for overtime work, it is likely that a detailed record of time spent on the premises is required. This is done by having the employee to register his arrival and departure times.

Time analysis

This is usually achieved by having the employee complete a daily or weekly timesheet or by having job cards or piecework tickets. Where time sheets are issued, the employee records the time analysis stating how much time was spent on each job and recording idle time. This sheet will then be authorized by the supervisor. Job cards move with a job as it passes from one employee to another.

There may be time clocks at each work center where the time spent on the job is recorded. Where this routine is used, employees may also be required to clock idle time on an idle time card, which will be analyzed to determine the cause of idle time. Where payments are made in return for out put units, piecework tickets may be completed which are signed by the supervisor certifying the number of units claimed. The analysis of employee time will facilitate:

- Correct charge of direct labour cost to each job
- Correct charge of indirect labour cost to cost centers
- Control of labour costs by job and cost center
- Calculation of employee bonus
- Measurement of efficiency

■ Improvement in the differential piece rate system

An improvement of the high day rate system is the measured day work system. This system attempts to grade workers according to their efficiency and pay them a fixed amount based on which bracket they fall. For example, a company may have the following efficiency brackets paid at the respective rates.

Efficiency Bracket	Fixed rate
90% to 95%	Shs.50,000 per month
96% to 100%	Shs.60,000 per month
101% to 105%	Shs.70,000 per month

Suppose a worker falls in the 96% to 100% bracket, the actual amount of wages to be paid to him is Shs.60,000. The challenge here is that some employees may be more or less efficient than graded. Does the company still pay them the same amount as indicated in the efficiency

table? This calls for a consistent review of the employees' efficiency and remuneration scheme. Where, for instance, an employee has performed more efficiently, the company may pay an excess amount based on the evaluation. Assuming the employee in the same bracket as above achieves 104% efficiency, the company may decide to pay him/her the basic amount plus an extra amount based on evaluation.

i.e:

$$\begin{aligned}
 &= \text{Shs.}60,000 + \left(\frac{104 - 100}{105 - 100} \right) \times (70,000 - 60,000) \\
 &= \text{Shs.}60,000 + \frac{4}{5} \times 10,000 \\
 &= \text{Shs.}60,000 + 8,000 \\
 &= \text{Shs.}68,000
 \end{aligned}$$

The challenge comes in when the employee hits a lower class than the one he has been rated. Does the company pay him less?

Note: Labour efficiency and or productivity measures how efficiently the employees are working. It can be expressed as follows:-

$$\text{Efficiency ratio} = \frac{\text{Standard time}}{\text{Actual hours worked (productive and nonproductive)}} \times 100$$

■ Overtime premium:

This is the compensation paid to employees in addition to normal wages for hours worked in excess of normal working hours. The overtime is that time paid for over and above the basic hours for the period. Overtime premium is the difference between the rate at which normal working hours are paid and the rate at which overtime hours are paid.

Overtime by direct workers might either be to make up for the lost time earlier in the production process or to produce more of the product than was originally anticipated. The premium is considered to be an indirect labour cost and is treated as a production overhead.

Note that if overtime is needed to produce extra units i.e. overtime hours are worked for general production, then it is unavoidable and it should be treated as part of production overheads (indirect labour costs). In addition, if overtime is worked at a specific request of a customer, to get his work or order completed, then the premium is charged to that order as part of direct labour costs.

■ Shift premium

This is the payment of labour over and above the standard rate when they work on shifts especially during the nights or periods outside the normal working hours.



■ Bonus payments

Bonus payment is paid to employees to increase their efficiency. Various incentive bonus schemes have been introduced. The characteristics of such schemes include;

- Employees are paid more for their efficiency
- In spite of extra labour costs, unit cost of output is reduced and the profit earned per unit of sale is increased
- The morale of the employees should be expected to improve since they are seen to receive extra reward for extra effort.

■ Idle time

Idle time is non-predictive time paid for i.e. workers are paid but no goods have been produced e.g. when there is machine breakdown, power failure or tea breaks. Idle time can either be avoidable or unavoidable. It could be due to production disruptions whereby there is machine breakdown, inefficient scheduling of jobs or shortage of raw materials or policy decisions i.e. changes in production specifications or retraining skills.

Labour costs for paying for hours of avoidable time are costs that simply should not have occurred. Therefore, they should be written off in the profit and loss account.

Unavoidable idle time is that which cannot be helped. It is uncontrollable or unnecessary cost to the business e.g. tea breaks, unexpected fall in demand for a product or a strike at the suppliers affecting vital supplies. Unavoidable idle time of direct workers may be included in the cost of products as a production overhead. All other idle time is treated as period costs.

$$\text{Idle time ratio} = \frac{\text{Idle time}}{\text{Total hours worked}} \times 100$$

■ Labour turnover

It is the number of employees leaving or being recruited in a period of time. It is expressed as a percentage of the total labour force. It is expressed as;

$$\text{Labour turnover} = \frac{\text{Replacement}}{\text{Average no. of employees in a period}} \times 100$$

Causes of labour turnover; these causes outline the reasons why an employee may leave an organization. They include

- Illness and accidents
- Retirement and death
- Rate of payment; the employee may find that the remuneration is not commensurate to the amount of work done
- Poor working relationship between the management and the employee
- Lack of opportunity for career or lack of job satisfaction

■ Costs of labour turnover

Costs of labour turnover can be broadly categorized into replacement costs and preventive costs.

Replacement costs are costs incurred as a result of hiring a new employee. They include cost of selection and placement (advertising and interviewing), inefficiencies in new labour, lower productivity, cost of training, loss of output due to delay in new labour becoming available, increased wastage and spoilage due to lack of expertise among the new staff, possibility of more frequent accidents, cost of tools and machine breakages.

Preventive costs are costs incurred in order to prevent employees from leaving an organization. They include cost of personnel administration in maintaining good relationships and cost of welfare, services and pension schemes.

■ >>> Illustration

Company BC which operates a flat time rate method of remuneration has won a tender to do Job XYZ which requires 30 hours of labour input. On negotiation, the employer agreed to pay to the employee Shs.500 per normal hour of input. The company has a policy of paying overtime at 1 ½. The job was due in three days time. Each working day has 8 normal working hours.

Required

Compute the actual cost of labour incurred in the completion of the job.

Solution

Note that the normal working hours available in three days are 24. This means that the employee has to work overtime for 6 hrs to meet the deadline.



Therefore the actual analysis of labour cost incurred would be:

Hours	Rate	Total amount (rate used)	Total amount (Normal rate)	Premium
24 hrs	500	12,000	12,000	0
6 hrs	750 =(500 x 1 ½)	4,500	3,000	1,500
30	1,250	16,500	15,000	1,500

Premium paid to the employee may also be calculated as

$$\text{Premium} = (\text{Overtime} - \text{Normal Rate}) \times \text{Overtime hours}$$

$$\begin{aligned} &= (750 - 500) \times 6 \\ &= 250 \times 6 \\ &= 1,500 \end{aligned}$$

>>> Illustration 1

Under a premium bonus scheme, workers receive a guaranteed basic hourly minimum rate of pay plus a bonus of 50% of the time saved. No payment is paid beyond the time allowed but the bonus which is paid at the basic hourly rate is applicable to the accepted output only. No penalty is imposed on rejected output. The following details are available for the month of January 2003

Worker	A	B	C
Time allowed per unit (hrs)	¼	1/6	½
Units produced	474	684	175
Units rejected	54	84	25
Time taken (hrs)	78	72	80
Basic Pay per hour (Kshs)	6	6	3

Required

From the above information, calculate for each employee

- (a) Bonus hours and amount of bonus paid
- (b) Gross wages earned
- (c) Labour cost for each good unit sold

Solution**Worker A**

$$\begin{aligned}
 \text{Total time saved} &= \text{Expected time} - \text{Time taken} \\
 &= \frac{1}{4} (474 - 54) - 78 = \frac{1}{4} \times 420 - 78 \\
 &= 105 - 78 \\
 &= 27 \text{ hours}
 \end{aligned}$$

$$\text{Accepted time saved} = 50\% \times 27 = 13.5 \text{ hrs}$$

$$\text{Therefore bonus hours} = 13.5 \text{ hours}$$

$$\text{Bonus pay} = 13.5 \times 6 = \text{Shs } 81$$

Worker B

$$\begin{aligned}
 \text{Total time saved} &= \text{Expected time} - \text{Time taken} \\
 &= \frac{1}{6} (684 - 84) - 72 = \frac{1}{6} \times 600 - 72 \\
 &= 100 - 72 \\
 &= 28 \text{ hours}
 \end{aligned}$$

$$\text{Accepted time saved} = 50\% \times 28 = 14 \text{ hrs}$$

$$\text{Therefore bonus hours} = 14 \text{ hours}$$

$$\text{Bonus pay} = 14 \times 6 = \text{Shs } 84$$

Worker C

$$\begin{aligned}
 \text{Total time saved} &= \text{Expected time} - \text{Time taken} \\
 &= \frac{1}{2} (175 - 25) - 80 = \frac{1}{2} \times 150 - 80 \\
 &= 75 - 80 \\
 &= (5) \text{ hours}
 \end{aligned}$$

$$\text{Accepted time saved} = \text{Nil}$$

$$\text{Therefore bonus hours} = \text{Nil}$$

Gross Wages = Regular wage by Bonus

Time allowed per Unit	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{2}$
Time taken	78hrs	72 hrs	80 hrs
Regular pay (6;6;3)	Shs.468	Shs.432	Shs.240
Bonus pay	Shs.81	Shs.84	Nil
Gross wages	Shs.549	Shs.516	Shs.240

**Labour cost for each good unit sold**

Worker	A	B	C
Units produced	474	684	175
Units rejected	54	84	25
Good units	420	600	150
Total cost of labour (regular + Bonus pay)	549	516	240
Labour cost per Unit	1.307	0.860	1.600

>>> Illustration 2

Based on the data below, you are required to calculate the remuneration of each employee as determined by each of the following methods

- i. Hourly rate
- ii. Basic piece rate
- iii. Individual bonus scheme where the employee receives the bonus in proportion of the time saved to time allowed

Name of employee	SS	RR	PP
Units produced	270	200	220
Time allowed in minutes per unit	10	15	12
Time taken (hours)	40	38	36
Rate per hour (Shs)	125	105	120
Rate per unit (Shs)	20	25	24

Solution**i. Hourly rate**

Name of employee	SS	RR	PP
Time taken (hours)	40	38	36
Rate per hour (Shs)	125	105	120
Total amount (Time x Rate)	Shs.5,000	Shs.3,990	Shs.4,320

ii. Piece rate

Name of employee	SS	RR	PP
Output in Units	270	200	220
Rate per Unit (Shs)	20	25	24
Gross wage (Units x Rate)	Shs.5,400	Shs.5,000	Shs.5,280

Bonus scheme

Name of employee	SS	RR	PP
Units produced	270	200	220
Time allowed in minutes per unit	10	15	12
Total time allowed (hrs) (units x time per unit/60)	45	50	44
Time taken (hours)	40	38	36
Time saved	5	12	12
Proportion (time saved/ time allowed)	$\frac{1}{9}$	$\frac{6}{25}$	$\frac{3}{11}$
Bonus time $\left(\frac{\text{Time saved}}{\text{Time allowed}} \times \text{time taken} \right)$	4.44	9.12	9.82
Total time to be paid (time taken + bonus)	44.44	47.12	45.81818
Rate per hour (Shs)	125	105	120
Total pay	5,555.56	4,947.0	5,498.18

GROUP BONUS PLAN

Fast forward

Group incentive schemes are used to encourage teamwork and cooperation among employees working in a group (team).

There are certain jobs or operations which require to be done collectively by a group of workers, for example, continuous production work flows in a sequence or in assembly work of computers, radio, televisions, etc. A team of workers is engaged in various operations and as such it becomes necessary to introduce bonus schemes for collective efficiency of the group as a whole and the intention is to create a collective interest in the work. In this case, the bonus is shared among the members. The proportionate share may depend on a number of factors, for example, the level of employee in management structure, the department in which the employee falls, his current salary e.t.c..



Characteristics of an effective bonus scheme

- (i) Efficiency in production: when the volume of production is so important, the bonus incentive scheme should reward higher producers i.e. should be based on output achieved.
- (ii) Effect on workers: the scheme should be designed to motivate the employees. It should be simple and understood by those of average intelligence.



- (iii) Both the employer and the employees should share the gains in labour efficiency. This will motivate the employees to be more efficient since they benefit from the gains made.
- (iv) The method of calculating the bonus should be known and acceptable to the employees
- (v) The standard hours set should be achievable and realistic. When the standards are high then the employees will not achieve them and the bonus will not be earned

■ Benefits associated with group bonus schemes include

- It encourages cooperation and teamwork among workers since each member in the group has an interest in the work.
- It reduces absenteeism since an absent worker is found to reduce the group earnings and the group may dislike him
- The approach reduces supervision time and cost, thus it is administratively much simpler.
- It greatly reduces the number of rates to be negotiated.
- It may encourage flexible working arrangements within the group.

■ But it suffers the following setbacks

- It may not provide a strong incentive to the individual workers, as it is group based.
- Less hardworking group members are similarly rewarded as the very hardworking ones: this may cause demotivation in the group.
- It is hard to determine each group members' fair share of the bonus.

Co-ownership incentive scheme (Profit Sharing Schemes)

Profit-sharing scheme is where a proportion of company profits is allocated to employees either in the form of cash or in company stock. The actual proportion of company profits to be allocated is normally calculated by a formula which is known in advance. This converts employees from mere salary seekers to individuals who are part of the organization.

Their purpose is to enable employees to benefit from the success of their employer in a tax-efficient way and, at the same time, encourage them to participate in their success. Approved profit-sharing schemes facilitate the allocation of company shares rather than the distribution of company profits in the form of cash. To receive the tax advantages, a profit-sharing scheme

must be set up under trust and approved by the Revenue. The trust receives a proportion of the company's profits, which it uses to buy shares for allocation to individual employees.

Employees must agree to leave their shares in the scheme for at least two years (unless they leave due to injury, redundancy or retirement). If they leave for any other reason, they must leave their shares in the scheme until they have been held for two years. If shares are sold within five years, income tax is payable on a percentage of their value or on the proceeds of the sale (whichever is the smaller). Shares which are held for more than five years and then sold are not liable for any income tax.

Departments involved in the accumulation of labour costs

Labour costs are accumulated by various departments.

(i) Personnel department

It is responsible for engagement, discharge and transfer of employees, classification and method of remuneration. It determines which employee to hire, the amount of remuneration based on the negotiation and to which branch or department the hired employee shall work.

(ii) Production planning department

It is responsible for scheduling work and issuing job orders to the production department. It schedules the work as it comes based on a number of factors such as urgency of the assignment and availability of resources: materials, time and /or others.

(iii) Time keeping department

It is responsible for recording the attendance time and job time i.e. time spent by each worker in a factory and time spent by each worker on each job.

The documents used are

- (1) **clock card:** it is a document on which is recorded the starting and finishing time of an employee for the ascertainment of total actual attendance time.
- (2) **job card;** it records time spent on a job
- (3) **time sheet;** It is a record of how a person's time has been spent daily or weekly. Time sheets on which the employee enters all particulars himself are commonly issued to indirect workers e.g. maintenance staff



(iv) Wages department

It is responsible for preparing the payroll and the payment of wages. The routine will require analysis of clock cards and check of overtime authorization, calculation of bonus, compilation of gross earning, calculations of deductions, and preparation of pay details for each employee showing net wages.

To arrive at the net amount of wages, a range of deductions are made from gross earnings. Some of the deductions are statutory or obligatory in nature while others are voluntary. In Kenya, Statutory deductions are pay as you earn (PAYE) tax, pensions, and employees, national insurance contributions. The employer is obliged to deduct and submit the deductions to the relevant parastatal bodies to which they act as agents. Examples of such bodies include Kenya Revenue Authority (KRA) to whom PAYE tax deducted is remitted, National Hospital Insurance Fund to whom the national insurance contributions deducted are submitted.

Voluntary deductions include items such as trade union subscription, charity deductions and contributions to saving schemes.

(v) The cost accounting department

It is responsible for the accumulation and classification of all costs. It will identify the direct and indirect costs and identify the direct costs with specific jobs, process or product to which they are charged.

Control of labour costs

Most of the firms aim at maximizing profits by minimizing costs, while optimizing on the revenues received. Labour costs being a significant expense in the books of account must be controlled in order to ensure that no overpayments are made and that only authorized payments are effected.

For effective control, the following techniques should be applied

(i) Production planning

The preparation of a production planning schedule well in advance with a supporting schedule of man hour requirements should result in the most efficient use of the man power available. Idle time should be reduced as much as possible and if possible avoided entirely. The scheme should also enable the management to predict long term labour requirements.

(ii) Labour budget and use of labour standards

A standard of expected performance is required for various reasons.

- (1) to make production schedule and labour budgets,
- (2) to measure productivity by comparing actual time against an expected time and taking control action if necessary. Without a labour standard, productivity cannot

be measured or controlled and greater productivity is the only realistic way of reducing labour costs

(iii) Labour performance reports

This should provide a periodic stimulus for controlled action. It is from the report that management is able to identify where the weaknesses were and take appropriate action. In other words, control action is very effective where regular feedbacks are provided.

(iv) Wages incentive schemes

Employees' productivity can be increased in various ways. One of the major ways that the employees can be motivated to be more productive and more efficient is through introduction of successful wages incentive schemes. These schemes reward both the company and employees for raising productivity.

(v) Identification of direct labour

The cost accounting system must be able to identify direct labour cost with a product, job or process. Cost control may then be applied by the manager responsible for the product, job or process.

>>> Illustration

All of a company's skilled labour, which is paid at Shs800 per hour, is fully employed in manufacturing a product to which the following data refer:

	Shs per unit	Shs per unit
Selling price		6000
Less Variable costs:		
Less Skilled labour	2000	
Less others	<u>1500</u>	
		<u>(3500)</u>
Contribution		<u><u>2500</u></u>

The company is evaluating a contract, which requires 90 skilled labour hours to complete. No other supplies of skilled labour are available.

Required:

Calculate the relevant skilled labour cost for the contract.

Solution

Each unit of the product being manufactured currently takes 2.5 hours



Shs. 2,000 per unit = 2.5 hours per unit

Shs.800 per hour

The contribution foregone by taking the contract shall be;

90 hours x 2500 per unit = Shs.90,000

2.5 hours per unit

Therefore, relevant labour cost shall be the sum of the labour cost on ordinary hours at Shs800 and the foregone contribution from the product currently being manufactured.

	Shs
Normal labour cost charged (Shs800 x 90hrs)	72,000
Contribution forgone	<u>90,000</u>
Total relevant labour cost	<u>162,000</u>

CHAPTER SUMMARY

The chapter discuss the various methods of labour remuneration and the calculation of labour costs. It has also highlighted on labour cost control.

There are various elements of labour costs. They include

- Fixed rate or fixed salary per month
- Piece rate or piece work
 - Straight piece rate
 - Straight piece rate with a guaranteed minimum pay
 - Differential piece rate
- Time rate or time work
 - Flat time rate
 - Measured day rate
 - Graduated time rate

Other than basic wages, there are other costs of labour. The premiums include overtime premium and shift premium. Bonus payments and idle time paid for also constitute cost of labour.

Labour turnover is the number of employees leaving or being recruited in a period of time. It is expressed as:

$$\text{Labour turnover} = \frac{\text{Replacement}}{\text{average no. of employess in a period}} \times 100$$

Costs of labour turnover include replacement cost and preventive cost

Characteristics of an effective bonus scheme include

- (i) Efficiency in production: when the volume of production is so important, the bonus incentive scheme should reward higher producers i.e. should be based on output achieved.
- (ii) Effect on workers: the scheme should be designed to motivate the employees. It should be simple and understood by those of average intelligence.
- (iii) Both the employer and the employees should share the gains in labour efficiency. This will motivate the employees to be more efficient since they benefit from the gains made.



- (iv) The method of calculating the bonus should be known and acceptable to the employees
- (v) The standard hours set should be achievable and realistic. When the standards are high then the employees will not achieve them and the bonus will not be earned

Departments involved in accumulation of labor costs include

- Personnel department
- Production planning department
- Time keeping
- Wages department
- Cost accounting department



CHAPTER QUIZ



1. Define labour cost
2. Highlight the elements of labour cost
3. What is labour turnover?
4. List the costs of labour turnover
5. List at least three departments that accumulate labour cost

ANSWERS TO CHAPTER QUIZ

1. Labour costs refer to all the costs incurred in compensating the human resources employed to provide a useful service in the production process
2. Elements of labour cost
 - Basic wages
 - Overtime premium
 - Shift premium
 - Bonus
3. Labour turnover is the number of employees leaving or being recruited in a period of time.
4. Costs of labour turnover
 - Replacement cost
 - Preventive cost
5. Departments accumulating labour cost
 - Personnel department
 - Production planning department
 - Time keeping department
 - Wages department
 - Cost accounting department

PAST PAPER ANALYSIS

Question from this chapter have been tested in the following exam sittings

06/07 Q4 ; 05/05 Q3; 06/04 Q6(c); 12/03 Q7(a); 12/01 Q5; 12/00 Q6; 05/00 Q5



EXAM QUESTIONS

Question one

A factory issues a job to employee A to produce 35 articles; it takes two standard hours to produce each article. Another job is given to employee B to produce 60 articles; it takes one and half standard hours to produce each article. For every hour saved, a bonus is paid at 50% of the base, which is Sh.200 per hour. The factory works a 40-hour week and overtime is paid at a rate of one and a third. At the end of the week, A's articles and B's clock cards show 49 and 46 hours respectively and the work is complete. However, three of A's articles and three of B's articles failed to pass inspection. This was due to defective material and, in view of this, all the articles produced were paid for, although as scrap they have no saleable value.

Required

For both A and B: compute

- Bonus due (8 marks)
- Total gross wages due (8 marks)
- Wages cost per unit of articles passing inspection (4 marks)

(Total 20 Marks)

Question two

Sannet Products Ltd., who manufactures and retails products A, B and C employs 60 direct workers who work under a group of bonus scheme. The company engages three grades of workers, who are paid a bonus of the excess of time allowed over time taken. The bonus paid is 75% of the workers' base rate and is shared by the workers in proportion to the time spent on the work. The following production data has been extracted from the company's records for April 2007.

Product	Units produced	Time allowed per unit (minutes)	
A	320	63	
B	640	120	
C	1200	100	

Grade of worker	Number of direct workers	Base rate per hour	Hours worked per worker
1	20	30	30
2	8	27	64
3	32	24	50

Required:

Compute

- Percentage of bonus saved to hours taken
- Bonus due to the group
- Gross earnings due to the group **(CPA05/00)**

Question three

- (a) Ardhi Company is considering the type of remuneration scheme to adopt for its employees. The following information is availed to you for your analysis:

	Mambo	Saidi	Mbogo
Actual hours worked	38	36	40
Hourly rate of pay (Sh.)	30	20	25
Output (units) A	42	120	-
B	72	76	-
C	92	-	50
	A	B	C
Standard time allowed per unit (minutes)	6	9	15

For the calculation of piecework earnings, the company values each minute at the rate of Sh.0.5.

Required:

Calculate the earnings for each employee using:

- Basic guaranteed hourly rates (4 marks)
- Piecework rates; (4 marks)
- Premium bonus, given that an employee earns the premium bonus at the rate of two thirds of the time saved. (5 marks)

- (b) Ushindi Limited manufactures ornaments for export trade. Jobs are allocated to two operators, Mbotela and Juma with bonus paid for hours saved.

In the month of February, 2005, Mbotela made 186 units and Juma made 210 units for which the time allowed of 30 standard minutes and 25 standard minutes per unit respectively was credited.

The basic wage rate was Sh.18 per hour for both employees. For every hour saved, a bonus was paid at 20% of the basic wage rate. Hours worked in excess were paid at the basic wage rate plus two thirds. Mbotela completed his job in 44 hours and Juma completed his job in 39 hours.

A basic week has 40 hours.

Required;

For each operator, compute:

- The amount of bonus payable; (2 marks)
 - The total gross wage payable; (3 marks)
 - The wages cost per unit (2 marks)
- (Total: 20 marks)**

(CPA05/05)



CASE STUDY

Labour turnover in Europe

Annual percentage change

Country/Region	LT 2008 Q2	LC 2008 Q2	LC 2008 Q3	Comp 2009 (forecast)
EU	27	4.8	3.4	4.1 -
Austria	4.6	-	-	2.6
Belgium	3.7	4.6	-	2.6
Bulgaria	5.2	21.9	19.4	10.9
Cyprus	5.4	6.7	6.0	5.7
Czech Republic	2.5	7.6	4.3	5.4
Denmark	8.1	3.2	4.0	3.9
Estonia	4.6	16.8	13.1	4.3
Finland	9.1	6.1	6.7	4.3
France	6.3	2.7	2.9	2.1
Germany	4.3	0.7	2.5	2.2
Portugal	3.5	3.0	5.5	2.3
Romania	3.1	23.0	21.2	9.0
Slovak Republic	2.6	7.7	5.2	7.6
Slovenia	4.4	8.1	11.5	5.1
Spain	7.3	4.8	6.1	3.0
Sweden	8.9	2.4	2.5	2.1
United Kingdom	4.3	4.3	2.7	1.7

Sources: Eurostat, National statistical offices and FedEE

Key: LT = Annual rate of labour turnover, LC = Annual increase (decrease) in labour costs since the same quarter of the previous year. Comp = compensation of employees per head

The annual rate of labour turnover is defined by FedEE as the percentage of employees who have changed jobs within the last 3 months. This will vary significantly due to the proportion of the working population who are on temporary or fixed-term contracts.

Labour costs are the total hourly payroll costs to employers (working day adjusted). They include wages, salaries, employer social security contributions and taxes net of subsidies connected to employment.

CHAPTER SIX



OVERHEAD COSTS



CHAPTER SIX

OVERHEAD COSTS

► OBJECTIVES

After you study this chapter, you should be able to:

- Define overhead costs and analyze overhead costs on various basis
- Define absorption costing and explain why firms absorb overheads costs.
- Distinguish between service departments and production departments.
- Distinguish between allocation and apportionment of overhead costs and explain the various methods of cost apportionment
- Explain the advantages and disadvantages of activity-based-costing, how appropriate it is and as a method of cost absorption.

► INTRODUCTION

Overhead costs may be defined as costs incurred in the course of manufacturing a product, providing a service or running a department which cannot be traced directly to the product, service or department. It is the total cost of indirect materials, indirect labour and indirect expenses.

Overheads may be divided into production overheads, administration overheads and selling and distribution. With this, they may be charged to production cost centers i.e. making, finishing and packing departments, service costs centers, for example, maintenance and power generation or other non-production cost centers for example administration, selling and distribution. Production overheads for instance, are added to the prime cost in order to obtain the total production costs.

This chapter focuses on how these overhead costs are charged to production and non-production departments so as to determine the total cost incurred by every department in the organization.

► DEFINITION OF KEY TERMS

Service cost center; this is a department that provides services to the production department.

Overhead allocation; the process by which the whole cost items are charged directly to a cost unit or as a cost center.

Overhead apportionment; occurs where the total value of an overhead item is shared between two or more cost centers that use the overheads

Over absorption; arises where the absorbed overheads are more than the actual overheads incurred

Under absorption; occurs when the overheads charged to the cost of sales are less than the actual overheads incurred.

► EXAM CONTEXT

This chapter is frequently examined. Key areas that you need to understand are calculation of overhead rates, cost allocation and cost apportionment.

The examiner may set a question touching on almost every part of this chapter. You need to understand how the various sections interrelate and integrate with the other chapters, especially material cost and labour cost chapters.

► INDUSTRY CONTEXT

In the real world, identification, allocation and apportionment of overhead costs is applied in manufacturing organizations in job and / or product costing.



ANALYZING OVERHEADS

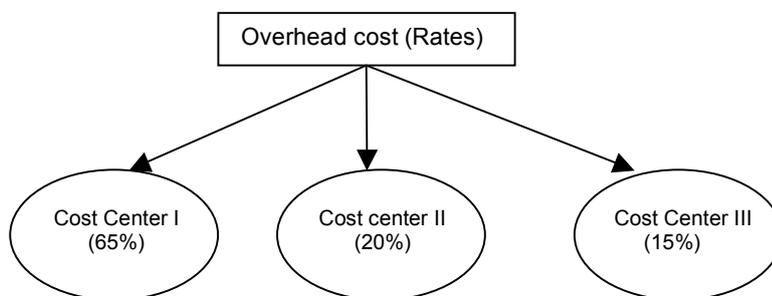
Fast forward;

Overhead analysis is the first step in determining how to treat overheads. This may be done for reasons such as allocation, apportionment, control, profit measurement and decision making.

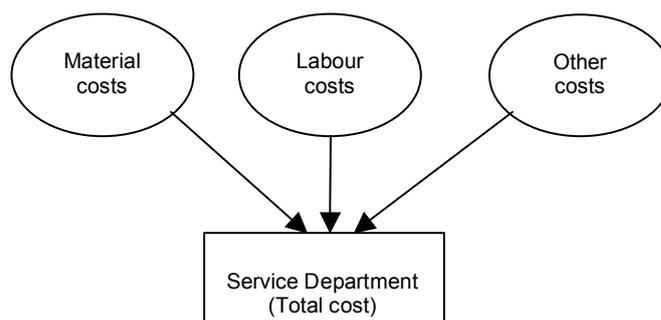
Overheads are of different types

There are overheads that are directly identifiable with a single cost center, for example, wages paid to indirect workers who work solely in one cost center such as finishing department. Such costs are entirely allocated to that department.

There are overheads arising in one department as a result of giving service to other departments or cost centers. Such costs, incurred as a single figure, are shared amongst cost centers that use them, for instance the rates payable to the local authority. If such rates apply to the whole organization, then the cost centers I, II and III in the diagram below will be the production cost centers, the service centers and other non-production cost centers respectively to which the cost shall be apportioned.



There are other overheads that arise in a service department or cost centers which are a composition of many other costs. For instance, in the diagram, the total cost of a service department, will have various costs charged to it for material, labor and other expenses.



Reasons for absorbing overheads

There are a number of situations in which the analysis of overhead costs will assist in the satisfactory evaluation of the relevant cost data. These include:

■ a) The control of overhead expenditures

There must be a link between overhead costs and the manager responsible for its control. This is best achieved by having the planned level of overhead costs for each cost center compared to the actual cost incurred in order that any differences may be investigated and corrective measures taken. Where the actual cost incurred is less than the budgeted expenditure, it may give a sign of less activity being undertaken thus not achieving the targeted performance. On the other hand, the overhead cost per unit of output may be less than budgeted thus giving a favorable variance.

Where the actual expenditure is more than the budgeted, there may be more activity than anticipated (more than the target output) or the overhead cost per unit may be more than the budgeted thus giving an adverse expenditure variance. These need to be investigated.

■ b) Charging of overheads to cost units

Just as direct costs are charged to the product, overheads relating to a specific job must be charged to that product, job or process in order to come up with the correct cost of the cost object or unit. Each product or job should share a part of indirect costs of the business. This may be done by assessing the benefits extracted from each cost center through which the product or job passes and then choosing a suitable absorption basis.

■ c) Valuation of work in progress

At any point in time, there may be partly completed goods in the production cycle. Such work in progress must be valued at the end of an accounting period to enable calculate profit and derive a balance sheet. To calculate profit, the cost of goods manufactured must be determined. A statement of goods manufactured (Manufacturing account) is prepared, which incorporates both opening and ending work in progress in order to determine cost of goods manufactured.

Inventory is a major current asset, which appears in the balance sheet, especially for manufacturing and merchandising firms. For manufacturing firms, work in progress (work in process) forms part of the inventory. Therefore, it becomes necessary to determine with accuracy the value of the work in process which comprises prime cost and manufacturing overheads.

■ d) Valuation of abnormal losses

This is a similar procedure to that for work in progress. Abnormal losses arise when the actual output given the budgeted input yields less than the expected output. (*Abnormal loss = Expected*



output – actual output) In other words, the actual loss incurred exceeds the expected or normal loss. (*Abnormal loss = Actual loss – Normal loss*). They arise due to unanticipated inefficiencies in production. Such losses need to be charged to the departments that incur them for efficiency analysis purposes.

■ e) Profit measurement

The valuation of work in progress and finished goods stock will affect the profit reported. The basis on which production overhead has been absorbed by cost units will, therefore, have a direct influence on the level of profit reported during the period.

■ f) Decision making

It is vital that relevant costs are used in any decision making situation. Production overhead costs may be allocated to a department (cost center) or apportioned to it using some arbitrary apportionment basis. In addition, overhead cost may be a fixed or variable behavior pattern as activity changes. The total costs associated with cost centre and the organization as a whole affect the kind of decisions made by the management. But such relevant costs need to be incremental (making a difference) and future costs (not sunk costs) that are controllable (not uncontrollable) by management.

■ ABSORPTION COSTING

This is the process by which overheads are absorbed into production. It is also known as full costing. The absorption of total overheads into product costs has implications for performance measurement, cost control and stock valuation and students should be aware that the process described is subject to criticism by some managers and accountants.

The criticism arises from the fact that overheads contain items, known as fixed costs - which do not change when the activity level changes and which would still have to be paid if there was no activity, e.g. rates - and items, known as variable costs, which vary more or less directly with activity, e.g. power consumption. To overcome some of the difficulties, an alternative method of costing has been developed, known as marginal costing, which, although using the process of absorption, excludes fixed costs from the absorption process.

Service Cost Centers or departments

These are departments that provide services to the production department. They do not provide products to be used externally. They include maintenance, stores, canteen, e.t.c. there are no production cost units that pass through the service cost centers. Therefore, it is necessary to

apportion the service department costs, to the production cost centers so that all production costs (including those for the servicing departments) are absorbed into production. Examples of, and the basis of apportionment to the various departments are given below.

Type of cost	Possible basis of Apportionment
Maintenance	▪ Machine time or number of hours spent
Insurance/depreciation of assets	▪ Value of assets and exposure to risk
Space cost e.g. rent and rates	▪ Size of the space occupied (floor area) per unit
Salaries	▪ Number of employees
Canteen costs	▪ Number of people
Stores cost	▪ Number of requests
Inspection	▪ Number of hours spent

Notes;

The basis chosen should be one that is judged to be the most equitable way of sharing the service department's costs over the departments which use the service. This may mean that a particular and unique basis of apportionment may have to be derived. It must reflect the use made of the services provided.

Wherever possible, service department costs should be charged directly i.e. allocated to respective departments. An example of this would be maintenance wages and materials. When a maintenance job is done for a department, the wages and materials used would be charged directly to the department concerned. In this way, only unallocated service department costs need to be apportioned.

Allocation and Apportionment of Overhead Costs

Allocation of overheads this is the process by which the whole cost items are charged directly to a cost unit or as a cost center. Examples of such costs include the salary of a service department manager.

Apportionment of overheads (primary apportionment) occurs where the total value of an overhead item is shared between two or more cost centers that use the overheads. Re-apportionment of overheads (secondary apportionment) occurs when service department costs are charged to user departments. For example, the maintenance department overhead costs are summarized and then charged to the user department, which will probably include other service or non-production departments.

Service departments do not participate directly in the manufacturing process but play a supportive indirect role. Products do not pass through the support departments. It is for this reason that service department costs have to be reapportioned to the production cost centers or departments. The re-apportionment of service department costs may be implemented in a number of ways.

The three extremes are:

- a) **Direct Method;** Where costs of each service department are only charged to production centers. Administration; selling and distribution centers are not charged with the cost of



- the service departments as they are not production centers.
- b) Where the reciprocal nature of service costs is fully recognized; that is service departments serve each other, a different approach is adapted. This can be implemented in a number of ways:
 - i. **The repeated distribution method:** this recognizes fully the reciprocal nature of service departments. It apportions the overhead costs. It continuously reapportions a share of a service cost center to other service centers instead of eliminating a center once its costs have been reapportioned.
 - ii. **Using an algebraic approach:** this recognizes the reciprocal nature of the service departments and expresses it as an equation.
 - c) **A compromise method** (elimination method or stepwise method) may be used where by the costs of each service cost centers are re-apportioned in turn. The costs of the first service center will be reapportioned to all user centers including other service centers, if any. The first service center, however, is then eliminated from any further reapportionment. The cost of the second service center including any costs already reapportioned from the first service center is then reapportioned to all user centers other than the first service center. The process is continued until all service centers are eliminated.

>>> Illustration 1

The following information is available in respect of overhead costs by Keringeti Ltd.

	Production department			Service departments		Non Production Department	
	A	B	C	S1	S2	ND1	ND2
	Shs	Shs	Shs	Shs	Shs	Shs	Shs
Allocated Overheads							
Indirect materials	1500	1000	2400	4800	3300	1000	1200
Indirect labour	10000	1200	900	14000	4400	2000	800
Other expenses	15000	8000	3000	1500	12400	24000	6600
Depreciation	8000	800	1200	2000	4800	1500	2300
Unallocated overheads							
Rates		18000					
Net vending machine cost		2300					
Heat and light		4000					
Other statistics		0					
Occupancy sq. m	600	400	500	50	100	200	50
Number of employees	20	40	50	20	10	70	15
Power estimate (KWH)	15000	2500	2500	2000		1500	500
Maintenance (hours)	2000	200	400		1000	250	400

STUDY TEXT

Required

Calculate the final distribution of overheads to cost centers including the reapportionment of maintenance and power generation service costs to user cost centers where:

- The reciprocal nature of maintenance and power generation center is ignored.
- The elimination method is used whereby the costs of each service center are apportioned in turn between users but once they have been apportioned they are eliminated from any subsequent apportionment.
- The repeated distribution method is used taking into account the reciprocal nature of the service costs.
- An algebraic approach is used as an alternative to the repeated distribution method.

Solution

- The Direct Method Ignoring reciprocal service charges

Overhead cost allocation and apportionment statement

	Basis of Allocation	Making	Finishing	Packing	Maintenance	Power	Admin.	Selling	Distribution	Total
		Shs	Shs	Shs	Shs	Shs	Shs	Shs	Shs.	Shs.
Overhead item										
Indirect materials	Direct	1500	1000	2400	4800	3300	1000	1200	1600	16800
Indirect labour	Direct	10000	1200	900	14000	4400	2000	800	5600	38900
Other expenses	Direct	15000	8000	3000	1500	12400	24000	6600	4000	74500
Depreciation	Direct	8000	800	1200	2000	4800	1500	2300	1800	22400
Rates	Occupancy	5400	3600	4500	450	900	1800	450	900	18000
Vending machine	Employee	200	400	500	200	100	600	150	150	2300
Heat and light	Area	1200	800	1000	100	200	400	100	200	4000
Subtotal		41300	15800	13500	23050	26100	31300	11600	14250	176900



Reapportionment of service department overheads to other departments is based on proportionate consumption as indicated by cost drivers. In this case for instance, maintenance cost of 23050 is reapportioned to making department using the following formula;

$$= \frac{\text{Number of maint. hours spent in Making}}{\text{Total number of maint. hours (excluding service dept)}} \times \text{Overhead costs incurred in maintenance}$$

$$= \frac{2000}{2000 + 200 + 400 + 250 + 400 + 750} \times 23050 = \text{Shs.}11,525$$

Please note that we have ignored the other service department in this case.
(Power department)

Service reapportionment; this is also known as secondary apportionment

Maintenance	11525	1152	2305	(23050)		1441	2305	4302	
Power	17622	2837	2837		(26100)	1702	567	1135	
Total Costs	69847	19789	18642	0	0	34443	14472	19707	176900

b) Using elimination method:

This procedure is exactly the same as for the above method except for the reapportionment of the maintenance and power generation costs. The illustration is, therefore, commenced on the subtotal point where the initial allocation and apportionment has been implemented

Note that the reciprocal nature of service is considered in this case. We start by reallocating maintenance department overheads to all departments including Power department (also a service department) based on proportionate consumption. We then proceed to reallocate Power Department overhead costs to all other departments excluding maintenance department. Please note that the denominator value used in the first reallocation is different from one used in the second since we only consider the departments to which costs are to be reallocated.

An illustration of first reallocation using Making department:

$$= \frac{\text{Number of maint. hours spent in Making}}{\text{Total number of maint. hours (excluding service dept)}} \times \text{Overhead costs incurred in maintenance}$$

$$= \frac{2000}{2000 + 200 + 400 + 250 + 400 + 750 + 1000} \times 23050 = \text{Shs.}9220$$

An illustration of second reallocation using making department;

Please note that the denominator value is less by value of maintenance department cost driver since we have already allocated Maintenance Department Overheads. In general, once a Cost Center's overheads are allocated, the department is eliminated in the next step of allocation. Additionally, you must sum up the total cost after reallocation at every step to obtain the figure to reallocate in the step after.

$$= \frac{\text{Number of maint. hours spent in Making}}{\text{Total number of maint. hours (excluding service dept)}} \times \text{Overhead costs incurred in maintenance}$$

$$= \frac{2000}{2000 + 200 + 400 + 250 + 400 + 750} \times 30710 = \text{Shs.}20028$$

The final apportionment will appear as follows

Overhead item	Making Shs	Finishing Shs	Packing Shs	Maint Shs	Power Shs	Admin. Shs	Selling Shs	Distribt.	Total
Subtotal	41300	15800	13500	23050	26100	31300	11600	14250	176900
Service reapportionment									
Maintenance	9220	922	1844	(23050)	4610	1152	1844	3458	
Power	20028	3338	3338		(30710)	2003	668	1335	
Total	70548	20060	18682	0	0	34455	14112	19043	176900

c) Recognizing fully the reciprocal nature of service costs (repeated distribution method)

This method differs from the elimination method in that it continues to reapportion a share of a service cost center to other service centers instead of eliminating a center once its costs have been reapportioned in the first instance. The cycle is repeated until the numbers become so small that no further reapportionments are required

The repeated distribution summary will appear as follows:

Overhead item	Making	Finishing	Packing	Maint.	Power	Admin.	Selling	Distribt.	Total
Maintenance hrs (%)	40	4	8		20	5	8	15	
Power kwh (%)	60	10	10	8		6	2	4	
Subtotal Kshs	41300	15800	13500	20050	26100	31300	11600	14250	176900
Service reapportionment									
1 st distrib. Maintenance	9220	922	1844	(23050)	4610	1152	1844	3458	
1 st distribution power	18426	3071	3071	2457	(30710)	1843	614	1228	
2 nd distrib. maintenance	983	98	197	(2457)	491	123	196	396	
2 nd distribution power	295	49	49	39	(491)	123	196	396	
3 rd distrib. Maintenance	15	2	3	(39)	8	2	3	6	



3 rd distrib. Power	5	1	1		(8)	1			
Total distrib maintenance	10218	1022	2044		5109	1277	2043	3833	
Total distribution power	18726	3121	3121	2496		1873	624	1248	
Total overhead charge to user department	70244	19943	?	0	0	34450	14267	19331	176900

d) Algebraic approach

This method requires that the reciprocal nature of the service costs is expressed in a set of simultaneous equations which are solved by matrix algebra

Let x = Total cost of the maintenance cost center

Let y = Total cost of the power generating cost center

Then $x = 23050 + 0.20Y$

$Y = 26100 + 0.20x$

The equation shows that;

Maintenance cost = initial allocated and apportioned costs of Shs.23050 plus 8% of the total cost of the power generating center

Power generating cost = initial allocated and apportioned costs of Shs. 26100 plus 20% of the total cost of maintenance center

In a matrix equation it is

$$\begin{pmatrix} 1 & -0.08 \\ -0.2 & 1 \end{pmatrix} \begin{pmatrix} 24050 \\ 26100 \end{pmatrix}$$

Simplifying the matrix gives

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 25546 \\ 31209 \end{pmatrix}$$

Hence x = Total maintenance cost center cost is Kshs 25,546

y = Total power generating cost center cost is Kshs 31,209

The percentage distribution of the service in the repeated distribution calculation summary shown above is then applied to the total cost figures x and y

For example for the making cost center

Maintenance cost to making cost center = Kshs 25546 x 40% = Shs. 10,218

Power to cost to making cost center = Kshs 31209 x 60% = Shs. 18,726

Note

You can also use the simultaneous equation solving method to arrive at exactly the same answers above (Shs.25,546 and Shs.31,209). Probably, this is more popular than the matrix.



Absorption of production overhead costs

Absorption of overheads refers to the sharing out of overhead costs to the various cost centers that used the overheads. It is used when the overheads cannot be allocated or attributed to a specified cost centre.

The aim is to establish the overhead cost per unit of output. Having allocated and or apportioned overhead costs, the next stage should be to absorb them into the cost of production.

There are various bases of overhead absorption used. Various factors are normally considered in determining the best base of overhead absorption. Overheads are not absorbed on the basis of actual cost but on the basis of estimated and budgeted costs calculated prior to the beginning of the period. This is because the actual overheads are not known until the year end and it is not easy to calculate overheads on a regular basis e.g. every month.

The first stage in absorption is to establish the absorption rate. The following is the general procedure followed in calculating the absorption rate;

- (i) Estimation of the overheads likely to be incurred during the period
- (ii) Estimation of the various levels of activities on which overhead absorption rates are to be calculated
- (iii) Calculation of the overheads absorption rate using the formula



$$\text{Absorption rate} = \frac{\text{budgeted overheads}}{\text{Budgeted activity level}}$$

- (i) Percentage of direct material cost = $\frac{\text{Overhead Cost}}{\text{Direct Material Cost}} \times 100$
- (ii) Percentage of direct labour cost = $\frac{\text{Overhead Cost}}{\text{Direct Labour Cost}} \times 100$
- (iii) Percentage of prime cost = $\frac{\text{Overhead Cost}}{\text{Prime Cost}} \times 100$
- (iv) Rate per direct labour hour = $\frac{\text{Overhead Cost}}{\text{Labour hours}}$
- (v) Rate per machine hour = $\frac{\text{Overhead Cost}}{\text{Machine hours}}$
- (vi) Units of output = $\frac{\text{Overhead Cost}}{\text{Units of Output}}$

>>> Illustration 2

The budgeted production overheads and other budgeted data of Calmxa Ltd are as follows:

Budget	
Overhead cost for the period = Shs 36,000	Production department
Direct material cost	Shs 32000
Direct labour cost	Shs 40000
Machine hours	10000 hrs
Direct hours of labour	18000 hrs
Units of output	10000 hrs

Required

Determine the absorption rate of the overheads

Solution

Total overhead costs to be absorbed = Shs.36000

Absorption rate	Calculation
a) Direct material cost	$= \frac{\text{Shs.36000}}{\text{Shs.32000}} \times 100 = 112.50\%$
b) Direct labour	$= \frac{\text{Shs.36000}}{\text{Shs.40000}} \times 100 = 90\%$
c) Machine hours	$= \frac{\text{Shs.36000}}{10000\text{hrs}} = \text{Shs.3.6 per machine hr}$
d) Labour direct hours	$= \frac{\text{Shs.36000}}{18000\text{hrs}} = \text{Shs.2 per Direct labour hr}$
e) Units of output	$= \frac{\text{Shs.36000}}{10000 \text{ units}} = \text{Shs3.6 per unit}$
f) Prime cost = (Direct labour + direct material cost)	$= \text{Shs}(32000 + 40000)$ $= \text{Shs.72000}$
∴ Overhead absorption rate based on prime cost	$= \frac{\text{Shs.36000}}{\text{Shs.72000}} \times 100\% = 50\%$

The overhead cost will vary according to the absorption base.

Assume that in the company an individual production has a material cost of Shs 80, labour cost of Shs. 85, requires 36 labour hours and 23 machine hours to complete. Determine

- i. Overhead per individual production on the above different bases
- ii. Individual production cost

Solution

a) Production overhead per each absorption rate

Absorption rate	Calculation
a) Direct material cost	$= 112.50\% \times \text{Shs.80} = \text{Shs.90}$
b) Direct labour	$= 90\% \times \text{Shs.85} = \text{Shs.76.50}$
c) Machine hours	$= \text{Shs.3.6 pmh} \times 23 = \text{Shs.82.80}$
d) Labour direct hours	$= \text{Shs.2 pdlh} \times 36 = \text{Shs.72.00}$
e) Overhead absorption rate based on prime cost	$= 50\% \times (80+85) = \text{Shs.82.50}$

**Production cost per each absorption base**

Absorption rate	(Prime cost + Overhead cost)	Production cost
a) Direct material cost	Shs. 165 + Shs.90.00	Shs.255.00
b) Direct labour	Shs. 165 + Shs.76.50	Shs.241.50
c) Machine hours	Shs. 165 + Shs.82.80	Shs.247.80
d) Labour direct hours	Shs. 165 + Shs.72.00	Shs.237.00
e) Overhead absorption rate based on prime cost	Shs. 165 + Shs.82.50	Shs.247.50

>>> Illustration 3

The following is the budget of Superb Engineering Works for the year 2002

Factory overheads	Shs.62,000
Direct labour cost	Shs.98,000
Direct labour hours	155,000
Machine hours	50,000
Actual labour hours were	40,000
Actual machine hours were	30,000
Actual direct labour costs were	Shs.50,000
Actual direct material costs were	Shs.45,000

Required

Determine:

- The overhead application rate on the basis of
 - Direct labour hours
 - Direct labour cost
 - Machine hours, and
- Overhead costs based on the absorption rates above
- Production cost

Solution

(a)

Absorption rate	Calculation
a) Direct labour hours	$= \frac{\text{Shs.62000}}{155,000 \text{ labour hrs}} = \text{Shs.0.4 pdlh}$
b) Direct labour cost	$= \frac{\text{Shs.62000}}{\text{Shs.98,000}} \times 100 = 63.27 \%$
c) Machine hours	$= \frac{\text{Shs.62000}}{50,000 \text{ machine hrs}} = \text{Shs. 1.24 pmh}$

(b)

Overhead costing using	Calculation
a) Direct labour hours	= Shs.0.4 pdlh x 40,000hrs = Shs.16000
b) Direct labour cost	=63.27 % x Shs.50,000 = Shs.31,635
c) Machine hours	=Shs. 1.24 pmh x 30,000hrs = Shs.37,200

(c)

Overhead costing using	Prime cost (50000 + 45000)	Overhead cost	Production cost	Cost per Unit
a) Direct labour hours	95,000	+Shs.16000	=Shs.111,000	=Shs.111.00
b) Direct labour cost	95,000	+Shs.31,635	=Shs.126,635	=Shs.126.64
c) Machine hours	95,000	+Shs.37,200	=Shs.132,200	=Shs.132.20

OVER AND UNDER ABSORPTION OF PRODUCTION OVERHEAD COSTS

Fast forward

The main reason for over or under absorption of overheads is a variance from the expected in the base of absorption.

The rate of overhead absorption is based on estimates i.e. both in the numerator and the denominator and it is quite likely that either one or both estimates will not agree with the actual overheads incurred. The difference between the absorbed and actual overheads incurred gives rise to an over or under absorption of overheads.

An **over absorption** arises where the absorbed overheads are more than the actual overheads incurred. One of the causes may be overestimation of overheads used to calculate the absorption rate. The other cause may be to under estimate the activity level or units of the cost driver at a given level of overhead cost.

An **under absorption** occurs when the overheads charged to the cost of sales are less than the actual overheads incurred. In this case, we say that the overheads absorbed are insufficient.



The causes of over or under absorption of overheads may be analyzed as follows;

a) **Activity Level of the business or cost center**

Expenditure on some items of production overhead costs will vary directly with activity whereas others will be fixed irrespective of the changes in activity level. For example in a machine oriented cost center, power cost will vary in proportion to machine hours whereas salary of the cost center manager will be fixed.

b) **Level of expenditure on production overhead**

Expenditure level may change from the budgeted level because of a change in the price of an overhead item or a change in the usage of the overhead item

c) **Activity level and the absorption of production overhead cost**

The variable cost per machine hour is fixed and may not cause an over or under absorption of overheads. This is because variable overheads vary with the level of activity or the cost driver chosen. However, fixed overhead absorption rate will change depending on the level of activity.

>>> Illustration:

Assuming that Company ABC incurred overhead costs amounting to Shs120,000 of which Shs60,000 were variable costs at an output level of 6000 units. Each unit required 2 machine hours to produce. The company's policy is to absorb costs on the basis of machine hours.

The absorption rate will be:

$$\begin{aligned} \frac{\text{Total overheads}}{\text{activity level}} &= \frac{\text{Shs.120,000}}{6000 \text{ units} \times 2 \text{ hrs per unit}} \\ &= \text{Shs.10 per machine hrs} \end{aligned}$$

If the company produced 6000 units but due to increase in efficiency each unit used 1.75 hrs then the total overheads absorbed will be:

$$\text{Shs.10 p.m.h} \times 6000 \times 1.75 = \text{Shs.105,000}$$

There is, therefore, an under absorption of the total overheads by Shs15,000. If it could be broken down to its constituents, then we would get an under absorption of the fixed overheads amounting to $\text{Shs.60,000} - \frac{\text{Shs.60,000} \times 6000 \times 1.75}{12,000\text{mh}} = \text{Shs.7,500}$ and no under or over absorption of the variable overheads since they vary in direct proportion to the activity level. The difference, Shs7500 is between the actual fixed overheads and the absorbed fixed overheads.

The total overheads are supposed to be $\text{Shs.}60,000 + \frac{\text{Shs.}60,000 \times 6000}{12,000\text{mh}} \times 1.75 = \text{Shs.}112,500$

i.e. comprising of actual fixed overheads and variable overheads

Note:

If the actual number of machine hours used differs from the number used in the calculation of the overhead absorption rate, an over or under absorption will occur. Over absorption will arise when the actual activity level is higher than the activity level on which the absorption rate was calculated (the budgeted). Under absorption will arise where the actual activity level is lower than the budgeted activity level (the activity level on which the absorption rate was based).

>>> Illustration 4

Using data from the table above, assume that the production overhead absorption rate was calculated where an activity of 200 machine hours was estimated. Prepare a summary showing any over or under absorption of overhead cost where the actual machine hours charged to jobs turns out to be

- a) 150 hours
- b) 250 hours

Solution

Absorption rate is Shs.5.50 per machine hour. This may be analyzed into fixed rate Shs.2.50 per machine hour and variable rate; Shs. 3 per machine hour.

- a) Where actual activity is 150 hours

	Fixed Shs	Variable Shs	Total Shs
Overhead incurred	500	450	950
Variable overhead absorbed (150 x 3)		(450)	
Fixed overhead absorbed (150 x 2.50)	(375)		
Total overhead absorbed (150 x 5.5)			(825)
Over or (Under) absorption	(125)	Nil	(125)

- b)

Where actual activity is 250 hours

	Fixed Shs	Variable Shs	Total Shs
Overhead incurred	500	750	1250
Variable overhead absorbed (250 x 3)		(750)	
Fixed overhead absorbed (250 x 2.5)	(625)		
Total overhead absorbed (250 x 5.5)			(1250)
Over or (Under) absorption	125	Nil	125



- c) Expenditure level and the absorption of production overhead cost
 A charge in expenditure on an overhead cost item may occur because of a charge in the price per unit and/or because of change in the number of units of the overhead commodity which are required
 Expenditure changes can affect the absorption of both fixed and variable overheads

>>> Illustration 5

AB Ltd has a machine cost center for which the following information is available

a) Budget

- i. Budgeted (expected) activity 3000 Machine hrs
- ii. Variable production overhead cost per machine hour Shs.2
- iii. Fixed production overhead cost (total) Shs.9000

b) Actual

- i. Activity level 3000 machine hours
- ii. Variable production overhead cost incurred Shs. 6400
- iii. Fixed production overhead cost incurred Shs. 8800

Required

- Calculate the over and under absorption of variable overhead and fixed overhead cost
- Comment on possible causes of over or under absorption figures

	Variable overhead cost	Fixed overhead cost
Absorbed overheads	Shs 2/hr x 3000hrs =Shs.6000	Shs.9000
Actual overheads incurred	=Shs.6400	Shs.8800
Over or (Under) absorption	=(Shs.400)	Shs.200

Under absorption of the variable overhead cost may have occurred through a combination of

- Increased price per unit of variable cost e.g. a rise in price or electricity
- An increase in the number of units of overhead cost item, e.g. machine efficiency has fallen through lack of maintenance

The fixed overhead absorption rate is $9000/3000$ machine hours = Shs.3 per machine hour.

The actual activity level of 3000 machine hours is the same as that budgeted. The over absorption of fixed overhead is, therefore, due to expenditure factors. It may have occurred because of the combination of

- A lower price of a fixed item e.g. salary may be lower than budgeted
- A reduced usage of what was classified as a fixed cost item e.g. the quantity of oil used to lubricate the machines



Absorption of non production overheads in production cost

Product costs may be compiled for a range of purposes including

- a) Stock valuation
- b) Product pricing
- c) Decision making

For **stock valuation** purposes International Accounting Standard No. 2 define cost being that expenditure which has been incurred in the normal course of business in bringing the product or service to its present location and condition. This expenditure should include in addition to the cost of purchase such costs of conversion as are appropriate to that location and condition

For **product pricing** purposes, administration, selling and distribution overheads may be absorbed in a number of ways including

- a) As a percentage of selling price
- b) As a percentage of full cost of production
- c) As a percentage of conversion costs
- d) As a rate per unit sold

For **Decision Making** purposes, it is also relevant to know which part of administration selling and distribution overhead costs are directly attributable to a particular product and which are avoidable if that product is discontinued. Only relevant costs are important in decision making.



ACTIVITY BASED COSTING (ABC)

Fast forward;

ABC identifies costs pools and cost drivers and absorbs overheads based on the cost drivers.

ABC is a costing method which recognizes that costs are incurred because of the activities which take place within the organization and for each activity a cost driver may be identified. Those costs which are driven or incurred by the same cost drivers are grouped together into cost pools and the cost drivers are then used as a basis for charging the cost of each activity in the product.

A cost pool is a collection of costs which may be charged to products by the use of a common cost driver. A cost driver is any activity or activities, series of which take place within an organization and which cause costs to be incurred. The essence of ABC is that activities are the cost drivers, not products. Products do consume activities. If the cost of activities and their relationship to products is understood, there can be established basis for product costing, performance measurement and profitability analysis.

Some examples of cost pools and related cost drivers are as shown below.

Cost pool	Cost driver
Power	Number of machine operations
Material handling	Quantity or weight of materials handled
Material receipt	Number of batches of materials received
Production planning	Number of jobs or materials planned
Sales administration	Number of customers or orders received
Set up costs	Number of jobs run

The development of ABC has been a response to a change in the cost base of many manufacturers over the last decades. In earlier times, most manufacturing was labour intensive. The variable cost of direct labour greatly outweighed all other costs and the overheads were a relatively small component of the total cost. Traditional absorption costing was accurate enough in these circumstances. Nowadays, most manufacturing processes are automated. The fixed overhead cost of depreciation is now an important component of the total cost. At the same time, work forces have been greatly reduced. This means that the variable cost of direct labour is now a much smaller proportion of the total cost. Traditional absorption costing has become inaccurate as a result and misleading product costs have led to poor decision making.

ABC analyses costs as short-term variable cost and long-term variable costs. Short-term variable costs equate with variable costs under the traditional absorption costing. These characteristics are volume related and change proportionately with the volume of production. Long-term variable costs are equivalent to fixed costs under traditional cost accounting. Under ABC, such costs do vary with activity even though there is a time lag e.g. salaried production engineers will not be immediately made redundant if the number of products decline but they may be if decline continues.

In addition the cost classification does not stop with factory overheads. Non-production overheads such as design and marketing costs are included in product costs and profitability analysis by the ABC system. Short-term variable costs can be identified with the products using volume related cost drivers such as direct labour hours, machine hours and direct materials used.

The cost drivers may be different depending on how the cost is driven thus the cost of power will be related to or driven by machine hours. Long-term variable costs, however, using volume related drivers will tend to be inappropriate e.g. the number and cost of salaried production engineers is not a function of direct labour hours or machine hours but a function of the number of times a machine has been set up for a production run. The activity which drives the cost is the number of setups. Costs should thus be allocated to products using this number. This contrasts with traditional practice, which absorbs all overheads based on (often) direct labour hours and has no regard to the activity.

Note:

1. Activities cause costs; activities include ordering, materials handling, machining, assembly, production scheduling and dispatching.
2. Products create demand for the activities.
3. Costs are assigned to products on the basis of a product's consumption of the activities.
4. Absorption rates under ABC should, therefore, be more closely linked to the cause of overhead costs and hence product costs should, therefore, be more realistic especially where support overheads are high.

■ The ABC system generally works on these guidelines;

- (i) Identification of the organization's major activities
- (ii) Identification of the cost drivers. These are factors which determine the size of the costs of the activity or causes of the incurrence of costs. Volume related cost drivers are commonly used for costs that vary with the production levels in the short term. Examples of some costs and their cost drivers are shown below

Activity	Possible cost driver
Car fuel cost	Number of kilometers
Materials handling	Number of production runs
Production scheduling	Number of production runs
Mailing costs	Number of mails sent



- (iii) Collection of the costs of each activity into cost pools. Cost pools are equivalent to cost centers. They are used to describe locations to which overhead costs are initially assigned.
- (iv) Charging support overheads to products on the basis of their usage of the activity. A product's usage of an activity is measured by the number of the activity's cost driver it generates. The service costs are only allocated to the production department according to the usage of the services provided.

Absorption costing and ABC are similar in many respects. In both systems, direct costs go straight to the product and overheads are allocated to production cost centers/cost pools. The difference lies in the manner in which overheads are absorbed into products.

Advantages of ABC

- (i) **It is a more equitable method of charging costs to products:** The product which uses the activity that causes the cost to be incurred bears those costs associated with the product activities in a more equitable manner. This overcomes the drawback in absorption costing where general overheads are spread over the product range using largely unrelated methods to the ways costs are generated.
- (ii) **It takes into consideration product complexity:** The costs charged to products relate to the production circumstances in which those products are produced. Under ABC, short run and complex products might attract consequently higher levels of unit cost compared to the long run and simple products. This aspect would have considerable impact therefore, in the measurement of relative product profitability compared to absorption costing approach.
- (iii) **Costs are more closely related to activity level:** Those costs which under absorption and marginal costing are traditionally regarded as fixed in total may be treated as variable in the long-term under ABC. As a consequence, ABC encourages the measurement of efficiency levels of administration functions.
- (iv) **It encourages a more realistic approach to stock policy:** ABC does not encourage the buildup of finished goods stock as in absorption costing. In ABC, the over recoveries which encourage stock build up in absorption costing do not arise to the same extent because greater proportion of the costs are treated as variable rather than fixed.
- (v) **It includes stock control:** ABC reflects closely what is happening in the production environment and identifies those elements which would be subject to managerial control. It encourages costs that management can best achieve through the management of those activities which cause costs to be incurred.

Disadvantages of ABC System

- (i) **A more detailed analysis is required:** A more detailed analysis of cost pools and drivers than necessary for absorption costing is usually required for an effective ABC system with the constant increase in the cost of administering the accounting system.

- (ii) **Some simplification required:** Identification of cost pools and drivers is not always a straight forward activity and at times, it is necessary to rationalize the number of cost pools and cost drivers in the interest of reducing complexity and the cost of ABC. This may be regarded as a compromise to the ABC system
- (iii) **It does not conform to the accounting standard on stock;** the ABC system encourages all costs including selling and distribution costs to be charged to work in progress and finished goods as product costs. This cuts across the normal basis of valuing stock for financial purposes. The accounting standard on stock requires that stocks and work in progress be valued at total production cost up to the stage of production reached which usually excludes the selling, distribution and administration overheads.
- (iv) **It is a more complex system of absorption costing:** ABC is regarded by some as not so very different from absorption costing in that absorption rates for each cost driver are still required to be computed under the ABC System in order to recover the cost of each cost pool.



Cost allocation

This refers to the distribution or assignment of a group of costs to cost centers. Such costs are assimilated in a similar manner and should be allocated on the same base. Allocation base is the measure of activity used to allocate a cost pool to the cost centers.

Reasons for Cost Allocation

- To facilitate comparison with externally provided services: It assists in assessing whether to continue the service or contact outsiders.
- To provide ideas on the efficiency of service departments: It helps to determine whether a service department is operating efficiently and its size is optimal.
- To discourage unnecessary service by some managers as they know they will be charged.
- To provide opportunity for cost price-quality trade offs: Cost allocation helps to eliminate friction between departments. This is because a user department that demands higher quality knows that it will have to bear higher costs.

Allocation of Service Department Costs to Production departments

Service departments are those departments that provide support to production departments but do not engage directly in the production of the products e.g. the accounting department, maintenance department, and the legal department. Service departments provide services to each other and at the same time to the production department. The methods of allocating service costs include



1. Direct Allocation Method
2. Step-wise Method
3. Reciprocal Method

(i) Direct Method

The service costs are only allocated to the production department according to the usage of the services provided. For example, maintenance services offered to the mixing department will be charged to the mixing department directly.

(ii) Step-wise Method

It is also referred to as elimination method. Some of the costs of the reciprocal services will be recognized although only to some extent. The steps followed include:

Choose one of the service departments and allocate its costs to all the other departments including the other service departments. Normally, the basis of choosing that service department to start with is the service department that provides services to the greatest number of other departments or the greatest percentage of the service costs incurred in that department is attributed to service offered to other departments.

Another service department is chosen and its total costs allocated the remaining departments excluding the first service departments.

Repeat the process until all the service department costs have been allocated to the production departments.

(iii) Reciprocal Method

This method fully considers all reciprocal services. It is the most precise in technically finished method. This method employs the following techniques as discussed earlier in this chapter.

- a) Simultaneous Equation
- b) Matrix Algebra

>>> Illustrations

Assume the following data:

User department	Unit of service provided			Costs Prior to Service Department
	S1	S2	S3	Shs
S1	0	2,000	4,500	92,400
S2	1,000	0	0	184,800
S3	2,000	4,000	0	138,600
P1	4,000	10,000	1,500	400,000
P2	3,000	4,000	9,000	500,000
Totals	10,000	20,000	15,000	1,315,800

(i) Direct Method allocation to production departments;

	S1	S2	S3	P1	P2
Cost Prior to Allocation	92,400	184,800	138,600	400,000	500,000
Allocate S1(4:3)	(92,400)			52800	39600
Allocate S2 (5:2)		(184,800)		132000	52800
Allocate S3(1 :6)			(138,600)	19800	118800

(ii) Step wise method (Elimination Method)

	S1	S2	S3	P1	P2	Total
Cost Prior to Allocation	92,400	184,800	138,600	400,000	500,000	1,315,800
Allocate S1(1:2:4:3)		9,240	18,480	36,960	27,720	
		194,040	157,080	436,960	527,720	
Allocate S2 (2:5:2)		(194,040)	38,808	97,020	58,212	
			195,888	533,980	585,932	
Allocate S3(1 :6)			(195,888)	27,984	167,904	
				561,964	753,836	1,315,800

(iii) Reciprocal Method

Let S_a be the total costs of service dept 1

Let S_b be the total costs of service dept 2

Let S_c be the total costs of service dept 3

Each of the coefficients in the expressions hereunder (used to get cost after recognition) are percentages based on proportional service received by a department from the departments

$$S_a = 92400 + 0.1S_b + 0.30S_c \dots\dots\dots \text{Equation (i)}$$

$$S_b = 184800 + 0.1S_a \dots\dots\dots \text{Equation (ii)}$$

$$S_c = 138600 + 0.2S_a + 0.2S_b \dots\dots\dots \text{Equation (iii)}$$

Substituting Equation (ii) into Equation (i) and solving, we get;

$$S_a = 92400 + 0.1(184800 + 0.1S_a + 0.0S_c) + 0.30S_c \dots\dots\dots \text{Equation (i)}_c$$

$$S_a = 92400 + (18480 + 0.01S_a) + 0.30S_c$$

$$S_a = 110880 + 0.01S_a + 0.3S_c$$

$$0.99S_a = 110880 + 0.3S_c \dots\dots\dots \text{Equation (iv)}$$

Substituting Equation (ii) into Equation (iii) and solving, we get,

$$S_c = 138600 + 0.2S_a + 0.2(184400 + 0.1S_a) \dots\dots\dots \text{Equation (iii)}$$

$$S_c = 138600 + 0.2S_a + 36880 + 0.02S_a$$

$$S_c = 175480 + 0.2S_a + 0.02S_a$$

$$0.98S_c = 175480 + 0.2S_a \dots\dots\dots \text{Equation (v)}$$



Substituting (v) into Equation (iv) and solving we get,

$$0.99S_a = 110880 + 0.3(175,480 + 0.2S_a) \dots \dots \dots \text{Equation (iv)}$$

$$0.99S_a = 110880 + 52,644 + 0.06S_a$$

$$0.99S_a = 163524 + 0.06S_a$$

$$0.93S_a = 163524$$

$$S_a = \frac{163524}{0.93}$$

$$S_a = 175,832$$

Therefore

$$S_b = 184,400 + 0.1(175,832) = 201,983$$

$$S_c = 138,600 + 0.2(175,832) + 0.2(201,983) = 214,163$$

	S1	S2	S3	P1	P2	Total
Cost Prior to Allocation	92,,400	184,800	138,600	400,000	500,000	1,315,800
Cost after recognition	175,832	201,983	214,163			
Allocate S1(1:2:4:3)		9,240	18,480	36,960	27,720	
		194,040	157,080	436,960	527,720	
Allocate S2 (2:5:2)		(194,040)	38,808	97,020	58,212	
			195,888	533,980	585,932	
Allocate S3(1 :6)			(195,888)	27,984	167,904	
				561,964	753,836	1,315,800

CHAPTER SUMMARY

We have looked at overhead allocation and apportionment, reasons for absorbing overheads and the various methods of absorbing service cost center overheads into production cost centers.

We have established how we can incorporate all costs associated with production in the item produced.

CHAPTER QUIZ

1. Define ABC Costing.
2. Define absorption costing.
3. Highlight reasons why overheads are absorbed.
4. List the methods used to apportion service department costs

ANSWERS TO CHAPTER QUIZ

1. ABC is a costing method which recognizes that costs are incurred because of the activities which take place within the organization and for each activity a cost driver may be identified
2. Absorption costing is the process by which overheads are absorbed into production
3. Reasons why overheads are absorbed
 - To control overhead expenditure
 - Charging overheads to cost units
 - Valuation of work in progress
 - Valuation of abnormal losses
 - Profit measurement
 - Decision making
4. Methods used to allocate service department costs
 - Direct method
 - Repeated distribution method
 - Algebraic
 - Compromise methods

PAST PAPER ANALYSIS

05/06 Q4; 12/05 Q4; 06/04 Q1; 06/04 Q7(a); 12/03 Q5; 06/03 Q1; 12/02 Q1; 05/02 Q6; 05/01 Q4



EXAM QUESTIONS

Question one

(a) Explain the following terms giving an example of each:

(i) Service centre; and

(ii) Production centre.

Explain how the treatment of overheads differs between the two different types of centers. (6 marks)

(b) Explain how Activity Based Costing differs from traditional absorption costing, giving an example. (4 marks)

Question two

A factory consists of two production cost centers (G and H) and two service cost centers (J and K). The total overheads allocated and apportioned to each centre are as follows:

G	H	J	K
Shs.40,000	Shs.50,000	Shs.30,000	Shs.18,000

The work done by the service cost centers can be represented as follows:

	G	H	J	K
Percentage of service cost centre J to	30%	70%	–	–
Percentage of service cost centre K to	50%	40%	10%	–

The company apportions service cost centre costs to production cost centers using a method that fully recognizes any work done by one service cost centre for another.

What are the total overheads for production cost centre G after the reapportionment of all service cost centre costs? (20 marks)

Question three

Given: Total budgeted overheads = Shs.240,000

Production budget is as follows:

Product	A	B
Units	20,000	10,000
Labour hours	20,000	20,000
Labour cost	Shs.17,500	Shs.22,500
Machine hours	45,000	15,000
Material cost	Shs.15,000	Shs.25,000

Required

Compute the overhead absorption rate per unit of A and B using the following methods:

- Unit method
- Percentage on material cost
- Percentage on labour cost
- Percentage on prime cost
- Labour hour rate
- Machine hour rate

Question four

ABC Company manufactures leather products with various end uses. The company applies factory overheads to individual jobs on the basis of machine hours for department A, and on the basis of direct labour cost for department B. The following budget estimates were made by the company at the start of year 2:

	Department A	Department B
	Shs.	Shs
Direct material cost	800,000	600,000
Direct labour cost	600,000	500,000
Factory overheads	600,000	400,000
	Hrs	Hrs
Direct labour hours	40,000	50,000
Machine hours	120,000	7,500

Cost records kept by the company showed that Job No.T506 consumed the following inputs during the year:

	Department A	Department B
	Shs.	Shs
Materials issued	5,000	15,000
Direct labour cost	4,800	4,000
	Hrs	Hrs
Direct Labour hours	400	500
Machine hours	1,500	100

**Required:**

- Determine the overhead application rate for both department A and B.
- Calculate the total cost of Job No.T506.
- Suppose the job consists of 50 items, what would be the cost per unit?
- At the end of the year 2, total factory overheads incurred amounted to Shs.975,000. A total of 110,000 machine hours were worked in department A while the total labour cost for department B was Shs.540,000.

Required

Calculate the over or under-applied for the company as a whole and indicate whether it is favorable or unfavorable.

Question five

- Equator Garments Ltd. manufactures custom-made suits tailored to the requirements of each customer. They use predetermined overhead absorption rates in allocating overheads to each job. In the cutting department, the rate is based on direct labour hours and in the stitching department the rate is based on machine hours. The management of Equator Garments Ltd. wants to set overhead absorption rates to help in determining prices in the next financial year.
The cost accountant has provided the following budgeted data for the next financial year.

	Cutting	Stitching
Direct labour cost	Shs.1200000	Shs.750000
Factory overhead	Shs.1500000	Shs.1620000
Direct labour hours	60000	30000
Machine hours		40000

Required

Calculate the overhead absorption rates for each department

- The following data relates to Job No.A4

	Cutting	Stitching
Direct materials	Shs.500	Shs. 750
Direct labour hours	30	10
Machine hours	-	20

Administration overheads are absorbed at 25% on factory costs.

Profit mark-up is 33 1/3 % on cost.

Required

Prepare a cost statement for job A4 showing the price that will be charged to the customer.

c) At the end of the year, the following data was obtained:

	Cutting	Stitching
Hours actually worked		
Direct labour hours	68,000	30,000
Machine hours		17,000
Factory overhead cost incurred	1,600,000	760,000

Required

Calculate the amount of under or over absorption for each department.

(Your attention is drawn to the interrelation between a, b, and c).

CASE STUDY

“It is now fairly and widely accepted that conventional cost accounting, distorts management’s view of business through unrepresentative overhead allocation and inappropriate product costing. This is because the traditional approach usually absorbs overhead costs across products solely on the basis of the direct labour involved in their manufacture. As direct labour cost expressed as a proportion of total manufacturing cost continues to fall, this leads to more and more distortion and misrepresentation of the impact of particular products on total overhead costs” (from Financial Times)

Overhead absorption is the technique of attributing departmental overhead costs to a cost unit.

Traditionally, the basis of overhead absorption was the number of labour hours expected within the budget period and this was then used to calculate an absorption rate per labour hour. This was then used to attribute costs to the cost units on the basis of the number of labour hours used to produce the cost unit.

Alternative bases of apportioning exist such as the number of machine hours or the percentage of particular elements of prime costs incurred in respect of cost units. If the method of manufacture is machine intensive, for example, it is more realistic to absorb the overhead cost on the basis of the number of machine hours instead of the number of labour hours.



A further development is to divide the overheads into those costs, which are labour related, and those, which are machine hour, related and apply a separate absorption rate to each part of the overhead cost. This is the use of multiple rates similar to the principle of activity bases costing (ABC).

ABC is based on the principle that activities cause costs and therefore the use of activities should be the basis of attributing costs to cost units. Costs are identified with particular activities and the performance of those activities is linked with products.

Traditional budgeting systems are incremental in nature and tend to focus on cost centers. Activity based budgeting (ABB) links strategic planning to the overall performance measurement aimed at continuous improvement

Incremental budgeting uses the previous year's budget as the starting point for the preparation of the following year's budget. It assumes that the basic structure of the budget will remain unchanged and that adjustments will be made to allow for changes in volume, efficiency and price levels. The budget is, therefore, concerned with increments to operations that will occur during the period and the focus is on existing uses of resources rather than considering alternative strategies for the future budget period. Incremental budgeting suffers from the following weaknesses:

- i. It perpetuates past inefficiencies
- ii. There is insufficient focus on improving efficiency and effectiveness.
- iii. The resource allocation tends to be based on existing strategies rather than considering future strategies.
- iv. It tends to focus excessively on the short term and often leads to arbitrary cuts being made in order to achieve short-term financial targets

CHAPTER SEVEN



COST BOOK KEEPING



CHAPTER SEVEN

COST BOOK KEEPING

► OBJECTIVES

By the end of this chapter, you should be able to:

- Distinguish between the two basic accounting systems normally used.
- Come up with a set of cost accounts from financial accounts.
- Identify the various ledgers required in cost book keeping and establish the link between cost and financial books of accounts.
- Reconcile profits disclosed by financial and cost accounts in an interlocking systems.
- List the causes of discrepancy between financial and cost accounts.

► INTRODUCTION

In this chapter, we look at the two main systems of cost book keeping. That is the integrated cost accounting system and interlocking cost accounting system.

We look at the process of cost book keeping and the main accounts that are normally kept in both sets of accounts.

We later look at the reconciliation of cost accounting books with financial accounting books using the T account.

► DEFINITION OF KEY TERMS

Integrated accounting system;. A system of accounting where the cost and financial accounts are kept in the same set of books. This system avoids the need for separate set of books for financial and costing purposes

Interlocking accounting system; this is an accounting system where separate cost accounting and financial accounting books are maintained although both use the same basic accounting data

► EXAM CONTEXT

The examiner will expect you to be able to reconcile cost accounts to financial accounts. You should, therefore, understand the concept of book keeping and reconciliation in depth. You must also be able to prepare various accounts when given the data.

► INDUSTRY CONTEXT

Book keeping is applicable in every business enterprise.

■ COST ACCOUNTING SYSTEMS

Fast forward

There are two main cost accounting systems. These are interlocking cost accounting system and integrated cost accounting system.

Interlocking Cost Accounting System:

Under this system, separate cost accounting and financial accounting books are maintained although both use the same basic accounting data. The financial accounting books have the normal and credit entries within themselves. In addition, a memorandum account, also known as Cost Ledger Control account is maintained and all the items to be transferred to the cost accounts are posted in this account.

Cost accounting books on the other hand contain impersonal accounts necessary for costing purposes in addition to a Financial Ledger Control Account, also known as Cost Ledger Control Account which enables the financial and Cost Ledger to be interlocked. The interlocking cost accounting system, costing and financial profit differ and have therefore to be reconciled at the end of the financial year.

■ Required Ledgers

In the financial Systems, the required ledgers are:

- a) The General Ledger



- b) Debtors Ledger (or Sales ledger)
- c) Creditors Ledger (or Purchases ledger)

In the cost book-keeping system, the required ledgers are:

- (i) **General Ledger Adjustment Account:** It is sometimes called the cost ledger account. All the items extracted from the financial account are recorded in this account. The balance in this account represents the total of all the balances of the impersonal accounts extracted from the financial books. It completes the double entry in the cost accounts.
- (ii) **Stores Ledger Control Account:** This account shows all the transaction of materials e.g. purchases, issuance of materials, returns to suppliers, e.t.c.. The balance of this account represents in total the detailed balance of the stores account.
- (iii) **Work in Progress Ledger Control Account:** It shows the total work in progress at any particular time.
- (iv) **Finished Goods Ledger Control Account:** Receipts from production and transfer to distribution department are entered in this account and the balance of this account shows the total value of finished goods in stock.
- (v) **Production Overheads Control Account:** It gives the total production overheads incurred in the manufacture or production of goods in question.
- (vi) **Wages Control Account:** It shows the total wages incurred in the production of goods.
- (vii) **Selling and Distribution Overheads Control Accounts:** It gives the overheads incurred in marketing the goods produced. Examples of such costs will include advertising costs, sales commission, repairs made to the distribution van e.t.c.
- (viii) **Administrative Overheads Control Accounts:** This will give the total of administrative overheads incurred in the organization. These costs are not related to production. Such costs will include salary to the general manager, salary to accounts department staff, e.t.c.



Link Between Cost And Financial Books

The link between the two sets of books is achieved by operating a cost ledger control account and a financial ledger control account (Cost Ledger Contra Account) in the financial and cost books respectively. In the cost ledger control account, all the items which affect the costs accounts are recorded, the same items are recorded in the financial ledger control accounts, but on the opposite side of the account hence the account completes the double entry. The Cost Ledger Control Account is just a memorandum entry and is, therefore, made in addition to the normal entries in the financial books of account.

To come up with a set of cost accounts from the financial accounts, a three stage approach is used;

- (i) Recording information directly from the financial ledger
- (ii) Recording the information analysis in the cost accounting system operation
- (iii) Finally, transferring of balances to costing financial statements

■ (i) Recording information directly from the financial ledger

In here, information relating to material procurement, labour costs (salaries and wages), sales revenue and overheads for the period is captured. The set of accounts opened is as shown;

Financial ledger control a/c		Stores ledger control a/c	
Sales A/c	x	Stores ledger Control a/c	X
		Wages Control a/c	X
		Production OH Ctrl a/c	X
		Non Production OH Ctrl a/c	X
<div style="text-align: center; border-bottom: 1px solid black; margin-bottom: 5px;">Wages control a/c</div> <div style="display: flex; justify-content: space-between; padding: 0 10px;"> FLC a/c X </div>		<div style="text-align: center; border-bottom: 1px solid black; margin-bottom: 5px;">Production Overhead control a/c</div> <div style="display: flex; justify-content: space-between; padding: 0 10px;"> FLC a/c X </div>	
<div style="text-align: center; border-bottom: 1px solid black; margin-bottom: 5px;">Non production overhead control a/c</div> <div style="display: flex; justify-content: space-between; padding: 0 10px;"> FLC a/c X </div>		<div style="text-align: center; border-bottom: 1px solid black; margin-bottom: 5px;">Sales A/c</div>	



The compound journal entry to be passed shall be:

Dr	Stores ledger control account(i)	x	
	Wages control account (ii)	x	
	Production overheads control account (iii)	x	
	Non production overheads control account (iv)	x	
	Financial ledger control account (Sales A/c Figure)		
Cr	Sales account		x
	Financial ledger control account (i+ii+iii+iv)		x

(ii) Recording the information analysis in the cost accounting system operation

In here, information obtained from the financial ledger is analyzed within the cost ledger. The analysis mainly involves the major accounts drawn from the financial accounting system. In addition to the accounts, additional adjusting accounts are drawn to effect the analysis. These accounts include; Over/under-absorption account and Sundry losses account.

The three major accounts, stores ledger control account, wages control account and production overheads control account, have credit entries which are equivalent to the debit entries in the work in progress account. They represent direct materials issued, direct labour and production overhead cost incurred.

Stores ledger control a/c

FLC a/c	x	WIP a/c	x
---------	---	---------	---

Wages control a/c

FLC a/c	X	WIP a/c	X
---------	---	---------	---

Production Overhead control a/c

FLC a/c	X	WIP a/c	X
---------	---	---------	---

Work in process a/c

Stores ledger Control a/c	x	
Wages Control a/c	X	
Production OH Ctrl a/c	X	

What constitutes production overhead are indirect materials issued for production and indirect labour; these will be credited to the stores ledger control account and wages control account respectively and the equivalent debit entries made to the production overheads account as follows;

Dr: Production overheads a/c (total)	x	
CR: Stores ledger control a/c		x
Wages control a/c		x

Wages control a/c			
FLC a/c	X	WIP a/c	X
		Production OH a/c	X

Production Overhead control a/c			
FLC a/c	X	WIP a/c	X
		Production OH a/c	X

Production Overhead control a/c			
FLC a/c	X	WIP a/c	X
Stores ledger Control a/c	X		
Wages Control a/c	X		

So far, one can identify the items that appear in each of the accounts and the corresponding entry. In addition, there may be material losses through evaporation, pilferage or theft while in store. Such an adjustment will be done in the stores ledger control account and the adjusting entry will be as follows:

Dr: Sundry losses a/c	x	
Cr Stores ledger control a/c		x

The balance in the Sundry losses account will be charged to the costing profit and loss account by passing the following journal entry;

Dr: Costing profit and loss a/c	x	
Cr Sundry losses a/c		x



Fixed Overhead costs are normally absorbed into the units of production by use of a predetermined rate, which is based on standard or budgeted output. The actual output may be less or more than the budgeted thus translating to an over or under absorption of the fixed production overheads.

Under absorption of overheads is adjusted in the production overhead control account as follows;

Dr: Under absorption a/c	x	
		Cr Production overhead control a/c
		x

The balance in the under absorption account is closed off in the costing profit and loss statement by passing the following journal entry;

Dr: Costing profit and loss a/c	x	
		Cr Under absorption a/c
		x

In case of an over absorption, the journal entry above will be reversed and the balance in the over absorption account will be closed off in the costing profit and loss account.

The three major accounts so far are as follows:

Stores ledger control account

Financial ledger control a/c	x	Work in progress a/c	x
		Sundry losses a/c	x
		Production overheads a/c	x

Wages control account

Financial ledger control a/c	x	Work in Progress a/c	x
		Production overheads a/c	x

Production overhead control account

Financial ledger control a/c	x	Work in progress a/c	x
Stores ledger control a/c	x	Under absorption a/c	x
Wages ledger control a/c	x		
Over absorption a/c	x		

Finalized goods from the manufacturing process are transferred to the finished goods control account. The journal entry passed is;

Dr: Finished goods a/c	x	
Cr: Work in Progress a/c		x

(iii) Transferring balances to Costing profit and Loss account

As discussed above, balances for the under absorption a/c and Sundry losses account are closed to the Costing Profit and loss account by debiting the later and crediting the individual accounts. A similar treatment is rendered to non production overheads balance.

To determine the profit earned, one needs to determine the cost of goods sold, which shall be subtracted from the sales revenue to obtain gross profit.

To transfer the cost of goods sold into cost of sales, the following journal entry is passed;

Dr Cost of sales a/c	x	
Cr Finished goods a/c		x

The Cost of sales a/c balance is closed off in the costing profit and loss account by passing the following journal entry;

Dr Costing profit and loss a/c	x	
Cr Cost of sales a/c		x

The Costing profit and loss a/c shall appear as below;

Costing Profit and Loss a/c			
Cost of sales a/c	xx	Sales	xx
Under absorption a/c	xx	Over absorption a/c	xx
Sundry losses a/c	xx		
Non Production overhead control a/c	xx		
Balance c/f	xx		
	<u>xx</u>		<u>xx</u>



The final trial balance in the cost ledger will show:

	DR	CR
Stores ledger control a/c	x	
W.I.P Control a/c	x	
Finished goods control a/c	x	
Costing profit and loss a/c		x
Financial Ledger Control a/c		x

The debit and credit total should be equal. Any difference should be investigated and corrected.

Focus on financial and cost accounts in relation to Materials Transaction

- (i) Purchase of Materials on Credit
- (ii) Return of Materials to Suppliers
- (iii) Purchase of Materials in Cash.

The above transactions affect both the financial accounts and cost accounts and the entries in the two sets of books will appear as follows:

In the Financial Books	In the Costing Books
Purchases on Credit: Dr Purchases a/c Cr Creditors a/c	Dr Stores Ledger Control a/c Cr General Ledger Adjustment a/c
Return of Materials to Suppliers Dr Creditors a/c Cr. Purchases a/c	Dr. General Ledger Adjustment a/c Cr. Stores Ledger Control a/c
Purchases of Materials in Cash Dr. Purchases a/c Cr. Cash a/c	Dr. Stores Ledger Control a/c Cr. General Ledger Adjustment a/c

The following entries of material transactions affect only the cost of books because they are merely transfers in the cost ledger:



Focus on financial and cost accounts in relation to labor transactions

- (i) Wages paid in cash
- (ii) Wages incurred as
 - a) direct labor or
 - b) Indirect labor

In the Financial Books	In the Costing Books
Wages Paid in cash:	
Dr. Wages Account	Dr. Wages Control a/c
Cr. Cash a/c	Cr. General ledger adjustment a/c
Wages incurred as direct labour	
Not distinguished as direct labour	Dr. Work in process a/ c
	Cr. Wages Control a/ c
Wages incurred as indirect labour	
Not distinguished as indirect labour	Dr. Work in Process a/ c
	Cr. Production Overheads Control a/ c

Tutorial Note

A cost account ledger system is required to analyze accounting information in order that costs may be accumulated for individual cost centers and charged to cost units. The information in the cost ledger will be used for a range of planning, control and decision making purpose.

The cost ledger control account in the financial ledger is a memorandum account which records the financial information, which has been extracted for use in the cost ledger. The financial ledger control in the cost ledger has two main purposes:

- (i) It makes the cost ledger self-balancing: It takes the place of an asset liability accounts in which one leg of the double entry would appear in the financial ledger for each transaction e.g. the purchase of material on credit would be credited to Sundry creditors control account in the financial ledger. In the cost ledger, it is credited to the financial ledger control account.



- (ii) It enables an internal check to be performed by comparing its balances with that of the cost ledger control account in the financial ledger. Both should record a balance which represents stock balances (Raw material, W.I.P and financial goods) the net profit, when all other transactions have been completed. Any difference should be investigated and reconciled. Thus the final trial balance in the cost ledger will show:

	DR	CR
Stores ledger control a/c	x	
W.I.P Control a/c	x	
Finished goods control a/c	x	
Costing profit and loss a/c		x
Financial Ledger Control a/c		x

>>> Illustration of the book keeping entries in a job costing system

Reconciliation of profits disclosed by Financial Accounts and Cost Accounts in an interlocking system

Fast forward;

Costing accounting profits can always be reconciled by identifying the items causing the difference in the numbers.

When interlocking cost accounting system is applied, there will always be differences between the profit shown in the financial accounts and that shown in the Cost accounts even if there are no errors in either accounts. This disparity in profits is caused by the different ways of recording accounting entries in the cost books and the financial books. For this reason, the two profit figures in the set of the two accounts should be periodically reconciled if they are to be meaningful. This reconciliation is done using an account known as the Memorandum Reconciliation Account.

Differences between the profit figures in the cost books and the financial books are caused by factors such as

- (i) Items shown only by one set of accounts i.e. Items appearing in the financial accounts and not in the cost books and vice versa.

Item shown only in the financial books include:

- Losses on disposal of assets
- Stamp duty and other expenses on issues and transfers of capital stock (shares, bonds, debentures, e.t.c.)

- Losses on investment
- Interest on bank loans
- Discounts on bonds and debentures
- Dividends received
- Profits arising from sale of fixed assets
- Dividends paid
- Rent receivable but excluding that portion receivable from sub-letting part of the business premises if it has been included in the cost accounts.

Items shown only in the cost books: These are normally notional charges therefore not real. They include:

- Interest on capital employed in production
- Notional rental charges of premises owned

The above two notional costs represents the opportunity cost of employing the capital in the business rather than investing it outside the business.

(ii) Different bases of Stock Valuation

Stocks are valued differently, in cost accounts and financial accounts; the financial stock is valued at the lower cost and net realizable value (mark value). The valuation of stocks in cost accounts is either based on LIFO, FIFO or weighted average. This use of different bases in valuing stocks will affect the profit/losses shown in the financial or cost accounts hence the need for reconciliation of the two.

(iii) Different Treatment of Overheads

In cost accounts, indirect expenses are recovered as overheads based on estimated expenditure and aligned with the estimated level of production. This results in under or over-absorption of overheads and this must be taken into account when reconciling the profits of the two sets of accounts. In the financial accounts, however, indirect expenses are recorded at the actual cost and charged to the production account.

**>>> Illustration**

The following are the final accounts of XYZ Limited for the year ending 31st December 1999

Manufacturing Trading Profit and Loss Appropriation Account			
Total Factory Costs c/ d	311,000	Sales	480,000
Finished goods; opening stock	20,000		
Cost of goods manufactured and transferred b/d	<u>311,000</u>		
Less closing stock	<u>(22,000)</u>		
	309,000		
Gross profit c/d	<u>171,000</u>		
	<u>480,000</u>		<u>480,000</u>
Expenses			
Office Salaries	35,000	Gross profit b/f	171,000
Office Expenses	20,000	Dividends received	3,000
Salesmen Commissions	18,000	Interest on bank deposits	1,000
Selling Expenses	15,000		
Loss on sale of land	1,000		
Distribution expenses	13,000		
Interest on mortgage	2,000		
Fines	1,000		
Net Profit c/d	<u>70,000</u>		
	<u>175,000</u>		<u>175,000</u>
Taxation	24,000	Net Profit b/d	70,000
Transfers to general reserve	9,000	Retained profit c/f	36,000
Ordinary share dividend	18,000		
Preference dividend	11,000		
Goodwill written off	7,000		
Retained Earnings c/f	<u>37,000</u>		
	<u>106,000</u>		<u>106,000</u>
		Retained earnings b/f	

The cost accounting records show the following:

(i). Profits were Shs.114,000. Office salaries and office expenses provided for as (in the financial books)

(ii). Stocks were as follows:

Opening Stocks:		Raw Materials	26,000
	Work in process		21,000
	Finished goods		23,000
Closing stock	Raw materials		30,000
	Work in process		20,000
	Finished goods		24,000

Required:

Prepare a Memorandum Reconciliation account

Solution

Memorandum Reconciliation account

Items not Debited in cost a/c		Profit as per cost books	
Stock difference:		114,000	
Closing finished goods difference	1,000		
Closing WIP difference	2,000		
Opening finished goods difference	3,000		
Closing raw materials difference	1,000		
Other costs		Items not credited in cost a/c	
Salesman Commission	18,000	Dividend received	3,000
Selling expenses	15,000	Interest received	1,000
Loss on sale of land	1,000	Difference in stocks	
Distribution Expenses	13,000	Opening WIP difference	8000
Interest on mortgage	2,000	Opening raw materials	1,000
Fines	1,000		
Net profit as per the financial books	<u>70,000</u>	_____	
	<u>127,000</u>	<u>127,000</u>	

Workings

	Financial a/c	Cost a/c	Difference
Work in progress: opening stocks:	29,000	21,000	8,000 CR
Finished goods: opening stocks:	20,000	23,000	3,000 DR
Raw materials: opening stocks:	27,000	26,000	1,000 CR
Raw materials: closing stocks:	21,000	20,000	1,000 DR
Work in progress: closing stock	22,000	24,000	2,000 DR
Finished goods: closing stock	29,000	30,000	1,000 DR



THE NATURE OF INTEGRATED ACCOUNTS

In integrated account, ledger system has a number of features which may be viewed as preferable to the interlocking ledger system. In the recent decade, there has in fact been a move towards greater integration of accounting information requirements in a single unified system (an integrated ledger system). Such an integrated ledger system has the following advantages:

- i. There is only one set of accounting records which is kept with sufficient analysis to enable the preparation of financial and cost accounting statements and to facilitate the control mechanisms undertaken by financial and management accountants.
- ii. There is only one profit and loss account. This removes the possibility of senior management confusion and frustration from the production of two seemingly different profit figures.
- iii. There is no requirement to reconcile cost and financial accounting records.
- iv. There is a removal of the duplication of effort and cost which arises when separate ledgers are maintained.
- v. The integrated ledger system fits in with the use of computer based information systems and a database approach to information availability and use.



Entries in the Integrated ledger system

The integrated ledger system contains most of the entries in the interlocking ledger system. The financial ledger control account is no longer in use. The range of asset and liability accounts required for financial control purposes and for the preparation of financial accounting statements will incorporate the entries, which would have appeared in the financial ledger control account.

>>> Illustration

- a) List and explain the reasons as to why profit or loss between cost and financial records may differ in an interlocking accounting system. (10 marks)
- b) Inter products Kenya Ltd. operates separate cost and financial accounting systems. The following balances from the final accounts of the company for both systems are available to you as the Company's Financial and Management Accountant.

	Shs'000
Net Profit as per financial accounts	95,670
Net profit as per cost accounts	100,140
Dividend paid	180
Loss due to theft and pilferage charged in the financial accounts	345
Stock depreciation charged in the financial accounts	1,290
Stores adjustment credited to financial accounts	630
Bank interest credited in financial accounts	345
Interest received not included in the cost accounts	675
Depreciation recovered in the financial accounts	5,925
Depreciation charge in the financial accounts	5,490
Excess administration cost recovered	6,375
Factory cost under-recovered in cost accounts	8,550
Tax premium	900

Required

A reconciliation of the company's cost and financial accounts (10 Marks)

Suggested Solution

Reasons why profit or loss between cost and financial accounts may differ in an interlocking system.

Solution

Generally, when certain transactions are viewed differently in these systems, any profit or loss declared will not be the same.

Some of the items which lead to differences include:

Items recorded in financial books but not in cost books and which tend to increase financial profits. These are mainly incomes and gains.

Examples

- Dividends received
- Interest received



- Discounts received
- Profits on disposal of assets

Items recorded in financial books but not cost books which tend to decrease financial profits.

These are expenses and losses. Examples:-

- Discounts allowed
- Capitalized items of profit appropriation i.e. Income tax
- Differences in overhead calculations
- Methods of stock valuation applied
- Items recorded in costing books and not in financial books (10 marks)

a) (i) Use of a T account Memorandum of Reconciliation

Memorandum of Reconciliation

		Cost accounting Profit	100,140
Items debited in the FA but not in CA profit		Items Credited in the FA but not in CA profit	
Stock depreciation charged in the financial a/c s	1,290	Bank interest credited in financial a/cs	345
Loss due to theft and pilferage charged in the financial a/c	390	Stores adjustment credited to financial a/c s	630
Depreciation charge in the financial a/cs	5,490	Interest received not included in the cost a/c s	675
Tax Premium	900	Depreciation recovered in the financial a/c	5,925
Dividend paid	1,800		
Items Increasing Cost accounting		Items Increasing Financial a/c profit	
Factory cost under-recovered in cost accounts a/c s	8,550	Excess administration cost recovered	6,375
Financial accounting profits	95,670		
	<u>114,090</u>		<u>114,090</u>

(ii) Use of Reconciliation statement (Vertical Format)

Inter Products Limited Reconciliation Statement		
	Shs'000	Shs'000
Profit as per financial accounts		95,670
Deduct Items increasing financial profit:		
Stores adjustment	630	
Bank interest	345	
Interest received	<u>675</u>	(1,650)
Add: Items decreasing financial profit:		
Dividend paid	1,800	
Loss due to theft	390	
Stock depreciation	1,290	
Tax premium	900	
Depreciation charge	5,490	9,870
Deduct: Items tending to increase cost profits		
Depreciation	5,925	
Excess administration costs	6,375	(12,300)
Add: Items in cost books tending to reduce cost profit		
Factory cost under covered	8,550	<u>8,550</u>
		<u>100,140</u>

CHAPTER SUMMARY

The chapter has covered the preparation of cost accounting and financial accounting records. Reconciliation of the two sets of accounts has also been covered.

It has elaborated substantially on the items that may bring a difference in the two sets of accounts, which act as the reconciling items. These are:

Items recorded in financial books but not in cost books and which tend to increase financial profits. These are mainly incomes and gains such as;

- Dividends received
- Interest received



- Discounts received
- Profits on disposal of assets

Items recorded in financial books but not cost books which tend to decrease financial profits. These are expenses and losses such as;

- Discounts allowed
- Capitalized items of profit appropriation i.e. Income tax
- Differences in overhead calculations
- Methods of stock valuation applied

CHAPTER QUIZ

1. What is an interlocking accounting system?
2. Highlight the reasons that cause the profit figures in the cost accounting books and those in the financial books to be different
3. Highlight the advantages of integrated systems.
4. Highlight some of the items that may appear in the cost accounting books and not financial accounting books.

ANSWERS TO CHAPTER QUIZ

1. Interlocking accounting system is a system where separate cost accounting and financial accounting books are maintained although both use the same basic accounting data.
2. Differences between the profit figures in the cost books and the financial books are caused by factors such as
 - Items shown only by one set of accounts
 - Different bases of stock valuation
 - Different treatment of overheads
3. Integrated ledger system has the following advantages:
 - i. There is only one set of accounting records which is kept with sufficient analysis to enable the preparation of financial and cost accounting statements and to facilitate the control mechanisms undertaken by financial and management accountants.
 - ii. There is only one profit and loss account. This removes the possibility of senior management confusion and frustration from the production of two seemingly different profit figures.
 - iii. There is no requirement to reconcile cost and financial accounting records.
 - iv. There is a removal of the duplication of effort and cost which arises when separate ledger are maintained.
 - v. The integrated ledger system fits in with the use of computer based information systems and a database approach to information availability and use.
4. Items that appear only in cost accounting books
 - Interest on capital employed in production
 - Notional rental charges of premises owned

PAST PAPER ANALYSIS

Question in this chapter have been tested in the following exam sittings;

12/06 Q5; 05/ 06 Q5; 11 04 Q2; 06/ 03 Q4; 12/01 Q6



EXAM QUESTIONS

QUESTION ONE

- a) Explain the following terms as used in accounting for costs:
- i. Financial Accounting (3 marks)
 - ii. Management Accounting (3 marks)
 - iii. Cost Accounting (2 marks)
- b) Explain how the following accounts are used in cost accounts
- i. Ledger Adjustment Account
 - ii. Stores Ledger Control Account
 - iii. Work in Progress Ledger Control Account
 - iv. Finished Goods Ledger Control Account (3 marks each)

QUESTION TWO

Explain the reasons that cause the profit figures in the cost accounting books and those in the financial books to be different. **(Total: 20 marks)**

QUESTION THREE

The profit shown in the financial books as at 31 March 2004 was Shs.11,287 and for the same period, the cost accounting books showed a profit of Shs.2,704. After checking the two sets of accounts for the source of the differences, the following issues come to your attention:

	Cost Accounts	Financial Accounts
	Shs	Shs
Depreciation	9,826	10,520
Stock Valuations:		
Opening Stock	27,510	25,500
Closing Stock	18,218	18,750
Profit on sale of asset		850
Dividends Received		2,635
Imputed rent Charge		3,250

Required:

Prepare a statement to reconcile the two profits, starting with the profits as per financial accounts

(20 marks)

QUESTION FOUR:

The profit shown in the financial accounts is Shs. 18,592 and for the same period, the cost accounts showed a profit of 20,496. Comparison of the two sets of accounts revealed the following:

Stock Valuations:	Cost Accounts	Financial Accounts
Raw Materials	Shs	Shs
Opening Stock	6,821	7,259
Closing Stock	5,483	5,128
Finished Goods		
Opening stock	13,291	12,905
Closing stock	11,430	11,131

Dividends and interest received of Shs.552 and a loss of 1,750 on the sale of a milling machine were not entered in the cost accounts

Required

Prepare a reconciliation of the two profits (20 marks)

QUESTION FIVE

Mali Yote Limited is a company engaged in the manufacture of specialist marine engines. It operates a job costing accounting system which is not integrated with financial accounts.

At the beginning of the month of May 2002, the operating balances in the cost ledger were as follows:

	Sh. '000'
Stores ledger control account	85,000
Work in progress control account	167,000
Finished goods control account	49,000
Cost ledger control account	302,000

During the month, the following transactions took place.

Materials:	Purchases	42,700
Issues to:	Production	63,400
	General maintenance	1,400
	Assembling of manufacturing equipment	7,600
Factory wages:	Total wages paid	124,000



Of the total wages paid. Shs.12,500,000 was incurred in the assembly of manufacturing equipment. Shs.35,700,000 was indirect wages and the balance was direct wages.

Other production overhead costs incurred amounted to Shs.152,000,000. Shs.30,000,000 of which was absorbed by the manufacturing equipment under assembly while Shs.7,500,000 was under absorbed overhead costs written off.

One of the engines manufactured by the company is produced under license. During the month of May 2002. Shs.2,100,000 was paid as royalty for that particular engine.

Selling overheads and distribution overhead costs were as follows:

	Sh. '000'
Selling overheads	22,000
Distribution overheads	410,000

The company's gross profit margin is 25% on factory cost.

At the end of May 2002, the stock of work in progress had increased by Shs.12,000,000. The manufacturing equipment under assembly was completed within the month and transferred out of the cost ledger at the end of the month.

Required: Prepare,

- (i) Cost ledger control account (8 marks)
- (ii) Stores ledger control account (3 marks)
- (iii) Work in progress control account (3 marks)
- (iv) Finished goods control account (3 marks)
- (v) Costing profit and loss account (3 marks)

(CPA 06/03)

CASE STUDY

Company XYZ maintains separate cost and financial ledgers.

The financial accountant has prepared the following Profit Statement from the financial ledger:

Income Statement For 31st December 2007

	\$	\$
Sales		188,300
Material purchases	73,200	
Wages & Salaries	32,490	
Expenses excluding depreciation	46,860	
Depreciation	17,340	
	169,890	
Stock Increase	2,800	
		167,090
		21,210
Investment Income		8,180
Profit		29,390

The profit reported by the cost accountant was \$19,206

The following are discovered:

- Neither investment income nor interest charges were included in the cost accounts
- Stock valuations in the cost accounts were

	\$	\$
	1/12/07	31/12/07
Raw materials	11,800	9,900
Work-in-progress	8,120	8,530
Finished goods	18,910	22,170
- The same depreciation methods and rates are used in both ledgers. However, in the cost ledger, depreciation continues to be charged at the rate of 10% per annum on fixed assets which have been fully depreciated. Fixed assets which had cost \$468,000 have been fully depreciated in the financial ledger.
- In the cost ledger, production overheads incurred comprises:
 - 5% of the cost of materials used
 - 10% of the wages and salaries
 - 80% of the expenses excluding depreciation
 - 60% of the depreciation cost



Absorbed production overheads were \$54,310 and the under-absorbed production overheads were carried forward, and not written off to the Income Statement

Required:

Prepare a reconciliation statement, commencing with the financial profit of \$28,310 and showing how this can be reconciled to the cost ledger profit of \$19,206

Suggested Solution:

Profit as per financial accounts

\$29,390

	Financial Ledger (\$)	Cost Ledger (\$)		Add (\$)	Less (\$)	
Investment income	8,180	-		-	8,180	
Increase in stock	2,800	1770	(W1)	-	1,030	
Over-depreciation		3,900	(W2)	-	3,900	
Under-absorbed production overhead		2,926	(W3)	2,926	-	
				2,926	13,110	\$(10,184)

Profit as per Cost accounts

\$19,206

Workings: (W1):

	Opening Stock (\$)	Closing Stock (\$)
Raw materials	11,800	9,900
Work-in-progress	8,120	8,530
Finished goods	18,910	22,170
Total	38,830	40,600

Increase in stock = \$40,600 - \$38,830 = **\$1,170**

W2: Depreciation in cost ledger = 10% x \$468,000 / 12 = **\$3,900**

W3: Production Overhead:

	\$
Opening stock of material	11,800
Add: Purchases	<u>73,200</u>
	85,000
Less: Closing Stock	<u>9,900</u>
Material Used	<u>75,100</u>

Actual overhead incurred in cost accounts:

		\$
Material used	5% x\$75,100	3,755
Wages & salaries	10% x\$32,490	3,249
Expenses	80% x\$46,860	37,488
Depreciation	60% x(\$17,340+\$3,900)	12,744
		57,236
Less: Overhead absorbed		54,310
Under-absorbed overhead		<u>2,926</u>

CHAPTER EIGHT



MARGINAL AND ABSORPTION COSTING



CHAPTER EIGHT

MARGINAL AND ABSORPTION COSTING

► OBJECTIVES

After studying this chapter, you should be able to:

- Distinguish between marginal and absorption costing
- Define contribution and explain the principles of marginal costing
- Compare and contrast marginal costing and absorption costing and pass arguments in favor of each depending on the circumstances
- Reconcile marginal profits and absorption profits
- Apply marginal costing in decision making, determination of the break-even point and carrying out the cost-volume-profit analysis
- Calculate the margin of safety of a firm and advise on whether a firm is to make or buy some items based on cost.
- Explain the decision making cycle and importance of relevant costs in decision making
- Analyze direct costs, opportunity and incremental costs as relevant costs

► INTRODUCTION

This chapter explores the use of cost accounting information for decision-making purposes.

► DEFINITION OF KEY TERMS

Marginal cost: This is the cost of a unit of a product or service, which would be avoided if that unit or service was not produced or provided

Break-even point: This is the volume of sales where there is neither profit nor loss.

Margin of safety: This is the excess of sales over the break-even volume in sales. It states the extent to which sales can drop before losses begin to be incurred in a firm

Contribution: This is the difference between sales value and the marginal cost of sales.

► EXAM CONTEXT

A variety of questions can be set from this chapter. The understanding of the this is critical since majority of the questions on decision making are set from it. The questions may not be straight forward and may require application of knowledge from other chapters such as cost classification.

► INDUSTRY CONTEXT

The theory in this chapter is applicable in real life situation especially in decision making. This may include 'make or buy' decisions, costing of an assignment, sensitivity analysis and strategy formulation and evaluation.

MARGINAL COSTING AND ABSORPTION COSTING

Fast forward:

Marginal costing is built on cost behavior.

To understand this topic, you need to understand the topic on cost behavior first. Marginal costing is built on cost behavior and terms. Of key importance are product costs, period costs, variable costs and fixed cost.

Product costs are costs identified with goods produced or purchased for resale. Such costs are initially identified as part of the value of stock and only become expenses when the stock is sold. In contrast, period costs are costs that are deducted as expenses during the current period without ever being included in the value of stock held. We saw how product costs are absorbed into the cost of units of output. Now we describe marginal costing and compare it with absorption costing.

Whereas absorption costing recognizes fixed costs (usually fixed production costs) as part of the cost of a unit of output and hence as product costs, marginal costing treats all fixed costs as period costs. Two such different costing methods obviously each have their supporters and we will be looking at the arguments both in favor of and against each method. Each costing method, because of the different stock valuation used, produces a different profit figure and we will be looking at this particular point in detail.



Note that in marginal costing, all costs need to be classified as variable costs or fixed costs. Semi-variable costs are separated into their fixed and variable components. For instance, if total overhead cost figure given is Shs.50,000, which comprises of, say, Shs.20,000 fixed costs, the difference, Shs.30,000 is taken to be variable and is taken into account when computing contribution. The fixed cost (Shs.20,000) is deducted from the contribution to get the profit figure.

MARGINAL COST AND MARGINAL COSTING

Marginal Costing is an alternative method of costing to absorption costing. In marginal costing, only variable costs are charged as a cost of sale and a contribution is calculated which is sales revenue minus the variable cost of sales. Closing stocks of work in progress or finished goods are valued at marginal (variable) production cost. Fixed costs are treated as a period cost, and are charged in full to the profit and loss account of the accounting period in which they are incurred.

Marginal costing as a form of management accounting is based on the distinction between the marginal costs of making selling goods or services, and fixed costs, which should be the same for a given period of time, regardless of the level of activity in the period.

Marginal Cost

This is the cost of a unit of a product or service which would be avoided if that unit or service was not produced or provided. A marginal cost refers to a variable cost just that the term 'marginal cost' is usually applied to the variable cost of a unit of product or service, whereas the term 'variable cost' is more commonly applied to resource costs, such as the cost of materials and labour hours.

The marginal production cost per unit of an item usually consists of the following items, which have been well elaborated in the previous chapters:

- Direct materials,
- Direct labour,
- Variable production overheads.

Contribution is the difference between sales value and the marginal cost of sales.

Contribution is fundamental in marginal costing, and the term 'contribution' is really short for 'contribution towards covering fixed overheads and making a profit'. Before a firm can make a profit in any period, it must first of all cover its fixed costs.

Suppose that a firm makes and sells a single product that has a marginal cost of Shs.25 per unit and that sells for Shs.40 per unit. For every additional unit of the product that is made and sold, the firm will incur an extra cost of Shs.25 and receive income of Shs.40. The net gain will be Shs.15 per additional unit. This net gain per unit is called contribution

$$\begin{aligned} \text{Contribution per Unit} &= \text{Sales} - \text{variable costs} \\ &= \text{Shs.40} - \text{Shs.25} \\ &= \text{Shs.15} \end{aligned}$$

The Principles of Marginal Costing

The principles of marginal costing are as follows:

Period fixed costs are the same, for any volume of sales and production (provided that the level of activity is within the 'relevant range'). Therefore, by selling an extra item of product or service the following will happen:

- Revenue will increase by the sales value of the item sold,
- Costs will increase by the variable cost per unit,
- Profit will increase by the amount of contribution earned from the extra item.

Similarly, if the volume of sales falls by one item, the profit will fall by the amount of contribution earned from the item.

Profit measurement should, therefore, be based on an analysis of total contribution. Since fixed costs relate to a period of time, and do not change with increases or decreases in sales volume, it is misleading to charge units of sale with a share of fixed costs from total contribution for the period to derive a profit figure.

When a unit of product is made, the extra costs incurred in its manufacture are the variable production costs (in this case, the variable costs are the marginal costs). Fixed costs are unaffected, and no extra fixed costs are incurred when output is increased. It is therefore argued that the valuation of closing stocks should be at variable production cost (direct materials, direct labour, direct expenses (if any) and variable production overhead) because these are the only costs properly attributable to the product. Before explaining marginal costing principles any further, it will be helpful to look at a numerical example.



WORKED EXAMPLES

>>> Marginal Costing Illustration I

Water Ltd makes a product, the Splash, which has a variable production cost of Ksh.6 (production, administration, sales and distribution). There were no variable marketing costs. Fixed costs per annum amount to Sh45,000.

Assuming a 20,000 splashes production and a selling price of Sh10; calculate the contribution and profit for September 19x0, using marginal costing principles, if sales were as follows:

- 10,000 Splashes
- 15,000 Splashes
- 20,000 Splashes

Solution

The first stage in the profit calculation must be to identify the variable costs, and then the contribution. Fixed costs are deducted from the total contribution to derive the profit. All closing stocks are valued at marginal production cost (Ksh.6 per unit). For 10,000, 15,000 and 20,000 Splashes this would be:

	10,000 Splashes		15,000 Splashes		20,000 Splashes	
	Ksh.	Ksh.	Ksh.	Ksh.	Ksh.	Ksh.
Sales (at Ksh.10)		100,000		150,000		200,000
Opening stock	0		0		0	
Variable production cost	<u>60,000</u>		<u>90,000</u>		<u>120,000</u>	
Variable cost of sales		<u>60,000</u>		<u>90,000</u>		<u>120,000</u>
Contribution		40,000		60,000		80,000
Less fixed costs		<u>45,000</u>		<u>45,000</u>		<u>45,000</u>
Profit/(loss)		(5,000)		15,000		35,000
Profit/(loss) per unit		Ksh.(0.5)		Ksh.1.00		Ksh.1.75
Contribution per unit		Ksh.4.00		Ksh.4.00		Ksh.4.00

The conclusions which may be drawn from the example are as follows:

- The **profit per unit varies** at differing levels of sales, because the average fixed overhead cost per unit changes with the volume of output and sales.

- b) The **contribution per unit is constant** at all levels of output and sales. Total contribution, which is the contribution per unit multiplied by the number of units sold, increases in direct proportion to the volume of sales.
- c) Since the **contribution per unit does not change**, the most effective way of calculating the expected profit at any level of output and sales would be as follows:
- First calculate the total contribution,
 - Then deduct fixed costs as a period charge in order to find the profit.

In our example, the expected profit from the sale of 17,000 Splashes would be as follows:

Total contribution (17,000 x Ksh.4)	68,000
Less fixed costs	<u>45,000</u>
Profit	<u>23,000</u>

So:

- If total contribution exceeds fixed costs, a profit is made,
- If total contribution exactly equals fixed costs, no profit and no loss is made and break-even point is reached,
- If total contribution is less than fixed costs, there will be a loss.

>>> Marginal costing illustration II

Plumber Ltd makes two products, the Loo and the Wash. Information relating to each of these products for April 19X1 is as follows

	Loo	Wash
Opening stock	Nil	Nil
Production (units)	15,000	6,000
Sales (units)	10,000	5,000
	Shs.	Shs.
Sales price per unit	20	30
Direct costs per Unit		
Direct materials	8	14
Direct labour	4	2
Variable production overhead	2	1
Variable sales overhead	<u>2</u>	<u>3</u>
Total direct cost per unit	16	20
Contribution (p – v)x	4	10
Fixed costs for the month		
Production costs	Shs.40,000	
Administration cost	Shs.15,000	
Sales and distribution costs	Shs.25,000	



Using marginal costing principles, calculate the profit in April 19x1. Use the approach set out in note (d) to the Water Ltd case, above.

Solution

We shall use the approach derived from the conclusions reached above. We first compute the contribution per unit, total contribution and then deduct total fixed costs to arrive at the profit.

Contribution from Loo (unit contribution =Ksh.20 – Ksh.16 = Ksh.4 x10,000)	40,000
Contribution from Washes (unit contribution =Ksh.30 - Ksh.20 = Ksh.10 x 5,000)	50,000
Total contribution	90,000
Fixed costs for the period	(80,000)
Profit	10,000

>>> Marginal Costing Illustration II

The Ghost Company manufactured one product, the Ghost. The following costs relate to a financial year when 50,000 units of Ghost are made

Direct materials	Shs.175,000
Direct labour	Shs.115,000
Indirect costs	Shs.155,000

Investigations into the cost behavior of the costs have revealed that:

- Direct materials behave as variable costs
- Direct labour behaves as a variable cost
- Of the Indirect costs, Shs.130,000 behaves as a fixed cost, and the remainder as a variable cost.

Required:

- (a) Calculate the cost of one unit of Ghost using marginal costing
- (b) If each unit of Ghost sells for Shs.10 and all the production of 50,000 units is sold, calculate the profit for the year using marginal costing statement. Show the contribution per unit and total contribution

Solution**Costing of a unit Ghost**

Using only the variable (marginal) costs to cost one unit of Ghost

Direct materials (Shs.175,000 ÷ 50,000) Shs.3.50

Direct materials (115,000 ÷ 50,000) Shs.2.30

Variable costs (Ksh.155,000 – 130,000) =25,000 ÷ 50,000) Shs.0.50

Marginal costing statement for the financial year

	Per unit	For year
	Shs	Shs
Sales	10.00	500,000
Less: variable costs	<u>6.30</u>	<u>315,000</u>
Contribution	3.70	185,000
Less Fixed costs**		<u>130,000</u>
Profit		<u>55,000</u>

**Note that the fixed costs are not calculated in unit terms but are simply deducted in total from the total contribution

MARGINAL COSTING AND ABSORPTION COSTING COMPARED

Fast forward:

The main cause of difference between marginal and absorption profits is fixed costs carried in opening and closing inventory in absorption costing.

Marginal Costing as a cost accounting system is significantly different from absorption costing. It is an alternative method of accounting for costs and profit, which rejects the principles of absorbing fixed overhead into unit costs.

Marginal costing	Absorption costing (sometimes referred to as full costing)
<ul style="list-style-type: none"> – Closing stocks are valued at marginal production cost, that is, the variable production costs only. 	<ul style="list-style-type: none"> – Closing stocks are valued at full production cost, and including a share of fixed production and include a share of fixed production costs



- Fixed costs are charged in full against the profit of the period in which they are incurred. They are treated as period costs.
- Fixed costs are treated as product costs**. They are only expensed when stock is sold.

**This means that the cost of sales in a period will include some fixed overhead incurred in a previous period (in opening stock values) and will exclude some fixed overhead incurred in the current period but carried forward in closing stock values as a charge to a subsequent accounting period.

This distinction**between marginal costing and absorption costing is very important and the contrast between the systems must be clearly understood. Work carefully through the following example to ensure that you are familiar with both methods.

The diagram below will help us understand the different approaches in computing the profits in both costing methods.

ABSORPTION COSTING	MARGINAL COSTING
Direct costs Direct materials Direct labour Direct overheads	Variable costs Variable direct materials Variable direct labour Variable direct expenses Variable overheads
Indirect expenses Variable overheads Fixed overheads	Fixed costs Fixed direct costs Fixed overheads

>>> Illustration

Two Left Feet Ltd manufactures a single product, the Claud. The following figures relate to the Claud for a one-year period,

Activity level		50%	100%
Sales and productions (units)		400	800
		Shs	Shs
Sales		8,000	16,000
Production costs:	Variable	3,200	6,400
	Fixed	1,600	1,600
Sales and distribution costs	Variable	1,600	3,200
	Fixed	2,400	2,400

The normal level of activity for the year is 800 units. Fixed costs are incurred evenly throughout the year, and actual fixed costs are the same as budgeted. There were no stocks of Clauds at the beginning of the year. In the first quarter, 220 units were produced and 160 units sold.

Now:

- Calculate the fixed production costs absorbed by Clauds in the first quarter if absorption costing is used,
- Calculate the profit using absorption costing,
- Calculate the profit using marginal costing,
- Explain why there is a difference between the answers to (c) and (d).

Solution

- The fixed production costs absorbed by Clauds in the first quarter (with absorption costing) are:

$$\frac{\text{Budgeted fixed production costs}}{\text{Budgeted output (Normal activity Level)}} = \frac{\text{Shs.1,600}}{600 \text{ Units}}$$

Absorption rate = Ksh.2 per unit produced.

During the quarter, fixed production overhead was
= 220 units x Shs.2 = Shs.440

- The under/over recovery of overheads for the quarter would be:

Accrual fixed production overhead	400 (3/12 mth x Shs.1,600)
Absorbed fixed production overhead	<u>440</u>
Over absorption of overhead	<u>40</u>

- Profit for the quarter, absorption costing,

	Shs	Shs
Sales (160 x Shs.20)		3200
Production costs		
Variable (220 x Shs.8)	1760	
Fixed (absorbed Overhead (220 x Shs.2)	<u>440</u>	
Total Production cost	2200	
Less: ending Inventory (60 units x Shs.10)	<u>(600)</u>	
Cost of sales (220 x Shs.10)	1600	
Adjustment for over absorbed overheads	<u>(40)</u>	
Net Cost of sales		1560
Gross Profit		<u>1640</u>
Less: Sales and distribution costs		
Variable (160 x shs.4)	640	
Fixed (¼ of Shs.2400)	<u>600</u>	
		1240
Net Profit		<u>400</u>

**Profit for the quarter, marginal costing**

	Shs	Shs
Sales (160 x Shs.20)		3,200
Variable Production costs (220 x Shs.8)	1760	
Less closing stock (60 x Shs.8)	<u>(480)</u>	
Variable Production cost of sales (160 x Shs.8)	1280	
Variable sales and distribution costs (160 x Shs.4)	<u>640</u>	
Total variable cost of sales		<u>(1,920)</u>
Gross Profit		1,280
Less:		
Fixed production cost	400	
Fixed sales and distribution (¼ of Shs.2400)	<u>600</u>	
		<u>1000</u>
Net Profit		<u>280</u>

- d) The difference in profit is due to the different valuations of closing stock. In absorption costing the 60 units of closing stock include absorbed fixed overheads of Ksh.120 (60 x Ksh.2), which are therefore costs carried over to the next quarter and not charged against the profit of the current quarter. They are treated as product costs. In marginal costing, all fixed costs incurred in the period are charged against the profit. They are treated as period costs.

The absorption costing profit may be reconciled to the marginal costing profit by adjusting it for the fixed costs carried forward to the next period as shown below.

Absorption costing profit	400
Fixed production costs carried forward in stock values	<u>(120)</u>
Marginal costing profit	<u>280</u>

**We can draw a number of conclusions from this example:**

- (a) Marginal costing and absorption costing are different techniques for assessing profit in a period.
- (b) If there are any changes in stocks during a period, marginal costing and absorption costing give different results for profit obtained:
- If stock levels increase, absorption costing will report the higher profit because some of the fixed production overhead incurred during the period will be carried forward in closing stock (which reduces cost of sales) to be set against sales revenue in the following period instead of being written off in full against profit in the period concerned (as in the example above),

- If stock levels decrease, absorption costing will report the lower profit because as well as the fixed overhead incurred, fixed production overhead which had been brought forward in opening stock is released and is included in cost of sales.
- (c) If the opening and closing stock volumes and values are the same, marginal costing and absorption costing will give the same profit figure.
- (d) In the long run, total profit for a company will be the same whether marginal costing or absorption costing is used because in the long run, total costs will be the same by either method of accounting. Different accounting conventions merely affect the profit of individual accounting periods.

>>> Review question

The overhead absorption rate for product X is Ksh.10 per machine hour. Each unit of product X requires five machine hours. Stock of product X on 1.1.X1 was 150 units and on 31.12.x1 it was 100 units. What is the difference in profit between results reported using absorption costing and results reported using marginal costing? Is it:

- a) The absorption costing profit would be Ksh.2,500 less?
- b) The absorption costing profit would be Ksh.2,500 greater?
- c) The absorption costing profit would be Ksh. 5,000 less?
- d) The absorption costing profit would be Ksh.5,000 greater?

Solution

The key is the change in the volume of stock. Stock levels have decreased therefore absorption costing will report a lower profit. This eliminates options (b) and (d).

Option (c) is NOT correct because it is based on the closing stock only (100 units x 5 hours). The correct answer is (a), based on the change in stock levels x fixed overhead absorption per unit = $(150 - 100) \times \text{Ksh.}10 \times 5 = \text{Ksh.}2,500$ lower profit, because stock levels decreased.

Comparison of total profits

To illustrate the point about profit in the long-term, let us suppose that a company makes and sells a single product. At the beginning of period 1, there are no opening stocks of the product, for which the variable production cost is Ksh.4 and the sales price Ksh.6 per unit. Fixed costs are Ksh.2,000 per period, of which Ksh.1,500 are fixed production costs,

	<u>Period 1</u>	<u>Period 2</u>
Opening stock	0 units	300 units
Sales	1,200 Units	1,800 Units
Production	1,500 Units	1,500 Units
Closing stock	300	0



What would the profit be in each period using the following methods of costing?

- (a) Absorption costing. Assume normal output is 1,500 units per period.
 (b) Marginal costing.

Solution

It is important to notice that although production and sales volumes in each period are different (and therefore the profit for each period by absorption costing will be different from the profit by marginal costing), over the full period, total production equals sales volume, the total cost of sales is the same, and therefore the total profit is the same by either method of accounting.

- a) Absorption costing: the absorption rate for fixed production overhead is,

$$\frac{\text{Shs. } 1,500}{1,500 \text{ Units}} = \text{Shs. } 1 \text{ per Unit}$$

	Period 1		Period 2		Total	
	Shs	Shs	Shs	Shs	Shs	Shs
Sales		7,200		10,800		18,000
Production costs						
Variable	6,000		6,000		12,000	
Fixed	<u>1,500</u>		<u>1,500</u>		<u>3,000</u>	
	7,500		7,500		15,000	
Add opening stock b/f	<u>-</u>		<u>1,500</u>		<u>-</u>	
	7,500		9,000		15,000	
Less closing stock c/f	<u>(1,500)</u>		<u>-</u>		<u>-</u>	
Production cost of sales	6,000				15,000	
Over/(Under) absorbed overheads	<u>-</u>		<u>-</u>		-	
Total production costs		<u>(6,000)</u>		<u>(9,000)</u>		<u>(15,000)</u>
Gross profit		1,200		1,800		3,000
Other costs		<u>(500)</u>		<u>(500)</u>		<u>(1,000)</u>
Net profit		<u>700</u>		<u>1,300</u>		<u>2,000</u>

b)

	Period 1		Period 2		Total	
	Shs	Shs	Shs	Shs	Shs	Shs
Sales		7,200		10,800		18,000
Production costs						
Variable	6,000		6,000		12,000	
Add opening stock b/f	<u>-</u>		<u>1,200</u>		<u>-</u>	
	6,000		7,200		12,000	
Less closing stock c/f	<u>(1,200)</u>		<u>-</u>		<u>-</u>	
Variable production cost of sales		<u>(4,800)</u>		<u>(7,200)</u>		<u>(12,000)</u>
Contribution		2,400		3,600		6,000
Fixed		<u>(2,000)</u>		<u>(2,000)</u>		<u>(4,000)</u>
		<u>400</u>		<u>1,600</u>		<u>2,000</u>

Note that the total profit over the two periods is the same for each method of costing, but the profit in each period is different.

>>> Review Exercise

When opening stocks were 8,500 liters and closing stocks 6,750 liters, a firm had a profit of Ksh.62,100 using marginal costing.

Assuming that the fixed overhead absorption rate was Ksh.3 per liter, what would be the profit using absorption costing?

- a) Ksh.41,850
- b) Ksh.56,850
- c) Ksh.67,350
- d) Ksh.82,350

Solution

Stock levels reduced; therefore the absorption costing profit would be lower. You can eliminate options (c) and (d).

The closing stock is less than the opening stock. This means that the production fixed costs absorbed in stock (in absorption costing) brought forward to the current period shall be released and charged to the profit statement in the current period. Thus our absorption costing profits will be less than marginal profits by the amount of fixed costs absorbed in opening stock (closing stock for previous period) brought forward and released in the current period.



Difference in profit = $(8,500 - 6,750) \times \text{Ksh.}3 = \text{Ksh.}5,250$

\therefore Absorption costing profit = $\text{Ksh.}62,100 - \text{Ksh.}5,250 = \text{Ksh.}56,850$

The correct answer is (b)

Note that, the difference in income equals the difference in the total amount of fixed manufacturing overhead charged as expense during a given year.

Distinction between marginal and absorption costing

These are two approaches of arriving at the **cost of production or net profit for a given period**.

The main difference between absorption costing and marginal costing is on the treatment of the fixed cost.

In absorption costing both variable and fixed production costs are included in the determination of the cost of a product. This implies that the fixed cost is treated as a product cost and not as a period expense. It is important for the student to note the term "fixed production costs" as they are the only costs that make the difference between the marginal and absorption in costs of production. In marginal costing, only variable costs are included in the determination of the production cost. This implies that fixed costs are treated as:

- Period costs
- Product costs

>>> Illustration

The following information was extracted from the book of Happy Ltd for the year ended 31/12/2001

Output	100,000 units
Production Costs	
Direct labour costs	5 Million
Direct material costs	2 million
Variable overheads	2 million
Fixed overheads	4 Million
Units sold	90,000
Selling Price per Unit	Shs.100,000

Assume closing stocks at the end of the previous period were nil.

Required

Using both absorption and marginal costing determine

- i. Cost per unit
- ii. Prepare the income statement

Solution

Marginal costing

Cost per unit will constitute variable production costs only i.e. the incremental costs of producing the output. Fixed overheads are not included in the cost per unit.

$$\text{Cost per unit} = \frac{5,000,000 + 2,000,000 + 2,000,000}{100,000} = \text{Shs.9 per Unit}$$

Note: Only variable costs are considered.

Total cost of units sold	= Shs.90 x 90,000	= Shs.8,100,000
Closing stock	= Shs.90 x 10,000	= <u>Shs.910,000</u>
Total costs for goods produced	= Shs.8.1m + 0.9m	= <u>Shs.10,000,000</u>

Absorption costing

Cost per unit will constitute both fixed and variable production costs. i.e. all costs incurred to bring the product into existence.

$$\text{Cost per unit} = \frac{5,000,000 + 2,000,000 + 2,000,000 + 4,000,000}{100,000} = \text{Shs.130 per Unit}$$

Note: All costs (fixed and variable) are considered in arriving at the cost per unit:

Total cost of units sold	=	Shs.130 x 90,000	=	Shs.11,700,000
Closing stock	=	Shs.130 x 10,000	=	<u>Shs.1,300,000</u>
Total costs for goods produced	=	Shs.11.7m + 1.30m	=	<u>Shs.13,000,000</u>

**Income statement for the year ended 31.12.2001**

	MARGINAL COSTING		ABSORPTION COSTING	
	Shs	Shs	Shs	Shs
Sales (90,000 x Sh100)		9,000,000		9,000,000
Cost of sales				
Opening stock	Nil		Nil	
Cost of finished goods	<u>9,000,000</u>		<u>13,000,000</u>	
Cost of goods available for sale	9,000,000		13,000,000	
Less closing stock	<u>(900,000)</u>		<u>(1,300,000)</u>	
Cost of goods sold		<u>(8,100,000)</u>		<u>(11,700,000)</u>
Gross profit/loss		900,000		(2,700,000)
Period costs				
Fixed overheads		<u>4,000,000</u>		<u> </u>
Net loss		<u>(3,100,000)</u>		<u>(2,700,000)</u>

How can the above differences in net losses be explained?

Note that they are caused chiefly by the differences in cost of goods sold, which is in turn caused by the differences in the cost per unit for finished goods and closing stock

Reconciliation of marginal costing and absorption costing profits

Net loss as per absorption costing	(2,700,000)
Net loss as per marginal costing	<u>(3,100,000)</u>
Difference	<u>400,000</u>
Value of closing stock as per absorption costing	1,300,000
Value of stock as per marginal costing	<u>(900,000)</u>
Difference	<u>400,000</u>

APPLICATION OF MARGINAL COSTING

Cost-Volume-Profit (CVP) Analysis

Fast forward;

CVP involves the determination of either of the variables (cost, profit or volume) given a relevant set of data. This includes the price per unit, cost per unit, fixed cost, and/ or profit.

In marginal costing, marginal cost varies directly with the volume of production or output. On the other hand, fixed cost remains unaltered within the relevant range. Thus, if volume is changed, variable cost will vary in proportion to the volume. In this case, selling price remains fixed, fixed cost remains fixed which translates to a change in profit.

Managers constantly strive to relate these elements in order to achieve maximum profit. Apart from profit projection, the concept of Cost-Volume-Profit (CVP) is relevant to virtually all decision-making areas, particularly in the short run.

The relationship among cost, revenue and profit at different levels of output may be expressed in graphs such as break-even charts, profit volume graphs, or in various statement forms.

Profit depends on a large number of factors, most important of which are the cost of manufacturing and the volume of sales. Both these factors are interdependent. Volume of sales depends upon the volume of production and market forces which in turn is related to costs. Management has no control over market. In order to achieve certain level of profitability, it has to exercise control and management of costs, mainly variable cost. This is because fixed cost is a non-controllable cost and is irrelevant for decision making where it is not changed by the course of action taken.

But then, cost is determined by various factors which include:

- Material prices, wage rates and overhead costs may all change because of the impact of inflation
- Material usage may change where scrap is expected to fall because of improved methods, better trained workers or better material quality.
- Labor efficiency may change where improved training programs or a reduction in labour turn over is expected to occur.
- Internal efficiency and the productivity of the factors of production; Overhead expenses may fall due to more efficient placement of order with suppliers who offer best terms



- Product volume of production or size of batches.
- Product mix may change either as part of overall company strategy or due to increased competition.
- Methods of production and technology.
- Size of plant.

Thus, one can say that cost-volume-profit analysis furnishes the complete picture of the profit structure. This enables management to distinguish among the effect of sales, fluctuations in volume and the results of changes in price of product/services.

In other words, CVP is a management accounting tool that expresses relationship among sale volume, cost and profit. CVP can be used in the form of a graph or an equation. Cost-volume-profit analysis can answer a number of analytical questions. Some of the questions are as follows:

- a) What is the break-even revenue of an organization?
- b) How much revenue does an organization need to achieve a budgeted profit?
- c) What level of price change affects the achievement of budgeted profit?
- d) What is the effect of cost changes on the profitability of an operation?

Cost-volume-profit analysis can also answer many other “what if” type of questions. Cost-volume-profit analysis is one of the important techniques of cost and management accounting. It provides an answer to “what if” theme by telling the volume required to produce. Cost and revenues will change as well as sales revenue due to a number of factors. These are:

- a) Increased competition may require selling price discounts in order to stimulate demand
- b) Material prices, wage rates and overhead costs may all change because of the impact of inflation
- c) Material usage may change where scrap is expected to fall because of improved methods, better trained workers or better material quality
- d) Labour efficiency may change where improved training programs or a reduction in labour turn over is expected to occur
- e) Overhead expenses may fall due to more efficient placement of order with suppliers who offer best terms
- f) Product mix may change either as part of overall company strategy or due to increased competition

Following are the three approaches to a CVP analysis:

- Cost and revenue equations
- Contribution margin
- Profit graph

■ Objectives of Cost-Volume-Profit Analysis

- a) In order to forecast profits accurately, it is essential to ascertain the relationship between cost and profit on one hand and volume on the other.
- b) Cost-volume-profit analysis is helpful in setting up flexible budget which indicates cost at various levels of activities.
- c) Cost-volume-profit analysis assists in evaluating performance for the purpose of control thus enabling management to take corrective actions where necessary and in good time.
- d) Such analysis may assist management in formulating pricing policies by projecting the effect of different price structures on cost and profit.

■ Assumptions and Terminology

CVP is based on various assumptions as listed below:

1. Volume is the only factor affecting sales and expenses. The changes in the level of various revenue and costs arise only because of the changes in the volume of output produced and sold, e.g., bales of flour produced by Unga Ltd. The number of output (units) to be sold is the only revenue and cost driver.
2. Total costs can be divided into fixed and variable components. Variable component will vary directly with level of output. Direct materials, direct labour and direct chargeable expenses form the direct variable costs while variable part of factory overheads, administration overheads and selling and distribution overheads form the variable overheads.
3. There is linear relationship between revenue and cost.
4. The behavior of both sales revenue and expenses is linear throughout the entire relevant range of activity. Graphically, it assumes a linear equation of the form $Y = mX + C$
5. The unit selling price, unit variable costs and fixed costs are constant.
6. The theory of CVP is based upon the production of a single product. However, of late, management accountants are functioning to give a theoretical and a practical approach to multi-product CVP analysis.



7. There is only one product or service or a constant Sales Mix. The analysis either covers a single product or assumes that the sales mix sold in case of multiple products will remain constant as the level of total units sold changes.
8. All revenue and cost can be added and compared without taking into account the time value of money.
9. The theory of CVP is based on the technology that remains constant.
10. The theory of price elasticity is not taken into consideration.
11. Inventories do not change significantly from period to period:

Many companies, and divisions and sub-divisions of companies in various industries have found the simple CVP relationships to be helpful in Strategic and long-range planning decisions and product features and pricing decisions

In real life, the assumptions described above may not hold. The theory of CVP can be tailored for individual industries depending upon the nature and peculiarities of the same.

For example, predicting total revenue and total cost may require multiple revenue drivers and multiple cost drivers. Some of the multiple revenue drivers are as follows:

- Number of output units
- Number of customer visits made for sales
- Number of advertisements placed

Some of the multiple cost drivers are as follows:

- Number of units produced
- Number of batches in which units are produced

The cost equation, for example, will be of the form;

$$Y = C + m_1X_1 + m_2X_2 + m_3X_3 + \dots + m_nX_n$$

Managers and management accountants, however, should always assess whether the simplified CVP relationships generate sufficiently accurate information for predictions of how total revenue and total cost would behave. However, one may come across different complex situations to which the theory of CVP would rightly be applicable in order to help managers to take appropriate decisions under different situations.

■ Limitations of Cost-Volume Profit Analysis

The CVP analysis is generally made under certain limitations and with certain assumed conditions, some of which may not occur in practice. Following are the main limitations and assumptions in the cost-volume-profit analysis:

1. It is assumed that the production facilities anticipated for the purpose of cost-volume-profit analysis do not undergo any change. Such analysis gives misleading results if expansion or reduction of capacity takes place, which in most cases does.
2. In case a variety of products with varying margins of profit are manufactured, it is difficult to forecast with reasonable accuracy the volume of sales mix which would optimize the profit.
3. It assumes that input price and selling price remain fairly constant which in reality is not the case. Thus, if cost or selling price changes, the relationship between cost and profit will not be accurately depicted.
4. It assumes that variable costs are perfectly and completely variable at all levels of activity and fixed cost remains constant throughout the relevant range. However, this situation is not a practical one.
5. It is assumed that inventories do not change significantly from period to period. However, in reality, opening inventory and closing inventory are never the same and in most cases they vary significantly.
6. Inventories are valued at variable cost and fixed cost is treated as period cost. Therefore, closing stock carried over to the next financial year does not contain any component of fixed cost. Inventory should be valued at full cost in reality because such costs were incurred to bring the inventory into existence..

The limitations of CVP analysis are actually its assumptions, which do not hold outside the relevant range!

■ Approaches to CVP

(i) Cost and revenue equations

From the marginal cost statements, the following equations can be derived:

$$\text{Sales} - \text{Marginal cost} = \text{Contribution} \dots \dots \dots (1)$$

$$\text{Contribution} - \text{Fixed costs} = \text{Profit}$$

$$\therefore \text{Fixed cost} + \text{Profit} = \text{Contribution} \dots \dots \dots (2)$$

From the above equations, we get the fundamental marginal cost equation as follows:

$$\text{Sales} - \text{Marginal cost} = \text{Fixed cost} + \text{Profit} \dots \dots \dots (3)$$



Rearranging the equation above to make profit the subject of the formula one will get

$$\text{Profit} = \text{Sales} - \text{Marginal cost} - \text{Fixed cost} \dots \dots \dots (4)$$

Let the selling Price be P, Marginal cost per unit (variable cost per Unit) be V, Profit be J, level of output be x and fixed costs be F

We have seen that sales and Marginal cost vary directly with output

From equation (4) above we obtain

$$\begin{aligned} \text{Profit, } \Pi &= (\text{Selling Price, } S - \text{Variable cost, } V) \text{Output, } x - \text{Fixed cost, } F \\ \Pi &= (S - V)x - F \end{aligned}$$

This is the basic equation used in cost volume profit analysis.

Illustration

Assume the following situation:

Selling price per Unit	Shs.2,000
Direct material unit cost	Shs.600
Direct labor unit cost	Shs.300
Variable manufacturing overhead	Shs.200
Variable marketing	Shs.250
Fixed manufacturing overhead	Shs.500,000

Required:

Calculate the level of profits in the following independent situations.

1. The level of output 1000 units
2. The level of output is 750 units
3. The price falls to Shs.1900 and the level of output produced is 1,500.
4. Direct material unit cost falls to Shs.500, selling price falls to Shs.1900 and the output produced rises to 1750 units

Solution

$$\begin{aligned} S &= \text{Shs.2,000} \\ V &= \text{Shs. (600+300+200+250) = Shs.1,350} \\ F &= \text{Shs.500,000} \end{aligned}$$

- 1 At 100 units output level

$$\begin{aligned}\Pi &= (S - V)x - F \\ &= (2,000 - 1,350)1,000 - 500,000 \\ &= 650 \times 1,000 - 500,000 \\ &= 650,000 - 500,000 \\ &= \underline{\underline{150,000}}\end{aligned}$$

- 2 At 750 units output level

$$\begin{aligned}\Pi &= (S - V)x - F \\ &= (2,000 - 1,350)750 - 500,000 \\ &= 650 \times 750 - 500,000 \\ &= 487,500 - 500,000 \\ &= \underline{\underline{(12,500)}}\end{aligned}$$

- 3 At Selling price of Shs.1900 and output of 1,500 units

$$\begin{aligned}\Pi &= (S - V)x - F \\ &= (1,900 - 1,350)1,500 - 500,000 \\ &= 550 \times 1,500 - 500,000 \\ &= 825,000 - 500,000 \\ &= \underline{\underline{325,000}}\end{aligned}$$

- 4 At Selling price of Shs.1900 and output of 1,750 units,

$$\begin{aligned}\Pi &= (S - V)x - F \\ &= (1,900 - 1,250)1,750 - 500,000 \\ &= 650 \times 1,750 - 500,000 \\ &= 1,137,500 - 500,000 \\ &= \underline{\underline{637,500}}\end{aligned}$$

(ii) Contribution margin approach

The sales and marginal costs vary directly with the number of units sold or produced. So contribution will bear a relation to sales, whether sales units or sales revenue, and the ratio of contribution to sales remains constant at all levels.

From the equation (iii) given above

$$\text{Sales} - \text{Marginal cost} = \text{Fixed cost} + \text{Profit} \dots\dots\dots (3)$$

$$(S - V)x = F + \Pi$$

But $(S - V)$ is the contribution margin per unit (CM), which is constant.



Therefore,

$$CM \cdot x = F + \Pi$$

To calculate the quantity, x that gives a specific profit, Π one can make x the subject of the formula by dividing both sides of the equation by the Contribution Margin per unit, CM

$$x = \frac{F + \Pi}{CM}$$

This equation is fundamental and is used as the basis for break-even analysis. One can work with either approach (i) or (ii) of the CVP analysis to obtain the variable needed.

Note, we use the term 'Profit Volume Ratio' in this context to refer to 'Contribution Volume Ratio'. We use Contribution figure and not Profit figure to calculate this ratio.

One can also use **Contribution Margin Ratio (CMR)** in the CVP analysis. CMR is extremely useful in that it shows how contribution margin will change in proportion to a given shilling change in total sales. It is expressed as a percentage or as a ratio.

$$\begin{aligned} CMR &= \frac{\text{Total Contribution}}{\text{Total sales}} = \frac{\text{Contribution per Unit (CM) x Units sold}(x)}{\text{Selling Price(P) x Units sold}(x)} \\ &= \frac{\text{Contribution per Unit(CM)}}{\text{Selling Price(P)}} \\ CMR &= \frac{CM}{P} \end{aligned}$$

Variable costs, just as sales revenue, vary directly with sales i.e. $\frac{VC}{S}$ is constant.

This ratio is the **Variable Cost Ratio, VCR**. It can also be calculated by subtracting the **CMR** from 1

$$\text{i.e. } VCR + CMR = 1$$

This can be justified as follows:

Sales – Variable costs = contribution

Make sales the subject of the formula to get;

Sales = Variable costs + Contribution

Divide through by the number of units sold to get

Selling price = Variable cost per unit + Contribution per Unit

Divide both sides of the equation by selling price to get;

$$1 = \frac{\text{Variable cost per Unit(VC)}}{\text{Selling Price(P)}} + \frac{\text{Contribution per Unit(CM)}}{\text{Selling Price(P)}}$$

$$1 = \text{VCR} + \text{CMR}$$

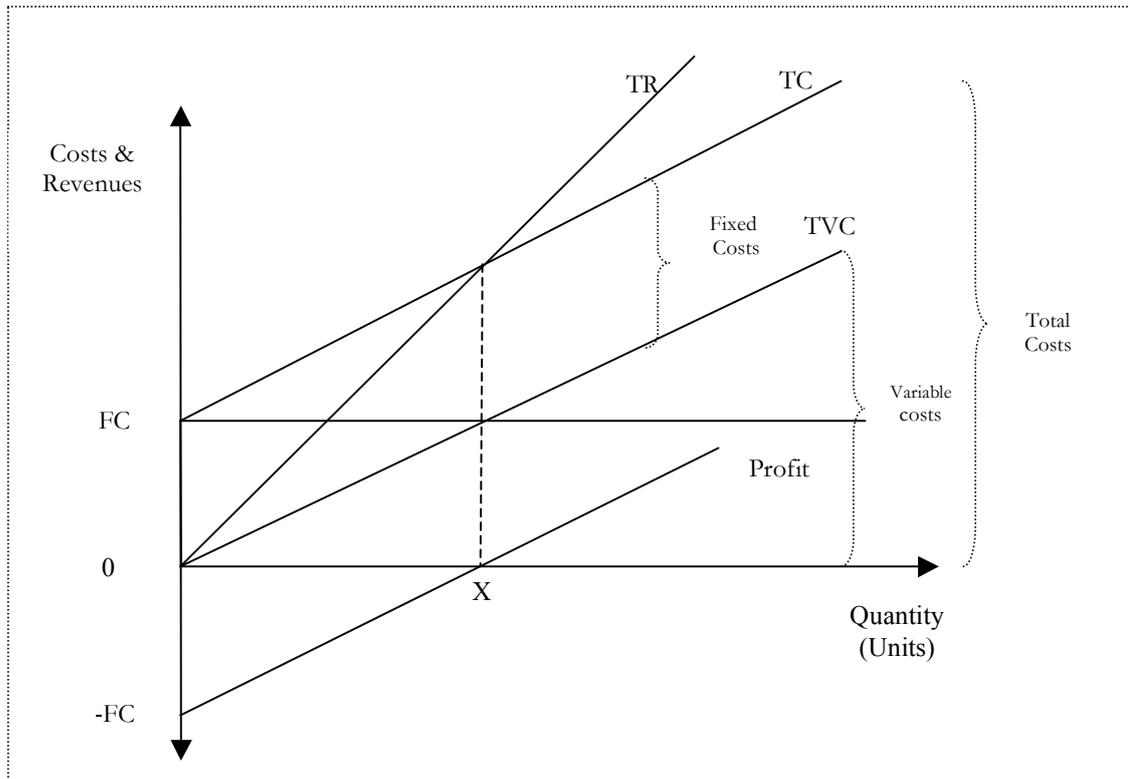
From the approach above, the basic marginal equation in the first approach $\Pi = (S - V)x - F$, has been modified to give the following two equations.

$$\left. \begin{aligned} \Pi &= \text{CM} \cdot x - F \\ \text{or} \\ \Pi &= \frac{P}{V} \cdot x - F \end{aligned} \right\} \dots\dots\dots(i)$$

$$\Pi = \text{CMR} \cdot S - F \dots\dots\dots(ii)$$

(iii) Profit graph

When one plots the various costs and revenue graphs given the CVP assumptions, the following diagram can be derived:





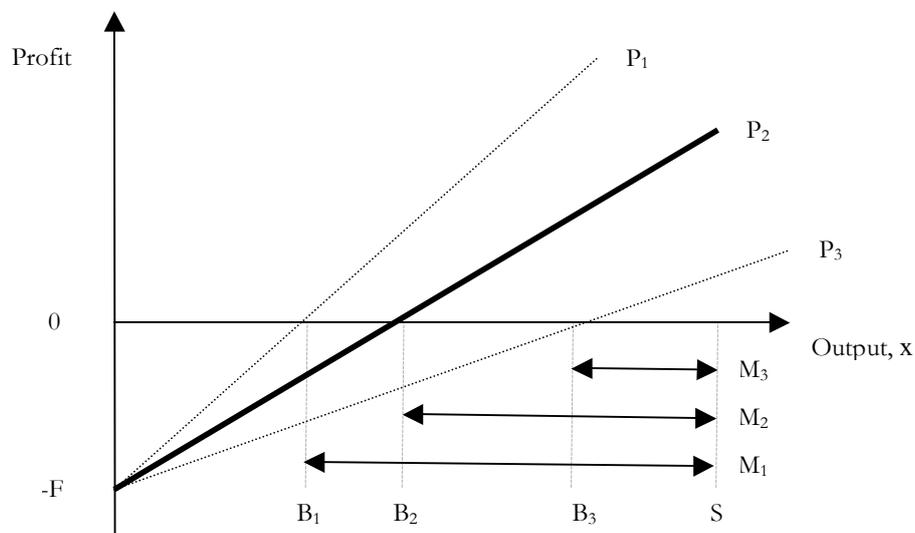
Where: TC = Total Cost (Variable + Fixed costs)
 TVC = Total Variable cost
 TR = Total revenue
 FC = Fixed costs
 X is the break-even point (no loss and no profit)

Graphical Illustration between Cost and Revenue Behavior

CVP analysis in conditions subject to change

Change in Selling Price and/or variable cost per Unit

The contribution sales ratio is affected by any change in selling price and or variable cost per unit. This ratio is a measure of the rate at which profit is being earned and its size illustrated by the steepness of the slope of the profit volume graph



To illustrate change in selling price and/ or contribution

In the figure above graph $-FP_2$ shows the existing profit curve for a company with a fixed cost OF , Break-even point B_2 , margin of safety M_2 . An increase in the selling price and/or decrease in the variable cost per unit will increase the contribution margin ratio. This translates to a higher profit. The graph line derived shall be steeper than the original one. In our chart above, the profit line $-FP_1$ illustrates such a situation.

A decrease in selling price and/or an increase in variable cost per unit will reduce contribution margin ratio thus translating to a lower profit. The profit graph obtained shall be gentler than the initial one. In the chart above, the profit line $-FP_3$ illustrates such situation.

Margin of safety (MOS)

This is the excess of budgeted sales over the break-even volume in sales. It states the extent to which sales can drop before losses begin to be incurred in a firm.

MOS is calculates as:

MOS = Total budgeted sales – Break-even sales

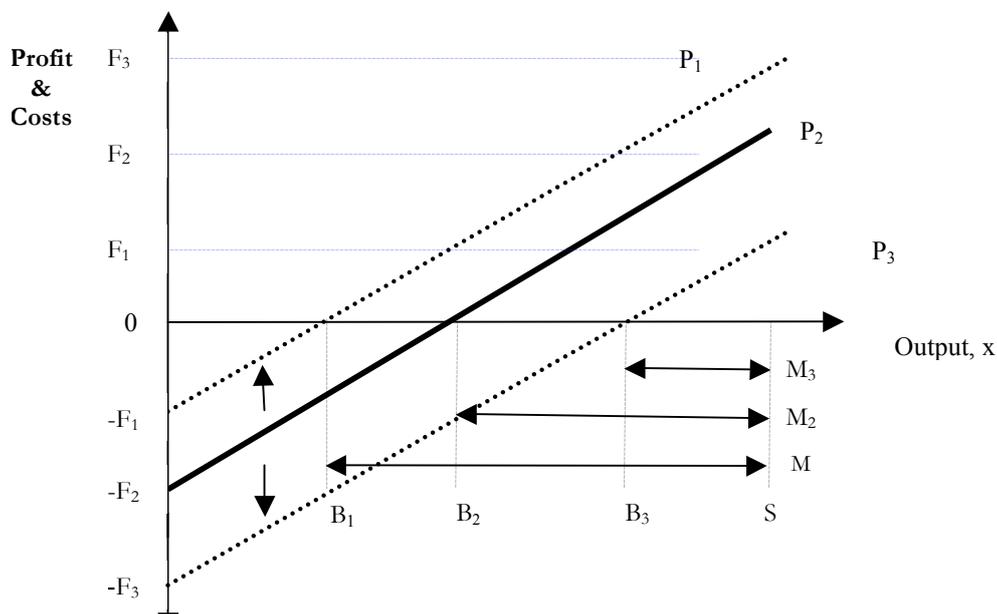
MOS may also be expressed as a percentage of sales. The higher the percentage, the better positioned a firm is in its operations.

$$\text{MOS\%} = \frac{\text{MOS in Shillings} \times 100\%}{\text{Total sales}}$$

Margin of safety is a tool designed to point out a problem but not to solve it. To rectify the problem of a low MOS, management must direct its efforts towards either reducing the break-even point or increasing the overall level of sales.

In the chart above, the margin of safety in the three situations analyzed equals M_2 , M_1 and M_3 respectively

Change in fixed cost



To illustrate effect of change in fixed costs



In figure on the previous page graph $-F_2P_2$ shows the existing profit curve for a company with a fixed cost OF_2 , Break-even point B_2 , margin of safety M_2 . Assuming constant production and sales volume, an increase in the fixed costs ($F_3 - F_2$) will translate to an increase in the break-even point ($B_3 - B_2$), a decrease in the Margin of safety ($M_2 - M_3$) and a decrease in profits. The profit graph line will have the same gradient as the initial one since a change in fixed costs does not affect the contribution to sales ratio. The line will shift downwards by a vertical distance equivalent to the increase in the fixed costs ($F_3 - F_2$)

The profit line – F_3P_3 illustrates the situation above.

On the other hand, a decrease in the fixed costs ($F_2 - F_1$) will translate to a decrease in the break-even point; ($B_2 - B_1$), an increase in the margin of safety ($M_1 - M_2$) and an increase in the profits. The profit graph line will have the same gradient as the initial one. The line will shift downwards by a vertical distance equivalent to the decrease in the fixed costs ($F_2 - F_1$). The profit line – F_1P_1 best illustrates the situation.

Change in production or sales mix

One of the key assumptions of break-even analysis is that there is only one product or service or a constant Sales Mix. Sales mix refers to the relative combination in which a company's products are sold. Managers strive to achieve an optimal sales mix which yields the greatest amounts of profits. Profits will be greater if high margin items make up a relative large proportion of sales and less if sales consist of low margin items.

■ Determining the constituents of the sales Mix

■ >>> Illustration

T-Bug plc produces and sells 2 products T and B. The following is the budget for the coming year.

		T	B	Total
Sales	Units	120,000	40,000	160,000
Selling price per unit		Shs.4	Shs.7.5	
Sales		480,000	300,000	780,000
Variable cost Per Unit		Shs.2	Shs.4	
Total variable cost		<u>240,000</u>	<u>160,000</u>	<u>400,000</u>
Contribution margin		240,000	140,000	380,000
Fixed costs				<u>250,000</u>
Net income				<u>130,000</u>

Required:

- Compute the company's break-even point
- Determine the constituents of the sales mix i.e. quantities of T and B

Solution

Sales Mix	T	B
Units Ratio	120,000	40,000
	3	: 1

Let b be the number of units of B sold and $3b$ be the number of units of T sold.

Using the fundamental marginal cost equation

$$(\text{Sales} - \text{variable cost}) - \text{fixed costs} = \text{Profit}$$

$$\text{Contribution} - \text{Fixed costs} = \text{Profit}$$

But at break-even point, profit is equal to zero. Therefore,

$$\text{Contribution} - \text{Fixed costs} = 0 \longrightarrow \text{Contribution} = \text{Fixed costs}$$

Given;

$$\begin{aligned} \text{Sales} &= (\text{Shs.}4 \times 3b) + (\text{Shs.}7.5 \times b) \\ &= \text{Shs.}12b + \text{Shs.}7.5b \\ &= \text{Shs.}19.5b \end{aligned}$$

$$\begin{aligned} \text{Variable costs} &= (\text{Shs.}2 \times 3b) + (\text{Shs.}4 \times b) \\ &= \text{Shs.}6b + \text{Shs.}4b \\ &= \text{Shs.}10b \end{aligned}$$

$$\text{Fixed costs} = \text{Shs.}250,000$$

$$\begin{aligned} \text{Contribution} &= \text{sales} - \text{variable costs} \\ &= \text{Shs.}19.50b - \text{Shs.}10b \\ &= \text{Shs.}9.50b \end{aligned}$$

$$\text{Contribution} = \text{Fixed costs}$$

$$\text{Shs.}9.50b = \text{Shs.}250,000$$

$$b = \frac{\text{Shs.}250,000}{\text{Shs.}9.50}$$

$$= 26,315.78 \text{ units}$$

$b = 26,316$ is the number of units of B sold and

$3b = 78,948$ is the number of units of t sold



Therefore the break-even point of T-Bug plc is 105,264 units comprising of 78,948 units of T and 26,316 units of B.

A change in sales mix without a change in the total output will no doubt give different results. This is because the individual products in the mix have different contributions thus giving a different weighted contribution sales ratio. This will cause a change in the overall profit curve.

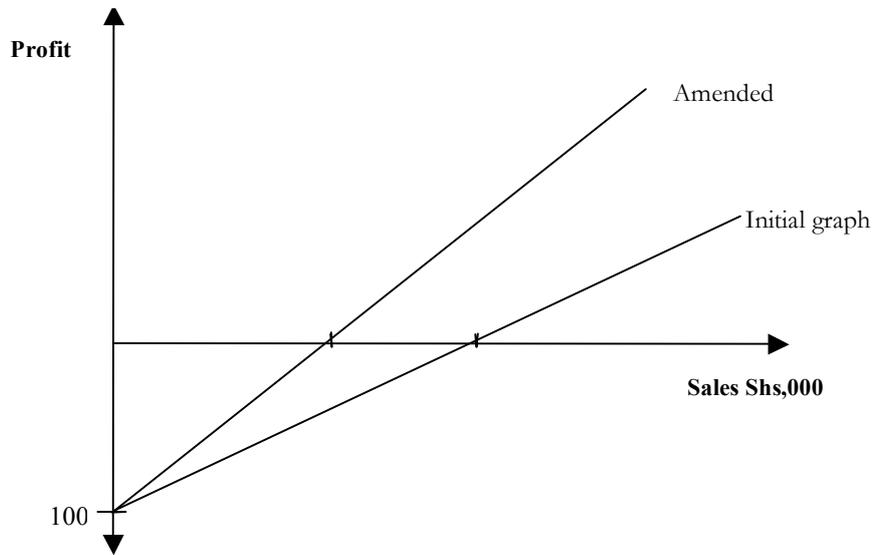
>>> Illustration

The summary of results of Donlon Ltd are as follows;

Product	A	B	C	Total
	Shs'000	Shs'000	Shs'000	Shs'000
Sales revenue	300	200	100	600
Variable costs	150	120	70	340
Contribution				260
Fixed costs				100
Net Profit				160
Contribution sales ratio	0.5	0.6	0.7	0.433

Required:

1. Prepare a profit volume graph which shows the overall results for Donlon Ltd
2. Prepare an amended profit curve where the market forces have led to a switch of Shs.200,000 of sales from product A to Product C.
3. Prepare a summary which shows the value of each of the following for both the original results and the amended results.
 - Net profit
 - Break-even point
 - Margin of safety
 - Overall contribution sales ratio

Solution:

The above profit volume graph shows the existing and amended cost curves for Donlon Ltd. The amended data which shows the switch of Shs.200,000 of sales from product A to Product C may be summarized as follows:

Product	A	B	C	Total
	Shs'000	Shs'000	Shs'000	Shs'000
Sales revenue	100	200	300	600
Variable costs	50	120	210	380
Contribution	50	80	90	220
Fixed costs				100
Net Profit				120
Contribution sales ratio	0.5	0.4	0.3	0.367

Note that the variable costs for Product A are reduced proportionally while those of product C are increased proportionally to the change in sales value according to the variable cost sales ratio (VCR) for each product.



BREAK-EVEN POINT AND ANALYSIS

Fast forward

Break-even point is primarily influenced by the value of fixed costs and contribution margin.

Break-even analysis and CVP analysis are one and the same thing. The only distinction is that CVP analysis targets to establish the relationship between the volume of output, the cost incurred and revenue received while Break-even analysis aims at establishing the minimum output that a firm must produce and sell in order to remain in business. If a firm operates below that level of activity, it makes a loss. Break-even analysis is built on CVP analysis principles.

Break-even point is the volume of sales where there is neither profit nor loss. At this point revenues and total costs are equal. For every unit sold in excess of the break-even point, profit will increase by the amount of the contribution per unit. All the variable costs and fixed costs are covered by the sales revenue.

$$\begin{aligned} \text{At Break-even point, BEP,} \\ \text{Total revenue} &= \text{Total costs} \\ \text{Profit } P &= 0 \\ \text{Contribution} - \text{Fixed costs} &= 0 \end{aligned}$$

$$\Rightarrow \text{Contribution} = \text{Fixed cost}$$

Break-even analysis

■ Mathematical determination of Break-even point

From the definition of break-even point, one can say that:

At Break-even point, Total revenue = Total costs and therefore, profit is equal to zero. i.e. from the fundamental marginal equation, $\text{CM} \cdot x = F + \Pi$, one can conclude that

Contribution ($\text{CM} \cdot x$) – Fixed costs, $F = 0$, since Profit is equal to zero. Upon making contribution the subject of the formula, one derives the following:

$$\begin{aligned} \Rightarrow \text{Contribution } (\text{CM} \cdot x) &= \text{Fixed cost } (F) \\ \text{CM} \cdot x &= F \end{aligned}$$

To obtain break-even point in units, make x (output) the subject of the formula by dividing both sides of the equation by Contribution margin per unit.

$$\text{Sale, } X_{\text{bep}} = \frac{\text{Fixed Costs}}{\text{CMor(P-V)}}$$

Note that this formula is identical to the CVP one except for the profit, which in this case is zero. This brings out clearly the idea that break-even analysis and cost volume profit analysis are one and the same thing. In fact, the terms are at times used interchangeably.

To obtain break-even sales in shillings where one is dealing with a single item, multiply the break-even sales volume by the sales price. Alternatively, use the contribution margin ratio to compute the same.

Using the equation below, one can calculate break-even sales in Shillings as follows:

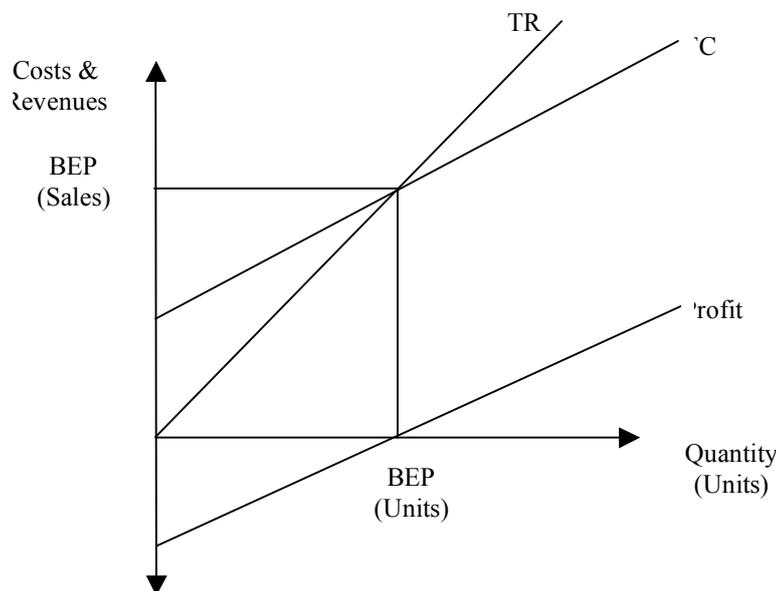
$$\begin{aligned} \Pi &= \text{CMR} \cdot S - F \\ \text{but } \Pi &= 0 \\ \therefore 0 &= \text{CMR} \cdot S - F \\ \text{CMR} \cdot S &= F \end{aligned}$$

To obtain break-even point in sales, divide both sides of the equation by CMR

$$\text{Sales (Shs), } S_{\text{bep}} = \frac{F}{\text{CMR}}$$

Using the graphical approach

Break-even charts graphically display the relationship of cost to volume and profits and show profit or loss at any sales volume within a relevant range. This is shown in the graph below. (Assumption; fixed costs do not change)



To illustrate the **Break-even Point**

**>>> Illustration (Break-even and CVP analysis)**

ABC produces and sells Product X at Shs.500. The Unit manufacturing cost of X is Shs.200 and total fixed manufacturing costs equal to Shs.300,000. The company incurs selling and administration costs equal to 2% of sales revenue and fixed selling cost of Shs.100,000 per annum.

Required:

- Determine the break-even sales in units and in shillings
- Determine the units that should be sold to earn a net income of Shs.200,000
- If the company was in the 30% tax bracket, how many units will have to be produced to earn the Shs.200,000
- Management is considering a policy which would increase fixed manufacturing costs by shs.200,000 but cut down on the variable manufacturing cost by 20%
 - What is the break-even point in units and in revenue under this policy?
 - Assuming the 30% tax bracket, how many units will have to be produced to earn the target profit of Shs.200,000 under this new policy?
- At what level of sales level will management be indifferent between the two policies?
- Assuming that the maximum possible demand is 6,000 units, determine the range of sales which will be financially beneficial in each policy.

Solution

Let the number of units produced be x

Summary of costs	Variable manufacturing Costs per Unit	Shs 200
	Variable Selling Costs (2% x Shs.200)	<u>4</u>
	Variable costs per Unit	<u>204</u>
	Fixed manufacturing costs	300,000
	Fixed selling costs	<u>100,000</u>
	Total fixed costs	<u>400,000</u>

- (a) At break-even point profit is equal to zero;
i.e. Shs. $(500 - 204) x - 400,000 = 0$
 $296 x - 400,000 = 0$
 $296 x = 400,000$
 $x = \frac{400,000}{296}$
 $x = 1,351$

$$\begin{aligned} \text{Sales (units)} &= \frac{\text{fixed costs}}{\text{CM}} \\ &= \frac{400,000}{(500 - 204)} \\ &= 1,351 \text{ units} \end{aligned}$$

Break-even point in sales is equal to
Break-even output x selling price
= 1,351 units x Shs.500 per unit
= Shs.675,500

$$\begin{aligned} \text{Sales (units)} &= \frac{\text{fixed costs}}{\text{CMR}} \\ &= \frac{400,000}{(500 - 204) \div 500} \\ &= 1,351 \text{ units} \end{aligned}$$

- (b) To earn a net income of Shs.200,000

$$\begin{aligned} \text{Profit} &= \text{Contribution} - \text{fixed costs} \\ 200,000 &= (500 - 204) x - 400,000 \\ 296x &= 600,000 \\ x &= \frac{600,000}{296} \\ x &= 2,027 \text{ units} \end{aligned}$$

Units to be sold shall be 2,027

$$\begin{aligned} \text{Sales (units)} &= \frac{\text{fixed costs} + \text{Profit}}{\text{CM}} \\ &= \frac{360,000 + 200,000}{(500 - 204)} \\ &= 2,027 \text{ units} \end{aligned}$$

- (c) In the 30% bracket, the number of units to be sold to earn the targeted income shall be

$$\text{Profit} = \text{Contribution} - \text{fixed costs}$$

Gross up the amount of target profit in order to obtain the actual amount targeted before tax

i.e. the desired amount of profits shall be 70% of the total amount of profits earned, P

$$\begin{aligned} \text{i.e. } 0.7 P &= 200,000 \\ P &= \frac{200,000}{0.7} \\ &= \text{Shs.}285,714 \end{aligned}$$

$$\begin{aligned} \text{Sales (units)} &= \frac{\text{fixed costs} + \left(\frac{\text{Profit}}{1 - T} \right)}{\text{CMR}} \\ &= \frac{400,000 + \left(\frac{200,000}{1 - 0.3} \right)}{(500 - 204)} \\ &= 2,317 \text{ Units} \end{aligned}$$

Using the marginal cost equation

$$\begin{aligned} 285,714 &= 296 x - 400,000 \\ 296 x &= \text{Shs.}685,714 \\ x &= \frac{685,714}{296} \\ &= 2,317 \text{ Units} \end{aligned}$$

- (d) With the new policy the new costs shall be

Variable manufacturing Costs per Unit (0.8 x 200)	160.00
Variable Selling Costs (2% x Shs.160)	<u>3.20</u>
Variable costs per Unit	<u>163.20</u>

Fixed manufacturing costs	500,000
Fixed selling costs	<u>100,000</u>
Total fixed costs	<u>600,000</u>

At break-even point profit is equal to zero;

$$\text{i.e. } \text{Shs}(500 - 163.2) x - 600,000 = 0$$

$$336.8 x - 600,000 = 0$$

$$336.8 x = 600,000$$

$$x = \frac{600,000}{336.8}$$

$$x = 1,781 \text{ Units}$$

$$\begin{aligned} \text{Sales (units)} &= \frac{\text{fixed costs}}{\text{CM}} \\ &= \frac{600,000}{(500 - 163.2)} \\ &= 1,781 \text{ Units} \end{aligned}$$



Break-even point in sales is equal to
 Break-even output x selling price
 = 1,781 units x Shs.500 per unit
 = Shs.890,500

$$\begin{aligned} \text{Sales (units)} &= \frac{\text{fixed costs}}{\text{CMR}} \\ &= \frac{600,000}{(500 - 163.2) / 500} \\ &= \text{Shs.890,500} \end{aligned}$$

In the 30% bracket, the number of units to be sold to earn the targeted income shall be:

$$\text{Profit} = \text{Contribution} - \text{fixed costs}$$

Gross up the amount of target profit in order to obtain the actual amount targeted before tax

i.e. the desired amount of profits shall be 70% of the total amount of profits earned, P

$$\text{i.e. } 0.7 P = 200,000$$

$$\begin{aligned} P &= \frac{200,000}{0.7} \\ &= \text{Shs.285,714} \end{aligned}$$

Using the marginal cost equation
 $285,714 = 336.8 x - 600,000$
 $336.8 x = \text{Shs.885,714}$
 $x = \frac{885,714}{336.8}$
 $= 2,630 \text{ Units}$

$$\begin{aligned} \text{Sales (units)} &= \frac{\text{fixed costs} + \left(\frac{\text{Profit}}{1 - T}\right)}{\text{CMR}} \\ &= \frac{600,000 + \left(\frac{200,000}{1 - 0.3}\right)}{(500 - 163.2)} \\ &= 2,630 \text{ Units} \end{aligned}$$

(d) The management will be indifferent between the two alternatives when profits obtained shall be equal i.e. point of equilibrium between the two policies.

$$\begin{aligned} \text{i.e. } 296 x - 400,000 &= 336.8 x - 600,000 \\ (336.8 - 296)x &= (600,000 - 400,000) \\ 40.8 x &= 200,000 \\ x &= 200,000/408 \\ x &= 4,902 \text{ units} \end{aligned}$$

	Test for 5,000 units	Test for 4000 units
Situation 1	$\text{Profit} = 296 (5000) - 400,000$ $= 1,480,000 - 400,000$ $= 1,080,000$	$\text{Profit} = 296 (4000) - 400,000$ $= 1,184,000 - 400,000$ $= 784,000$
Situation 2	$\text{Profit} = 336.8 (5000) - 600,000$ $= 1,684,000 - 600,000$ $= 1,084,000$	$\text{Profit} = 336.8 (4000) - 600,000$ $= 1,347,200 - 600,000$ $= 747,200$

Policy II is more profitable than Policy I between 2,630 units and 4,902 units while Policy I is more profitable between 4,902 units and 6,000 units of output.

CVP and computer applications

The wide availability of personal computers encourages more managers to apply cost volume profit analysis. Computers can quickly make the computations for changes in the assumptions identifying proposed projects e.g. computer spreadsheets allow managers to determine the most profitable combination of selling process, variable and fixed cost volume. A manager enters into the computer various numbers for price and cost in an equation based on CVP relationships to yield target income for each combination. Because of a computer's speed and accuracy in providing this information, the manager can select the most profitable actions.

■ ■ ■ DECISION MAKING

Fast forward

Marginal cost information is most relevant in decision making. Make or buy decisions, limiting factors and decision making, relevant costs and controllable costs are considered under decision making.

Nature of Decision-making

Decision-making may fall into any of the following categories

1. Short run operational decisions
2. Short run tactical decisions
3. Longer term strategic planning decisions

Short run operational decisions are made in relation to the achievement of short-term output requirements. A decision may be made to work overtime in a department in order to have a job completed in accordance with a scheduled delivery date to the customer. Such decisions are aimed at ensuring that the current business plan is achieved. Short run tactical decisions are related to specific events which management wish to decide upon and which will change the future operation of the business in some way. Its time horizon is short and it is usually within 12 months.

Longer term strategic planning is more concerned with the overall direction of the business plan. It may have a time horizon of 5 to 10 years. For example should a decision be made to install a fully automated production line to replace existing labour intensive machine process. These decisions require consideration of factors such as;



- The level of market likely to be available in future
- An estimation of changing price levels
- The timing of cash flows in relation to the decision
- The degree of uncertainty estimated in relation to data used in the evaluation of the situation
- The strategy which competitors are likely to implement
- The cost of capital or target rate of return

The decision making cycle

Steps in decision-making cycle are:

- a) Clearly define the objective, which is to be the focus of the decision. This is important in order that the decision makers have a well-defined problem, which has to be solved and not a vague idea which lacks clarity.
- b) Consider the alternative strategies available to the satisfactory attainment of the objective. This is important in order that the final decision agreed upon has taken account of all relevant possibilities.
- c) Gather relevant information in order to compare alternative strategies in quantifiable terms. This may require considerable thought and effort in order to ensure that all relevant data are obtained.
- d) Consider the qualitative factors, which are likely to influence the decision. This is important as an element in decision making. There may be non-quantifiable costs and benefits, which lead to a final choice of strategy different from the highest quantifiable return.
- e) Compare the alternative strategies using both quantitative and qualitative data and then make a final decision.
- f) Re-evaluate your decision; determine if you are achieving the objectives and if not, repeat the process.

Relevant costs and decision-making

The relevance of costs will depend upon the purpose for which they are being used. Relevance is related to future decision.

The relevance of costs in decision-making is related to whether they are avoidable in relation to the decision made or if they are unavoidable, in that they will remain irrespective of the decision taken. Relevant costs in decision-making are, therefore, said to be incremental and future costs relating to the decision to be made. Costs are incremental if they will result in a difference e.g. avoidable costs result in reduced costs if they are avoided. Future costs are those costs that have not yet been incurred i.e. they are not sunk costs or committed costs. This is explained further in this text.

Limiting factors and decision making

Limiting factor may be defined as 'any factor, which has a limiting effect on the activities of an undertaking at a point in time over a specific period'

The decision-making strategy, which management wish to pursue, may be constrained because of shortage of manpower, machinery, material, money, markets or a combination of these. It may also be affected by the availability of management expertise and methods improvement capability.

In short term decision making where one or more factors will limit the strategy which may be implemented, it is likely that profit maximization will be seen as a major decision making goal. It should be noted, however, that in practice a number of goals will form part of the objective of an organization. In addition to short term profits management may wish to consider a number of longerterm goals, for example

- Consolidation of market share.
- Improving longer term productivity and profitability.
- Quality leadership.
- Employee and customer satisfaction.
- Social responsibility.

This balance between short and long term goals is likely to lead to decisions, which are profit satisfying rather than profit maximizing resulting in the satisfactory profit level being earned in the shorterterm

Single Limiting factor

Where a single limiting factor exists, the decision making sequence may be implemented as follows:

- Calculate the contribution per unit of limiting factor for each product.



- Rank the products in order of size and contribution per unit of limiting factor.
- Allow any minimum retention of less profitable products which is decided upon.
- Use up the total units of the limiting factor in order to fulfill the forecast quantities in order of product ranking.

A company manufacturers and sells three products A, B & C. The unit cost and revenue structure for each product and its maximum forecast demand for the coming period are as follows:-

Product	A	B	C
Selling price per unit (Shs)	140	100	120
Variable cost per unit (Shs)	70	60	80
Maximum demand (Units)	500	300	300
Machine hours requested per unit	10	4	5

The company has a maximum of 6000 machine hours available during the coming period. Annual fixed costs incurred amount to Sh20,000.

Required

- Calculate the number of units of each product A, B, and C, which should be produced and sold in order to maximize profit
- Calculate the maximum profit earned from the decision strategy per (i) above.
- Suggest other factors which management may wish to consider which could result in a change in their decision
- Calculate the product units to be produced and sold and the net profit earned if the company wishes to maximize sales of product A because it is thought to be a future market leader
- Calculate the product units to be sold and the net profit earned if the company agree to produce a minimum of 70% of the maximum demand of each product in order to maintain market spread.

Solution

Product	A	B	C	Total
Maximum demand (Units)	500	300	300	
Machine hours requested per unit	10	4	5	
Machine hours required	5000	1200	1500	7700
Machine hours available				<u>6000</u>
Short fall				<u>1700</u>

The above calculation confirms that machine time is a limiting factor, which will restrict the number of products, which can be produced and sold.

Contribution per unit (Shs)	70	40	40	
Machine hours requested per unit	10	4	5	
Contribution per machine hr (Shs)				
$\left(\frac{\text{Contribution per Unit}}{\text{Machine hrs per unit}} \right)$	Shs.7	Shs.10	Shs.8	
Product ranking	3	1	2	
Machine hours utilised ***	3300	1200	1500	
i. Products units produced				
$\left(\frac{\text{Machine hrs utilised}}{\text{Machine hrs per unit}} \right)$	330	300	300	
Contribution earned	23100	12000	12000	47100
Less fixed costs				<u>20000</u>
ii. Net Profit				<u>27100</u>

*** the figure is the balance of machine hours remaining after allocacting to other products in order of ranking.

- iii. The profit maximizing mix may not be implemented where management wish to maintain a more balanced market mix or where they wish to concentrate on a future market leader. In addition they may wish to explore the possibility of sub-contracting some production or of acquiring additional machinery either on hire or part of a long term expansion of capacity
- iv. Where the sales of product A are to be maximized because it is thought that it will be a future market leader, the analysis sequence is:
- **Utilize the machine hours required to maximize production of A**
i.e 500 units x 10 hrs = 5000 hrs
 - Use the remaining 1000 machine hours to produce B and C in their ranking order.

Product B has a higher contribution per machine hour. The 1000 machine hours available are sufficient to produce $1000/4 = 250$ units of B. This is less than its maximum demand. There are no hours left in which to produce product C.

The sales and profit strategy is therefore:

	Units	Contribution per unit (Shs)	Total
Product A	500	70	35000
Product B	280	40	10000
Product C	Nil		<u>0</u>
			45000
Less fixed costs			<u>(20000)</u>
Net profit			<u>25000</u>



- v. Where sales have to be spread in order to satisfy 70% of the maximum demand of each product as the first criterion, the analysis sequence is
- Utilize the machine hours required to produce 70% of the maximum production of each product
 - Use the residual hours up to the maximum of 6000 hours to produce additional units of the product in their ranking up to the maximum demand in each case so far as it is possible

Product	A	B	C	Total
Maximum demand (Units)	500	300	300	
70% of the units	350	210	210	
Machine hours utilised	3500	840	1050	5390
Balance to meet maximum demand	150	90	90	
Ranking (as earlier calculated)	3	1	2	
Residual hours usage	Nil	360	250	610
Machine hours used	3500	1200	1300	6000
Total Units	350	300	260	
Total contribution (Shs)	24500	12000	10400	46900
Less fixed costs				<u>(20000)</u>
Net profit				<u>26900</u>

Direct cost as a relevant cost

Direct costs may be directly chargeable to a product or a cost center. They may be fixed costs or variable costs when it comes to decision-making.

>>> Illustration

A summary of profit and loss reported in each of the three product lines B, C and D is as follows:

Product	B	C	D
	Shs'000	Shs'000	Shs'000
Sales revenue	60	40	40
Less variable costs	<u>40</u>	<u>30</u>	<u>42</u>
Contribution	20	10	(2)
Less fixed costs	<u>15</u>	<u>12</u>	<u>10</u>
Net profit	<u>5</u>	<u>(2)</u>	<u>(12)</u>

Required:

- (i) Comment on the financial situation as required in the above summary

- (ii) Comment on a decision to discontinue product C where
 - a. 60% of the fixed costs charged to it relate to advertising of product C and are avoidable if discontinued.
 - b. All the fixed costs charged to product C are avoidable if discontinued
- (iii) Discuss whether product D should be discontinued if
 - a. 90% of fixed costs charged to it are company costs arbitrarily apportioned to it OR
 - b. Eliminating of its variable costs would result to an increase in the material costs for products B and C because of lost discounts which would have an effect of increasing their variable costs by 5% OR
 - c. Products B and D are complementary products whose sales demand is directly related to that of each other.

Solution

The existing figures show that products B and C are making a contribution towards fixed costs whereas product D is in a negative contribution situation. The cash out flow directly related to product D are not paid for by the cash in flows from sales revenue. Product B shows a net profit of Shs. 5000 whereas product C shows a net loss of 2000. The question data has not indicated whether the fixed costs allocated to each product are an arbitrary apportionment of the total company fixed cost

Where 60% of the fixed costs charged to product C relate to advertising of the product and are avoidable if it is discontinued, it is earning a net contribution or net margin of Shs. 10000 - (60% x Shs. 12000) = Shs. 2800. This means that Product C is contributing to the net cash in flows of the company and should be retained in the short term if no more profitable use of the capacity is available

Where all the fixed costs charged to product C are avoidable if it is discontinued, this means that they are directly attributable to product C. The net loss of Shs. 2000 is a true measure of its effects on company cash flows. If the position cannot be improved, the company will save Shs. 2000 in the short term by discontinuing product C

Product D has a negative contribution of Shs. 2000, if 10% of the fixed costs charged to it are directly attributable to the product. This adds a further Shs. 1000 (10% x 10000) to its adverse effect on company cash flow

- b) The variable costs of products B and C would increase by 5% if product D is discontinued
 Increase in cost of products B and C = 5% x Shs. 40000 + Shs. 30000 = Shs. 3500
 Savings by discontinuing product D = Shs. 2000
 Net benefit of retaining product D = Shs. 1500
 In this situation the discontinuance of product D will result in net loss to the company of Shs. 1500 because of the increased costs of products B and C due to loss of discount



- c) If products B and D are complementary products, their position must be examined. If product D is discontinued it implies that product B sales will be lost. Product B currently earns a contribution of Shs. 20000, which far outweighs the negative contribution of Shs.2000, which results from product D. Both products should be produced and sold



Incremental costs as relevant costs

An incremental cost is specifically incurred by the following a course of action and avoidable if such action is not implemented. This contrasts with sunk costs, which have already been incurred and cannot be avoided whether the future course of action is taken or not. Incremental costs are relevant in decision-making situations such as:

- a) Whether to buy in a component or service or manufacture it using the company's own resources
- b) Whether to further process one of the joint products which emerge from a process before it is sold or sell it in its existing form without further processing.

>>> Example 3

A company currently makes a component which has the following unit cost structure

Direct materials	Shs.100
Direct wages	Shs.200
Variable Overheads	Shs.50
Fixed overheads	<u>Shs.140</u>
Total	<u>Shs.490</u>

Required:

Advise the management whether the component should be bought in from outside the company at Shs.330

Solution

1. The total cost to manufacture the component is Shs.490
2. The apparent saving by buying the component is $\text{Shs}(490 - 330) = \text{Shs.160}$
3. If the fixed overheads is an apportionment of the company's fixed overhead, which will be avoided if production is discontinued, the relevant cost of manufacture is Shs.350. This assumes that direct materials, direct labor and variable overheads are all directly variable with the production of the component. This still leaves the purchase of the component for Shs.330 a cheaper option than manufacture at a relevant cost of Shs.350.

4. Other factors which are non quantifiable in the short term should be considered, however, before a final decision is made.
 - a. Will the quality of the bought in component be as acceptable as that which is manufactured internally?
 - b. Will the outside supplier be able to supply the components as required or will there be production delays because of late delivery?
 - c. Will there be industrial relations problem because of the loss of jobs by workers who currently make the component?
5. Further analysis of the solution may reveal that the production capacity currently used to make the component could be used as an alternative manufacturing opportunity which could be sold externally and yield a contribution equivalent of Shs. 50 for each component it replaces



Opportunity costs are relevant costs

Opportunity cost introduces an additional concept which is not available as part of normal cost analysis in the accounting record system

Opportunity cost may be defined as 'the best opportunity foregone by following a particular course of action', it may be redefined as the net cash flow lost by choosing one alternative rather than another (value of the next best forgone alternative). Opportunity cost may be used in a number of decision making situations where there is an alternative choice between possible future course of action, Examples are:

- a) Whether to close a department immediately or in one years time
- b) Whether to operate an internal service department or to use an outside service.
- c) Whether to accept one or another of two mutually exclusive contracts

Opportunity costs will be part of an incremental cost and revenue analysis in many decision making situations

>>> Illustration question (marginal costing and absorption costing)

Karamoja Plc is a manufacturing company which produces and sells a single product, 'Moto sana'.



The following is the standard cost per unit of the product:

Cost	Shs
Variable manufacturing	45
Fixed manufacturing	35
Variable selling and administration	8
Fixed selling and administration	<u>30</u>
	<u>118</u>

Fixed manufacturing costs per unit are based on a predetermined rate established at a normal activity level of 18,000 production units per period. Fixed selling and administration costs are absorbed into the cost of sales at 20% of the selling price. Under/over recovery of overheads are transferred to the profit and loss account at the end of each period.

The following information has been provided for two consecutive periods.

	Period 1	Period 2
	Units	Units
Sales	17,000	18,000
Production	16,000	18,400
	Shs	Shs
Sales	2,550,000	2,700,000
Variable manufacturing costs	720,000	828,000
Variable selling and administration costs	136,000	144,000
Fixed manufacturing costs	640,000	630,000
Fixed selling and administration costs	540,000	540,000

Required: Prepare,

- Income statement for each of the periods under absorption method
- Income statements for each of the periods under the direct costing method
- Reconciliation for each period of the profit or loss obtained under the two methods in (a) and (b) above
- Outline the arguments in favor of
 - The full costing method
 - The direct costing method

Solution**Absorption costing (full costing) method**

a)

Karamoja plc				
(Absorption Costing) Income statement for				
	Period 1		Period 2	
	Shs	Shs	Shs	Shs
Sales (units x Selling price)		2,550,000		2,700,000
Less: cost of sales				
Opening Stock (total cost)	80,000			
Variable manufacturing costs	720,000		828,000	
Fixed manufacturing costs	<u>560,000</u>		<u>644,000</u>	
Cost of Goods available for sale	1360,000		1472,000	
Less closing stock	<u>(0)</u>		<u>(32,000)</u>	
Cost of sales		<u>1,360,000</u>		<u>1,440,000</u>
Gross profit		1,190,000		1,260,000
Add overabsorption		<u>0</u>		<u>14,000</u>
		1,190,000		1,274,000
Less: Expenses				
Under absorption	80,000			
Fixed selling and Admin	510,000		510,000	
Variable selling and admin	136,000		30,000	
Selling fixed under absorbed	<u>30,000</u>	<u>(756,000)</u>	<u>144,000</u>	<u>(684,000)</u>
		<u>434,000</u>		<u>590,000</u>

b)

Karamoja plc				
(Marginal Costing) Income statement for				
	Period 1		Period 2	
	Shs	Shs	Shs	Shs
Sales (units x Selling price)		2,550,000		2,700,000
Less: cost of sales				
Opening Stock (direct cost only)	45,000			
Variable manufacturing costs	<u>720,000</u>		<u>828,000</u>	
Cost of Goods available for sale	765,000		828,000	
Less closing stock	<u>(0)</u>		<u>(18,000)</u>	
Cost of sales		<u>(765,000)</u>		<u>(810,000)</u>
		1,785,000		1,890,000
Less variable and administration		<u>(136,000)</u>		<u>(144,000)</u>
Contribution		1,649,000		1,746,000
Less: Expenses				
Fixed manufacturing costs	640,000		630,000	
Selling fixed under absorbed	<u>540,000</u>	<u>(1,180,000)</u>	<u>540,000</u>	<u>(1,170,000)</u>
		<u>469,000</u>		<u>576,000</u>

**c) Reconciliation**

Karamoja plc Reconciliation statement		
	Period 1	Period 2
	Shs	Shs
Marginal profit	469,000	576,000
Add: Over absorption of profits		14,000
Less: under absorption	<u>(35,000)</u>	
Absorption profits	<u>434,000</u>	<u>590,000</u>

d)

The arguments for marginal and absorption costing are discussed in the topic.

CHAPTER SUMMARY

Marginal Cost is the cost of a unit of a product or service which would be avoided if that unit or service was not produced or provided.

Contribution is the difference between sales value and the marginal cost of sales.

A comparison between marginal and absorption costing can be summarized as

Marginal costing	Absorption costing (sometimes referred to as full costing)
<ul style="list-style-type: none"> - Closing stocks are valued at marginal production cost, that is, the variable production costs only. - Fixed costs are charged in full against the profit of the period in which they are incurred. They are treated as period costs. 	<ul style="list-style-type: none"> - Closing stocks are valued at full production cost, and including a share of fixed production and include a share of fixed production costs - Fixed costs are treated as product costs**. They are only expensed when stock is sold.

Marginal costing and absorption costing are different techniques for assessing profit in a period.

If there are any changes in stocks during a period, marginal costing and absorption costing give different results for profit obtained:

- If stock levels increase absorption costing will report the higher profit because some of the fixed production overhead incurred during the period will be carried forward in closing stock (which reduces cost of sales) to be set against sales revenue in the following period instead of being written off in full against profit in the period concerned (as in the example above),
- If stock levels decrease, absorption costing will report the lower profit because as well as the fixed overhead incurred, fixed production overhead which had been brought forward in opening stock is released and is included in cost of sales.

If the opening and closing stock volumes and values are the same, marginal costing and absorption costing will give the same profit figure.

In the long run, total profit for a company will be the same whether marginal costing or absorption costing is used because in the long run, total costs will be the same by either method of accounting. Different accounting conventions merely affect the profit of individual accounting periods.

Cost is determined by various factors which include:

- Material prices, wage rates and overhead costs may all change because of the impact of inflation
- Material usage may change where scrap is expected to fall because of improved methods, better trained workers or better material quality
- Labour efficiency may change where improved training programs or a reduction in labour turn over is expected to occur
- Internal efficiency and the productivity of the factors of production; Overhead expenses may fall due to more efficient placement of order with suppliers who offer best terms
- Product Volume of production or Size of batches
- Product mix may change either as part of overall company strategy or due to increased competition
- Methods of production and technology
- Size of plant

Assumptions of CVP analysis include

- Volume is the only factor affecting sales and expenses The changes in the level of various revenue and costs arise only because of the changes in the volume of output



produced and sold, e.g., bales of flour produced by Unga Ltd. The number of output (units) to be sold is the only revenue and cost driver.

- Total costs can be divided into fixed and variable components. Variable component will vary directly with level of output. Direct materials, direct labour and direct chargeable expenses form the direct variable costs while variable part of factory overheads, administration overheads and selling and distribution overheads form the variable overheads.
- There is linear relationship between revenue and cost.
- The behavior of both sales revenue and expenses is linear throughout the entire relevant range of activity. Graphically, it assumes a linear equation of the form $Y = mX + C$
- The unit selling price, unit variable costs and fixed costs are constant.
- The theory of CVP is based upon the production of a single product. However, of late, management accountants are functioning to give a theoretical and a practical approach to multi-product CVP analysis.
- There is only one product or service or a constant Sales Mix. The analysis either covers a single product or assumes that the sales mix sold in case of multiple products will remain constant as the level of total units sold changes.
- All revenue and cost can be added and compared without taking into account the time value of money.
- The theory of CVP is based on the technology that remains constant.
- The theory of price elasticity is not taken into consideration.
- Inventories do not change significantly from period to period

Break-even point is the volume of sales where there is neither profit nor loss. At this point revenues and total costs are equal.

CHAPTER QUIZ

1. Define break-even point.
2. List down two limitations of CVP analysis.
3. Highlight the objectives of CVP analysis
4. Write down the equation used to calculate break-even point (units).

ANSWERS TO CHAPTER QUIZ

1. Break-even point is the volume of sales where there is neither profit nor loss. At this point revenues and total costs are equal
2.
 - a. It is assumed that the production facilities anticipated for the purpose of cost-volume-profit analysis do not undergo any change. Such analysis gives misleading results if expansion or reduction of capacity takes place, which in most cases does.
 - b. In case a variety of products with varying margins of profit are manufactured, it is difficult to forecast with reasonable accuracy the volume of sales mix which would optimize the profit.
 - c. It assumes that input price and selling price remain fairly constant which in reality is not the case. Thus, if cost or selling price changes, the relationship between cost and profit will not be accurately depicted.
 - d. It assumes that variable costs are perfectly and completely variable at all levels of activity and fixed cost remains constant throughout the relevant range. However, this situation is not a practical one.
 - e. It is assumed that inventories do not change significantly from period to period. However, in reality, opening inventory and closing inventory are never the same and in most cases they vary significantly
3.
 - a. In order to forecast profits accurately, it is essential to ascertain the relationship between cost and profit on one hand and volume on the other.
 - b. Cost-volume-profit analysis is helpful in setting up flexible budget which indicates cost at various levels of activities.
 - c. Cost-volume-profit analysis assists in evaluating performance for the purpose of control thus enabling management to take corrective actions where necessary and in good time.
 - d. Such analysis may assist management in formulating pricing policies by projecting the effect of different price structures on cost and profit.
- 4.

$$\text{Break-even point (units)} = \frac{\text{Fixed Costs}}{\text{Contribution margin}}$$



PAST PAPER ANALYSIS

Questions in this chapter have been tested in the following exam sittings.

06/ 07 Q1; 06/ 07 Q6; 12/06 Q(b); 12/06 Q2; 05/06 Q2; 05/06 Q6(c); 12/05 Q3; 05/ 05 Q1; 11 04 Q1; 11 04 Q3; 11 04 Q6; 06/ 04 Q6(b,d); 12/03 Q2; 06/ 03 Q3; 12/02 Q7; 05/ 02 Q1; 05/ 02 Q2; 05/ 02 Q3; 12/01 Q4; 05/ 01 Q5; 05/ 01 Q7(a); 12/00 Q2; 06/ 00 Q1; 05/ 00 Q3;

EXAM QUESTIONS

Question one

Oathall Limited, which manufactures a single product, is considering whether to use marginal or absorption costing to report its budgeted profit in its management accounts.

The following information is available:

	Shs/unit
Direct materials	4
Direct labour	<u>15</u>
	19
Selling price	50

Fixed production overheads are budgeted to be Shs300,000 per month and are absorbed on an activity level of 100,000 units per month. For the month in question, sales are expected to be 100,000 units although production units will be 120,000 units. Fixed selling costs of Shs150,000 per month will need to be included in the budget as will the variable selling costs of Shs2 per unit. There are no opening stocks.

Required:

- Prepare the budgeted profit and loss account for a month for Oathall Limited using absorption costing. Clearly show the valuation of any stock figures
- Prepare the budgeted profit and loss account for a month for Oathall Limited using marginal costing. Clearly show the valuation of any stock figures

(20 marks)

Question two

KNL produces and sells two products, K and L. The products pass through two departments, Firing and Finishing. The following budgeted data for the coming financial year are available:

Department	Firing	Finishing
Allocated and apportioned fixed overhead costs	Shs.120,000	Shs.103,125
Direct labour minutes per unit:		
– Product K	45	31.25
– Product L	60	43.75

Budgeted production is 7,500 units of product X and 9,375 units of product Y.

Fixed overhead costs are to be absorbed on a direct labour hour basis.

Required:

Calculate the budgeted fixed overhead cost per unit for product Y. (20 marks)

Question three

Langdale Ltd is a small company manufacturing and selling two different products – the Lang and the Dale. Each product passes through two separate production cost centers – a machining department, where all the work is carried out on the same general purpose machinery, and a finishing section. There is a general service cost centre providing facilities for all employees in the factory.

The company operates an absorption costing system using budgeted overhead absorption rates. The management accountant has calculated the machine hour absorption rate for the machining department as Shs3·10 but a direct labour hour absorption rate for the finishing section has yet to be calculated. The following data have been extracted from the budget for the coming year:

Product	L	D
Sales (units)	6,000	9,000
Production (units)	7,200	10,400
Direct material cost per unit	Shs52	Shs44
Direct labour cost per unit:		
– machining department (Shs8 per hour)	Shs72	Shs40
– finishing section (Shs6 per hour)	Shs42	Shs36
Machining department – machine hours per unit	5	3
Fixed production overhead costs:	Shs	Shs
– machining department	183	120
– finishing section	241,320	
– General service cost centre	82,800	
Number of employees:		
– machining department	14	
– finishing section	32	
– General service cost centre	4	



Service cost centre costs are reapportioned to production cost centers.

Required:

- Calculate the direct labour hour absorption rate for the finishing section. (5 marks)
- Calculate the budgeted total cost for one unit of product Dale only, showing each main cost element separately (5 marks)
- The company is considering a change over to marginal costing. State with reasons, whether the total profit for the coming year calculated using marginal costing would be higher or lower than the profit calculated using absorption costing. No calculations are required. (10 marks)

Question four

The data below relates to operations of XYZ Ltd, a manufacturing company that employs normal job costing. All jobs pass through the company's two departments, preparation and finishing.

	PREPARATION DEPARTMENT	FINISHING DEPARTMENT
Direct Materials	600,000	60,000
Direct labour	480,000	120,000
Factory overheads	240,000	180,000
Direct labour hours	120,000	45,000
Machine hours	60,000	30,000

The following information relates to job No. 31 undertaken by the company during the year:

	PREPARATION DEPARTMENT	FINISHING DEPARTMENT
Direct Materials	60,000	120,000
Labour (Direct)	24,000	18,000
Factory overheads	240,000	180,000
Direct labour hours	25,000	1,600
Machine hours	20,000	2,000

The company employs the same overhead absorption method in the two departments.

Required:

- Using the direct labour hours and machine hours as the overhead absorption basis in each of the two departments, compute the cost for the job. Comment on your results (16 marks)
- What basic criteria guides the choice of an appropriate overhead absorption method in job costing? (4 marks)

Question five

A company manufactures small assemblies to order and has the following budgeted overheads for the year, based on normal activity levels:

Department	Budgeted overheads	Overhead Absorption Base
Blanking	8,000	1,500 labour hours
Machining	23,000	2,500 machine hours
Welding	10,000	1,800 labour hours
Assembly	5,000	1,000 labour hours

Selling and administrative overheads are 20% of factory cost. An order for 250 assemblies type 3RR made as Batch B3RR incurred the following costs:

Materials:	Shs 3,107.
Labour:	128 hours at the blanking shop at Shs 2.25 per hour.
	452 hours at the Machining shop at Shs 2.50 per hour.
	90 hours at the Welding shop at Shs 2.25 per hour.
	175 hours at the Assembly shop at Shs 1.80 per hour.

Shs.525 was paid for the hire of a special equipment for testing the batch items. After the direct labour time in the machining department, the batch spent an extra 191 hours in the department undergoing special treatment, which incurred overheads at the normal rate.

Required:

Compute the batch cost and profit as well as the unit cost and profit (20 marks)



CASE STUDY

“It is now fairly and widely accepted that conventional cost accounting, distorts management’s view of business through unrepresentative overhead allocation and inappropriate product costing. This is because the traditional approach usually absorbs overhead costs across products solely on the basis of the direct labour involved in their manufacture. As direct labour cost expressed as a proportion of total manufacturing cost continues to fall, it leads to more and more distortion and misrepresentation of the impact of particular products on total overhead costs” (from Financial Times)

Management accountants have adopted various approaches to overcome the above criticism.

Traditionally, the basis of overhead absorption was the number of labour hours expected within the budget period and this was then used to calculate an absorption rate per labour hour. This was then used to attribute costs to the cost units on the basis of the number of labour hours used to produce the cost unit.

Alternative bases of apportioning exist such as the number of machine hours or the percentage of particular elements of prime costs incurred in respect of cost units. If the method of manufacture is machine intensive for example, it is more realistic to absorb the overhead cost on the basis of the number of machine hours instead of the number of labour hours.

A further development is to divide the overheads into those costs, which are labour related, and those, which are machine hour, related and apply a separate absorption rate to each part of the overhead cost. This is the use of multiple rates similar to the principle of activity bases costing (ABC).

ABC is based on the principle that activities cause costs and therefore the use of activities should be the basis of attributing costs to cost units. Costs are identified with particular activities and the performance of those activities is linked with products.

Traditional budgeting systems are incremental in nature and tend to focus on cost centers. Activity based budgeting (ABB) links strategic planning to the overall performance measurement aimed at continuous improvement.

CHAPTER NINE



COSTING SYSTEMS



CHAPTER NINE

COSTING SYSTEMS

► OBJECTIVES

After studying this chapter, you should be able to:

- Explain the features of the various costing methods and the environment under which the various product costing methods are applicable
- Compute unit cost in the systems analyzed hereafter and distinguish between the various systems
- Calculate unit cost given batch costing and process costing systems and prepare cost reports
- Calculate nominal profits in a given contract given contracts at various stages of completion
- Calculate the cost of finished goods in a process costing system given normal losses, abnormal losses and abnormal gain situations; calculate equivalent unit of production
- Account for process losses using various approaches
- Allocate joint costs where a process' end products are more than one item, which may or may not need further processing. Account for by-products and joint products
- Identify the importance of unit costs

► INTRODUCTION

This chapter aims at defining and explaining the features of the various costing methods, explaining the environment under which the various product costing methods are applicable and performing various computations.

The chapter will focus on various costing systems namely:

- Specific order costing
- Process costing and
- Uniform costing

► DEFINITION OF KEY TERMS

Progress payments: these are interim payments made by the client to the contractor throughout the course of the work.

Architects certificate: this is a certificate that provides confirmation that work done up to a certain value has been completed.

Retention money: this is a proportion of value of work certified withheld by the customer for a specified period during which the customer must make good all contractual defects.

Cost of Work certified; this includes the portion of all total costs that relate to the work certified.

The Notional Profit: this is the difference between the value of work certified to date and cost of work certified to date less a provision for any anticipated unforeseen eventualities.

Profit not taken refers to the part of the notional profit that is not recognized in the current period.

A batch: is defined as a cost unit consisting of a group of identical items in particular characteristics

Equivalent units: This is a notional quantity of completed goods in the production process

Scrap: Material held after a productive process, which are irrecoverable or have no recoverable value.

Joint products: two or more products of relatively high value emerge simultaneously from a single process, each of which has significant value relative to the others up to the point of separation

By products: This is an incidental or secondary product from a process, which has an insignificant value compared to the main product.

► EXAM CONTEXT

The examiner may set theory and calculation questions. Calculation questions are more frequently set.



► INDUSTRY CONTEXT

The chapter is applicable in real life situation especially in coming up with the cost of an assignment, product or process.

SPECIFIC ORDER COSTING

Fast forward;

Specific job costing involves determining the cost and price of a specific identifiable item, batch or contract.

This is a broad costing system, which is applicable where work jobs consist of separate jobs, batches or contracts. Each job, batch or contract is a cost unit and in most cases, it is different from another. Each order made can be identified separately and the system is designed to find the cost of each order. Specific order costing is subdivided into:

- a) Job costing
- b) Batch costing
- c) Contract costing

Job Costing

This is a costing method which is applied when a job/cost unit is relatively of small size, is undertaken to fit the customer's specifications and is of comparatively short duration: Each job moves through the operations continuously as an identifiable unit. The method is usually adopted by businesses, which receives orders for work peculiar to the needs of individual customers.

Features of Job costing

Product is against the customer's order and specifications and not on job stocks. Each job has its own characteristics and requires special attention and skills.

Job order accumulates manufacturing costs for each job separately through the use of subsidiary ledger t-accounts or cost statements.

Procedures of Job Costing

The application of job costing method begins when a customer's order is received. After accepting an order, an individual work/job order number is assigned to each job for or separate order identification. Production order is then made giving authority for the job to start. A job cost account for each job is then opened. In this account, all costs relating to that particular job are recorded and this account closed only when the job is complete. After completion of the job, an invoice is prepared and served to the customer.

Materials for each job are made using material requisition forms. Material costs are estimated based on the material schedule available or purchase price where materials have to be specifically purchased for the job. Where materials are stock items, replacement cost may be used as the basis of determining the cost. For instance, if it costs Shs.500 to buy a bag of cement and the company has 200 bags in stock, the total cost of cement in store based on replacement cost is Shs.100,000.

Labour is charged on the basis of the amount of time used to complete that particular job as recorded in time-keeping records. Past experience in similar jobs is used to predict labour cost. This takes into account the basic wage, overtime paid and any bonuses.

Overheads are charged on the basis of an predetermined overhead absorption rate.

$$\text{Applied Overhead absorption rate} = \frac{\text{Budgeted Overheads}}{\text{(Basis of Absorption)}}$$

Where the denominator value refers to units of some specified overhead absorption base e.g. machine hours, direct labour hours. (Refer to Cost Accumulation Topic – Absorption of overheads)

Job order costing system is used in manufacturing and service industries. In manufacturing industry, it is used in those situations where many unique products or jobs are being produced in each financial period (heterogeneous production). For instance, in furniture industry, the carpenter makes furniture based on customers' specifications, which are occasionally similar. In the service industry, most of the instances are unique in that the quality and value attached to each service is normally different. For instance, hospitals will give treatment based on the illness of first patient, which is not necessarily the same as that of the second patient.

Accounting for Job Order Costing

The production process of any job starts with the transfer of raw materials from the stores to the production line. The raw materials include both direct and indirect raw materials. The issue



of raw materials from the stores is facilitated by presentation of a **requisition form**. This is a detailed document that gives the specifications of the materials to be issued and the job to which the materials are being charged. Entries into the accounting records are made based on the requisition form. Where a company frequently manufactures a specific product, any requisition of materials will be based on a **bill of materials** prepared for the product; this is a control sheet that shows the quantity and type of each item of material going into a completed unit. Example of a materials requisition form is as shown below:

Department: _____	No	MR617		
Job number: _____	Date: ____ / ____ / ____			
Item Code	Description	Quantity	Cost per unit	Total Cost
Authorized by: _____				
Signature: _____				

Materials requisition form

The following journal entries relate to material procurement and issue from the store to the production process.

1. **(a) Direct materials purchase**

Dr Stores ledger control A/c	X	
Cr Cash A/c		X

To record cash purchases

Dr Stores ledger control A/ c	X	
Cr Creditors A/ c - for credit purchasers		X

To record credit purchases

(b) Return of materials to suppliers

Dr Cash A/ c or creditors control A/ c	X	
Cr Stores ledger control A/ c		X

To record return of materials to suppliers

(c) Issue of materials from the store

Dr W.I.P. Control A/c X
 Cr stores ledger control A/c for direct materials. X

To record issue of direct materials from the store

Dr Factory overheads control A/ c X
 Cr Stores ledger control A/ c X

To record issue of indirect materials from the store

Labour cost is measured and accumulated in the same way as material cost. It includes both direct and indirect labour. Direct labour can be traced directly to the individual job where as indirect labour cannot or if it has to be traced, it can only be done with expenditure of great effort. Labour costs are accumulated based on the time tickets prepared by workers. The worker needs to indicate the duration of time he/she spent on a specific job or, when not assigned to a specific job, what type of indirect labour task he was assigned to and the amount of time expended on the task. Total labour costs are calculated based on the time sheets submitted at the end of the day by all the workers. An example of a time ticket is shown below:

Department: _____		Ticket No. 617	
_____		Date: ____/____/____	
Employee: _____		_____	

Started	Ended	Time Completed	Rate	Amount	Job No. or Description
Totals		xx		xx	

Signature of Employee: _____

Supervisor : _____

Signature: _____

Time ticket

Below are the journal entries passed to record direct and indirect labour.

2. (a) Direct Labor

Dr W.I.P. Control A/e X
 Cr Cash a/c X

To record direct labour Paid in cash

**7. (i) When there is over absorption of production overheads:**

Dr Factory overheads control A/c
 Cr P & L A/c

To record over absorption of production overheads

(ii) When there is under absorption of production overheads:

Dr P & L A/c
 Cr Factory overheads control A/c

To record under absorption of production overheads

8. When there are non-manufacturing overheads:

Dr P & L A/c
 Cr Non-manufacturing overheads control A/c OR

Non-manufacturing overheads/expenses are regarded as period costs & are therefore not charged To W.I.P control A/c.

Note: Overheads entries apply when there is an interlocking accounting system.

JOB Cost Account

	Shs		Shs
Direct materials issued from stock	x	Materials returned to the store	x
Direct Wages	x	Materials transferred to other jobs	x
Production overheads absorbed	x	Jobs transferred to finished goods a/c	x
Materials transferred from other jobs	x	Balance c/d	x
	<u>x</u>		<u>x</u>

Once the units being processed are completed, they are transferred to the stores. The cost of those goods is transferred from work in progress account to finished goods account. The journal entry passed to effect the same is;

4. Finished goods transferred to the store:

Dr Finished goods stock control A/c
 Cr W.I.P Control A/c

To record the transfer of finished goods to the store

>>> Illustration

The following transactions were made by Z limited in the month of December

- Direct Materials Shs.8,000 was bought on credit, out of these, materials worth Shs.5,000 were returned to the suppliers. Shs.50,000 was issued from the store
- Indirect materials issued amounted to Shs.5,000.
- Direct wages allocated to production amounted to Shs.20,000.
- Goods worth Shs.200,000 were sold.
- Finished goods worth Shs.100,000 were transferred to the store.
- The cost of goods sold was Shs.140,000.
- Unpaid indirect expenses were Shs.32,000.
- Indirect wages allocated amounted to Shs.15,000.
- Non-manufacturing overheads incurred amounted to Shs.20,000.
- Overhead expenses charged to the jobs Shs. 60,000.

Required:

- a) Prepare the stores ledger control a/c
- b) Factory overhead control a/c
- c) W.I.P a/c
- d) Costing P & L a/c

Solution

Stores ledger control account

Shs		Shs	
Balance b/f	xx	Creditor control	5,000
Creditors (material)	8000	Work in Progress	50,000
		Factory Overheads	5,000
		Balance c/f	xx
	xx		xx

**Factory Overhead cost account**

	Shs		Shs
Indirect materials	5,000	Work in progress	60,000
Creditors	32,000		
Indirect wages	15,000		
Under absorption	8,000		
	<u>60,000</u>		<u>60,000</u>

Work in Progress account

	Shs		Shs
Balance of WIP b/f	xx	Finished goods a/c (transfers)	100,000
Stores ledger (Materials)	50,000		
Creditors (Wages)	20,000	Balance of WIP c/f	xx
Overhead expenses	60,000		
	<u>xx</u>		<u>xx</u>

Costing profit and loss a/c

	Shs		Shs
Finished goods a/c (Cost of sales)	140,000	Sales	200,000
Non manufacturing overheads	20,000	Factory overhead absorption	8,000
Costing Profit c/f	48,000		
	<u>208,000</u>		<u>208,000</u>

>>> Illustration

At the start of the year, no jobs were in process. During the year, job no 2.1, 2.2 and 2.3 were started; materials were purchased at a cost of Shs.100,000. Materials worth Shs.75,000 were used of which Shs.70,000 were direct. (Shs.10,000 on job 2.1, Shs.40,000 on job 2.2 and the balance on job no.2.3). Labour costs worth Shs.250,000 were incurred of which Shs.220,000 was direct labour (Shs.80,000 on job 2.1, Shs.75,000 on job 2.2 and the balance on job 2.3). Other manufacturing overhead costs of Shs.72,800 were incurred; manufacturing overhead is applied to production on the basis of direct labour costs. Estimated manufacturing overhead for the year was Shs.100,000 and estimated direct labour cost for the year was Shs.200,000. Jobs 2.2 and 2.3 were completed with job 2.3 being sold for Shs.200,000

Required:

- Pass the necessary journal entries to record the above transactions.
- Prepare a costing profit and loss account for the period above.

Solution

	Description	Dr	Cr
1.	Materials Cash <i>To record purchase of materials</i>	100,000	100,000
2.	Work in Progress Manufacturing overheads Materials <i>To record issue of materials</i>	70,000 5,000	75,000
3.	Factory Labour Cash <i>To record labour costs incurred</i>	250,000	250,000
4.	Work in progress Manufacturing overheads Factory labour <i>To record issue of materials</i>	220,000 30,000	250,000
5.	Manufacturing overheads Cash <i>To record other manufacturing overheads</i>	72,800	72,800
6.	Work in Progress (see working below) Applied manufacturing overhead <i>To record applied overheads</i>	110,000	110,000
7	Finished goods; Job 2.2 Finished goods; job 2.3 Work in Progress <i>To record transfer of jobs to finished goods</i>	152,500 117,500	270,000
8	Cash Sales <i>To record sale of job 2.3</i>	200,000	200,000
9.	Cost of goods sold Finished goods <i>To record transfer of job 2.3 to cost of sales</i>	117,500	117,500
10.	Applied manufacturing overheads Manufacturing overheads Cost of sales <i>To record over absorbed overheads</i>	110,000	107,800 2,200

**Costing profit and loss account**

Sales			200,000
<u>Cost of goods sold</u>			
Opening stock of work in progress(WIP)		-	
Opening stock of raw materials		-	
Add: direct material cost	70,000		
Direct labour cost	220,000		
Applied overheads	<u>110,000</u>	<u>400,000</u>	
		400,000	
Less: Closing Raw materials		0	
Closing W.I.P		<u>(130,000)</u>	
Cost of goods manufactured		270,000	
Add Opening Finished goods inventory		<u>0</u>	
Goods available for sale		270,000	
Less Closing Finished goods inventory		<u>(152,500)</u>	
Cost of goods sold (<i>see note below</i>)		117,500	
Over applied overheads		<u>(2,200)</u>	
Cost of goods sold			<u>115,300</u>
Profit for the period			<u>82,500</u>

Note: The cost of goods sold as computed above is the same as computed below when various costs are accumulated as shown in the table.

Working

$$\text{Overheads absorption rate} = \frac{\text{Estimated manufacturing overheads}}{\text{Estimated direct labor cost}}$$

$$= \frac{\text{Shs.100,000}}{\text{Shs.200,000}} \times 100\%$$

$$= 50\%$$

Therefore, total manufacturing costs absorbed = 50% x total direct labour cost
 = 50% x 220,000
 = 110,000

Accumulated costs of jobs;

	Direct materials	Direct labour	Applied overheads	Total Cost
Job no 2.1	10,000	80,000	40,000	130,000
Job no 2.2	40,000	75,000	37,500	152,500
Job no 2.3	20,000	65,000	32,500	117,500

CASE STUDY

Fulcrum Lighting and Power Solutions

Fulcrum Lighting Ltd specialize in the creative design and implementation of lighting and power systems for applications ranging from live events, exhibitions and themed environments to retail outlets, bars, restaurants, leisure developments and private homes.

It is a client-focused company, which strives to exceed clients' expectations in the quality of service that it provides. The aim is to build a long-term relationship with customers, to offer personal service, and to develop and extend the effective use of lighting and power within client projects.

Fulcrum is an independent solution provider, with the ability to tap in to a global network of partnering equipment suppliers and reputable designers, project managers and engineers, to deliver innovative solutions with creative flair and technical expertise. All members of the creative team at Fulcrum bring a diverse design background to their work, including extensive theatrical, architectural, event and exhibition applications. A knowledgeable technical group, with many years experience in transforming design into reality, supports the design process with on site implementation.

Services include - Creative Lighting Design and Consultancy; Project Management, Co-ordination and Logistics; Specifying and Sourcing Equipment; Installation, Focusing and Programming, and Technical Liaison, Drawings and Support. The customer base extends to several blue chip organizations and the innovative approach that the company has is always in demand.

Richard Cross (MD) said, *"It is very difficult to find software that can cope with the full business process – planning and estimating, job purchasing, cost collection and subsequent customer invoicing. The exordia software impressed me so much that I felt it had been written specifically for our industry."*

The typical job cycle at Fulcrum starts with a request for quotation, which the engineers develop using Exordia Job Costing; in many cases deploying previously designed templates (which are simply edited) to speed the job planning and estimating process. When the customer accepts



the quotation, it is converted to a job and purchase orders are raised within the program for the procurement of bought in materials and services. Costs are collected, mainly from supplier invoices, and logged against the job. Finally, Exordia Job Costing is used to invoice the work to the customer and the details are automatically transferred to the customer files in the Sage accounting program.

“The main benefits we see are in planning and monitoring job costs,” commented Richard “we were attracted to the program by its front end and ease of use, its simplicity and affordability. We have had a multi user version in use for some time now and we are delighted with the results.”

BATCH COSTING

This is a type of job costing that is used when production consists of limited repetitive work and definite number of item manufactured in one batch. A batch is defined as a cost unit consisting of a group of identical items in particular sizes and colors of shoes, toys, spare parts, e.t.c.. The total cost incurred in production is spread on the number of units made when the batch is completed. Batch costing is not any different from job costing. The only distinction comes in when calculating unit cost. In job costing, the cost of a unit is the total cost incurred while unit cost in batch costing is equal to the total cost incurred divided by the number of units in the batch.

a) Procedures:

- Allocation of batch number
- Production order is made
- Creation of batch costs account
- Completion of the work and closure of the batch cost account
- Allocation of costs to individual units in the batch
- Determination of selling price/batch and unit.

>>> Illustrations

The budgeted variable overheads of Githurai Ltd for the year 2001 are given as below:

Department	Overhead (Shs)	Absorption base
A	150,000	15,000 direct labour hours
B	200,000	25,000 direct labour hours
C	120,000	20,000 direct labour hours
D	300,000	30,000 machine labour hours

Additional Information

- Selling and administering overheads are charged at 10% of total production costs while the profit mark up is 25% of total costs:
- An order for 2,000 units was received from a customer. The batch number of this order is 510. The following additional information in respect of this batch is provided below:
 - ◇ Direct materials - 87,000/ =
 - ◇ Direct Labor
 - Dept A (150 direct labor hrs) @ Shs.12. per hour.
 - Dept B (40 direct labor hrs) @ Shs.15 per hr
 - Dept C (60 direct labor hrs) @ Shs.20 per hr
 - Dept D (100 direct labor hrs) @ Shs.10 per hr
 - ◇ A total of 50 machine hours were used in this job

Required: Calculate:

- a) Total cost of the batch
- b) Cost/Unit
- c) Selling Price of the batch
- d) Selling Price unit

**Solution**

Using the Job Cost sheet approach, one can compute the total cost of the batch as follows

Department: _____ n _____	Batch No. 510
	Date Started: <u> n / n / n </u>
Description: _____ n _____	Date completed: <u> n / n / n </u>
Units of output: _____ 2000 _____	

Direct Materials		Direct labour			Manufacturing overheads		
Item Code	Total Cost	Ticket	Labour hrs	Total Cost	Base of absorption	Rate Per hr	Total
N	87,000	Dept A	150 @Sh12	1800	Directlabourhr	10	1500
		Dept B	40 @Sh15	600	Directlabourhr	8	320
		Dept B	60 @Sh20	1200	Directlabourhr	6	360
		Dept C	100 @Sh10	1000	50 Machine hr	10	500
Totals	87,000			4,600			2,680

Cost Summary:	
	Shs.
Direct materials	87,000
Direct Labour	4,600
Manufacturing Overheads	2,680
Total Production Cost	94,280
Selling and admin costs (10%)	9,428
Total cost of Batch	103,708

(a) Total cost of the batch Shs.103,708

(b) Cost per unit

$$= \frac{\text{Total cost of the batch}}{\text{Total no of units}} = \frac{\text{Sh.103,708}}{2,000 \text{ Units}} = \text{Shs.51.86 per unit}$$

(c) Selling price of the batch; Cost plus 25% markup

Cost of the Batch	Shs 103,708
Mark up @ 25%	<u>Shs25,927</u>
Selling Price of the Batch	<u>Shs.129,635</u>

(d) Selling price per unit

$$= \frac{\text{Selling Price of the Batch}}{\text{Total no of units}} = \frac{\text{Sh.129,635}}{2,000 \text{ Units}} = \text{Shs.64.82 per unit}$$

CONTRACT COSTING

This is a form of specific order costing that is applied to relatively large cost units, which normally take a considerable length of time to complete e.g. building or construction works. Contract jobs are undertaken in accordance with specific requirements of contractee/customer. Contracts may be distinguished from job orders by the following features:

- The money value of a contract is much larger than that of a job order.
- A contract consumes significantly larger amount of resources than a job order.
- For a contract, special progress reports are usually made while in job costing, reports are made after the completion of the job.
- For a contract, indirect costs are relatively smaller in relation to direct costs but the vice versa is true for job order.

To second the progress of contract works, a special account known as a contract account is maintained.

Contract Accounts

This is a separate account that is opened and maintained for each contract undertaken for the purpose of accumulating costs. Each contract is given a number and all costs relating to that particular contract are recorded in this account. A typical contract account is as shown below:

Contract No. XYZ Account			
Materials b/f	x	Materials returned to store	x
Materials purchased	x	Materials c/ d	x
Direct wages	x	Machinery c/ d	x
Indirect wages	x	Balance c/d: Cost of work done	x
Subcontractors fees	x		
Cost of special plant	x		
Machinery/Plant b/f	x		
	x		x
Cost of work done b/d	x	Value of work certified	x
Notional Profit	x	Cost of work done but not certified	x
	x		x



Contract Costing Terminology

Progress payments: these are interim payments made by the client to the contractor throughout the course of the work. This is mainly on expensive contracts or contracts that take a long time to complete. The basis of these payments is an architect's certificate of work satisfactorily done. The progress payment will consist of the sales value of the work carried and certified net off the retention money and payments due to date.

Architects certificate: this is a certificate that provides confirmation that work done up to a certain value has been completed. It is the basis on which the progress payments made are based.

Retention money: this is a proportion of value of work certified withheld by the customer for a specified period during which the customer must make good all contractual defects. The retention money is calculated as a percentage of the value of work certified. This amount is released after satisfactory performance under the contract.

Cost of work certified: this includes the portion of all total costs that relate to the work certified. It is also referred to as cost of sales. It is derived by determining the cost of work not certified and the balances of inputs charged to the income statement and then deducting them from the sum of the current costs and previous period costs b/f, if any, that were incurred.

It is important to determine the profit attributable to each accounting period due to the considerable time taken to complete a contract. The approach slightly contravenes the normal accounting revenue recognition principle, which requires revenue recognition at the time of sale, time of receipt of cash or on completion of production. In here, the revenue recognition on completion of production will not be appropriate especially when the contracts are long term. This is because for the year that the contract was incomplete, the profit and loss statement will not reflect a fair view of the company's profitability. It will only show the results of contracts completed before the end of the period.

The Notional Profit: this is the difference between the value of work certified to date and cost of work certified to date less a provision for any anticipated unforeseen eventualities.

Profit not taken: refers to the part of the notional profit that is not recognized in the current period. It is profit carried forward to be recognized in the years that follow.

□ Principles of profit income recognition in contracts

The concept of prudence should be applied when determining the profits or losses to be taken up on accounts.

- (i) If the contract is in its early stages, no profits should be taken until when the outcome can be measured with reasonable certainty
- (ii) Where a loss has occurred, it must be recognized in the period it has occurred regardless of the stage of maturity of the project or the timing.
- (iii) When substantial costs have been incurred on the contract but the contract is not near completion, the notional profit is apportioned using the formula in order to determine the notional profit taken.

$$\text{Profit taken} = \text{Notional profit} \times \frac{2}{3} \times \frac{\text{cash received}}{\text{work certified}}$$

- (iv) When the contract is near completion, the profit taken is calculated as:

$$\text{Profit taken} = \text{Estimated profit} \times \frac{\text{cash received}}{\text{contract price}}$$

Where Estimated profit = Contract price – Estimated total cost and
Estimated total cost = Costs incurred to date + estimated future costs.

>>> Illustration

Sasumwa Construction limited has been awarded a contract to build a house. This is a contract No 45 for the company and the contract price is Shs.2.65 million. At the end of the company's financial year, the contract was 85% complete and hence regarded as being near completion. You are also provided with the following information about the contract:

Particulars	Shs.
Materials purchased and delivered	580,000
Materials issued from store	60,000
Materials returned to stores	9,000
Site expenses	300,000
Site wages	200,000
Plant sent to site	100,000
Architect's fees	30,000
Plant returned from site	10,000
Subcontractor's fees	105,000
Head Office overheads absorbed	60,000
Valuation at the year ending disclosed the following:	Shs
Materials:	19,500
Plant on site	50,000
Work done but not yet certified	60,000

**Additional information**

- a) The portion of the work which was completed during the year and certified by the architect was assessed as representing 75% of the whole contract price. The contractee made payments to this extent less 10% retention money.
- b) The management of the company decided for the purpose of preparing the company's annual accounts to make a provision of a third of the notional profit against the possibility of defects and other contingencies arising later in respect of the work already certified for payment.

Required:

- Prepare the contract account
- Compute the amount of profit or loss to be taken to the main profit and loss account of the company.
- Compute the value of work in progress.

Contract No 45 A/ c

Materials Purchased:	580,000	Materials returned to store	7,000
Materials issued from stores	60,000	Plant returned form site	10,000
Site expenses	300,000	Materials c/ d	19,500
Site wages	200,000	Plant on site	50,000
Plant set to site	100,000		
Architects fees	30,000	Cost of work done	1,346,500
Sub-contractors	105,000		
Head office overheads	60,000		
	<u>1,435,000</u>		<u>1,435,000</u>
Cost of work done b/d	1,346,500	Value of work certified	1,987,500
Profit taken	473,175	Value of work done but not certified	60,000
Profit in suspense	227,825		
	<u>2,047,500</u>		<u>2,047,500</u>

WORKINGS

a)	Value of work certified = 75% x 2.65 million = 1.9875 million										
b)	Notional Profit = Value of work Done less Cost of work done = value of work certified + value of work done but not certified - Cost of work done = 1,987,500 + 60,000 - 1,346,500 = Shs.701,000										
c)	Cash received = value of work certified less retention money = 90% x 1.9875 Million = Shs.1,788,750										
d)	Profit taken = Notional Profit x $\frac{\text{Cash received}}{\text{Contract Price}}$ = Shs.701,000 x $\frac{1,788,750}{2,650,000}$ = Shs.473,175 (Contract near completion thus we use the 2 nd formula)										
e)	Profit in Suspense = Shs(701,000 – 473,175) = Shs.227,825										
f)	Value of work in Progress <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Cost of work certified</td> <td style="text-align: right;">1,346,500</td> </tr> <tr> <td>Add: Profit taken</td> <td style="text-align: right;"><u>473,175</u></td> </tr> <tr> <td></td> <td style="text-align: right;">1,819,675</td> </tr> <tr> <td>Less cash received</td> <td style="text-align: right;"><u>(1,788,750)</u></td> </tr> <tr> <td>Work in Progress valuation</td> <td style="text-align: right;"><u><u>30,925</u></u></td> </tr> </table>	Cost of work certified	1,346,500	Add: Profit taken	<u>473,175</u>		1,819,675	Less cash received	<u>(1,788,750)</u>	Work in Progress valuation	<u><u>30,925</u></u>
Cost of work certified	1,346,500										
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	1,819,675										
Less cash received	<u>(1,788,750)</u>										
Work in Progress valuation	<u><u>30,925</u></u>										



PROCESS COSTING

Fast forward;

Process costing is applied where there are standard operations with continuous production of homogeneous and identical units.

This is a costing method that is applied where there are standard operations with continuous production of homogeneous and identical units. Products are produced in the same manner and consume the same amount of material and labour. The output is the final product of a sequence of operations. In this type of costing, costs are accumulated on the basis of process, and individual units of output are thus assigned the average cost per unit. The cost per unit is arrived at by dividing the total process costs by the number of input of the next process and further materials can be added at each stage production. Therefore, cost per unit for the second and subsequent processes is a cumulative cost. For example, the cost per unit for the output transferred from process 2 is the cost of production for both process 1 and 2 and not for process 2 above.

Production moves from one department (or production process) to the next until the final product is obtained. The output of department I becomes the input of department II and the output of department II the input of department III and so on until the completion of production in the last department where the output is transferred to finished goods. The fact that the output for the first process becomes the input for the next process means that the process costing procedure strives to maintain the cost of each process product and charge that with the first process. The aim is to transfer the cost accumulated in the first process to the next process. Cost accumulation procedure follows the production flow where control accounts are maintained for each production department or process and costs assigned to each department or process. Costs are transferred with production as the latter moves from process to process. This is illustrated below:

Process I			
	Shs		Shs
Direct materials	1,000	Transferred to process 2	3,000
Direct labour	500		
Overheads	1,500		
	<u>3,000</u>		<u>3,000</u>
Process II			
	Shs		Shs
Transfer from Process I	3,000	Transfer to finished goods	6,000
Direct materials	1,500		
Direct labour	1,000		
Overheads	500		
	<u>6,000</u>		<u>6,000</u>

A process costing system is used in those industries where masses of similar products or services are produced or where individual jobs undertaken are passed through a number of departments or worked on in one location with materials, labour and other requirements brought to that location. Cost accumulation and analysis should be tailored to ensure that effective controls are procedures in operation, which are suited to the nature of an industry.

Process Costing Procedure

The production factory is divided into a number of processes.

- An account is opened and maintained for each process.
- Each process account is debited with materials, labor, direct expenses and overheads apportioned to the process.
- The good output of a process is transferred as input to the next process. At the end of the period, the products will include various items. These are normal loss, abnormal loss, finished goods (or output to the next process) and work in progress.
- The finished output of the last process is transferred to the finished goods account.

VALUATION OF WORK IN PROGRESS

The concept of equivalent units

This is a notional quantity of completed goods in the production process. It is a collection of work application (direct materials, direct labor and overheads) necessary to produce one complete unit of output. They are the number of units that would have been produced during a period if all the departments' efforts had resulted into completed units.

The concept is used for purposes of translating the partially completed production into its completed unit equivalent. This enables cost accountants to value the work-in-progress in an objective, consistent, reliable manner.

Equivalent units are a number of fully completed units considered to be equivalent to a greater number of partially completed units. The equivalent unit cost of manufacturing an item equals the total cost divided by the equivalent units

**>>> Illustration 1**

Suppose there are 4,000 units of a product in ending inventory out of which 60% are fully complete, whereas the remaining are 70% complete. What are the equivalent units of the product?

Solution:

$60\% \times 4,000 = 2,400$ units fully complete

$40\% \times 4,000 = 1,600$ units partially completed. The equivalent units are calculated as;

$1,600 \times 70\% = 1,120$ units –Equivalent units.

Total equivalent units = $2,400 + 1,120 = 3,520$ units

Assume we had total process costs of Shs.7,040, then each unit would cost $\text{Shs.}7,040 / 3,520 = \text{Shs.}2$

>>> Illustration 2

Material A is added at the beginning of a production process. Labor and overheads are added continuously during the production process. At the end of the process, 10,000 units were complete and 2,000 units were 60% complete as per labor and overheads. The cost of raw materials used during the period amounted to Shs.220,000, labor Shs.150,000 and overheads Shs.74,000. There was no opening inventory.

Required:

Determine the cost per unit of both the completed units, and the units in the ending inventory.

Solution:

	Physical Units	Materials	Conversion
Completed	10,000	10,000	10,000
Ending Inventory	<u>2,000</u>	2,000	1,200
	<u>12,000</u>		
Equivalent Units		<u>12,000</u>	<u>11,200</u>
Cost per period		220,000	224,000
Cost per equivalent unit			=Shs.20
= Cost per period		= 220,000	= 224,000
Equivalent units		12,000	11,200
		Equivalent units	Equivalent units

In the above illustrations, there is no opening work in process. When it exists, we need to adopt a method of valuing it and incorporating it into the process accounts.

The two main methods used for purposes of valuing the opening work in progress have:

- (a) Weighted Average Method
- (b) First In First Out (FIFO) Method.

Using these methods enables the cost of the opening work in progress to be appropriately assigned to the finished goods and the closing work in process.

a) Weighted Average Method (WAM)

When this method is used, all costs of production are considered in assigning costs to inventory. The method puts together opening work in process inventory costs and cost of production. It mixes the costs of previous period with those of current period in determining costs per unit.

Under this method, equivalent units are calculated as follows:

- Equivalent Units = Units completed and Transferred + Ending WIP inventory: (% completion)
- Total Costs considered = Previous Period costs + Current period costs
- Cost per equivalent =
$$\frac{\text{Previous period costs} + \text{Current period costs}}{\text{Units completed and transfered} + (\text{Ending WIP} \times \% \text{ Completion})}$$

Under WAM approach, we do not distinguish the “units started and completed in the current period” from the ‘units completed and transferred’ and the ‘Ending working period’

b) First In First Out (FIFO)

This method considers only those costs incurred during the current period. Equivalent units are calculated as follows:

- Equivalent Units = Units completed and transferred + (Units in ending W.I.P x % of completion Units in beginning)
- Total Costs considered = Previous Period costs + Current period costs
- Cost per equivalent unit =
$$\frac{\text{Current period costs}}{\text{Units completed and transfered} + (\text{Ending WIP} \times \% \text{ Completion}) + \text{Starting WIP}}$$



Carefully note that FIFO distinguishes the “units started and completed in the current period” from the units completed and transferred. This is done by subtracting the “beginning W.I.P.” from the “units completed and transferred” and “the ending work in process”.

>>> Illustration

The following work in progress account relates to the blending department of ABC Limited, a soft-drinks company for the month of January 1999. Raw materials were introduced at the start of the work while labour and overheads were incurred through-out the blending process.

Blending Department: W.I.P A/ C

<i>Particulars</i>	Litres	Shs	<i>Particulars</i>	Litres	Shs
Balance b/f (4/5)	5,000	65,000			
Direct materials	30,000	125,000	Completed and Transferred out	29,000	?
Direct labour added		145,000	Ending WIP (2/3)	6,000	?
Overheads		201,000			
		<u>536,000</u>			<u>536,000</u>

Additional Information

1. Beginning W.I.P. consists of the following:
 - (a) Raw materials 15,000
 - (b) Direct labour 20,000
 - (c) Factory overheads 30,000

Required

Calculate cost/equivalent units using:

- a) Weighted Average Method (WAM)
- b) First in First out (FIFO) method

Solution

WAM

(i) Summary of the flow of units

	Total physical units	Materials	Conversion
Transferred out	29,000	29,000	29,000
Work in progress	<u>6,000</u>	<u>6,000</u>	(2/3 x 6,000) = <u>4,000</u>
	<u>35,000</u>	<u>35,000</u>	<u>33,000</u>

(ii)

Process costs

In the beginning inventory	15,000	50,000
Current costs	<u>125,000</u>	<u>346,000</u>
	<u>140,000</u>	<u>396,000</u>
	$\frac{\text{Shs.140,000}}{35,000 \text{ Units}} = \text{Shs.4 per unit}$	$\frac{\text{Shs.396,000}}{33,000 \text{ Units}} = \text{Shs.12 per unit}$

(iii)

Cost per equivalent unit

(iv) Total cost per equivalent unit = Shs(4 + 12) per unit

FIFO**(i) Summary of the flow of units**

	Total physical units	Materials	Conversion
Beginning WIP inventory	5,000	-	(1/5 x 5,000) = 1,000
Started and completed in the current period	24,000	24,000	24,000
Ending WIP	<u>6,000</u>	<u>6,000</u>	(2/3 x 6,000) = <u>4,000</u>
Equivalent units	<u>35,000</u>	<u>30,000</u>	<u>29,000</u>

(ii)

Process costs

Current costs	<u>125,000</u>	<u>346,000</u>
<i>(only current costs are considered)</i>		

(iii)

Cost per equivalent unit

$\frac{\text{Shs.125,000}}{30,000 \text{ Units}} = \text{Shs.4 per unit}$	$\frac{\text{Shs.346,000}}{29,000 \text{ Units}} = \text{Shs.11.9310 per unit}$
---	---



- (iv) Total cost per equivalent unit = Shs(4.00 + 11.9310) per unit
= Shs 15.931

PROCESS COST REPORT

Set of three schedules that help managers track and analyze costs in a process costing system; it consists of the schedule of equivalent production, the unit cost analysis schedule, and the cost summary schedule. This statement traces the flow of units produced and costs incurred in the production process. The report is prepared for each process and it provides a reconciliation of the physical flow of units and the total costs for the period. Assuming no spoilage or losses, the following relationships will always hold:

- 1. Physical Units:**
Beginning W.LP + Units started - Units to account for the period.
= Units completed and transferred + Ending work in progress - Units accounted for.
- 2. Costs:**
Cost of Beginning W.I.P. + Current costs incurred - Costs to account for = Costs of units completed and transferred



Steps in preparing process costing statement

(1) FIFO Method

- (a) Physical flow of units;** this identifies the units to be accounted for (units in beginning WIP inventory plus the units started during the period) and the units accounted for (the units completed during the current period plus the units in the ending WIP)
- (b) Equivalent units of production:** the common denominator for completed units and partially completed units are computed by multiplying the units accounted for by their percentage of completion by each category of costs i.e. material cost (100%), labour cost, e.t.c. (75%).
- (c) Costs to be accounted for:** total costs to be accounted for (the cost of units in the beginning WIP plus the costs added to production during the current period) are identified for each category of costs.
- (d) Cost per equivalent unit of production:** these are computed by dividing the costs to be accounted for by the total equivalent units of production.
- (e) Costs accounted for (Cost allocation):** total costs to be accounted for are allocated for each category of costs to the units accounted for by multiplying the equivalent units of production by the cost per equivalent unit of production.

1) Weighted Average Method (WAM)

- (a) **Physical flow of units;** the WAM does not keep the beginning inventory units separate from the units that were started and completed during the period
- (b) **Equivalent units of production:** in computing equivalent units of production, the WAM does not keep the percentage of completion performed in the prior period separate from the percentage of completion performed in the current period.
- (c) **Costs to be accounted for:** in identifying costs to be accounted for, the WAM does not keep the costs of the units in the beginning inventory at the start of the current period separate from the costs added to the production during the current period
- (d) **Cost per equivalent unit of production:** these are computed by dividing the costs to be accounted for by the total equivalent units of production
- (e) **Costs accounted for (Cost allocation):** total costs to be accounted are allocated for each category of costs to the units accounted for by multiplying the equivalent units of production by the cost per equivalent unit of production. The WAM does not keep the cost of the units in beginning WIP separate from the costs added to production during the current period.

>>> Example

Assume that the beginning work in progress in Maendeleo Company Ltd in the month of November was 1,000 units which were 100% complete in terms of materials and 75% complete as to conversion. Raw materials costs relating to beginning work in progress amounted to shs.3,000 and conversion was Shs.1,000. Some 10,000 units were completed during the period and transferred to finished goods stock a/c. Some 2,000 units were still in process and were 100% complete in relation to materials and 50% complete in relation to conversion costs. Costs incurred during the period for raw materials Shs.33,000, conversion Shs.43,000;

Required

Use both weighted average and FIFO methods, to determine cost per equivalent unit and value of ending inventory. Prepare the process cost report.

MAENDELEO COMPANY LIMITED.

PROCESS COST REPORT

WAM

1. Physical flow of units

Units in beginning work in process	1,000
Units started during the period	<u>11,000</u>
Units to account for	<u>12,000</u>
Units completed and transferred out	10,000
Units in ending work in process	<u>2,000</u>
Units accounted for	<u>12,000</u>



Note that the totals are the same. There are no units lost as normal loss or abnormal losses.

2. Computation of equivalent units

	Total	Materials	Conversion
Units completed and transferred out	10,000	10,000	10,000
Units in the ending work in process	<u>2,000</u>	<u>2,000</u>	<u>1,000</u>
Equivalent units	<u>12,000</u>	<u>12,000</u>	<u>11,000</u>

3. Summary of flow of costs (costs to be accounted for)

	Total	Materials	Conversion
Costs relating to beginning WIP b/f	4,000	3,000	1,000
Current costs		<u>33,000</u>	<u>43,000</u>
		<u>36,000</u>	<u>44,000</u>

4. Equivalent cost per unit

Total	Materials	Conversion
Shs.7	<u>Shs.36,000</u>	<u>Shs.44,000</u>
	12,000 Units	11,000 Unis
	= Shs 3 per eq.unit	= Shs 4 per eq.unit

5. Cost Summary Schedule

	Total	Materials	Conversion
Units started and completed	70,000	30000	40000
Units in the ending work in process	10,000	6,000	4,000

FIFO method

1. Summary of flow of physical units

Beginning work in process	1,000
Units started and completed	9,000
Ending WIP	<u>2,000</u>
Total units	<u>12,000</u>

2. Computation of equivalent units

	Total	Materials	Conversion
Beginning WIP	1,000	0	250
Started and completed			
(current period)	9,000	9,000	9,000
Ending WIP	<u>2,000</u>	<u>2,000</u>	<u>1,000</u>
Equivalent units	<u>12,000</u>	<u>11,000</u>	<u>10,250</u>

3. Summary of flow of costs

	Total	Materials	Conversion
Current costs only	76,000	33,000	43,000

4. Equivalent cost per unit

Total	Materials	Conversion
Shs.33,000	Shs.43,000	
11,000 Units	10,250 Units	
= Shs.3 per eq.unit	= Shs.4.195 per eq. unit	

5. Cost summary schedule

	Total	Materials	Conversion
Units completed and transferred out			
Beginning WIP (completed)	1,048.75	0	1,048.75
Started and completed	64,755.00	27,000	37,755.00
Ending WIP	10195	6000	4195
	<u>75998</u>	<u>33.000</u>	<u>42998</u>
Opening WIP-previous cost			4000

PROCESS LOSSES

Fast forward:

The amount input in a process is not always equivalent to the output. Ordinarily, it may vary due to process losses such as evaporation, spoilage and by products.

Most manufacturing processes result in some portion of the raw materials used not being converted into a reliable half hence losses. These losses may take the form of waste, scrap, rework, and spoilt units.

- **Waste:** are materials lost in the process, which are irrecoverable or have no recoverable value. The term also refers to discarded substances having no value and is disposed off
- **Scrap:** Material held after a productive process, which are irrecoverable or have no recoverable value. The term also refers to discarded materials, which have some recoverable value which is usually either disposed off without further treatment, or reintroduced into the production process in place of the raw materials. Scrap are process losses that can be sold for some small value.
- **Rework:** These are finished goods that do not meet quality standards but which with some additional work can be sold.



- **Loss:** Refers to finished or partially finished units, which cannot be reworked or used for their intended purpose. They may be discarded or sold for minimal value. There are two types of spoilage;
 - i. **Normal Loss:** is loss expected and unavoidable even under the most efficient systems of production. Normal spoilage cost is normally included in product cost.
 - ii. **Abnormal Spoilage:** This is loss that is avoidable with efficient operating conditions.

The cost is regarded as controllable and can be eradicated if due diligence and supervision are exercised. The cost is normally treated as a loss and charged to profit and loss account.

ACCOUNTING TREATMENT OF SPOILAGE COSTS

Normal Spoilage Costs:

Normal losses are unavoidable costs that are expected to occur under efficient operating conditions. They are inherent in the production process and cannot be eliminated or controlled. The level of normal loss selected as being the standard for the period under review is based on various factors such as past experience, quality control records from the past periods and industry norms. These costs are assigned to the good output using two approaches;

- (a) **Recognition and Re-Assignment Approach** In this approach, the normal spoilage is included in the equivalent units computation; further, the normally spoiled units will be assigned costs just like any other unit. The spoilage costs will then be reallocated to these good units that have passed the inspection point. The steps to follow under this method are:
- i) Compute equivalent units including normal spoilage.
 - ii) Assign costs to all units including normal spoilage.
 - iii) Reassign normal spoilage costs to good output.

>>> Illustration

ABC plc produces and sells a certain type of insecticide, YMX. In the year just ended, ABC material input into production process I was 2000 units at Shs.10 per unit. Labour costs incurred amounted to Shs.30,000 while overhead costs absorbed amounted to 20,000. The normal loss in the process is 5%. Compute the cost of spoilage and the cost per unit of output transferred to process II after reassigning the normal loss costs.

Solution

(The process I account will help us solve the problem)

Process I Account					
Materials	2,000	20,000	Transferred to process II	1,900	66,500
Labour cost		30,000	Normal loss (5%)	100	3,500
Overhead cost		20,000			
		70,000			70,000

Cost per unit = Shs.70,000/2,000 units = Shs.35 per unit

Reassigning of costs to the good units

= 3500/1900 per good unit = Shs.1.84 (2.d.p)

Therefore, cost per good unit shall be Shs (35 + 1.84) = Shs.36.84

(b) Omission Approach: Under this approach, the normally spoilt units are not included in the calculation of equivalent units. This means that the cost of the normally spoilt units will automatically be distributed to the good output. By excluding the normal spoilage in the computation to the good output, a lower figure will be derived. This is the most commonly used method of accounting for normal losses. The weaknesses of this method are;

- i) The cost of normal spoilage is spread equally into the finished goods and the ending W.I.P regardless of whether the ending W.I.P. has passed the inspection stage or not.
- ii) It does not allow the manager to see the costs of spoilage because these costs are not computed.

Using the illustration above**Solution**

The process I account will appear as follows

Process I Account					
	Units	Shs		Units	Shs
Materials	2,000	20,000	Normal loss (5%)	100	-
Labour cost		30,000	Transferred to process II	1,900	70,000
Overhead cost		20,000			
		70,000			70,000



The cost per unit of the good units shall be computed using the formula given below

$$\text{Cost per unit} = \frac{\text{Total accumulated cost}}{\text{Expected output}}$$

Expected output = Total input (units) – Normal loss (Units)

Thus the cost per unit of production transferred shall be

$$= \text{Cost per unit} = \frac{\text{Shs.70,000}}{95\% \times 20,000 \text{ units}} = \text{Shs.36.84}$$

The situation above exists where normal loss with no scrap value exists. There are instances where the normal loss will have a scrap value. For instance, in the Jua Kali industry, the metal scraps may be used to mend patches or be sold out for some other use. In this case, the revenue obtained from the sale of scrap is offset against costs incurred in the production process to arrive at the total costs to be allocated to each unit. In accounting terms, the cashbook is debited with the amount received from the sale of scrap and the process account is credited with the equivalent.

>>> Illustration

Assume that the normal loss output of process I could be sold as manure at Shs.5 per unit. Calculate the new cost per unit of production transferred to Process II.

Solution:

Using approach (b) the process I account would appear as follows.

Process I Account					
	Units	Shs		Units	Shs
Materials	2,000	20,000	Normal loss (5%)	100	500
Labour cost		30,000	Transferred to process II	1,900	69500
Overhead cost		20,000			
		70,000			70,000

$$\text{Cost per unit} = \frac{\text{Total accumulated cost} - \text{Scrap value of normal loss}}{\text{Expected output}}$$

The modified formula used to incorporate the above will be

$$\text{Cost per unit transferred} = \frac{\text{Shs (70,000 - 500)}}{(2,000 - 100) \text{ Units}} = \text{Shs.36.48}$$

ABNORMAL SPOILAGE COSTS

These costs do not add any production benefit to the company and are treated as accounting losses. They are controllable losses which are not expected to occur under efficient operating conditions e.g. improper mixing of ingredients, omission of some important chemical in the manufacture of a product, e.t.c.. Abnormal losses are considered to result from production inefficiencies that should be eliminated and are not an inherent part of the production process. The cost of abnormal spoilage not included in the process cost nor included in inventory valuation but reported separately as abnormal is written off directly as losses for the period in which it occurs.

Abnormal losses, just as normal losses, may or may not have a scrap value. Abnormal loss with or without scrap value is treated in a similar way in the process account. The sales revenue received from sale of abnormal loss units is offset against the cost of abnormal loss in the abnormal loss account to arrive at the net abnormal loss that shall be charged to the profit and loss account in the period in which it arises.

>>> Illustration

Maybud Ltd operates Process X which creates two Product A. There is no work in progress. The following information relates to Process X for last month:

- (i) 80,000 litres of raw materials with a total cost of Shs158,800 were input into the process and conversion costs were Shs133,000.
- (ii) A normal process loss of 5% of the input was expected. An actual loss of 5,500 litres was identified at the end of the process.

Required:

- (a) Prepare the Process X account for last month showing the amount of abnormal loss.
- (b) Assuming that losses have a realizable value of Shs.1 per unit, calculate the loss to be charged to the Profit and loss account in the period. Show the process account as it would appear.

Solution

(a)

Step 1:

Physical flow of units

Units in beginning WIP	0
Started during the period	80,000
Units to be accounted for	<u>80,000</u>
Units in ending WIP	0
Normal loss (5%)	4,000
Abnormal loss	1,500
Units transferred out	<u>74,500</u>
Units accounted for	<u>80,000</u>

**Step 2: Calculation of Cost per unit**

$$\begin{aligned} \text{Cost per unit} &= \frac{\text{Total accumulated cost}}{\text{Expected output}} \\ &= \frac{\text{Shs.291,800}}{95\% \times 80,000} = \frac{\text{Shs.291,800}}{76,000 \text{ units}} = \text{Shs.3.84} \end{aligned}$$

Step 3: Process Account

Department 2 Process Account					
Raw materials	80,000	158,800	Normal loss	4,000	0
Conversion cost		133,000	Abnormal loss @Shs3.84	1,500	5,759
			Units transferred out	74,500	286,041
		291,800			291,800

(b)

Abnormal loss to be charged to the Profit and loss account shall be net of the revenue received. However, the cost per unit transferred shall change because the normal loss at this point has a value which shall be offset against the total costs in computing the unit cost.

$$\begin{aligned} \text{Cost per unit} &= \frac{\text{Total accumulated cost} - \text{Scrap value of normal loss}}{\text{Expected output}} \\ &= \frac{\text{Shs.291,800} - 4000}{95\% \times 80,000} = \frac{\text{Shs.287,800}}{76,000 \text{ unit}} = \text{Shs.3.79 (Actual cost = Shs3.786842)} \\ \text{Abnormal loss shall be} &= \text{Shs.3.7868} \times 1500 \text{ units} = \text{Shs5,680} \end{aligned}$$

Amount charged to the P&L Account = Shs(5,680 – 1500 x 1) = Shs4,180

The Process account will appear as follows

Department 2 Process Account					
Raw materials	80,000	158,800	Normal loss @ Shs1	4,000	4,000
Conversion cost		133,000	Abnormal loss @Shs3.79	1,500	5,680
			Units transferred out	74,500	282,120
		291,800			291,800

>>> Illustration

Mombasa Limited manufactures a product through two departments. The following is the data in respect of department 2 for the month of January:

Beginning W.I.P. (25% complete as to conversion):	10,000 units
Costs for beginning W.I.P	
Transferred in	Shs.82,900
Conversion costs	Shs.42,000
Units started in the current period.	70,000 units
Current costs: Transferred in	Shs.645,100
Conversion	Shs.612,500
Additional Materials* s	Shs651,000
Units completed and transferred:	50,000 units
Units in ending W.I.P (95% complete as to conversion)	20,000 Units
Spoilt Units	10,000 Units

Additional Information

- Normal spoilage is 10% of all good units that pass inspection
- Inspection occurs when production is 80% complete.
- Conversion costs are incurred evenly through-out the process.
- Additional materials* are added after units pass the inspection point

Required

Prepare a process cost report using

Weighted Average (Omission Method)

Apply both the recognition and re-assignment and the omission approach in dealing with the spoilage.

**Solution**

Mombasa Limited
Process Cost Report for department 2
Weighted average Approach (Omission Method)

Physical flow of units

Beginning WIP (units)	10,000
Units started during the period	<u>70,000</u>
Units to account for	<u>80,000</u>
Units completed during the period	50,000
Ending WIP (units)	20,000
Normal loss	7,000
Abnormal loss	<u>3,000</u>
Units accounted for	<u>80,000</u>

Calculation of equivalent units

	Total	Transferred	Materials	Conversion
Units completed and transferred	50,000	50,000	50,000	50,000
Units in Ending WIP	20,000	20,000	20,000	19,000
Abnormal loss (80% Conversion)	<u>3,000</u>	<u>3,000</u>	<u>0</u>	<u>2,400</u>
Equivalent units	<u>73,000</u>	<u>73,000</u>	<u>70,000</u>	<u>71,400</u>

Summary flow of costs

	Total	Transferred	Materials	Conversion
Costs b/f Beginning WIP	124,900	82,900	0	42,000
Current costs	1,908,600	645,100	651,000	612,500
Equivalent units	<u>2,033,500</u>	<u>728,000</u>	<u>651,000</u>	<u>654,500</u>

Equivalent cost per unit

	Total	Transferred	Materials	Conversion
	Shs.728,000	Shs.651,000	Shs.654,500	
	73,000 Units	70,000 Units	71,400 Units	
Equivalent Cost per unit	= Shs.9.97	= Shs.9.30	= Shs.9.167	

Cost assignment

	Total	Transferred	Materials	Conversion
Finished goods	<u>1,421,850</u>	<u>498,500</u>	<u>465,000</u>	<u>458,350</u>
Ending WIP				
Transferred	199,400	199,400		
Materials	186,000		186,000	
Conversion	<u>174,173</u>			<u>174,173</u>
	<u>559,573</u>	<u>199,400</u>	<u>186,000</u>	<u>174,173</u>
Abnormal spoilage				
Transferred	29,910	29,910		
Materials	0		0	
Conversion	<u>22,001</u>			<u>22,001</u>
	<u>51,911</u>	<u>29,910</u>	<u>0</u>	<u>22,001</u>
Total costs accounted for	<u>2,033,334</u>	<u>727,810</u>	<u>651,000</u>	<u>654,524</u>

SHRINKAGE

This refers to a loss or disappearance of material inputs used during the production process. It occurs mainly through the evaporation. This is unlike spoilage in which the units are still existing only that they will be of a lower value than the good units. Shrinking is common in chemical mixtures, which produce or use liquid gases as material inputs. **The problem associated with shrinking is the reconciliation of the beginning and ending inventory.** This problem is resolved by expressing the various layers of production in terms of what its weights or volume would be either at the beginning or end of the process.

>>> Illustration

Assume that a chemical company, which is processing one of its products through one of its processes, must start with 100kg of a certain chemical for its 80kg of finished products. Assume that all the chemical is added at the beginning of the process and 20% of the evaporation takes place gradually through-out the process. The actual weights through measurement were as follows:

<u>Units</u>	
Beginning W.I.P Inventory (75%complete)	21,250kg
Units started	110,000kg
Finished Goods Transferred	80,000kg
Ending W.LP (25%)	33,250kg
<u>Costs:</u>	<u>Shs</u>
Beginning W.I.P:	100,000
Current Conversion Costs:	252,000
Current Material Costs:	220,000

Prepare cost report:

- Using the FIFO method
- Using ending weight
- Using beginning weights

Solution

For beginning W.I.P: actual weight - 21250kg, only $20\% \times 75\% = 15\%$ evaporation will have occurred. Therefore, beginning weight (without evaporation).

$$= 21,250 \times \frac{100}{85}$$

$$= 25,000\text{kg}$$

The 21,250kg of beginning WIP are equivalent to 85% of the input and 5% above the expected output. The actual output expected is 80% of the input (units). However, the units are only 75%



complete. Therefore, 20% evaporation on the 75% complete units in beginning inventory has already occurred. The remaining 20% on the 25% to be processed is yet to evaporate.

Thus evaporation should be 25,000kg (75%complete) at 20% evaporation.

$$=25,000\text{kg} \times 75\% \times 20\% = 3,750 \text{ kg}$$

For ending W.LP., we have 33,250kg actual weight (25% complete).

By 25% completion, 20% (25%) = 5% evaporation will have occurred. Therefore, the ending Weight without evaporation = $\frac{33,250}{95\%} \times 100\% = 35,000 \text{ kg}$

Thus evaporation should be: 35,00kg (25% complete) at 20% evaporation.

PROCESS COST REPORT

FIFO Method:

Assuming beginning weights

	Physical units	Materials	Conversion
Beginning WIP	25,000	0	0
Units started	<u>110,000</u>		
Units to account for	<u>135,000</u>		
Beginning WIP (to complete)	25,000		(25%) 6,250
Units Started & completed	75,000	75,000	75,000
Ending WIP	<u>35,000</u>	<u>35,000</u>	(25%) <u>8,750</u>
	<u>135,000</u>	<u>110,000</u>	<u>90,000</u>

Cost statement

	Total cost	Materials	Conversion
Beginning WIP	100,000		
Current costs	<u>472,000</u>	<u>220,000</u>	<u>252,000</u>
Costs to account for	<u>572,000</u>	<u>220,000</u>	<u>252,000</u>
Cost per equivalent unit	4.80	Shs2.00	Shs2.80

Cost assignment

Units started and completed	75,000 x shs4.80		360,000
Ending WIP			
Materials	35,000 x Shs2.00	70,000	
Conversion	8,750 x Shs2.80	<u>24,500</u>	94,500
Beginning WIP	Process cost b/f	100,000	
Conversion	6,250 x Shs.2.80	<u>17,500</u>	<u>117,500</u>
Costs accounted for			<u>572,000</u>

Using ending weights

	Start		End
Beginning WIP	25,000	80%	20,000
Units Started	110,000	80%	88,000
Finished goods	100,000	80%	80,000
Closing WIP	35,000	80%	28,000

	Physical units	Materials	Conversion
Beginning WIP	$\left(\frac{21,250 \times 80\%}{0.85} \right)$ 20,000		
Units started	$(110,000 \times 80\%)$		
Units to account for	<u>108,000</u>		
Finished goods	80,000	80,000	80,000
Ending WIP	<u>28,000</u>	<u>28,000</u> (25% x 28,000)	<u>7,000</u>
	<u>108,000</u>		
Equivalent units		108,000	87,000
Less work done previously (75% of Beginning WIP)		<u>20,000</u>	<u>15,000</u>
		<u>88,000</u>	<u>72,000</u>

Summary of costs

	Total cost	Materials	Conversion
Beginning WIP	100,000		
Current cost	<u>472,000</u>	<u>220,000</u>	<u>252,000</u>
	<u>572,000</u>	<u>220,000</u>	<u>252,000</u>

Cost per equivalent unit

<u>Shs.220,000</u>	<u>Shs.252,000</u>
88,000	72,000
= Shs.2.50	Shs.3.50

CASES OF ABNORMAL GAINS

In some instances, the actual output may be greater than expected or, put in other words, actual loss less than normal or expected. In such circumstances, abnormal gains are considered to have arisen.

The main objective of preparing the process account is to determine the cost per unit of expected output (Normal output).

In a case where abnormal gains have no scrap value, (i.e. where if scrapped would not have a value) the cost per expected output

$$= \frac{\text{Input cost}}{\text{Expected output}}$$

**>>> Illustration**

BNY produces and sells an insecticide X. The following data relates to process II for the period just ended;

	Units	Shs
Beginning WIP	0	0
Transferred in from Process I	14,500	500,000
Additional Materials	5,000	100,000
Conversion Costs		200,000
Transferred to process III	9,900	

Normal loss in process II is usually 5% of the input

Required:

- Determine the cost per unit of unit transferred to department III
- Prepare the process account as it would appear clearly showing the abnormal loss or gain, if any
- Assuming that the spoilt units can be sold to a farmer at Shs.10 per unit, prepare the process account as it would appear in the books of BNY

Solution

- Cost per unit of transferred units = $\frac{\text{Input cost}}{\text{Expected output}} = \frac{800,000}{95\% \times 15,000} = \text{Shs.}56.103$
-

Process 2 Account					
	Units	Shs		Units	Shs
Transferred from Process I	10,000	500,000	Normal loss	750	0
Raw materials	5,000	100,000			
Conversion cost		200,000	Units transferred out	14,500	814,035
Abnormal gain	250	14,035			
		814,035			814,035

- Assuming a scrap value of Shs10 per spoilt unit
 Cost per unit of transferred units = $\frac{\text{Input cost} - \text{Scrap value of Normal loss}}{\text{Expected output}}$

$$= \frac{800,000 - (10 \times 5\% \times 15,000)}{95\% \times 15,000}$$

$$= \text{Shs.}55.61404$$

Process 2 Account					
	Units	Shs		Units	Shs
Transferred from Process 1	10,000	500,000	Normal loss @ Shs10	750	7,500
Raw materials	5,000	100,000			
Conversion cost		200,000	Units transferred out @55.61404	14,500	806,404
Abnormal gain @ 55.61404	250	13,904			
		813,904			813,904

ALLOCATION OF JOINT COSTS

When two or more products of relatively high value emerge simultaneously from a single process, each of which has significant value relative to the others up to the point of separation, they are called **Joint products e.g.** milk products and oil products. The process that gives rise to these products is called a joint process and the costs involved are referred to as joint product costs. **Joint costs** are production costs incurred by the firm when two or more outputs are jointly produced. Joint costs and joint production can arise from either an interdependent production process or the presence of allocatable fixed factors. Any costs beyond the split off point are referred to as **Separable costs**. Examples include milk products (cheese, butter, fat free milk e.t.c.) and oil products (gas, petrol, diesel, kerosene, paraffin and tar)

Problems in accounting for joint costs

Joint products are not separately identifiable as individual products until their split off point. **Split-off point** is the point at which joint products become separate entities or are individually identifiable.

Costs incurred prior to the separation or split off point are common costs thus the problems are:

- (i) How common costs should be apportioned between products in order to value closing stock and to cost the product cost for sale and determination of profits.
- (ii) Whether it is more profitable to sell a joint product at one stage of processing or to process the product further and sell it at a later stage.

To deal with the above problems, various methods are used to allocate the joint costs. Allocation of joint costs involves assigning the costs of the joint process to the products emerging at the split off point.



Methods Used to Allocate Joint Costs

- (a) Physical/Unit Measure
- (b) Constant gross margin rate
- (c) Net realizable value.

1) Physical Measure/Unit

Joint costs are allocated to the joint products based on their relative physical measure (such as volume, weight, e.t.c.)

>>> Illustration

AMC plc incurred joint costs of Shs.2,400 in manufacturing Product A and Product B to the split-off point; Product A weighed 700 kg and had a sales value at the split-off point of Shs1,800; Product B weighed 300kg and had a sales value at the split-off point of Shs.1,200 Cost Allocation:

Required: Using the physical measure /unit approach, calculate the cost allocated to products A and B. Prepare the income statement for the period

Product A	= $700 / (700 + 300) \times 2,400$	1,680
Product B	= $300 / 1,000 \times 2,400$	<u>720</u>
		<u>2,400</u>

Income Statement:

	Product A	Product B	Total
Sales	1,800	1,200	3,000
Cost of Goods Sold	<u>(1,680)</u>	<u>(720)</u>	<u>(2,400)</u>
Gross Margin	<u>120</u>	<u>480</u>	<u>600</u>

Gross Margin %:

$$\begin{aligned} \text{Product A} &= 120 / 1,800 = 7\% \\ \text{Product B} &= 480 / 1,200 = 40\% \\ \text{Total} &= 600 / 3,000 = 20\% \end{aligned}$$

2) Constant Gross Margin Rate

This method assumes that each product contributes an equal percentage of gross profit for every shilling of sales. It works back from gross margin to the joint costs allocation. Joint costs are allocated to the joint products in a way that results in the same gross margin percentage for each joint product. It involves the following steps:

- (i) **Total Gross Margin Percentage**--the gross margin percentage for all of the joint products is computed by dividing the excess of the sales value of all the joint products at the first point at which the products can be sold over the sum of the joint costs and the processing costs that must be incurred after the split-off point up to the first point at which the products can be sold by the sales value of all the joint products at the first point at which the products can be sold
- (ii) **Cost of Goods Sold** - the cost of goods sold for each joint product is computed by multiplying the sales value for each joint product by one minus the total gross margin percentage for all the joint products (1 – Margin).
- (iii) **Joint Cost Allocation** - the joint costs allocated to each joint product is computed by subtracting the processing costs incurred after the split-off point for each joint product from its cost of goods sold

>>> Illustration

KY Ltd incurred joint costs of Shs.2,400 in manufacturing Product A and Product B to the split-off point; Product A weighed 700kg and had a sales value of Shs3,600 after incurring additional processing costs of Shs675; Product B weighed 300 kg and had a sales value of Shs1,400 after incurring additional processing costs of Shs425

Constant Gross Margin Percentage:

Total Cost of Goods Sold = 2,400 + 675 + 425 = 3,500

Total sales = 3,600 + 1,400 = 5,000

Total Gross Margin = 5,000 – 3,500 = 1,500

Total Gross Margin Percentage = $\frac{1,500}{5,000} = 30\%$

Cost of Goods Sold:

Product A =	(1 – 30%) x 3,600	2,520
Product B =	70% x 1,400	980

Cost Allocation:

Product A	= 2,520 - 675	1,845
Product B	= 980 - 425	<u>555</u>
-		<u>2,400</u>

Income Statement:

	Product A	Product B	Total
Sales	3,600	1,400	5,000
Cost of Goods Sold	<u>2,520</u>	<u>980</u>	<u>3,500</u>
Gross Margin	<u>1,080</u>	<u>420</u>	<u>1,500</u>



Gross Margin %:

$$\text{Product A} = \frac{1,080}{3,600} = 30\%$$

$$\text{Product B} = \frac{420}{1,400} = 30\%$$

$$\text{Total (overall)} = \frac{1,500}{5,000} = 30\%$$

3) Net Realizable Value

If the sales value at the split-off point is known, joint costs are allocated to the joint products based on their relative sales value at the split-off point

$$\text{Net Realizable Value} = \text{Ultimate Sales Value} - \text{Separable Costs.}$$

>>> Illustration

BM Corporation incurred joint costs of Shs2,400 in manufacturing Product A and Product B to the split-off point; Product A weighed 700 kg and had a sales value at the split-off point of Shs.1,800; Product B weighed 300kg and had a sales value at the split-off point of Shs.1,200.

Cost Allocation:

Product A = $1,800 / (1,800 + 1,200) \times 2,400$	1,440
Product B = $1,200 / 3,000 \times 2,400$	<u>960</u>
	<u>2,400</u>

Income Statement:

	Product A	Product B	Total
Sales	1,800	1,200	3,000
Cost of Goods Sold	<u>(1,440)</u>	<u>(960)</u>	<u>(2,400)</u>
Gross Margin	<u>360</u>	<u>240</u>	<u>600</u>

Gross Margin %:

$$\text{Product A} = 360 / 1,800 = 20\%$$

$$\text{Product B} = 240 / 1,200 = 20\%$$

$$\text{Total} = 600 / 3,000 = 20\%$$

Suppose BM Corporation incurred additional processing costs of Shs.675 to process product A and Shs.425 to process product B. What is the new cost allocation?

Net realizable value A = (Shs.1800 – 675) = Shs1,125

B = (Shs1,200 – 425) = Shs775

Cost allocation A = $\text{Shs}1,125 / (1,125 + 775) \times 2400 = \text{Shs}1,421$

B = $\text{Shs}775 / (1,125 + 775) \times 2400 = \text{Shs}979$

>>> Illustration on the three approaches

A company produces three products, Y1, Y2, and Y3 in the same process. The data below reflects average monthly results:

	Y1	Y2	Y3
Monthly output(kg)	40,000	20,000	20,000
Sales value at split off point (Shs)	0	30,000	105,000
Sales value after split off	45,000	100,000	155,000
Costs on further processing	20,000	40,000	65,000

The joint costs were Shs.100,000

Required

Allocate the joint cost using the three methods used to allocate joint costs.

Solution

(i) Physical/measurement/Unit method

	Y1	Y2	Y3	Total
Physical output (kg)	40,000	20,000	20,000	80,000
Proportion	50%	25%	25%	100%
Joint costs allocated	50,000	25,000	25,000	100,000

(ii) Constant Gross Margin rate

		Shs	Shs	
Total sales value at split off:	Y1	45,000		
	Y2	100,000		
	Y3	155,000		
			300,000	
Less: Total costs				
	Joint costs	100,000		
	Further processing costs:Y1	20,000		
	Y2	40,000		
	Y3	65,000	(225,000)	
			75,000	
Costs allocated to	Y1	Y2	Y3	Total
Sales value	45,000	100,000	155,000	
Less gross margin	(11,250)	(25,000)	(38,750)	
Total costs	33,750	75,000	116,250	
Less separate costs	(20,000)	(40,000)	(65,000)	
Joint costs allocated	13,750	35,000	51,250	

**(iii) Net realizable value method**

Net realizable value = Ultimate sales value – Separable costs

	Y1	Y2	Y3	Total
Ultimate sales value	45,000	100,000	155,000	
Less separable costs	(20,000)	(40,000)	(65,000)	
Net realizable value	25,000	60,000	90,000	175,000
Proportion on net realizable value	14%	34%	52%	
Allocation of joint cost	14,000	34,000	52,000	100,000

Importance of Unit cost

Companies need to allocate total product costs to units for the following reasons:

- (i) The company may manufacture thousands or millions of units of products in a given period of time
- (ii) Products are manufactured in large quantities, but may be sold in small quantities sometimes at one time or in dozens or bulk.
- (iii) It is important to determine with accuracy the cost of goods sold as it is needed, especially at the point of transfer from finished goods to cost of sales. This calls for a correct and accurate accounting for product cost per unit in order to properly match costs against related sales revenue. This also helps managers to maintain cost control over the manufacturing process.
- (iv) A small change in unit cost can represent a significant change in overall profitability, when selling millions of units of a product. Managers thus need to keep track of per unit cost on daily basis through the production process while at the same time dealing with materials and output in large quantities
- (v) Materials in the production process might need to be given a value, process costing allows for this through the determination of equivalent units and cost per equivalent unit of production.

By-product

This is an incidental or secondary product from a process, which has an insignificant value compared to the main product.

■ Accounting for the by product

When the product has some commercial value, the accounting treatment of the income is as follows:

- (i) Income (less any separation cost) from the sale of the by-product may be added to the sales of the main product thereby increasing the sales turnover for the period.
- (ii) The sales income of the by product may be deducted from the cost of production or the cost of sales of the main product
- (iii) The sales of the by-product may be treated as a separate incidental source of income against which are set only post separation costs (if any) of the by-product. The revenue is then recorded in the income statement as other income.
- (iv) The net realizable value (sales value less any further processing cost) of the product may be deducted from the cost of the main product;

Examples of by-products; wax, hides, molasses, saw dust and coffee husks

UNIFORM COSTING

This is a common system using agreed concepts, principles and standard accounting practices adopted by different entities in the same industry to ensure that they all deal with accounting information in a similar manner so as to facilitate inter-firm comparison.

The objectives of uniform costing are:

- (a) To promote uniformity of costing methods, so that valid costs comparisons can be made between similar organizations.
- (b) To eliminate inefficiencies and promote good practice revealed by the cost comparison.
- (c) Serve as a basis for government subsidies or grants which need similar costing systems to ensure equitable distribution.
- (d) Serve as a basis for competitive bidding.

Requirements of Uniform Costing

Uniform costing systems should have the following features:

- (i) Cost statements and reports should be organized and laid out in a similar format so that each element of cost and revenue can be compared quite easily.



- (ii) Accounting periods must be the same in all firms in the industry.
- (iii) The methods of valuing stocks and work in progress must be the same.
- (iv) The basis of valuing fixed assets must be the same.
- (v) The method and actual rates of depreciation for each type of asset must be the same.
- (vi) The basis of cost or overhead apportionment and absorption must be similar.
- (vii) Cost classification systems must be the same in all the firms in the industry so that similar items are classified in the same names.

■ Advantages of Uniform Costing

- (a) It enables costs to be compared easily
- (b) It makes it easier to computerize the accounting system of various organizations in the industry.
- (c) It leads to easier cost transferability between organizations.

■ Disadvantages

- (a) It may not be appropriate or suitable to an individual organization in the industry if there is a difference in size and structure.
- (b) It is slow to adapt to changing conditions and demands.

Other Costing Methods

- (a) Unit Costing
- (b) Service Costing

SERVICE COSTING

Service costing is no longer an elective pursuit, it is a compulsory exercise. It ensures that tariffs represent prices for customers and competitors. Economic, accounting and engineering costs all play a role in determining service costs. Engineering costs measure technological relationship between inputs, outputs, *Accounting costs* record, analyze historic costs according to industry rules, *Economic costs* apply the theories of resource allocation to forward looking costs

Examples of operating costs include repair and maintenance, labour, site rental, utilities, license, regulatory fees and taxes and depreciation.

Service costing can use either of the methods highlighted below:

- **Activity based costing;** ABC assigns costs based on the activities required to deliver a service and the resources these activities absorb. ABC might bring more transparency in the calculation of transferred cost, making the current costing practice look redundant. Nevertheless, ABC hides potential inefficiencies of the service provider. Even if an element or asset is underutilized, its cost is completely shared by the services that use it and there is no incentive for the provider to improve its efficiency
- **Fully distributed cost;** in here, the total cost of a service, both direct and indirect costs, are distributed among the services sold. FDC comes from historic/embedded cost. It relates prices to information available in accounting, billing systems. However, it requires judgment in allocating indirect costs devising methodology.
- **Long run average incremental cost (LRAIC):** this constitutes cost of production of an additional unit plus an allocated share of common costs. Forward-looking costs are used to approximate costs in a competitive market, not historical costs which typically reflect inefficiencies and investment in outdated technologies. LRAIC mimics the competitive marketplace and encourages economic efficiencies. However, it is difficult to calculate or model the incremental costs, lacks transparency and negotiation skills and specialized expertise on inputs required. Additionally, an amalgamation of embedded and forward looking costs, blended together and computed on an average cost basis should not be called incremental cost.
- **Marginal cost:** this measures the change in total output resulting from a small change in the level of activity. The marginal cost in this case is the cost of adding a service to an existing portfolio of products or services.

Fully Distributed Cost (FDC) and Long Run Average Incremental Cost (LRAIC) are the common ones in literature and in practice. FDC may be “easier” to calculate, but LRAIC promotes operator



efficiency. Efforts should be made to encourage operators to use ABC especially in apportioning the indirect costs. All cost regimes require policy decisions and negotiation. The goal is finding costs that are just, reasonable, and practical to calculate and apply.

CHAPTER SUMMARY

In job costing, overheads are charged on the basis of a predetermined overhead absorption rate.

$$\text{Applied Overhead absorption rate} = \frac{\text{Budgeted Overheads}}{\text{Machine hrs, direct labour hrs etc}}$$

Procedure in job costing are as follows

- Allocation of batch number
- Production order is made
- Creation of batch costs account
- Completion of the work and closure of the batch cost account
- Allocation of costs to individual units in the batch
- Determination of selling price/batch and unit.

Contracts may be distinguished from job orders by the following features:

- The money value of a contract is much larger than that of a job order.
- A contract consumes significantly larger amounts of resources than a job order.
- For a contract, special progress reports are usually made while in job costing, reports are made after the completion of the job.
- For a contract, indirect costs are relatively smaller in relation to direct costs but the vice versa is time for job order.

Progress payments: these are interim payments made by the client to the contractor throughout the course of the work.

Architects certificate: this is a certificate that provides confirmation that work done up to a certain value has been completed

Retention money: this is a proportion of value of work certified withheld by the customer for a specified period during which the customer must make good all contractual defects.

Cost of Work certified: this includes the portion of all total costs that relate to the work certified

The Notional Profit: this is the difference between the value of work certified to date and cost of work certified to date less a provision for any anticipated unforeseen eventualities.

Profit not taken: refers to the part of the notional profit that is not recognized in the current period. It is profit carried forward to be recognized in the years that follow.

Principles of profit recognition under contracts

The concept of prudence should be applied when determining the profits or losses to be taken up on accounts.

- (i) If the contract is in its early stages, no profits should be taken until when the outcome can be measured with reasonable certainty
- (ii) Where a loss has occurred, it must be recognized in the period it has occurred regardless of the stage of maturity of the project or the timing.
- (iii) When substantial costs have been incurred on the contract but the contract is not near completion, the notional profit is apportioned using the formula in order to determine the notional profit taken.

$$\text{Profit taken} = \text{Notional profit} \times \frac{2}{3} \times \frac{\text{Cash received}}{\text{Work certified}}$$

- (iv) When the contract is near completion the profit taken is calculated as:

$$\text{Profit taken} = \text{Estimated profit} \times \frac{\text{Cash received}}{\text{Contract price}}$$

Where Estimated profit = Contract price – Estimated total cost and

Estimated total cost = Costs incurred to date + Estimated future



Equivalent units :This is a notional quantity of completed goods in the production process

CHAPTER QUIZ

1. Define equivalent units
2. Highlight the various methods of allocating joint costs
3. List two methods used in accounting for normal spoilage
4. How do you account for by products?

ANSWERS TO CHAPTER QUIZ

1. Equivalent units is a notional quantity of completed goods in the production process
2. Methods of allocating joint costs
 - (a) Physical/Unit Measure
 - (b) Constant gross margin rate
 - (c) Net realizable value.
3. Two methods of accounting for normal spoilage
 - Recognition and reassignment approach
 - Omission approach
4. Accounting for the by product
 - When the product has some commercial value, the accounting treatment of the income is as follows:
 - Income (less any separation cost) from the sale of the by-product may be added to the sales of the main product thereby increasing the sales turnover for the period.
 - The sales income of the by product may be deducted from the cost of production or the cost of sales of the main product
 - The sales of the by-product may be treated as a separate incidental source of income against which are set only post separation costs (if any) of the by-product. The revenue is then recorded in the income statement as other income.
 - The net realizable value (sales value less any further processing cost) of the product may be deducted from the cost of the main product;

PAST PAPER ANALYSIS

06/ 07 Q3; 12/06/ Q3; 12/05 Q5; 05/ 05 Q6; 11 04 Q5; 06/ 04 Q5; 06/ 04 Q6(a); 06/ 04 Q7(b); 12/03 Q4; 06/ 03 Q7; 12/02 Q2; 12/01 Q3; 05/ 01 Q1; 05/ 01 Q3; 05/ 01 Q4; 12/00 Q3; 06/ 00 Q3;



EXAM QUESTIONS

Question one

Process ii Account

Mutha Ltd uses process costing and the FIFO method of valuation. The following information for last month relates to Process II, where all the material is added at the beginning of the process:

Opening work-in-progress: 2,000kg (30% complete in respect of conversion costs) valued in total at Shs24,600 (Shs16,500 for direct materials; Shs8,100 for conversion).

Costs incurred:

Direct materials	Shs99,600 for 12,500 kg of input
Conversion	Shs155,250

Normal loss: 8% of input in the period. All losses, which are incurred evenly throughout the process, can be sold for Shs3 per litre.

Actual output: 10,000 kg were transferred from Process G to the finished goods warehouse.

Closing work-in-progress: 3,000 kg (45% complete in respect of conversion costs).

Required:

Prepare the Process II Account for last month in Shs and kg. (10 marks)

Question two

Timau Ltd produces a detergent which passes through two processes, namely, mixing and refining to completion. The following data relate to the refining process for the month of June 2000.

Cost of opening stock:	Shs.
Materials	100,000
Labour	25,000
Overheads	60,000

During the month, 20,000 units were passed from the mixing to the refining process. Costs incurred during the month were:

	Shs.
Labour	125,000
Overheads	108,100
Other materials	45,300

At the end of the month 21,000 units had been completed and passed to finished goods while 4,000 were still in process having reached the following stages:

Materials	100%
Labour	40%
Overheads	60%

Required:

Refining Process Account. (14 marks)

Question three

With reference to accounting for overheads in the cost centers of an organization, explain the relevance of Activity Based Costing (ABC) in allocating costs to products.

Question four

- In your opinion, is it acceptable to declare profit on uncompleted contracts? Support your opinion. (2 marks)
- On May 2nd 2001, Mugoya Construction Company was contracted by Alliance Hotels to construct a new accommodation unit at their Mombasa Beach Hotel at a total contract price of Shs. 950,000,000.

Work commenced on the contract on 28th July 2001. Retention money was agreed at 10% of the work certified. At the end of the first year, no profit was declared as the contract was considered to be in its infancy.

The following information relates to the contract for the year ended 31st December 2002:

	Shs. '000
Balance brought forward on 1 st January 2002:	
Materials on site:	4,500
Plant (cost):	150,000
Cost of work done:	158,200
Work certified to 31 st December 2001	160,000
Transaction during the year:	
Material delivered to site: from stores	14,600
From other suppliers	128,400
Additional Plant (cost)	120,000
Subcontractors' fees	18,450
Consultancy fees	49,130
Inspection fees	500
Salaries and Wages	160,000
Head Office expenses	1,200
Materials transferred out	15,000
Materials sold (cost 19,800) 22	22
Plant hiring charges	250
Direct Expenses	2,600

**Additional Information:**

- i) The company policy is to take the current year's profit and loss account the whole of the profit realized.
- ii) Plant is depreciated at 12% per annum on cost. It is a practice of the company accountants to reflect only the plant values changed and carried forward in the contract account.
- iii) Alliance Hotels had paid Shs580 million to Mugoya Construction Company by 31st December 2002.
- iv) The work certified in the year 2002 was for Shs.660 million.
- v) These was work done in the year but not yet certified costing Shs.42,000.
- vi) At the year ended, accrued wages were for Shs.1.550 million while the balances of materials on the site were valued at Shs.51 million.

REQUIRED:

- i) Contract Account for the year to 31st December 2002, showing clearly the profits or losses on the contract for the work done to date. (10 marks)
- ii) Valuation of the work in progress (4 marks)
- iii) The contractee's account, (4 marks)

Question five

In a joint product situation, explain the following:

- i) Reasons why it is important to allocate joint cost to products. (4 marks)
- ii) Any four methods of allocating joint cost to products. (8 marks)
- iii) What factors should be considered in selecting the most appropriate method of allocating joint costs?

(CPA 11/02)

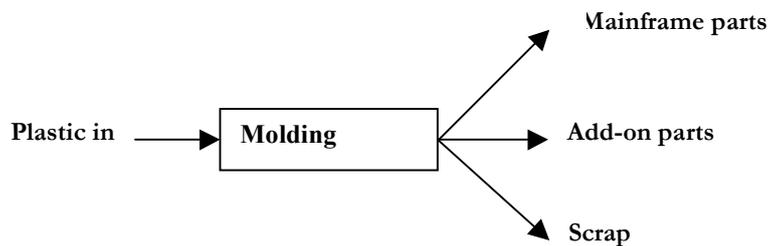
CASE STUDY

This case study describes a simple mass balance that leads to an initial scrap cost estimation.

An automobile manufacturer makes the plastic interiors of cars in an injection molding facility. In one year the facility buys 21,600,000 pounds of polycarbonate plastic for \$1.39 per pound. The polycarbonate is molded into: 1,360,000 mainframe parts totaling 18,300,000 pounds and 1,360,000 add-on parts totaling 2,720,000 pounds. The balance of the polycarbonate is scrap.

Questions:

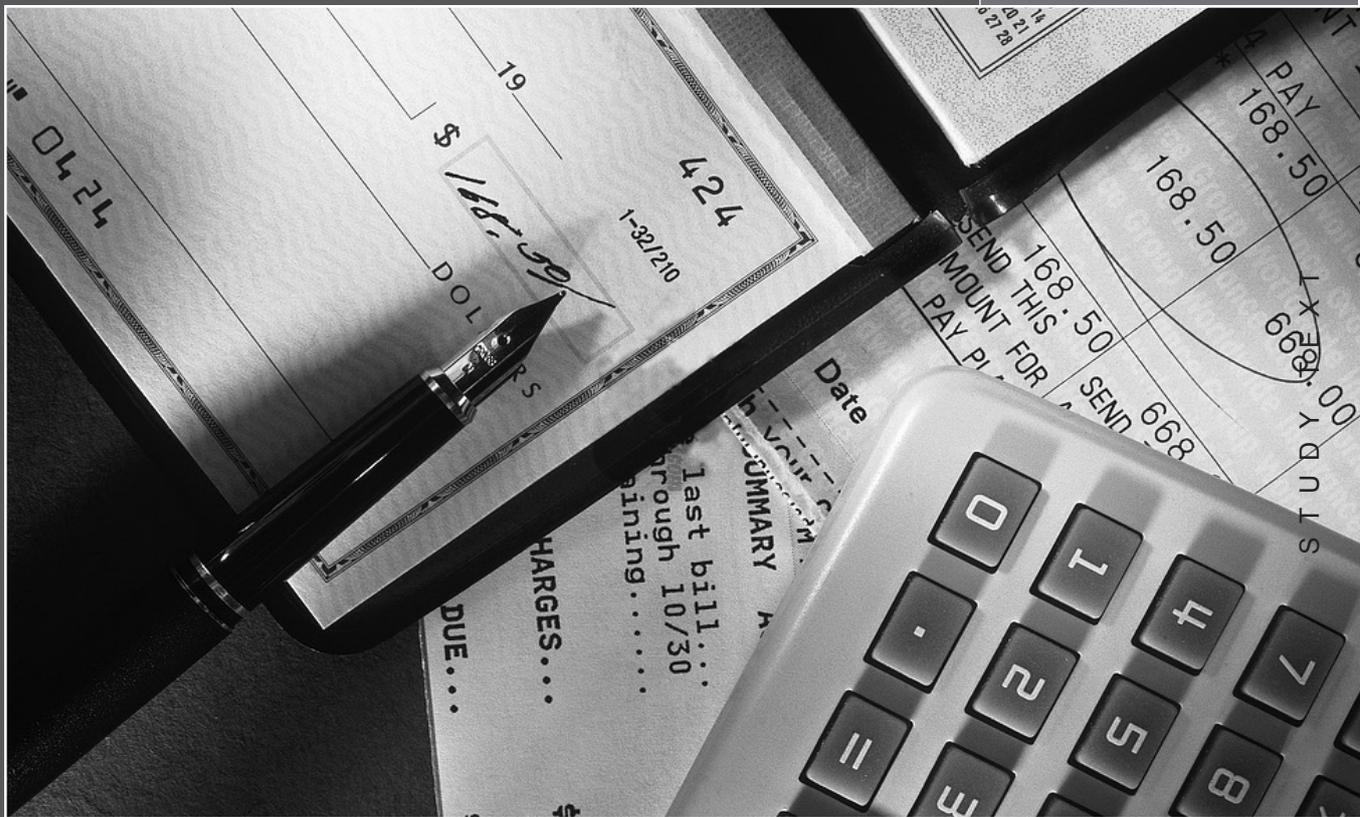
- Approximately how much material is scrapped?
- What percent of the total purchased plastic does this represent?
- What is the cost of scrap?



Answers:

- Pounds of Scrap: $21,600,000 - 18,300,000 - 2,720,000 = 580,000\text{lbs}$
- Percent Scrap: $580,000/21,600,000 = 3\%$
- $580,000\text{ lbs} * \$1.39/\text{lb} \sim \$806,000$

CHAPTER TEN



BUDGETING AND BUDGETARY CONTROL



CHAPTER TEN

BUDGETING AND BUDGETARY CONTROL

► OBJECTIVES

By the end of this chapter, you should be able to:

- Define budgets and explain the nature and purpose of budgets and explain the objectives of budgeting.
- Explain the administration of budgets and organization of budgetary control
- Prepare the various types of budgets and distinguish production budgets from non-production budgets.
- Explain the behavioral aspects of budgeting.
- Distinguish fixed budgets from flexible budgets. Outline the advantages and disadvantages of both.
- Understand the various bases of budgeting.

► INTRODUCTION

This lesson explores Budgetary Planning and Control Techniques looking at the purpose, preparation, application and interpretation of budgets as well as their behavioral aspects.

► DEFINITION OF KEY TERMS

A budget is a detailed plan outlining the acquisition and use of financial and other resources over some period of time in the future.

A budget center is a section of the organization created for the purpose of budgetary control.

Budget bias (budgetary slack) occurs when managers aim to give themselves easier budget targets by understating budgeted sales revenue or overstating budgeted costs.

Flexible budget is a budget that is designed to change in accordance with the level of activity attained.

Fixed budget is a budget prepared for a specific level of output.

A budget manual is a document, which sets out the responsibilities of the persons engaged in the routine of, and the forms and records required for budgeting control.

Master budget is the overall quantifications of the budgeting plan.

► Exam context

The examiner may set discussion questions, calculation questions or both. The need to understand the relationship between the various budgets is crucial. Additionally, the examiner may set a question examining on standard costing, budgeting and variance analysis. This calls for the need to understand the interrelationships between the various topics.

► Industry context

Budgeting is applicable in every organization as it is through budgetary planning and control that organizations strive to achieve their standards. More so, budgeting relies heavily on standards, which is the key to variance analysis.

NATURE AND PURPOSES OF BUDGETS

Fast forward:

Budgets are used as a forecast and also as a control tool to evaluate performance. They are prepared for reasons such as coordination, communication, control and evaluation. The process of budget preparation is procedural.

Budgeting refers to the process of quantifying the plans of an organization so as to enable it to achieve its objectives in the defined period. The result of the process is budgets, which are used for cost control, performance evaluation and future decision-making.

A budget is a detailed plan outlining the acquisition and use of financial and other resources over some period of time in the future. Budgets may be prepared for departments, functions or



financial and resource items. In fact, some people refer to budgeting as a means of coordinating the combined intelligence of the entire organization into a plan of action.

Budgetary Planning and Control may be seen as short-term quantification and monitoring of long-term strategic plans of the organizations. Strategic planning involves preparation of strategic plans, which define the objectives to be pursued within the framework of corporate policy. It is by budgeting that a long-term corporate plan is put into action.

Objectives of budgetary planning

■ 1. Coordination

The budgetary process requires that visible detailed budgets are developed to cover each activity, department or function in the organization. This is only possible when the effort of one department's budget is related to the budget of another department. In this way, coordination of activities, function and department is achieved.

■ 2. Communication

The full budgeting process involves liaison and discussion among all levels of management. Both vertical and horizontal communication is necessary to ensure proper coordination of activities. The budget itself may also act as a tool of communication of what is expected of the departments and managers. High standards set calls for hard work and more input in terms of labour, time and other resources.

■ 3. Control

This is the process for comparing actual results with the budgeted results and reporting upon variances. Budgets set a control gauge, which assists to accomplish the plans set within agreed expenditure limits. The approach followed in the control process has five basic steps:

- (i) Preparation of budgets based on the predetermined data on performance and prices.
- (ii) Measurement of actual performance and recording the data.
- (iii) Comparing the budget with the actual performance and recording the difference.
- (iv) Ascertaining reasons for the differences through, including others, variance analysis.
- (v) Taking corrective actions through administering of proper strategies and measures.

■ 4. Motivation

Budgets may be seen as a bargaining process in which managers compete with each other for scarce resources. Budgets set targets, which have to be achieved. Where budgetary targets are tightly set, some individuals will be positively motivated towards achieving them. Involvement of managers in the preparation of budgets motivates them towards achieving the goals they have set themselves. However, imposing budgets on managers will be discouraging as they may perceive the targets as unattainable.

■ 5. Clarification of Responsibility and Authority

Budgetary process necessitates the organization of a business into responsibility and budget centers with clear lines of responsibilities of each manager. This reduces duplication of efforts. Each manager manages those items directly under his or her control. To facilitate effective responsibility accounting, authority and responsibility relationship must be balanced.

■ 6. Planning

It is by Budgetary Planning that long-term plans are put into action. Planning involves determination of objectives to be attained at a future predetermined time. When monetary values are attached to plans they become budgets. Good planning without effective control is time wasted. Unless plans are laid down in advance, there are no objectives towards which control can be affected.



Steps followed in the planning process

1. Identify the objectives

The formulators and implementers of the budget need to understand what the organization is aiming to achieve. This is the first step towards effective budgetary planning and control. Without identifying the objectives, optimal allocation of organizational resources will not be achieved.

2. Identifying the alternative strategies available

In here, a range of possible courses of action, which might enable the company achieve its aimed objectives are identified. Such courses of action are arrived at after carrying out a SWOT analysis meant to determine the company's financial and other positions. SWOT analysis involves the understanding of the company's strengths and weaknesses and possible opportunities and threats. Strengths and weaknesses are from within the organization while opportunities and threats are from without the organization.



3. Evaluation of strategies available

In here, the options available are narrowed down for a detailed evaluation. There are various basis of evaluating the alternative courses of action. The course of action selected should be acceptable in terms of risk and profitability; feasible in that it can be funded with resources available and should be the most suitable for the problem/opportunity at hand and aimed at achieving the company's objectives.

4. Selection of the best course of action

Among the courses of action evaluated above, the one that had the greatest potential for achieving the company's objectives is selected.

5. Implementation of the selected course of action

In here, the selected course of action is put in place. Budgets clearly indicate what is expected to be achieved in the period they cover. They are developed within the context of ongoing business and ruled by previous decisions in the planning process. They are based on highly reviewed and revised proposals based on the information available thus considered as an integral part of the planning process.

6. Control

The control process involves monitoring of actual outcomes and responding to any diversion of actual from planned or budgeted outcome.



Stages in the budgeting process

- (i) **Communicating details of the budget policy and guidelines to people responsible for preparation of budgets.** Policies to be communicated will include changes in the sales mix, expansion or contraction of the organization's activities, while important guidelines in budget preparation will include allowances to be made for salary and wages increment, expected changes in productivity, expected changes in industry demand and output. It is essential to communicate policies of top management to all managers on order to establish common guidelines to implement the long-term plan in the current year's budget.
- (ii) **Determining the limiting factor.** Limiting factor is that factor in an organization, which restricts performance in a given period. It may be the production capacity or sales demand. The limiting factor gives the starting point of the budgeting process.
- (iii) **Preparation of the sales budget;** this is the most difficult to plan as it is very much influenced by external factors, which are beyond management's control. Such factors include customers' tastes and preferences, state of the economy, competition and availability of substitutes to the company's product in the market. The sales budget is most important when sales demand is the limiting factor as all other budgets will be based on it.
- (iv) **Initial preparation of other budgets.** Budgets for other areas of the organization are prepared at this stage. Each manager prepares a budget for his responsibility center, which in turn are refined and coordinated at higher levels of management.

Involving managers in the budgeting process motivates them as they strive to achieve what they set for themselves. It also increases the probability that they'll accept the budget. The managers use historical data to prepare budgets for their sections. However, such data must be adjusted for changes expected to occur in the future in order to be meaningful.

- (v) **Negotiation of budgets:** at this level, the lower level managers submit the budgets they have prepared to their superiors for approval. Each superior then incorporates the budgets for his responsibility centers in which he will be in charge and forwards it for approval to his senior. The budgets are consolidated starting at the lowest level of management towards the highest. At each stage the new budget (consolidated one) will be negotiated between the budgetees and (persons consolidating the budgets) and their superiors.

Negotiation is of vital importance in the budgeting process and can be used to determine whether the budget is serving as an effective management tool or just as a clerical device. Managers must establish trust and confidence with their subordinates for negotiation to produce a meaningful improvement.

- (vi) **Coordination and review of the budget.** At this stage, various budgets are modified in order to strike a balance among all the budgets and ensure compatibility. This takes place as negotiation moves up the organizational hierarchy. Any modifications of the budgets should be made by relevant managers and may require that the budgeting process be started all over again. This can be done as many times as possible until all the budgets are coordinated and accepted by all. Budgeted financial statements are prepared at this level to ensure that all the parts combine to produce an acceptable whole.
- (vii) **Final acceptance of the budget:** at this stage, all the budgets, which are in harmony with each other, are consolidated into a master budget. In addition, the financial statements prepared are included. Upon approval of the master budget, various departmental budgets are forwarded to the managers of those departments. Those budgets act as authority to carry out the plans contained therein.
- (viii) **Budget review;** this is a control process meant to check on adherence of the various responsibility centers to the budgets. In here, periodic comparison of actual and budgeted results is done and a report prepared, which is forwarded to the appropriate budgetees early enough to have a maximum motivational impact. In case of any deviation of actual from budgeted calls for investigations, management should take corrective action for the differences that are within their control in order to avoid similar inefficiencies in the future.



Limitations of Budgeting

- **Budgets are based on estimates:** they are based on forecasts and forecasting is not accurate. The strength or weaknesses of the budgetary control system depends to a large extent on the accuracy at which estimates are made. Thus when using the system, the fact that the budget is based on estimates must be taken into consideration



- **Danger of rigidity:** a budget program must be dynamic and continuously adjusted to changing business environments. Budgets lose much of their usefulness if they acquire rigidity and are not revised with the changing circumstances in the environment.
- **Budgeting is only a tool of management:** budgeting cannot take the place of management. It is only a tool of management. Execution of a budget will not occur automatically. It is necessary that the entire organization participate in the program in order to realize the budgeting goals.
- **It is an expensive technique:** the installation and operation of a budget control system is costly as it requires the employment of specialized staff and involves other expenses. Note that it is essential that the cost of introducing and operating a budgetary control system should not exceed the benefits derived from running it.
- **Difficult to set levels of attainment:** high levels of attainment may result into too tight budgets that cause loss of morale. In addition, antagonism may arise where budgets exert undue pressure.
- Budgeting control is a terminate exercise and, therefore, variances may be of little use to the current operations.

ORGANIZATION OF BUDGETARY CONTROL

Budgetary control ideally involves the following steps:

1. The creation of budget centers

A budget center is a section of the organization created for the purpose of budgetary control. Budget centers must be clearly defined because a separate budget has to be set for each center.

2. The introduction of adequate accounting records

The accounting system should be designed in such a way that it is able to record and analyze the information required. The budget procedures must also employ the same classification of revenue and expenses as the accounting department for comparison purposes.

3. The preparation of organization charts.

They define the hierarchy and responsibilities of officers of the company. This is helpful in identifying the officers to include in the budget committee.

4. The establishment of a budget committee:

It will consist of operating and financial managers, who will be required to review, discuss and co-ordinate business activities.

Its major task is to ensure that budgets are realistically established and are well coordinated.

The main functions of this committee involve:

- To issue instructions to departments regarding budget requirements, deadline dates for the receipt of budgets, e.t.c.
- Draw up the budget preparation timetable. It takes the form of network analysis whereby some activities are preceded by some others.
- To define the general policies of management in relation to the budget.
- Checking initial draft and problems considered. Limiting factors are usually considered.
- Ensuring that the budgets are synchronized within the boundaries of available resources.
- To analyze comparison of budgets and actual results and to recommend corrective action where necessary.
- Review of budgets.
- Prepare the master budget after functional budgets have been prepared.
- The preparation of a budget manual.



Budget manual

A budget manual contains the purpose of, procedure for and responsibility of the people involved in budgeting. It is a statement of budget policies and lays down the details of the organizational set up with duties and responsibilities of the executives including the budget committee and the budget director and the procedure and programmes to be followed for developing budgets for various activities.

The contents of the budget manual are:

- i. Description of the budget system and its objectives
- ii. Procedures and forms to be used by budget committee and the director
- iii. The responsibilities of operating executives, budget committee and the director
- iv. The budget calendar specifying special dates for the completion of each part of the budget submission of the reports



- v. Method of accounting and the accounts code in use
- vi. Procedure to be adopted in operating the system
- vii. The follow-up activities

Budget bias

Budget bias (budgetary slack) occurs when managers aim to give themselves easier budget targets by understating budgeted sales revenue or overstating budgeted costs.

Cost control using budgets is achieved by comparing actual costs for a budget period with budgeted or planned costs. Significant differences between planned and actual costs can then be investigated and corrective action taken where appropriate.

Budget bias will lead to more favorable results when actual and budgeted costs are compared. Corrective action may not be taken in cases where costs could have been reduced and in consequence inefficiency will be perpetuated and overall profitability reduced.

Managers may incur unnecessary expenditure in order to protect existing budget bias with the aim of making their jobs easier in future periods, since if the bias were detected and removed, future budget targets would be more difficult to achieve. Unnecessary costs will reduce the effectiveness of cost control in supporting the achievement of financial objectives such as value for money or profitability.

Where budget bias exists, managers will be less motivated to look for ways of reducing costs and inefficiency in those parts of the organization for which they bear responsibility. The organization's costs will consequently be higher than necessary for the level of performance being budgeted for.

The Master Budget Framework and the Various Types of Budgets

The **Master budget** is the overall quantifications of the budgeting plan. In it, functional budgets are incorporated. A functional budget is a budget of income and/or expenditure for a particular function. The master budget therefore combines all the budgets of the various departments in an organization. It is useful in ensuring that all the individual budgets are consistent with one another and also presents a 'unit' picture of the entire organization.

All these budgets translate into the projected profit and loss a/c and the budgeted Balance Sheet. The relationship between all these budgets is summarized in the next page.

Production budgets

Sales budget: this is a detailed schedule showing the expected sales in the period to come. It essentially forecasts what the company can reasonably expect to sell to the customer during the budget period. It is expressed in both units and shillings. The sales budget is the key to the entire budgeting process thus must be prepared accurately. It is key in the sense that all the constituent parts of the master budget are dependent on the sales budget. For instance, the production estimate for the period will be based on the demand in the market and the stocks available. If the sales forecast is not correct, then the production estimate for the period under consideration will not be correct.

Various factors are normally considered in coming up with the sales forecast and sales budget. They include the actual sales in the previous periods, reports from salesmen, market research information and level of orders obtained in advance, among others.

Format

Item	Quantity	(Units)	Revenue (Shs)
A	xx	xx	
B	xx	xx	
C	<u>xx</u>	<u>xx</u>	
Total	<u>xx</u>	<u>xx</u>	

Production budget: it summarizes the production requirements for the forthcoming period to match the forecasted sales above. Budgeting of ending inventory is crucial as it ensures that economic stock levels are maintained i.e. no excess stocks are carried thus minimizing on holding costs and avoiding tying of capital and that there is adequate level inventory in to avoid shortage costs and unnecessary ordering costs. The production budget is expressed as units of each type of product. Various factors considered while preparing the production budget include available production capacity, the sales forecast, finished goods stock level policy, among others.

The cycle for the preparation of the production budget usually is determined by the budget committee. It follows the following steps:

- Determine the production capacity available.
- Consider the possible ways in which the available production capacity may be expanded if required.
- Linkage of production capacity available to the stock level
- Determine the detailed budgets within the production budget.



The general format of the production budget is as follows:

	A (Units)	B (Units)	C (Units)
Required ending stock	xx	xx	xx
Add: Sales during the year	<u>xx</u>	<u>xx</u>	<u>xx</u>
Total requirement	xx	xx	xx
Less: Estimated opening Stock	<u>xx</u>	<u>xx</u>	<u>xx</u>
Production requirement (units)	<u>xx</u>	<u>xx</u>	<u>xx</u>

Direct Materials budget: this shows the estimated quantities and costs of all the raw materials and components needed for the output demand by the production budget. Sufficient raw materials must be available to meet the production process and, in addition, provide ending raw materials working inventory for the period under consideration. Direct raw materials budget is expressed in units. It consists of

- **Direct Materials Usage Budget:** it shows the estimated quantities of materials required for budgeted production.

Format

Product	units of product	Units of X req. Per unit of product	Material X (Total Units)	Units of Y req. Per unit of product	Material Y (Total Units)
A	xx	k	xx	k	Xx
B	xx	k	xx	k	xx
C	xx	k	xx	k	xx
Total direct materials			xx		xx

- **Direct Materials Purchases Budget:** It ensures that materials are within the planned materials stock levels i.e. after considering both usage and material stocks required.

Format

	Material X Units	Material Y Units
Required ending Inventory	xx	Xx
Add: Current usage	xx	Xx
Total material requirement	xx	Xx
Less: Opening Stock	xx	xx
Materials to be purchased (Units)	xx	xx
Cost per unit	Shs.Y	Shs.Y
Material purchase budget (Shs)	xx	xx

Total purchases budget shall be equal to the summation of the totals for each material. In our case above, the total material budget shall be cost of material X and material Y.

Direct Labour budget: this is crucial as it forecasts the number of labour hours required and thus helps the company to know whether sufficient labour time is available to meet production needs in the budget period. It is based on production budget estimate. This budget helps the company know whether it will need additional labour force in the future and how much it will incur as labour costs.

Format

Product	Units	Hrs req. per unit	Total No. of hours
A	xx	k	xx
B	xx	k	xx
C	xx	k	xx
Total No. of hrs			xx
Standard wage per hr			ShsY
Direct labour cost budget (Shs)			xx

The budgeted direct labour cost is therefore determined by multiplying direct labour hours with the wage rates for every category of labour.

■ Factory Overhead Budget:

This budget presents the forecasts of all the production, fixed, variable and semi-variable overheads to be incurred during the budget period. i.e. gives a summary of all costs other than direct costs.

Format

	Department A	Department B
Budgeted overheads (Excluding depreciation)	xx	xx
Add: Depreciation		
Existing plant	xx	xx
New Plant (apportioned per period)	xx	xx
Total budgeted overheads (a)	xx	xx
Absorption base (b)	b	b
Overhead absorption rate (a)/(b)	Shsx	Shsx



The summation of budgeted costs of production for the budget period makes up Production Cost Budget. It includes:

- Budgeted Materials Cost
- Budgeted Labour Cost
- Budgeted Overhead Cost

Non-Production Budgets

Selling and Distribution Cost Budget: It is the forecast of all costs incurred in selling and distributing the company's product during the budget period. It is closely concerned with the sales budget in that it is mainly based on the volume of sales projected for the period. Expenses included are selling office costs, salesmen salaries and commission, advertising expenses, e.t.c.

Administration Costs Budget: It represents the costs of all administration expenses. Each department or budget centre will be responsible for the preparation of its own budget. Management, Secretarial, Accounting and Administration costs, which cannot be directly related to the production are included here. The budget will be mainly incremental i.e. previous year's figure will tend to apply for its next budget with an allowance for inflation.

Research and Development Cost Budget: These are costs, which are discretionary in nature i.e. they are determined on need basis by the managers concerned. Research cost is the cost of original investigation undertaken in order to gain new scientific or technical knowledge and directed towards a specific practical aim objective.

Development cost is the cost of using scientific or technical knowledge in order to produce new or substantially improved materials, devices, products, processes systems or services prior to the commencement of commercial production.

Capital Expenditure Budget: It represents the expenditure on all fixed assets during the budget period. Addition intended to benefit future accounting periods, or expenditure which increases the production capacity, efficiency lifespan or economy of existing fixed assets are also incorporated.

Cash Budget; It records the cash inflows and outflows, which are expected to take place in respect of each functional budget. It may be prepared for a period span of one week, month or quarter of the budget period. It has the following benefits/advantages:

- It ensures that sufficient cash is available when required.

- It shows whether capital expenditure projects can be financed internally.
- It indicates the cash needed for current operating activities.
- It indicates the effect the position of each seasonal requirements, large stocks, unusual receipts and laxity in collecting account receivable.
- It indicates the availability of cash for taking advantage of discounts.
- It reveals the availability of excess cash so that short-term investments may be considered.
- It serves as a basis for evaluating the actual cash management performance of responsible managers.

>>> Illustration of a cash budget

The management of Beck plc have been informed that the union representing the direct production workers at one of their factories, where a standard product is produced, intends to call a strike. The accountant has been asked to advise the management of the effect the strike will have on cash flow.

The following data has been made available:

	Week 1	Week 2	Week 3
Budgeted sales	400 units	500 units	400 units
Budgeted production	600 units	400 units	Nil

The strike will commence at the beginning of week 3 and it should be assumed that it will continue for at least four weeks. Sales at 400 units per week will continue to be made during the period of the strike until stocks of finished goods are exhausted. Production will stop at the end of week 2. The current stock level of finished goods is 600 units. Stocks of work in progress are not carried. The selling price of the product of Shs60 and the budgeted manufacturing cost is made up as follows:

	Shs
Direct materials	15
Direct wages	7
Variable overheads	8
Fixed overheads	18

Direct wages are regarded as a variable cost. The company operates a full absorption costing system and the fixed overhead absorption rate is based upon a budgeted fixed overhead of Shs9000 per week. Included in the total overheads is Shs.700 per week for depreciation of equipment. During the period of the strike, direct wages and variable overheads would not be incurred and the cash expended on fixed overheads would be reduced by Shs1500 per week.



The current stock of raw materials are worth Shs7500; it is intended that these stocks should increase to Shs11000 by the end of week 1 and then remain at this level during the period of the strike. *All direct materials are paid for one week after they have been received. Direct wages are paid one week in arrears. It should be assumed that all relevant overheads are paid for immediately the expense is incurred.* All sales are on credit, 70% of the sales value is received in cash from the debtors at the end of the first week after the sales have been made and the balance at the end of the second week.

The current amount outstanding to material suppliers is Shs.8000 and direct wage accruals amount to Shs.3200. Both of these will be paid for in week 1. The Current balance owing from debtors is Sh.s31200, of which Shs.24000 will be received during week 1 and the remainder during week 2. The current balance of cash in hand and at bank is Shs.1000.

Required:

Prepare a cash budget for weeks 1 to 6 showing the balance of cash at the end of each week, together with a suitable analysis of the receipts and payments during the week

Comment upon any matters arising from the cash budget, which you consider should be brought to the management's attention

(Management and Cost accounting, Colin Drury)

Solution

Cash budget for weeks 1 to 6

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
	Shs	Shs	Shs	Shs	Shs	Shs
Payments from debtors	<u>24,000</u>	<u>24000</u>	<u>28200</u>	<u>25800</u>	<u>19800</u>	<u>5400</u>
Payments						
To material suppliers	8000	12500	6000	nil	nil	nil
To direct workers	3200	4200	2800	nil	nil	nil
For variable overheads	4800	3200	nil	nil	nil	nil
For fixed overheads	<u>8300</u>	<u>8300</u>	<u>6800</u>	<u>6800</u>	<u>6800</u>	<u>6800</u>
Total payments	<u>24300</u>	<u>28200</u>	<u>15600</u>	<u>6800</u>	<u>6800</u>	<u>6800</u>
Net movement	(300)	(4200)	12600	19000	13000	(1400)
Opening balance week 1	<u>1000</u>	<u>700</u>	<u>(3500)</u>	<u>9100</u>	<u>28100</u>	<u>41100</u>
Closing balance	<u>700</u>	<u>(3500)</u>	<u>9100</u>	<u>28100</u>	<u>41100</u>	<u>39700</u>

Workings**Collection from debtors**

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
	Shs	Shs	Shs	Shs	Shs	Shs
Units sold	400	500	400	300	0	0
Sales (@Shs60)	<u>24000</u>	<u>30000</u>	<u>24000</u>	<u>18000</u>	<u>0</u>	<u>0</u>
Cash received (70%)		16800	21000	16800	12600	0
(30%)			7200	9000	7200	5400
Given	<u>24000</u>	<u>7200</u>				
Total receipts	<u>24000</u>	<u>24000</u>	<u>28200</u>	<u>25800</u>	<u>19800</u>	<u>5400</u>

Payments to creditors

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
	Shs.	Shs.	Shs.	Shs.	Shs.	Shs.
Materials consumed at Shs15	9000	6000				
Increase in stocks	<u>3500</u>	<u>0</u>				
Materials purchased	<u>12500</u>	<u>6000</u>				
Payment to suppliers	8000	12500	6000	nil	nil	nil

Wages

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
	Shs.	Shs.	Shs.	Shs.	Shs.	Shs.
Wages consumed at Shs7	4200	2800	nil	nil	nil	nil
Wages paid	3200	4200	2800	0	0	0

Comment:

- (i) Finance will be required to meet the deficit in week 2, but a lowering of the budgeted material stocks at the end of week 1 would reduce the amount of cash to be borrowed at the end of week 2.
- (ii) The surplus cash at the end of week 2 should be invested on a short-term basis.
- (iii) After week 6, there will be no cash receipts but cash outflows will be Shs.6800 per week. The closing balance of Shs.39700 at the end of week 6 will be sufficient to finance outflows for a further 5 or 6 weeks.



OTHER TYPES OF BUDGETS

Annual budgets: this is a budget covering a period of 12 months. Under this approach, planning horizon decreases as the year progresses.

Continuous budgets: this budget covers a period of 12 months but constantly adds a new month on the end as the current month is completed. It keeps the management planning and thinking 12 months ahead and thus stabilizing the planning horizon.

>>> Illustration

Venus Plc produces two products N and A. the budget for next year to 31 Dec xx is to be prepared. Expectations for the forthcoming year include:

Venus Plc			
Balance sheet as at 1 Jan xx			
Fixed assets	Shs	Shs	Shs
Land and buildings			45,000
Plant and equipment (NBV)			112,000
			<u>157,000</u>
Current assets		7,650	
Raw materials		23,615	
Finished goods		19,500	
Debtors		4,300	
Cash		55,065	
Current liabilities			
Creditors	6,800		
Taxation	24,500	31,300	23,765
			<u>180,765</u>
Financed by			
150,000 ordinary shares of Shs.1 each			150,000
Retained profits			<u>30,765</u>
			<u>180,765</u>

Finished products

The sales director has estimated the following

	N	A
Demand for Company's products	4500	4000
Expected selling price per unit	Shs.32	Shs.44
Closing stock @ 31 March 2008 is required to be	400 units	1200 units
Opening stock at 01 April 2007	900 units	200 units
Unit cost of this opening stock will be	Shs.20	Shs.28
The amount of plant capacity required for each product is;		
Machining:	15 min	24 min
Assembling	12 min	18 min
The raw materials content per unit is		
Material A	1.5 kg	0.5 kg
Material B	2.0 kg	4.0 kg
Direct labour hours required per unit of each product is	6 hrs	9 hrs

Finished goods are valued at FIFO basis at full factory cost

Raw materials	Material X	Material Y
Closing stock requirements kilos at 31 March 2008	600	1000
Opening stock at 1 April 2007 kilos	1100	6000
Budgeted cost of raw materials per kilo	Shs1.50	Shs1.00
Actual cost per kilo of opening stocks are as budgeted cost for the incoming year		

Direct labour

The standard wage rate of direct labour is Shs1.60 per hr

Factory overhead

Factory overhead is absorbed on the basis of machining hours with separate absorption rates for each department.

The following are expected overheads in the production cost center budgets

	Machining depart	Assembly depart
	Shs	Shs
Supervisors salary	10,000	9,150
Power	2,400	2,000
Maintenance and running costs	2,100	2,000
Consumables	3,400	500
General expenses	<u>19,600</u>	<u>5,000</u>
	<u>39,500</u>	<u>18,650</u>

Depreciation is taken at 5% straight-line on plant and machinery equipment. A machine costing the company Shs20,000 is due to be installed on 1 October 2007 in the machining department, which already has machinery installed to the value of Shs.100,000 at cost.

Selling and distribution expenses	Shs
Sales commission and salaries	14,300
Traveling distribution	3,500
Office salaries	10,100
General administration expenses	<u>2,500</u>
	<u>30,400</u>



There is no opening or closing work in progress and inflation should be ignored.

Required

Prepare the following budgets for the year ended 31 March 2008 for Venus PLC.

- (i) Sales budget
- (ii) Production budget (units)
- (iii) Plant utilization budget
- (iv) Direct materials utilization budget
- (v) Direct labour budget
- (vi) Factory overhead budget
- (vii) Direct materials purchases budget
- (viii) Cost of goods sold budget
- (ix) Budgeted profit and loss account

Solution

Venus Plc

- (i) Sales Budget

	Quantity	Revenue
N	4,500	144,000
A	4,000	176,000
Total		<u>320,000</u>

- (ii) Production Budget (units)

	N (Units)	A (Units)
Required ending stock	400	1,200
Add: Sales during the year	4,500	4,000
Total requirement	4,900	5,200
Less: Estimated opening Stock	(900)	(200)
Production requirement (units)	<u>4,000</u>	<u>5,000</u>

- (iii) Plant utilization budget

	Machinery	Assembly
N*3	1000 hrs	800 hrs
A*4	2,000hrs	1,500hrs
Total Plant utilization	<u>3,000 hrs</u>	<u>2,300hrs</u>

$$*3 \ 4000 \times 15/60 = 1000$$

$$4000 \times 12/60 = 800$$

$$*4 \ 5000 \times 24/60 = 2000$$

$$500 \times 18/60 = 1,500$$

(iv) Direct materials usage budget

Product	Units of product	Units of X req. Per unit of product	Material X (Total Units)	Units of Y req. Per unit of product	Material Y (Total Units)
N	4,000	1.50	6,000	2.0	8,000
A	5,000	0.50	2,500	4.0	20,000
Totals			8,500		28,000

(v) Direct materials Purchases Budget

	Material X Units	Material Y Units
Required ending inventory	600	1,000
Add: Current usage	8,500	28,000
Total material requirement	9,100	29,000
Less: Opening Stock	(1,100)	(6,000)
Materials to be purchased (Units)	8,000	23,000
Cost per unit	Shs.1.50	Shs.1.00
Material purchase budget (Shs)	12,000	23,000
Total Materials purchases Budget	Shs.35,000	

(vi) Direct labour budget

Product	Units	Hrs req. per unit	Total No. of hours
A	4,000	6	24,000
B	5,000	9	45,000
Total No. of hrs			69,000
Standard wage per hr			Shs1.60
Direct labour cost budget (Shs)			110,400

(vii) Factory overhead budget

	Machining	Assembly
Budgeted overheads (Excluding depreciation)	39,500	18,650
Add: depreciation		
Existing plant*5	5,000	4,350
New Plant (apportioned per period) *6	500	0
Total budgeted overheads (a)	45,000	23,000
Absorption base (machine hrs)(b)	3,000	2,300
Overhead absorption rate (a)/(b) *7	Shs15/mh	Sh10/mh

*5 100,000 x 5%

87000 x 5%

*6 20,000 x 5% x 6/12

*7 4,500 /3000

23,000/2,300

**(viii) Cost of goods sold budget**

	N (Shs)	A (Shs)
Opening Stock	18,000	5,600
Add: Production	78,400	140,750
Less: Closing stock	7,840	33,780
Cost of goods sold	<u>88,560</u>	<u>112,570</u>

Workings**a. Opening stock**

N	900 x 20	18,000
A	200 x 28	5,600

b. Production cost per unit of finished products

		N		A
Materials	A 1.5 x 1.5	2.25	0.5 x 0.5	0.75
	B 2.0 x 1.0	2.0	4.0 x 1.0	4.0
Labour: 6 hrs x 1.6		9.6	9hrs x 1.6	14.40
Overheads				
Machining	15 x 15/60	3.75	15 x 24/60	6.00
Assembly	10 x 12/60	2.0	10 x 18/60	3.00
Total production per unit		Shs19.60		Shs28.15
Production in units		4,000		5,000
Valuation		<u>78,400</u>		<u>140,750</u>

c. Closing inventory

	N	A
Closing stock units	400	1,200
Unit cost	19.6	28.15
Stock units	<u>7,840</u>	<u>33,780</u>

(ix) BUDGETED PROFIT AND LOSS ACCOUNT
For the period ending 31 March 2008

	N(Shs)	A (Shs)	Total(Shs)
Sales	144,000	176,000	320,000
Cost of good sold	88,560	112,570	201,130
Gross profit	55,440	63,430	118,870
Less: Selling and administration costs			(30,400)
Net profit			<u>88,470</u>

FIXED BUDGETS

Fast forward:

Unlike a flexible budget, a fixed budget is geared towards only one level of activity and is not adjusted to reflect the actual level of activity when change occurs.

The budgets that we have studied so far are essentially fixed in nature, for example, the master budget.

A fixed budget has two characteristics

- i) It is geared towards only one level of activity. It is thus defined by only one level of activity
- ii) It is not adjusted to reflect actual activity level when change occurs. Actual results are always compared against budgeted costs at the original level of activity and not against the adjusted budget.

Fixed budget has the following limitations:

- It provides little assistance at the planning stage. It does not give implications of various alternative strategies which management may wish to consider.
- It fails to provide relevant and reliable base against which to measure actual performance where actual activity differs from the budget; for instance, if the actual output differs significantly from the budgeted, the base of comparison and evaluation of performance of managers shall not be reliable.
- Little motivation to management to use the budgeting control system as a control aid. Fixed budgets are used as a production control tool in that they serve to ensure that production goals in terms of output are met. It does not make any sense to compare costs at different levels of activities thus does not serve as a cost control tool.

Flexible budgets

Flexible budget is a budget that is designed to change in accordance with the level of activity attained. It involves budgeting at various levels in anticipation of changes. In other words, it does not confine itself to only one level of activity, but rather is geared toward a range of activity. The original budget is adjusted (flexed) to reflect the actual conditions in which the performance was done.



If actual costs are incurred at a different level of activity from what was originally planned, the manager(s) construct a new budget on which the actual results shall be compared against.

A flexible budget is more useful than fixed budgeting because:

- i) **Planning:** It provides a range of information at the planning stage, which will assist in short term planning.
- ii) **Control:** It provides control data when compared with actual performance. Various budgets can be prepared at various levels of performance. It is geared toward all levels of activity within the relevant range, rather than toward only one level of activity as in fixed budgets. This enables the comparison between the budgeted and actual costs at the same level of activity thus able to come up with realistic variances.
- iii) **Motivation:** More likely to be acceptable to management to provide a positive motivational stimulus because the control data is adjusted to conform to current activity level. In addition manager's performance is evaluated on both aspects of production and cost control. Production data indicates whether production was met while cost data shows how well cost was controlled for the actual output thus they strike a balance between the two by ensuring that the production was met at the minimum cost.



How the flexible budgets work

To flex any budget, one needs to understand the cost behavior patterns. There are various steps that should be followed while preparing a flexible budget. These are:

- (i) Determining the relevant range over which the activity is expected to fluctuate during the period under consideration.
- (ii) Analyzing costs that will be incurred over the relevant range in terms of determining cost behavior patterns. A cost can either be variable, fixed or mixed.
- (iii) Separation of costs by behavior patterns, determining the formula for variable and mixed costs. You may use any cost determination method such as linear regression to separate mixed costs into variable and fixed elements.
- (iv) Using the formula for the variable portion of costs, prepare a budget showing what costs will be incurred at the various points throughout the relevant range.

The most appropriate flexing basis should be considered in that it assists in the comparison of alternative budget data at the planning stage and for the comparison of budget and actual data at the control stage.

Different organizations use different flexing bases but the following are most commonly used:

- Machine hours
- Direct labour hours
- Input to a cost centre
- Output from a cost centre

For the above flexing bases to be used, a number of requirements must be fulfilled:

- (i) The flexing bases should be correlated with the way in which costs vary e.g. does the number of miles traveled by distribution vehicles affect the repairs and maintenance expenses?
- (ii) The flexible bases should be easily understood by the management and not subject to manipulation.
- (iii) The flexible bases should be readily obtainable.
- (iv) It should be independent of other factors.

>>> Illustration

Mini Bakeries Ltd. has budgeted to produce and sell 100,000 units of cakes during the next period. The selling price per cake is Shs20 and variable cost per cake is Shs.12. Fixed overheads are budgeted to at Shs.6,000,000.

Additional information

1. Fixed costs will increase to Shs.700,000 where activity is in excess of 110,000 units; Fixed costs will fall to Shs.480,000 where activity level is less than 90,000 units.
2. Variable costs will fall by 5% per unit (cake) of all units where activity is in excess of 100,000 cakes because of the economies of scale.

The actual results of the period in which 115,000 units (cakes) were produced and sold were:

- (i) Sales revenue Shs.2,242,500
- (ii) Variable costs Shs.1,320,000
- (iii) Fixed costs Shs.67,000

Required

- (i) Prepare a summary, which shows the budgeted results for activity levels from 80,000 to 120,000 cakes using the above information.
- (ii) Prepare a control statement comparing budgeted with actual results where a fixed budget system is used based on 100,000 units.

**Solution****Flexible budget summary**

Units	80,000	90,000	100,000	110,000	120,000
Sales Revenue	1,600,000	1,800,000	2,000,000	2,200,000	2,400,000
Variable cost	960,000	1,080,000	1,200,000	1,254,000	1,368,000
Contribution	640,000	720,000	800,000	946,000	1,032,000
Fixed Costs	480,000	600,000	600,000	600,000	700,000
Net Profit	160,000	120,000	200,000	346,000	332,000

Control Statement (Fixed Budget)

	Budget	Actual	Variance
Units	100,000	115,000	15,000(F)
Sales revenue	2,000,000	2,242,500	242,500(F)
Variable costs	1,200,000	1,320,000	120,000(A)
Contribution	800,000	922,500	122,500(F)
Fixed costs	600,000	670,000	70,000(A)
Net profit	200,000	252,500	52,500(F)

Advantages of flexible budgets

- (i) A flexible budget is used to find well in advance the cost of layoff pay, idle time e.t.c.. if the output falls short of the budget.
- (ii) It is used when deciding on whether it would be possible to find alternative uses for spare capacity if output falls short of the budget.
- (iii) It is used in estimating the costs of overtime, subcontracting work or extra machine hire if sales volume exceeds the fixed budget estimates and finding out if there is a limiting factor, which would prevent high volume of output and sales to be achieved.

BASES OF BUDGETING **Activity based budgeting**

In ordinary/conventional budgeting, budget expenses for the current activities are normally based on previous year budget adjusted for price changes and anticipated future changes. Such costs are considered to be fixed in relation to the activity level. Activity based budgeting manages costs more effectively by authorizing the supply of only those resources required to perform activities directed towards meeting the budget. Activity-based costing is the reverse of Activity based costing in that it starts with the output to determine the level of activity, which in turn is used to estimate the resources required to meet the output. The following steps are followed in coming up with an activity-based budget

- (i) Estimation of production and sales volume by individual products and customers.
- (ii) Estimation of demand for organizational activities
- (iii) Determination of the resources required to perform organizational activities
- (iv) Estimation of quantity for each resource that must be supplied to meet the demand
- (v) Taking appropriate action to adjust capacity of resources.



Zero Based Budgeting

It is also referred to as **Priority based budgeting**. It is a cost benefit approach budgeting where it assumes that the cost allowance is Zero for any item until the manager responsible justifies its existence in terms of costs and benefits. It ignores all previous budgets and assumes that items in the budget are no longer required

CIMA definition: A method of budgeting whereby all activities are re-evaluated each time the budget is set.

It takes away the implied right of existing activities to continue receiving resources unless they can be shown to be the best use of such resources.

It is concerned with alternative means that established activities have been compared with alternative uses of the same resources. It works from the premise that projected expenditure for existing programmes should start from base zero with each year's budget being compiled as if the programmes were being launched for the first time. It seeks to overcome the deficiencies of incremental budgeting, which include perpetuation of past inefficiencies and waste inherent in the past way of doing things.

Perpetuation of inefficiencies arise because indirect costs and support activities are prepared on an incremental basis i.e. the budget for the current period is prepared based on the previous period's operations but adjusted for changes expected to occur in the current period. In this way, majority of expenditure associated with the base level of activity remain unchanged.

■ Stages of Implementation

- (i) Definition of decision package: This is the comprehensive description of the organization's functions or activities.
- (ii) Evaluation and ranking of packages: This is on benefit basis.
- (iii) Resource allocation according to priorities



Advantages

- (i) More efficient allocation of resources
- (ii) Focus attention on values for money and makes clear relationship between input and output.
- (iii) Develops a questioning attitude and makes it easier to identify obsolete, inefficient and less cost effective operations.
- (iv) Leads to greater staff and management knowledge of operations

Disadvantages

- 1. Time consuming.
- 2. High skills required.
- 3. May encourage wrong impression that all decisions must be made through budgets.
- 4. Short-term benefits may be emphasized to the detriment of long-term benefits.

OTHER BASES OF BUDGETING

Incremental or traditional budgeting: this involves taking the previous period's budget as the starting point and adjusting it for any changes. This may result in efficiency and ineffective use of resources.

Rolling budgeting: this is an approach to budgeting where a whole year's budget is considered, then divided into quarters. After every quarter, the budget is reviewed and another quarter budgeted for i.e. there is always a full years budget.

Program planning budget system: it is applied in the budgeting for non-profit organizations which have no profit objective and in most cases have difficulties in measuring their performance. Budgeting is done on the basis of the programs going on and those anticipated.

CHAPTER SUMMARY

Objectives of budgeting

- Coordination
- Communication
- Control Motivation
- Clarification of Responsibility and Authority
- Planning

Steps followed in the planning process

- Identify the objectives
- Identifying the alternative strategies available
- Evaluation of strategies available
- Selection of the best course of action
- Implementation of the selected course of action
- Control

Stages in budgeting process

- Communicating details of the budget policy and guidelines to people responsible for preparation of budgets
- Determining the limiting factor
- Preparation of the sales budget
- Initial preparation of other budgets
- Negotiation of budgets
- Coordination and review of the budget
- Final acceptance of the budget
- Budget review

Limitations of budgeting

- Budgets are based on estimate
- Danger of rigidity
- Budgeting is only a tool of management
- It is an expensive technique
- Difficult to set levels of attainment
- Budgeting control is a terminate exercise and therefore variances may be of little use to the current operations.

Organization of budgetary control

- The creation of budget centres
- The introduction of adequate accounting records
- The preparation of organization charts
- The establishment of a budget committee



CHAPTER QUIZ

1. Distinguish between budgeting and a budget
2. List the roles of a budget committee
3. Distinguish between a flexible budget and fixed budget
4. Highlight the limitations of a fixed budget

ANSWERS TO CHAPTER QUIZ

1. Budgeting refers to the process of quantifying the plans of an organization so as to enable it achieve its objectives in the defined period. A budget is a detailed plan outlining the acquisition and use of financial and other resources over some period of time in the future.
2. Roles of a budget committee
 - a. To issue instructions to departments regarding budget requirements, deadline dates for the receipt of budgets e.t.c..
 - b. Draw up the budget preparation timetable. It takes the form of network analysis whereby some activities are preceded by some others.
 - c. To define the general policies of management in relation to the budget
 - d. Checking initial draft and problems considered. Limiting factors are usually considered.
 - e. Ensuring that the budgets are synchronized within the boundaries of available resources.
 - f. To analyze comparison of budgets and actual results and to recommend corrective action where necessary
 - g. Review of budgets.
 - h. Prepare the master budget after functional budgets have been prepared.
 - i. The preparation of a budget manual
3. A fixed is a budget geared towards only one level of activity. It is thus defined by only one level of activity. It is not adjusted to reflect actual activity level when change occurs. Actual results are always compared against budgeted costs at the original level of activity and not against the adjusted budget.
Flexible budget is a budget that is designed to change in accordance with the level of activity attained. It involves budgeting at various levels in anticipation of changes
4. Fixed budget has the following limitations:
 - It provides little assistance at the planning stage.
 - It fails to provide relevant and reliable base against which to measure actual performance where actual activity differs from the budget
 - Little motivation to management to use the budgeting control system as a control aid.



PAST PAPER ANALYSIS

Questions from this chapter have been examined in the following exam sittings

06/ 07 Q2; 12/06 Q6; 05/ 06 Q3; 05/ 06 Q6(a); 12/05 Q1; 12/05 Q6; 05/ 05 Q4; 11 04 Q4; 12/03 Q1; 12/03 Q3(a); 12/02 Q3; 12/02 Q4; 05/ 02 Q4; 12/01 Q7(b); 12/00 Q7; 06/ 00 Q5; 06/ 00 Q7; 05/ 00 Q1; 05/ 00 Q2; 05/ 00 Q7;

EXAM QUESTIONS

QUESTION ONE

ABC limited manufactures three products A, B and C in two production departments D and E each of which employs two grades of labour. The following data are available

	Total	A (Units)	B (Units)	C (Units)
Finished stocks				
Budgeted stocks are as follows				
1 January 20X0		720	540	1800
31 December 20X0		600	570	1000
All Stocks are valued at expected cost per unit		Shs24	Shs15	Shs20
Expected profit calculated as % of the SP			20%	25%
				$16\frac{2}{3}$
	Shs'000	Shs'000	Shs'000	Shs'000
Budgeted sales				
Nakuru	6600	1200	1800	3600
Nanyuki	5100	1500	1200	2400
Kisumu	6380	1500	800	4030
	18080	4200	3800	10080
Normal loss in production		10%	20%	5%
Expected labour times per unit and expected rates per hour				
	Rate Shs	hrs/unit	hrs/unit	hrs/unit
Department E Grade I	1.80	1.0	1.50	0.50
Grade II	1.60	1.25	1.00	0.75
Department F Grade I	2.00	1.50	0.50	0.50
Grade II	1.80	1.00	0.75	1.75

Required:

Prepare the production budget in units for products A, B and C.

(20 marks)

Question two

Thorne Co values, advertises and sells residential property on behalf of its customers. The company has been in business for only a short time and is preparing a cash budget for the first four months of 2006. Expected sales of residential properties are as follows.

Month	2005 December	2006 January	2006 February	2006 March	2006 April
Units sold	10	10	15	25	30

The average price of each property is Shs180,000 and Thorne Co charges a fee of 3% of the value of each property sold. Thorne Co receives 1% in the month of sale and the remaining 2% in the month after sale. The company has nine employees who are paid on a monthly basis. The average salary per employee is Shs35,000 per year. If more than 20 properties are sold in a given month, each employee is paid in that month a bonus of Shs140 for each additional property sold.

Variable expenses are incurred at the rate of 0.5% of the value of each property sold and these expenses are paid in the month of sale. Fixed overheads of Shs4,300 per month are paid in the month in which they arise. Thorne Co pays interest every three months on a loan of Shs200,000 at a rate of 6% per year. The last interest payment in each year is paid in December.

An outstanding tax liability of Shs95,800 is due to be paid in April. In the same month Thorne Co intends to dispose of surplus vehicles, with a net book value of Shs15,000, for Shs20,000. The cash balance at the start of January 2006 is expected to be a deficit of Shs40,000.

Required:

- Prepare a monthly cash budget for the period from January to April 2006. Your budget must clearly indicate each item of income and expenditure, and the opening and closing monthly cash balances. (10 marks)
- Discuss the factors to be considered by Thorne Co when planning ways to invest any cash surplus forecast by its cash budgets. (5 marks)
- Discuss the advantages and disadvantages to Thorne Co of using overdraft finance to fund any cash shortages forecast by its cash budgets. (5 marks)



Question three

Acred Ltd manufactures a single product. It is preparing monthly budgets for the six months from July to December 2004. The following standard revenue and cost data is available:

Selling price	£12.00 per unit
Materials	2 kg per unit at £2.40 per kg
Labour	£1.80 per unit
Direct expenses	£1.20 per unit

Sales in June 2004 and July 2004 are forecast to be 10,000 units in each month. As a direct result of marketing expenditure of £95,000 in August 2004, sales are expected to be 11,000 units in August 2004 and to increase by 1,000 units in each month from September to December. Sales after December 2004 are expected to remain at the December 2004 level.

Some 25% of sales are paid for when they occur and 75% of sales are paid for in the month following the sale. Stocks of finished goods at the end of each month are required to be 20% of the expected sales for the following month. Stocks of materials at the end of each month are required to be 50% of the materials required for the following month's production.

Materials are paid for in the month following the purchase. Labor and direct expenses are paid for in the month in which they occur. Overheads for production, administration and distribution will be £34,000 per month, including depreciation of £12,000 per month. These overheads are payable in the month in which they occur. Acred Ltd has a £750,000 bank loan at 8% per annum on which it pays interest twice per year, in March and September. The cash balance at the end of June 2004 is expected to be £50,000.

Required:

- Prepare the following budgets for Acred Ltd on a month by month basis for the six month period from July to December 2004:
 - production budget (units);
 - Cash budget (13 marks)
- Critically discuss the relative merits of periodic budgeting and continuous budgeting. (7 marks)

Question four

Mavuno Ltd. is a small-scale company that specializes in the production of farm tools.

The company uses budgets for planning and controlling its activities. Currently the management are preparing budgets for the three months ending 31 March 2006.

The projected balance sheet as at 31 December 2005 is shown below:

	Cost Shs.	Depreciation Shs.	Net book value Shs.
Fixed assets	<u>2,000,000</u>	<u>200,000</u>	<u>1,800,000</u>
Current assets:			
Inventory		320,000	
Trade debtors		630,000	
Cash and bank balances		<u>8,400</u>	
		958,400	
Current liabilities:			
Trade debtors	28,000		
Accrued expenses	20,000		
Proposed dividend	4,000		
Taxes payable	<u>3,500</u>	<u>(55,500)</u>	<u>902,900</u>
			<u>2,702,900</u>
Financed by:			
Ordinary share capital 100,000 ordinary shares of Sh. 10 each			1,000,000
Share premium			500,000
Retained profits			452,900
Long term liability:			
Bank loan			<u>750,000</u>
			<u>2,702,900</u>

The following information has been extracted from the company's budget schedules:

	Sales Shs.	Rent Shs.	Overheads Shs.	Wages Shs.	Material stocks Shs.
2005					
November	500,000	80,000	180,000	40,000	272,000
December	340,000	80,000	180,000	60,000	320,000
2006					
January	400,000	80,000	190,000	60,000	480,000
February	600,000	80,000	200,000	80,000	464,000
March	580,000	80,000	200,000	74,000	464,000
April	580,000	80,000	200,000	70,000	500,000

Additional information:

1. The company sells the farm tools at a mark up of 25%.



2. Purchase of material stocks is on credit and it is paid for in the month of receipt by the company.
3. Employees are paid wages at the end of every week with the earnings of the last week of the month being settled in the following month. (Assume one month has 4 weeks)
4. Sales commission is paid one month in arrears at the rate of 1% of sales.
5. Overheads include a monthly depreciation charge of Sh. 25,000.
6. 25% of the sales are on cash basis. The other 75% is receivable two months after the sale.
7. The company will receive a loan of Shs. 2, 500,000 in the month of March 2006 from Wakulima Bank.
8. Old equipment will be sold for Shs. 250,000 in February 2006 and a new equipment will be purchased at Sh. 1,200,000 to replace the old equipment sold. The new equipment will be paid for in the month of March 2006.
9. Rent is paid for quarterly in advance in the months of January, April, July and October.

Required:

- (a) Cash budget for the three months ending 31 March 2006. (6 marks)
 - (b) Budgeted trading profit and loss account for the three months ending 31 March 2006. (6 marks)
 - (c) Budgeted balance sheet as at 31 March 2006. (8 marks)
- (CPA 12/05)

Question five

Ideal Products Limited, manufactures two products A and B. For the financial year ended 30 June 2004, the following information was assembled for preparation of the budget:

Standard data per unit

Direct Materials	Standard Price per Kg; Sh.	Product A Kg	Product B Kg
M1	10	10	4
M2	20	4	6
Direct Labour	Standard rate per hour	Product A Hours	Product B Hours
L1	30	8	10
L2	20	12	5

The following additional information was available:

- 1) Fixed Production overhead costs were recovered on a direct labour basis.
- 2) Administration, selling and distribution costs were absorbed at the rate of 20% of production cost.
- 3) Profit was estimated at the rate of 25% of cost of making and selling the products.
- 4)

	Product A Sh. '000'	Product B Sh. '000'
Expected sales for the year	13,494	18,816

- 5) Finished goods stock valued at standard production cost was as follows:

	Product A Sh. '000'	Product B Sh. '000'
1 July 2003	1,730	1,176
30 June 2004	1,038	1,568

- 6) Direct materials stock valued at standard prices was as follows:

	Material M1 Sh. '000'	Material M2 Sh. '000'
1 July 2003	640	600
30 June 2004	360	800

- 7) For the year ended 30 June 2004, 'fixed overheads had been budgeted at Sh. 5,760,000 and direct labour hours budgeted at 3,600,000 hours.
- 8) It is management's expectations that there will be no opening or closing work-in-progress.

Required:

- a) Production budget in units (8 Marks)
- b) Direct Material cost budget. (3 Marks)
- c) Purchases budget (6 Marks)
- d) Direct labour cost budget. (3 Marks)

(CPA 11/04)



CASE STUDY

In his study of “the impact of budgets on people” C Argyris reported the following comment by a financial controller on the practice of participation in setting budgets in his company:

“We bring in the supervisors of budget areas, we tell them that we want their frank opinion, but most of them just sit there and nod their heads. We know they are not coming out with exactly what they feel. I guess budget scares them”.

Managers may be reluctant to participate fully in setting budgets, indicating the negative side effects, which may arise from the imposition of budgets by senior management due to the following reasons.

- (i) The budget is seen as a **pressure device**, based by management to force ‘lazy’ employees to work harder. The intention of such pressure is to improve performance, the unfavorable reactions of subordinates against it seems to be at the core of the budget problem.
- (ii) The accounting department is usually responsible for recording actual achievement and comparing this against budget. Accountants, therefore, are ‘budget man’ is the failure of another manager and this failure causes loss of interest and declining performance. The accountant, on the other hand, fearful of having his budget derailed by factory management, obscures his budget and variance reporting and deliberately makes it difficult to understand.
- (iii) The budget usually sets targets for each department, achieving the departmental target becomes of paramount importance regardless of the effect this may have on the other departments and the overall company performance.
- (iv) Budgets are used by managers to express their character and patterns of leadership on subordinate; subordinates, resentful of their leadership style, blame the budget rather than the leader thus it loses meaning.

Computer Games Ltd. (CGL) makes and sells three types of computer games for which the following budget/standard and actual information is available for a week’s period:

Model	Sales (Units)	Budget/standard		Actual
		Selling price Shs. Per unit	Variable cost Shs. Per unit	Sales (Units)
A	15,000	3,900	3,120	18,000
B	25,000	3,120	1,950	21,000
C	10,000	2,730	1,716	9,000

Required:

Prepare a summary of sales variances for quantity, mix and volume for each model and in total, where individual product standard contribution per unit is used as the variance valuation base.

Prepare an alternative summary giving the same range of variances as in (a) above, but using the budgeted weighted averaged contribution per unit as the variance valuation base.

Model	Actual	Budgeted	Sales	Standard	S
Units	Units	Units	Variance (units)	Contribution (Shs)	V
A	18,000	15,000	3,000 (F)	(3,900 – 3,120) = 780	2
B	21,000	25,000	4,000 (A)	(3,120 – 1,950) = 1,170	4
C	<u>9,000</u>	<u>10,000</u>	<u>1,000 (A)</u>	<u>(2,730 – 1,716) = 1,014</u>	<u>1</u>
	<u>48,000</u>	<u>50,000</u>	<u>2,000 (A)</u>		<u>3</u>

Sales quantity variance in total is 2,000 units (A) with a cost of Kshs.3, 354,00

Weights Based on Budgeted units

Model	Proportion	Actual	Budgeted	Sales	Standard
		Sales in	sales	Quantity	Contribution
		Budgeted	In units	Variance	(Shs)
		proportion			
A	3/10	14,400	15,000	600 (A)	780
B	1/2	24,000	25,000	1,000 (A)	1,170
C	1/5	<u>9,600</u>	<u>10,000</u>	<u>400 (A)</u>	<u>1,014</u>
		<u>48,000</u>	<u>50,000</u>	<u>2,000 (A)</u>	

CHAPTER ELEVEN



STANDARD COSTING



CHAPTER ELEVEN

STANDARD COSTING

► OBJECTIVES

After studying this chapter, you should be able to:

- Define standard costing
- Understand how the various standards are set thus be able to set material standards, direct labour standards, overhead standards and sales standards among others.
- Outline the various types of standards
- Explain the importance of standard costing
- Prepare a standard cost card

► INTRODUCTION

This lesson describes how a standard cost is arrived at, the various types of standard costs and the application of standard costing in budgeting. The critical part of the chapter is variance analysis, the real life application of standard costing in budgeting and cost control. The behavioral implications of standard costs emanating from them are also briefly outlined.

► DEFINITION OF KEY TERMS

Standard cost is a yardstick that measures how well the organization has achieved its set objectives.

► EXAM CONTEXT

The examiner may set both theoretical and practical question. They may be application questions but most of the times not. You are required to familiarize yourself with the content of this chapter as it is the building block of budgeting and variance analysis, studied in the next chapter.

► INDUSTRY CONTEXT

Standard costing is mainly applicable in the manufacturing industry. It is the basis on which variance analysis is done. All planned productions are based on specific standards.

INTRODUCTION

Fast forward:

Standard costing is primarily used for control reasons.

This lesson describes how a standard cost is arrived at and the various types of standard costs and the application of standard costing in budgeting. The critical part of the chapter is variance analysis, the real life application of standard costing in budgeting and cost control. The behavioral implications of standard costs emanating from them are also briefly outlined.

Tutorial note:

It is especially critical that you establish a link between standard costs and budgets. At this point, you need to put it in your mind that standard costs are the “building blocks and cement” used to “build” a budget. There are other ways of establishing a budget other than using the standard costs, but the use of standard costs makes budgeting very easy and realistic!

What is Standard costing?

To effectively control the costs of a certain organization, we need a yardstick to measure the actual performance against. Traditionally, most organizations are known to use the previous period costs as the yardstick. But due to the fast changing business environment that businesses operate in today, managers always find that the previous period's performance is not an appropriate yardstick to measure the next and future periods' performance against. This is why most organizations develop standard costs.

Standard cost is, therefore, a yardstick that measures how well the organization has achieved its set objectives. This simple definition standard cost shows that a standard cost is developed simply for performance evaluation and cost control purposes. A standard cost has, therefore, to be developed in advance before the actual performance to be measured begins. For this reason, a standard cost is a predetermined costs based on certain assumptions. One has to appreciate the fact that a standard cost is a mere estimate of expected costs under certain conditions.



From the above discussion, a standard cost clearly comes out as a cost set before the actual costs are actually incurred. Some scholars, therefore, refer to it as the “**cost level that should be**” **under attainable, acceptable performance conditions**. Others refer to standard costs as carefully predetermined costs of production used as a basis for measurement and comparison. It is one of the most important techniques used in management accounting. It basically tries to establish a predetermined cost for products or services with which actual costs will be compared to establish whether there are any variances. The predetermined cost is an estimated unit cost *built up of standards for each cost element* (standard resource price and standard usage)

Standard costs establish the minimum desirable costs. When actual costs incurred exceed or are below the standard costs, we then investigate the variances with an objective to take appropriate corrective measures. Standard costing, on the other hand, is defined as the process of establishing predetermined estimates of the costs of products and services and comparing this with the actual cost when they are incurred. Thus, it is an exercise that determines the expected cost levels under certain conditions (standard costs), then applies the standard costs to the actual performance (performance analysis) so as to determine the difference (variance).

This difference can be good (favorable) or bad (unfavorable) depending on whether it is more or less than the standard; it is the basis of taking corrective action (Control). The variance needs to be further analyzed to determine how it came about. This is referred to as variance analysis and it is important because it pinpoints the exact causes of favorable (F) or unfavorable (U) deviation. Such causes can be corrected so as to achieve the desired performance.

Process of Setting Standards

Establishing a correct standard is very important because accuracy of the standards usually determine the success of the standard cost system. It is more of an art than a science which requires combined thinking and expertise of all the persons who have responsibility over prices and quantities of input.

As we will see later, the standard cost system has very serious behavioral implications for the staff whose performance will be measured against the standards. If the staff feel that the standards are too high, (unachievable), they will be frustrated and will be greatly demotivated. Also, if a disciplinary action is taken on an employee who fails to achieve the standards, but the employees feel that it is unfair as the standard was inaccurate, this will bring about resentment, sabotage and demotivation to the employees. On the other hand, if the standards are too low, they will be easily achieved by employees and they will not be challenged to work harder.

In determining standard cost, each cost should be carefully analyzed to ensure all factors affecting the cost level (in the period the costs are to be used) have been considered. In addition, managers in charge of the departments responsible for meeting the standards should approve the bases for the standards.

For the standard setting process and standards implementation to be successful, the employees responsible for meeting the standards should have the opportunity to participate in the Standard Setting Process. They are the best positioned in pinpointing inaccuracies in the set standards. It is easier to enforce standards once their acceptance is solicited through participation in the setting process.

The manager overseeing the setting of standards should also have an honest desire to set achievable targets, and also to assist their lower managers and employees to achieve them. Also, standards should only be set after there has been interaction between all the individuals involved.

Last, and very important, the top management must fully support the standard costing process from Standards Setting to standards implementation. This support gives the standards the enforcement they need to be effected in the whole organization.

i. Setting standards for material costs

These are based on product specifications derived from an intensive study of the input quantity necessary for each operation. The material content of the product: raw material, sub assemblies, piece parts, finishing materials, e.t.c. constitute the material quantity standards that are usually recorded on a bill of materials.

The intensive study should establish most suitable material for each product and also the optimal quantity that should be used after allowing for inevitable wastage or loss. The study is important as savings and alternative materials and ways of using materials are usually discovered.

When it comes to standard price, the onus is on the purchasing department. They estimate direct material cost per unit on the knowledge of the following

- a) Purchasing contracts already agreed
- b) Pricing discussions with regular suppliers
- c) Forecast movement of prices in the market
- d) Availability of bulk purchase discounts
- e) Quality of material required
- f) Carriage and packaging charges

The cost ought to include allowance for bulk discounts and it could be weighted average if different suppliers are used.



■ ii. Setting standards for direct labor

To set labor standards, a time motion study has to be performed for an activity. This is in a bid to establish, at efficiency level, how many labor hours will be needed to complete an activity having removed all the unnecessary elements. *Standard hour: amount of work achievable at standard efficiency levels in an hour or minute.* Unavoidable delays such as machine breakdowns and routine maintenance are included in the standard time.

The standard wage rate will be set by reference to the payroll and to any agreements on pay rises with trade union representatives of the employees.

The learning effect must be incorporated in setting the standard times. Learning effect is the increase in efficiency with time of a worker in handling a specific task. For instance, a football player will not perform as good on the first day as he will three months after exercising.

STANDARD HOURS PRODUCED EXPLAINED

It is not possible to measure output in terms of units produced for a department making several different products or operations.

If a department produces 100 units of X, 200 of Y and 300 of Z, it is not possible to add their production since they aren't homogeneous.

What would solve this is the use of standard hours that can act as a common denominator for adding together the production of unlike items.

That is, assume that the unit standard times are as follows

X - 5std hours

Y - 2std hours

Z - 3std hours

The production for the department will be calculated in standard hours as follows.

	STD hrs/unit	Actual output	STD hrs produced
X	5	100	500
Y	2	200	400
Z	3	300	900
			1800

From the illustration, we expect the output of 1800 standard hours to take 1800 direct labor hours of input if the department works at the present level of efficiency.

iii. Setting standards for overheads

In setting standard overhead costs we apply what we have learnt in our earlier chapter (in absorption costing). The predetermined overhead absorption rates become the standards for overheads for each cost center using the budgeted standard labor hours as the activity base or planned production volume.

Production volume will depend on two factors:

- production capacity (or volume capacity) measured in standard hours of output which in turn reflects direct production labor hours

Efficiency of costing by labor or machines, allowing for rest times and contingency allowances

Separate rates for fixed and variable overheads are essential.

$$\text{Standard variable OAR} = \frac{\text{Budgeted Variable Overheads for cost center}}{\text{Budgeted Standard labour hours for cost center}}$$

$$\text{Standard variable OAR} = \frac{\text{Budgeted Fixed Overheads for cost center}}{\text{Budgeted Standard labour hours for cost center}}$$

N.B: The level of activity adopted will be assumed as 100% capacity and for control purposes and will be the base for the master budget.

>>> An Illustration on standard hours

A department has a workforce of 20 men working a 30-hour week making standard units. Each unit has a standard time of 2 hours to make. The expected efficiency of the workforce is 125%.

- Budgeted capacity of indirect labor hours = $20 \times 30 = 600$ production hours per week



- b. Budgeted efficiency is 125%, so that the workforce would take only 1 hour of actual production time to produce 1.25 standard hours of output
- c. This means that budgeted output is $600 \times 1.25 = 750$ standard hours with each requiring 2 standard hours, the production activity or volume of 375 units per week.



iv. Setting standards for sales price and margin

Setting of product selling price is a top-level decision that is based on factors such as:

- anticipated market demand
- manufacturing costs
- competing products
- inflation estimates.

After much discussions and deliberation, a price for the product is set; this is the standard selling price. The standard sales margin is the difference between the standard cost and the standard selling price.

Recapitulation

A standard cost is a predetermined calculation of how much is expected to be incurred under certain specified working conditions. It is a benchmark for measuring performance. In managerial and cost accounting, standards relate to the **quantity** and **cost** of inputs used in manufacturing goods and services. Quantity standards say how much of a specific input should be used in manufacturing a unit of product or in providing a unit of service. Cost standards say what the cost of the input should be.

It is not an average of past costs since these may contain mistakes of past inefficiencies and may not incorporate changes in the business' operating environment e.g. technological changes.

Standard costs are developed from a scientific study of the various production cost elements involved in producing a certain good or service (These are usually specified in a product's technical specifications). To develop these costs, one needs to have a good idea or reliable estimate of the materials, labour and other cost levels that will apply during a specified period.

Standard costs give a basis of cost control through variance analysis. It is one of the leases. It is also the basis of budgeting. Standard costs are also applied in setting prices, valuing closing stocks and performance evaluation

A standard costing system is most suited to an organization whose activities consist of repetitive operations and the requirements per unit can be specified, for instance, in the manufacturing

sector where standardized output is produced. More so, it can be used in the manufacturing industries where the organization produces different goods which undergo a series of common operations. Note that standard costing cannot be applied to activities of a non-repetitive nature.

Types of Standard

The standard cost set could be basic, ideal, attainable or current.

(i) **Basic Standards:** These are long-term standards that would remain unchanged over the years. Their sole use is to show trends over time for such items as material prices, labour rates, efficiency, e.t.c.. They, therefore, cannot be used to highlight current efficiency or inefficiency; for this reason, basic standards do not normally form part of the reporting system and will, therefore, be used as a background for statistical analysis over time. Their main advantage is that they provide a base for a comparison with actual cost through a *period of years with the same standard* and establish efficiency trends over time.

(ii) **Ideal Standards:** These are standards, which can be achieved under the best circumstances. They represent perfect performance. They are, therefore, based on the best possible operating conditions. They allow for no work interruptions and call for a level of effort that can only be attained by the most skilled worker working at 100% efficiency. Normal production problems such as material spoilage, stoppages, idle time, machine breakdowns, shrinkage, e.t.c. are not allowed in ideal standards.

They can be revised periodically to reflect changes in the organization's operating conditions, e.g. changes in technology. However, since the ideal standards assume perfect operating conditions, they would be unattainable in real life, which has normal operating problems such as idle time and machine breakdown, idle time and employee slowdown due to fatigue.

These standards act as a motivational tool to the workers. Although workers know that they will never stay within the standard set, it acts as a constant reminder that he/she is not efficient enough and needs to improve. However, when these standards are set too high, they tend to discourage even the most productive and diligent worker.

(iii) **Attainable standards:** these are practical standards, which are tight but attainable. They can be attained through reasonable, though highly efficient, efforts by an average worker at a task. They allow for normal machine breakdowns, employee rest times, idle time, decline in efficiency and other inefficiencies that may arise in the production process.

They are used for product costing and pricing for stock valuation, for budgeting and for cost control and performance evaluation. But to be meaningful, attainable standards need to be revised regularly so as to affect the conditions expected to prevail during the period in which the standards would be applied. Variances from attainable standards are very useful to management as they represent deviations that fall outside the normal, recurring inefficiencies and signal a need for management's attention.

Of all the standards, attainable standards are likely to produce the highest level of motivation especially when the employees are adequately involved in setting them. They should provide a challenge to employees by giving them a tough but realistic target, thus it motivates employees and management to achieve high levels of output.



- (iv) **Current Standards** These are standards set for use over a short period of time, related to current. Since basic standards cannot be used for analyzing current efficiency levels, a current period standard can be developed for the basic standards. The current period standard can then be used to analyze the current period performance.

Current standards are useful especially in inflationary conditions where current standards could be set for a three-month period or on a monthly basis to reflect the changes in prices.

Tutorial note

- (i) The type of standard used (basic, ideal, attainable, current) directly affects the level of the variances which can arise, and the meaning, which can be attached to the variances. For example, negative (unfavorable) variance will be taken more seriously if it is registered using a current and attainable standard than when it is registered using basic or ideal standards.
- (ii) Standards for the same cost can vary from organization to organization depending on the level of efficiency desired by the management. Thus, standards are very subjective; what is also a matter of management opinion.
- (iii) The accuracy of the standards set depends on the accuracy of the forecasting prices, activity level, and wage, e.t.c. of the team setting such standards. If the team is good in forecasting skills, then the standards set are likely to be error free and vice versa.
- (iv) The various types of standards have various impacts of human behavior:

Type	Impact
Ideal	<ul style="list-style-type: none"> - one school of thought says that they provide employees with incentive to be more efficient even though they are unattainable - others say that they are demotivation since the variance will always be adverse and they see it as impossible and decide not to work so hard.
Attainable	- they are motivating. Realistic but a challenging target to achieve
Current	- they have no effect on motivation
Basic	- may have an unfavorable impact on motivation. Over time they become easily achievable; employees become bored and lose interest since they have nothing to aim for



The Relationship Standards and Budgets

Standards and budgets are one and the same thing. The only distinction between the two is that a **standard is a unit amount** and it applies to particular products, individual processes or single operations while a **budget** is a total amount, which lays out the cost limits for functions and departments and for the firm as a whole.

>>> Illustration

The standard cost for labour per unit of product is Shs500. If 10,000 units are to be produced during the period then the budgeted cost of materials is Shs.5,000,000 (Shs.500 per unit x 10,000 units).

Importance of standard costing; Why set standards? (Advantages of standards)

Standard costing systems provide cost information for various uses. These include:

(i) Setting of budgets

Standard costing systems assist in setting budgets and evaluating performance of the managers. Standard costs are of particular importance for budgeting as they provide reliable and convenient source of data to be used in the budgeting process. This, thus, reduces the budgetary time because for instance, once the desired output units is known, then the budgeted cost is simply derived by multiplying the budgeted cost per unit and the desired output in units.

(ii) Act as control devices and simplifies performance evaluation

Standard costing systems act as control devices by highlighting those costs or items that do not conform to the budget or plan and thus alerts managers to those situations that need corrective action. It acts as a yardstick against which costs and other items are measured to determine whether the variance is favorable or unfavorable.

Once the budgets are prepared and agreed upon, the employees' performance can be acceptably measured against the set standards to determine whether the performance is acceptable or not. Appropriate corrective measures can then be taken by the management.

(iii) Profit measurement and inventory valuation

Standard costing makes inventory valuation much easier as it simplifies the task of tracing costs to products for inventory valuation and profit measurement purposes. If the actual number of physical units in inventory is known then the value of inventory is simply obtained by multiplying the standard cost per unit by the physical units. This is because, profit measurement may be time consuming thus making it cumbersome to allocate costs as per the period incurred. Variances are calculated later and written off in the books of account as period costs. This enables the reflection of inventory at actual cost while at the same time determining the correct profit figure.

(iv) Decision making

Standard costing provides a prediction of the future costs that can be used for decision-



making purposes. Standard costs are preferable to estimates based on adjusted past costs because the later may incorporate avoidable inefficiencies.

(v) Management by exception

Standard costing is an example of management exception. By studying the variances, management's attention is directed towards those items that are not proceeding as per the plan. Most of management's time is saved and can be directed to other value adding activities. Management only concentrates on the few exceptions reported.

(vi) Motivation

A standard costing system provides a challenging target that individuals are motivated to strive and achieve. Involving the management and employees at all levels of operation in the setting of standards makes them feel as part of the system thus working to meet the standards that they set for themselves.

(vii) Pricing

Standard costs act as a reliable base of calculating total cost of producing a good or service to which a margin can be added to determine the selling price. (Cost plus markup method of price determination)

(viii) Cost reduction

The process of setting, revising and monitoring standards encourages reappraisal of methods materials and techniques thus leading to cost reductions. Analysis of variance (Anova) directs cost analysis to factors that are causing unfavorable variances and thus costs can be controlled, leading to cost reduction.

THE STANDARD COST CARD

This is a card record of the Standard or expected costs in producing a given output. It gives the physical quantities of inputs as well as their monetary values. It also gives the quality required, e.g. Grade A labour. The process of setting standards results in the establishment of the standard cost for the product. The make up of the standard cost is recorded on a standard cost card.

>>> Illustration

SK's Ltd. produces a product B which consumes 2 types of materials, A56 and C91, and passes through 3 departments X, Y and Z. The following information relates to the product B and its production process;

Materials: A56: 5 kg each @ Shs.7.4: it is applied in department A
 C91: 500 units @ Shs.7.50 per 100 units: It is applied in department B.

Labour for the period just ended:
 4.8 hours @ Shs.2.5/hr in Department A
 9.2 hours @ Shs.2.5/hr in Department B.
 16.4 hours @ Shs.1.75/hr in Department C.

Absorption of Production overheads:

Machine overheads: based on direct labour hours. They are incurred as Shs.11/hr in departments A and B.

Indirect labour: based on direct labour hours in Department C above at Shs.6/hr.

Required

Prepare a standard cost card for product B.

Solution:

SK's Ltd					
Standard cost card for product B					
					Revised : 31.12.20XX
					By: JKC
Cost type and Quantity	Standard rate (Shs)	Dept A (Shs)	Dept B (Shs)	Dept C (Shs)	Total (Shs)
Direct materials					
5 kg of A56	Shs7.4	37.0	--	--	37.00
500 units of C91	Shs7.5 per 100units	--	37.5	--	<u>37.50</u>
74.50					
Direct labour					
Department A: 4.80 hrs	2.50	12	--	--	12.00
Department B: 9.20 hrs	2.50	--	23	--	23.00
Department C: 16.4 hrs	1.75	--	--	28.70	<u>28.70</u>
63.70					
Production overheads					
Machining	11	52.80	101.20	--	154.00
Indirect labour	6	--	--	98.40	<u>98.40</u>
252.40					
Standard cost Summary			Shs		
			Direct materials 74.50		
			Direct Labour 63.70		
			Production overheads <u>252.40</u>		
			Standard cost per unit <u>390.52</u>		



CHAPTER SUMMARY

Standard cost is a yardstick that measures how well the organization has achieved its set objectives.

The process of standard costing involves setting standards for:

- Material costs.
- Direct labor.
- Sales price and margin.

Types of standards include:

- Basic standards
- Ideal standards
- Attainable standards
- Current standards

Standard costing systems provide information for various uses. These include:

- Setting of budgets
- Acts as a control device and simplifies performance evaluation
- Facilitates profit measurement and inventory valuation
- Aids in decision making, motivation, pricing and cost reduction

CHAPTER QUIZ

1. List the major considerations made in determining the unit material cost.
2. What are the major types of standards?
3. Briefly distinguish standards and budgets.

ANSWERS TO CHAPTER QUIZ

1. Major considerations made in determining the unit material cost.
 - a) Purchasing contracts already agreed
 - b) Pricing discussions with regular suppliers
 - c) Forecast movement of prices in the market
 - d) Availability of bulk purchase discounts
 - e) Quality of material required
 - f) Carriage and packaging charges
2. Types of standards:
 - (i) Basic Standards
 - (ii) Ideal Standards
 - (iii) Attainable standards
 - (iv) Current Standards
3. Standards and budgets are one and the same thing. The only distinction between the two is that a **standard** is a unit amount and it applies to particular products, individual processes or single operations while a **budget** is a total amount which lays out the cost limits for functions and departments and for the firm as a whole.



EXAM QUESTIONS

QUESTION ONE

- (a) Distinguish between practical standards and ideal standards (10 marks)
- (b) Explain how direct materials standards and labour standards are set (10 marks)

QUESTION TWO

- (a) Enumerate the advantages and disadvantages of using standard costs (10 marks)
- (b) Explain how a manager would determine whether a variance constituted an exception that would require his or her attention. (10 marks)

QUESTION THREE

- (a) Explain the importance of a standard cost card. (10 marks)
- (b) Distinguish between standard costing and budgetary control (10 marks)

CASE STUDY

Introduction

BSI was the first national standards-making body in the world. It was founded in London in 1901 and is the UK's National Standards Body. Today it is part of the BSI Group with offices throughout the world. Businesses choose to conform to standards as they protect consumers, lead to new developments and bring benefits to industry. Businesses that apply standards are recognized as providers of quality and BSI works with a wide range of groups to decide on standards.

Research

Most new products are the result of research and the application of standards throughout the research process. Standards increase the effectiveness of many goods and services, help to lower costs and reduce the time it takes to develop a concept into a viable product. Each standard has a number and description, which shows if it is a British (BS), European (EN) or International (ISO) Standard. BSI identifies best practice and uses this to create standards that provide a framework for research. Standards even help with new technology. For example, BSI supports nanotechnology research. This involves making new products by controlling individual atoms.

Development

BSI sets out guidelines for developers to follow which show best practice. By following best practice, businesses can become more effective, more efficient and able to make more profit. Standards provide a common framework for products that need to work together. For example, all CDs are the same size so they fit into CD players around the world. A team of experts discuss what factors are needed to make a product safe, reliable and of high quality. This panel creates a list of rules and tests that a product or process needs to meet. Even services have standards, for instance, the process for businesses to handle complaints from customers.

Testing

Testing is vital when bringing new products to the market. Products must be safe and fit for purpose meant. This means they must do what customers expect of them. A product with a Kitemark is BSI tested and businesses need a BSI license in order to use the Kitemark. Some standards are compulsory. For instance, fire extinguishers must meet health and safety regulations, - without this, they cannot legally be sold. The CE marking shows that a product meets the requirements of European laws. Some products, like toys, must carry this mark.

Production and launch

BSI helps companies from research and development through to product launch and marketing. During pre-production, trained assessors and inspectors check that processes and production comply with the standards before products are considered 'fit for sale'. On launch, a BSI certificate gives customers confidence. Working to standards helps businesses because:

- It helps attract customers and encourages them to buy
- It demonstrates market leadership
- It creates competitive advantage
- It maintains best practice.

Conclusion

New products, processes and services are continually coming onto the market. Innovative product developers research and develop new ideas. However, they need a framework in which to work. BSI can support every stage of the process by creating standards, providing advice and supporting research.

CHAPTER TWELVE



VARIANCE ANALYSIS



CHAPTER TWELVE

VARIANCE ANALYSIS

► OBJECTIVES

After studying this chapter, you should be able to:

- Understand the general model for variance analysis.
- Calculate various variances and give possible causes of the variance.
- Analyze fixed overhead volume variance into fixed overhead capacity and fixed overhead efficiency variances.
- Distinguish between efficiency ratio and capacity ratio.
- Calculate sales variance and criticize sales margin variance.
- Calculate material mix and yield variances and highlight problems in using conventional mix and yield variances.

► INTRODUCTION

This section describes how material, labour and overhead variances are calculated and describes what causes those variances. Students in most cases attempt to memorize the formulas for calculation of variances which does not help them understand the concept and variables in variance analysis.

We shall use a single product to in order to simplify the learning and understanding process. However, note that in real life situation, many products will exist with different variances which may be cumbersome to calculate and integrate without the use of computerized systems.

► DEFINITION OF KEY TERMS

A variance is factually a deviation from the expected.

Price/rate variance measures the difference between the actual price (AP) paid and the standard price (SP) that should have been paid.

Quantity/efficiency variance measures the difference between the actual quantity (materials or labour hours) used and the standard quantity that should have been used

► **EXAM CONTEXT**

The examiner will often set questions from this topic. The nature of questions set may differ from time to time. Note that this topic is dependent on all the other topics preceding it. The examiner may test for definitions, discussions and suggestions besides testing on calculations.

► **INDUSTRY CONTEXT**

Mainly applicable in the manufacturing industry, it is aimed at establishing the deviations from the expected and giving explanations as to why those deviations existed.

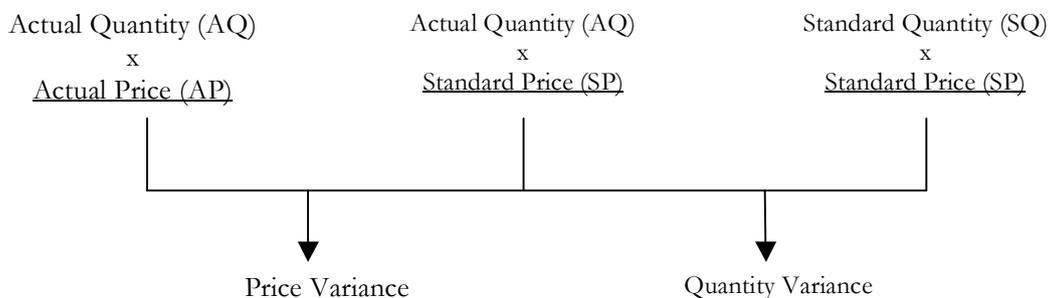
INTRODUCTION

Fast forward;

Variance analysis relies to a great extent on standard costing. Standard prices and quantities and actual prices and quantities must be known in order to calculate variances. Variance analysis is used as a control and evaluation tool.

This chapter covers variance analysis. In here we first discuss the various types of variances and how they are calculated. We go further to establish the causes of those variances.

General model for variance analysis



AQ (AP – SP)	SP (AQ – SQ)
AQ = Actual quantity	SP = Standard Price
AP = Actual Price	SQ = Standard Quantity
Material Price variance	Material usage variance
Labour rate variance	Labour efficiency variance
Variable OH spending variance	Variable OH efficiency variance

Note: Total variance = Price variance + Quantity variance



The diagram on the previous page shows the general relationship between variables that are used to compute the various variances. For instance, AQ will represent actual quantity of materials used when calculating material price variance, actual labour hours worked when calculating labour rate variance and actual units of the absorption base incurred.

Material variances

Material variances comprise both material price variance and material usage variance. Material price variance deals with the price paid for the materials while material usage variance deals with the quantity used in the production process. Thus material variance may arise if the quantity used in the production process differs from the budgeted or if the actual price paid for the materials is different from the standard.

Material price variance (MPV)

Material price variance measures the difference between the actual price (AP) paid for a given quantity of materials and the standard price (SP) that should have been paid for the same quantity of materials purchased (AQ). This variance arises in the purchasing department.

It can, therefore, be calculated as

Material Price variance = (Actual Price x Actual Quantity) – (Standard Price x Actual quantity)

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

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

The simplified formula above is the most widely used in calculating material price variance as it is simple.

When calculating variances, the sign obtained does not tell the nature of the variance, i.e. whether Favorable or Adverse. What matters is the interpretation. One needs to understand variance analysis to correctly interpret the results obtained. For instance, MPV may also be calculated as $(\text{SP} - \text{AP}) \times \text{AQ}$. If one person uses the first formula and obtains a negative value and a second person uses the second formula and obtains a positive value, assuming same data, then the two will interpret the variances differently.

>>> Illustration I (MPV)

The following information relates to product XYZ for the period just ended.

- The standard direct material cost for a product is Shs.50 per unit (12.5 kg at Shs.4 per kg).
- The actual amount paid for 45,600 kg of material purchased and used was Shs.173,280

Required: Calculate the direct material price variance for the period just ended.

Solution

$$\begin{aligned}
 \text{Material Price variance} &= (\text{Actual Price} \times \text{Actual Quantity}) - (\text{Standard Price} \times \text{Actual quantity}) \\
 &= \text{Shs.}173,280 - (\text{Shs.}4.00 \times 45,600\text{kg}) \\
 &= \text{Shs.}173,280 - \text{Shs.}182,400 \\
 &= \text{Shs.}9,120 \text{ (Favorable)}
 \end{aligned}$$

Note that the actual price paid for all the units has been given in total and thus we do not need to calculate it i.e. Shs173,280 (Actual Price x Actual quantity)

>>> Illustration II (MPV)

A company has a budgeted material cost of Shs.62,500 for the production of 12,500 units per month. Each unit is budgeted to use 2 kg of material. The standard cost of material is Shs2.50 per kg. Actual materials in the month cost Shs.68,000 for 13,500 units and 26,500 kg were purchased and used.

What was the adverse material price variance?

Solution

$$\begin{aligned}
 \text{Material price variance} &= (\text{Actual Price} \times \text{Actual Quantity}) - (\text{Standard Price} \times \text{Actual quantity}) \\
 &= \text{Shs.}68,000 - \text{Shs.}2.50 \times 26,500 \\
 &= \text{Shs.}1,750 \text{ (Unfavorable)}
 \end{aligned}$$

The variance is unfavorable since the price paid for the materials is above the standard price the company should have paid.



Possible causes of material price variance

- Actual prices may change following a change in the market conditions that cause a general price increase or decrease for the type of materials used. Thus the company may end up paying more or less than the standard price.
- Inferior quality materials, which are less expensive, may be bought thus translating to a favorable material price variance. Buying of substitute materials due to unavailability of the planned ones may translate to favorable or unfavorable material price variance.
- A shortage in materials which calls for an urgent purchase at short notice may increase the purchase costs where the company may be required to airlift the materials or pay for other costs associated with that order. This will translate to unfavorable material price variance.
- Quantity discounts lost or gained by buying in smaller or larger quantities than planned also translate to a material price variance.

Material Usage Variance (MUV)

Material Usage Variance measures the difference between the Actual Quantity of materials used in production (AQ) and the standard quantity (SQ), which should have been used according to the standard set, all valued at the standard purchase price. This variance arises due to the production department using more or less than the expected or standard material input. However, there are instances where the purchasing department may be held responsible for the unfavorable material usage variance e.g. purchase of inferior goods. When calculating MUV, one uses the actual quantity used and not the actual quantity purchased. This is because there are instances where the actual quantity purchased is more than the actual quantity used thus leaving some materials in stock.

Material Usage variance is calculated as follows:

Material Usage Variance = Standard quantity x Standard Price – Actual Quantity x Standard Price

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

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

>>> Illustration III (MUV)

A company has a budgeted material cost of Shs.125,000 for the production of 25,000 units per month. Each unit is budgeted to use 2 kg of material. The standard cost of material is Shs2.50 per kg. Actual materials in the month cost Shs.136,000 for 27,000 units and 53,000 kg were purchased and used.

Required: calculate the material usage variance?

Solution

$$\text{Standard cost} = \frac{\text{Budgeted material cost}}{\text{Budgeted material input}} = \frac{\text{Shs.125,000}}{25,000 \text{ units} \times 2\text{kg per unit}} = \text{Shs.2.50 per kg}$$

Actual quantity = 53,000 kg

Standard quantity = 27000 units x 2 kg per unit = 54,000

$$\begin{aligned} \text{MUV} &= \text{Actual Quantity} \times \text{Standard Price} - \text{Standard quantity} \times \text{Standard Price} \\ &= \text{Shs}2.5 \times 53000 - \text{Shs}2.50 \times 54,000 \\ &= \text{Shs}2,500 \text{ (Favorable)} \\ &= (\text{AQ} - \text{SQ}) \times \text{SP} = (53,000 - 54,000) \times \text{Shs}2.50 = 2,500 \text{ (F)} \end{aligned}$$

>>> Illustration IV (MUV)

The following information relates to product XYZ for the period just ended.

- The standard direct material cost for a product is Shs50 per unit (12.5 kg at Shs4 per kg).
- The actual amount paid for 45,600 kg of material purchased and used was Shs173,280
- The direct material usage variance was Shs15,200 (Unfavorable)

Required: Calculate the actual production for the period just ended.

Solution

Material Usage variance = (Actual Quantity x Standard price) – (Standard quantity x Standard Price)

$$15200 = (45600 \times \text{Shs}4.00) - (\text{SQ} \times \text{Shs}4.00)$$

$$\text{Shs}4.00 (\text{SQ}) = (45600 \times \text{Shs}4.00) - \text{Shs.}15,200$$

$$= \text{Shs}(182,400 - 15,200)$$

$$= \text{Shs}167,200$$

$$\text{SQ} = \frac{\text{Shs.}167,200}{\text{Shs. } 4 \text{ per unit}} = 41,800\text{kg}$$

$$\text{SQ} = \text{Actual output} \times \text{Standard quantity per unit}$$

$$\text{Actual Output} = \text{SQ} / \text{Standard qty per unit}$$

=



$$\frac{41,800\text{kg}}{12.5\text{kg per unit}} = 3,344 \text{ units}$$

Possible causes of material usage variance

- Careless handling of materials by production personnel or working with untrained workers who are poorly supervised OR extremely high quality labour than expected.
- Inferior quality materials thus requiring more input than budgeted OR higher quality materials than budgeted that reduces the quantity of material input below the budgeted.
- Faulty or inefficient machinery OR efficient machinery
- Theft and pilferage
- Changes in methods of production and quality control, greater or lower rate of scrap than anticipated

Total material variance

Total material variance comprises of material price variance and material usage variance.

Material variance = Material Price variance + Material Usage variance

$$\begin{aligned} &= [(AP \times AQ) - (SP \times AQ)] + [(AQ \times SP) - (SQ \times SP)] \\ &= AP \cdot AQ - SP \cdot AQ + SP \cdot AQ - SP \cdot SQ \\ &= AP \cdot AQ - SP \cdot SQ \end{aligned}$$

Therefore, Material Variance shall be given by the difference between the actual quantity bought and used at actual cost less standard Quantity that should have been bought and used at standard price. However, when the materials purchased are more than materials used, the summation of the MUV and MPV will not agree with the total material variance.

>>> Illustration

The total material variance for product XYZ (Illustrations I and IV) is equal to

$$\begin{aligned} MV &= MPV + MUV \\ &= 9120 (F) + 15,200 (A) \\ &= 6,080 (A) \\ &= AP \cdot AQ - SP \cdot SQ \\ &= \text{Shs.}173,280 - (\text{Shs.}4 \times 3,344 \text{ units} \times 12.5 \text{ kg per unit}) \\ &= \text{Shs.}6,080 (A) \end{aligned}$$

LABOUR VARIANCES

The total labour variance comprises of labour rate variance and labour efficiency variance. Labour rate variance occurs when there is a difference between the price (wages) paid out and the standard wages, which should have been paid. It measures the deviation, if any, from the standard of the average wages paid to direct labour hours. Labour efficiency occurs when there is a difference between the actual number of hours taken and the standard hours that would have been taken to complete an assignment. It measures the productivity of labour time.

Labour Rate Variance (LRV)

Labour rate variance measures the deviation from the standard of the average wages paid to direct labour hours. It is calculated by comparing the standard price per hour with the actual price paid per hour and multiplying the difference with actual hours taken.

In many organizations, LRV tends to be nonexistent since most of the rates paid to workers are set by union contracts. This means that the actual wage rate paid equals the standard wage rate paid. However, there are instances in which wage rate variance may arise. This, in most cases, depends on the way labour is used. For instance, highly skilled workers are more expensive to hire and if it demands that they be hired to take up an assignment, which was initially to be taken up by semi-skilled workers, then the wage rate paid to them shall be higher than the standard set initially. This will automatically translate to an adverse labour rate variance. The officers in charge of effective utilization of labour time are held responsible in ensuring that labor rate variances are kept under control.

Labour rate variance is calculated using the following formula;

$$\begin{aligned} \text{Labour rate variance} &= \text{Actual rate} \times \text{Actual hours} - \text{Standard rate} \times \text{Actual hours} \\ &= \text{AR} \cdot \text{AH} - \text{SR} \cdot \text{AH} \\ &= (\text{AR} - \text{SR}) \times \text{AH} \end{aligned}$$

>>> Illustration V (LRV)

The following information relates to labour costs for the period just ended:

Budget	Labour rate	Shs.100 per hour
Actual	Wages paid	Shs.1,760,000
	Production	5,500 units
	Total hours worked	14,000 hours

There was no idle time.

Required: Calculate the labour rate variance?

**Solution**

$$\begin{aligned}\text{Labor rate variance} &= \text{Actual rate} \times \text{Actual hours} - \text{Standard rate} \times \text{Actual hours} \\ &= \text{Shs.}1,760,000 - \text{Shs.}100 \times 14000 \text{ hrs} \\ &= \text{Shs.}360,000 \text{ (A)}\end{aligned}$$

>>> Illustration VI (LRV)

A company operating a standard costing system has the following direct labour standards per unit for one product AB611.

4 hours at Shs.12.50 per hour

In the period just ended, when 2,195 units of the product were manufactured, the actual direct labour cost for the 9,200 hours worked was Shs.110,750.

Required: Calculate labour rate variance for the period

Solution

$$\begin{aligned}\text{Labour rate variance} &= \text{Actual rate} \times \text{Actual hours} - \text{Standard rate} \times \text{Actual hours} \\ &= \text{Shs.}110,750 - \text{Shs.}12.50 \times 9200 \\ &= \text{Shs.}4,250 \text{ (F)}\end{aligned}$$

 Possible causes of Labour Rate Variance

- Negotiation of wages where the employee may demand a higher rate than the standard, this may be considered as uncontrollable as the employer has very little, if any, control on the wage rate. Higher wages than planned may be paid.
- Unexpected overtime, which has an element of premium and bonus may also cause this variance
- Misallocation of workforce, allocating semi-skilled workers

 Labor Efficiency variance (LEV)

Labour efficiency variance measures the productivity of labour. It is equivalent to material usage variance. This variance is closely watched by management as increasing the productivity of labour is the vital key to minimizing unit cost of production.

Labor efficiency variance is calculated as follows:

$$\begin{aligned} \text{Labor efficiency variance} &= \text{Standard hours} \times \text{Standard rate} - \text{Actual hours} \times \text{Standard rate} \\ &= \text{SH} \cdot \text{SR} - \text{AH} \cdot \text{SR} \\ &= (\text{SH} - \text{AH}) \times \text{SR} \end{aligned}$$

>>> Illustration VII (LEV)

The following information relates to labour costs for the past month:

Budget	Labour rate	10 per hour
	Production time	15,000 hours
	Time per unit	3 hours
	Production units	5,000 units
Actual	Wages paid	Shs176,000
	Production	5,500 units
	Total hours worked	14,000 hours

There was no idle time.

Required: calculate the labour efficiency variance?

Solution

$$\begin{aligned} \text{Labour efficiency variance} &= \text{Standard hours} \times \text{Standard rate} - \text{Actual hours} \times \text{Standard rate} \\ &= 5500 \text{ units} \times 3 \text{ hrs} \times \text{Shs}.10 \text{ per hr} - 14,000 \text{ hrs} \times \text{Shs}.10 \text{ per hr} \\ &= \text{Shs}.165,000 - \text{Shs}.140,000 \\ &= \text{Shs}.25,000 \text{ (F)} \end{aligned}$$



Causes of labour efficiency variance

- Labour efficiency variance may be caused by various factors including
- Use of poor quality materials and poorly trained workers or incorrect grade of workers and poor supervision of workers, requiring more labour time in processing.
- Use of incorrect materials or experiencing machine problems
- Use of higher or better quality materials
- Use of faulty equipment causing breakdowns and work interruptions.



□ Total Labor Variance

Total labor variance, like total material variance, comprises two elements; labour rate variance and labour efficiency variance:

$$\begin{aligned}
 \text{Total labor variance} &= \text{labour rate variance} + \text{labour efficiency variance} \\
 &= AH(SR - AR) + SR(SH - AH) \\
 &= AH \cdot SR - AH \cdot AR + SR \cdot SH - AH \cdot SR \\
 &= SR \cdot SH - AH \cdot AR
 \end{aligned}$$

>>> Illustration

Budget	Labour rate	Shs10 per hour
	Production time	15,000 hours
	Time per unit	3 hours
	Production units	5,000 units
Actual	Wages paid	176,000
	Production	5,500 units
	Total hours worked	14,000 hours

There was no idle time.

Required: Calculate total labour variance

Solution

$$\begin{aligned}
 \text{Labor rate variance} &= \text{Actual rate} \times \text{Actual hours} - \text{Standard rate} \times \text{Actual hours} \\
 &= \text{Shs.}176,000 - \text{Shs.}10 \times 14,000 \text{ hrs} \\
 &= \text{Shs.}36,000 \text{ (A)}
 \end{aligned}$$

$$\begin{aligned}
 \text{Labor efficiency variance} &= \text{Standard hours} \times \text{Standard rate} - \text{Actual hours} \times \text{Standard rate} \\
 &= 5,500 \text{ units} \times 3 \text{ hrs} \times \text{Shs.}10 \text{ per hr} - 14,000 \text{ hrs} \times \text{Shs.}10 \text{ per hr} \\
 &= \text{Shs.}165,000 - \text{Shs.}140,000 \\
 &= \text{Shs.}25,000 \text{ (F)}
 \end{aligned}$$

$$\begin{aligned}
 \text{Total labor variance} &= \text{Labour rate variance} + \text{Labour Efficiency Variance} \\
 &= \text{Shs.}36,000 \text{ (A)} + \text{Shs.}25,000 \text{ (F)} \\
 &= \text{Shs.}11,000 \text{ (A)}
 \end{aligned}$$

OR

$$\begin{aligned}
 \text{Total labor variance} &= SR \cdot SH - AH \cdot AR \\
 &= \text{Shs. } 10 \times 5,500 \text{ units} \times 3 - \text{Shs. } 176,000 \\
 &= \text{Shs. } 11,000 \text{ (A)}
 \end{aligned}$$

Overhead variances

Direct materials and direct labour vary directly with the output. However, total overheads do not. This is because they can further be classified into variable and fixed components. The variable overheads, which vary directly with output can be analyzed and controlled using the variance formulas used to analyze direct materials and direct labour variances.

Tutorial notes:

1. Overheads refer to fixed overheads that cannot be traced directly to a particular product or unit of production. Overheads are absorbed into costs by means of **predetermined overhead absorption rates (OAR)**, which are determined as follows:

$$\text{OAR} = \frac{\text{Budgeted Overhead cost for the period}}{\text{Budgeted Activity level}}$$

2. The activity level so budgeted could be expressed as units, weight, sales, e.t.c.; but the most useful concept of the activity level is the standard hour. Thus the total overhead absorbed = OAR x Standard hours of production.
3. Overhead variances can be analyzed into variable overhead variances and fixed overheads variances.

Variable Overhead Variances (VOV)

Variable overhead variance comprises two elements; variable overhead expenditure variance and variable overhead Efficiency variance.

Variable Overhead Expenditure Variance (VOXV)

Variable Overhead Expenditure variance (equivalent to material price variance or labour rate variance) measures the deviation from the standard in amount spent for overhead input. It measures the difference between the budgeted flexed variable overheads for the actual units of the absorption base and the actual variable overhead costs incurred. The reason why we use the same multiplier (the actual units of the absorption base) is to remove any element of inefficiency; meaning that any difference arising is purely due to a difference in actual variable overhead spending and standard variable overhead spending.



The formula for the variable overhead Expenditure variance can be expressed as:

$$\begin{aligned} \text{VOXV} &= \text{Standard rate} \times \text{Actual hours} - \text{Actual rate} \times \text{Actual hours} \\ &= \text{SR} \cdot \text{AH} - \text{AR} \cdot \text{AH} \\ &= (\text{SR} - \text{AR}) \times \text{AH} \end{aligned}$$

Possible causes of variable overhead expenditure variance

These include all factors that can cause a change in the standard overhead absorption rate; this may include a change in the overheads to be absorbed or a decrease in the activity level which is more than or less than proportionate increase in the overheads.

Variable Overhead Efficiency Variance (VOEV)

Variable overhead efficiency variance measures the difference between the actual activity of a period and the standard activity allowed, multiplied by the variable part of predetermined overhead rate. It is the difference between the allowed variable overheads and the absorbed variable overheads.

Variable overhead efficiency variance formula can be expressed as;

$$\text{VOEV} = \left(\begin{array}{c} \text{Standard hrs of production} \\ \times \\ \text{V.O.A.R} \end{array} \right) - \left(\begin{array}{c} \text{Actual labour hrs} \\ \times \\ \text{V.O.A.R} \end{array} \right)$$

Where VOAR is the variable overhead absorption rate

$$\begin{aligned} &= \text{SH} \times \text{VOAR} - \text{AH} \times \text{VOAR} \\ &= (\text{SH} - \text{AH}) \times \text{VOAR} \end{aligned}$$

Possible causes of Variable Overhead Efficiency Variance

Variable overhead expenditure variance can be caused by any factor that causes a deviation of actual hours of production from the standard hours of production. This may include inefficiencies caused by use of faulty equipment thus increasing repair and maintenance and unskilled indirect laborers.

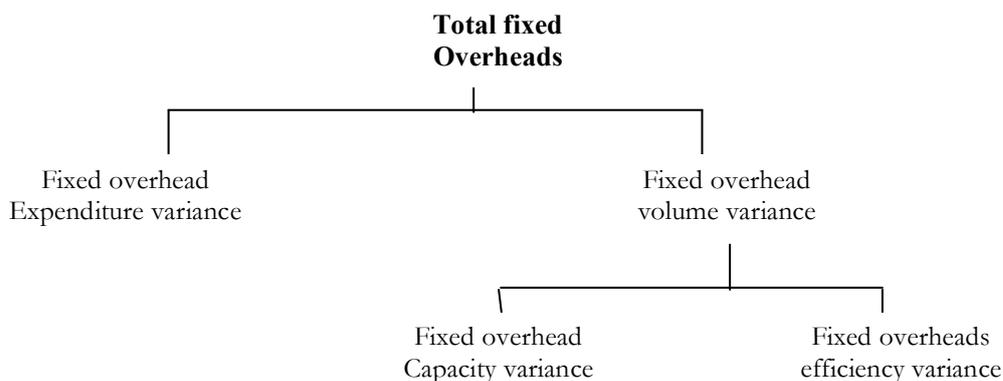
In general, all factors that may cause labor efficiency variance can cause variable overhead efficiency variance.

Fixed Overhead Variances (FOV)

Where marginal costing systems are in place, only variable overheads are absorbed into production costs and thus only variances relating to variable overheads arise. However, where full costing system is used, fixed overhead variances may arise. Fixed overheads are assumed to remain unchanged in the short term in response to changes in the level of activity, but they may change in response to changes in other factors.

Fixed overhead variances fall into two categories; fixed overhead expenditure variance and fixed overhead volume variance. Fixed overhead volume variance comprises of fixed overhead efficiency variance and fixed overhead capacity variance.

A diagrammatical illustration of fixed overhead variances



Fixed Overhead Expenditure Variance (FOEV)

Fixed overhead expenditure variance explains the difference between the budgeted fixed overheads and the actual fixed overheads. It is the difference between the budgeted fixed overheads and actual fixed overheads.

Fixed overhead expenditure variance = budgeted fixed overheads – Actual fixed overheads

>>> Illustration

A company operates a standard marginal costing system. Last month, its actual fixed overhead expenditure was 10% above budget resulting in a fixed overhead expenditure variance of Shs.36,000. What was the actual expenditure on fixed overheads last month?

Solution

Fixed overhead expenditure variance = budgeted fixed overheads – Actual fixed overheads



Let the budgeted fixed overheads be x

$$(36,000) = x - 1.1x$$

Since the actual overheads were more, then make the variance figure a negative. Alternatively, it can be expressed as

Fixed overhead expenditure variance = Actual fixed overheads – budgeted fixed overheads

$$36000 = 1.1x - x$$

$$36,000 = 0.1x$$

$$x = \frac{36,000}{0.1} = \text{Shs.}360,000$$

The budgeted fixed expenditure on fixed overheads was Shs. 360,000 and, therefore, the actual was Shs.396,000

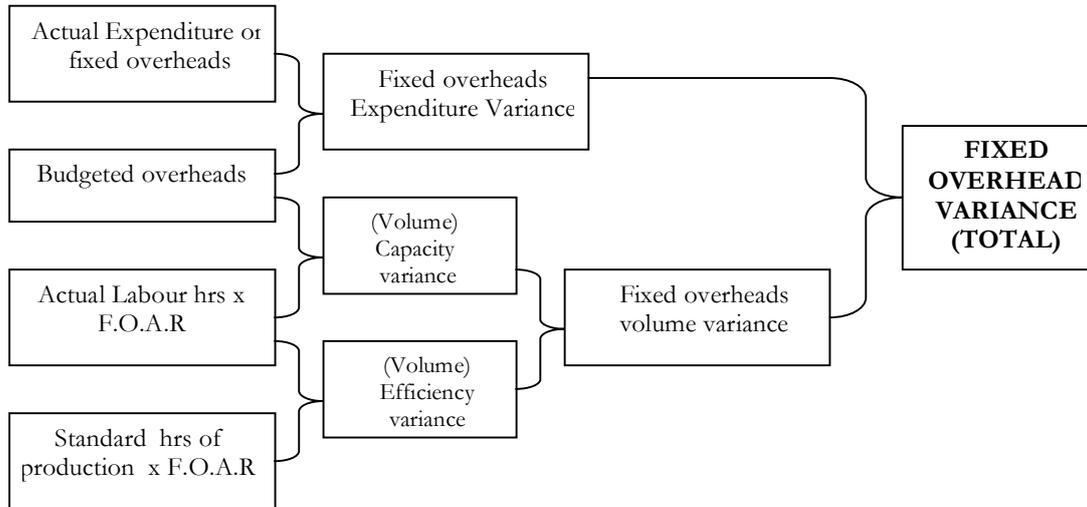
Fixed Overheads Volume Variance (FOVV)

This is the difference between the standard cost absorbed in the production achieved and the budget cost allowed for the period. It arises due to the actual production volume differing from the planned: this is in turn caused by volume differing from the planned, labour efficiency variance and or capacity variance (hours of working being less or more than planned). The fixed overhead volume variance has a portion of fixed overheads capacity variance and fixed overheads efficiency variance:

Fixed overheads capacity variance

This is the portion of the fixed overhead volume variance, which is the difference between the standard cost absorbed in the production achieved whether completed or not, and the actual labour hours worked. (Valued at the standard hourly absorption rate).

Summary of the fixed overhead variances and their



Fixed overheads efficiency variance

This partly explains why the actual production was greater than the budgeted production. It accrues to labour efficiency or inefficiency. For instance, a team may be assigned a specific task, which in ordinary circumstances can take 10 hours (standard). However, the team may cooperate and finish the task in eight hours (being more efficient). The saving will be expressed in monetary units by multiplying the difference with standard fixed overhead absorption rate to reflect the amount of fixed overheads equivalent that was not absorbed at the standard rate.

It means that the part of overheads that could be absorbed in the 2 hours saved shall not be absorbed in the cost of the job. However, fixed cost being fixed shall still be incurred.

Distinguish between efficiency ratio and capacity ratio

Efficiency ratio: This is the standard hours equivalent to the work produced, expressed as a percentage of the actual hours spent in producing that work. It measures the efficiency in the utilization of hours available. It compares the standard time and the actual time taken. Efficiency ratio, therefore, represents the measure of fixed budgeted hours to match the actual level of production achieved.

Capacity ratio: This is the relationship between the budgeted number of working hours and the maximum possible number of hours in a budget period. Capacity measures whether there is enough resources as was budgeted for. If the hours that were available are less than the budgeted hours, then the firm operated below its capacity.



□ Total fixed overhead variance

Total fixed overhead is given by the summation of fixed overhead expenditure variance and fixed overhead volume variance. But fixed overhead variance has two portions; Fixed overhead capacity variance and Fixed overhead efficiency variance.

Total fixed overheads can be expressed in a formula as follows;

$$\text{Total fixed overheads variance} = \left[\left(\begin{array}{c} \text{fixed overheads} \\ \text{Expenditure variance} \end{array} \right) + \left(\left(\begin{array}{c} \text{Fixed overhead} \\ \text{capacity variance} \end{array} \right) + \left(\begin{array}{c} \text{Fixed overheads} \\ \text{Efficiency variance} \end{array} \right) \right) \right]$$

$$\text{Total fixed overheads variance} = \left[\left(\begin{array}{c} \text{fixed overheads} \\ \text{Expenditure variance} \end{array} \right) + \left(\begin{array}{c} \text{Fixed overheads} \\ \text{Volume variance} \end{array} \right) \right]$$

>>> Illustration

JVM Company uses a standard absorption costing system. Last month budgeted production was 8,000 units and the standard fixed production overhead cost was Shs15 per unit. Actual production last month was 8,500 units and the actual fixed production overhead cost was Shs17 per unit.

What was the total adverse fixed production overhead variance for last month? Calculate the fixed overheads volume variance

$$\begin{aligned} \text{Total fixed overheads variance} &= \text{Absorbed fixed overheads} - \text{actual fixed overheads} \\ &= (\text{Shs.}15 \times 8,500 \text{ units}) - (\text{Shs.}17 \times 8,500) \\ &= \text{Shs. } (127,500 - 144,500) \\ &= \text{Shs.}17,000 \text{ (Adverse)} \end{aligned}$$

$$\text{Total fixed overheads variance} = \left[\left(\begin{array}{c} \text{fixed overheads} \\ \text{Expenditure variance} \end{array} \right) + \left(\begin{array}{c} \text{Fixed overheads} \\ \text{Volume variance} \end{array} \right) \right]$$

$$\begin{aligned} \text{Fixed overhead expenditure variance} &= \text{budgeted fixed overheads} - \text{Actual fixed overheads} \\ &= (\text{Shs.}15 \times 8,000) - (\text{Shs.}17 \times 8,500) \\ &= \text{Shs.}120,000 - \text{Shs.}144,500 \\ &= \text{Shs.}24,500 \text{ (Adverse)} \end{aligned}$$

Fixed overhead Volume variance = Fixed overheads variance – fixed overheads expenditure variance

$$= \text{Shs.}17,000 \text{ (A)} - \text{Shs.}24,500 \text{ (A)}$$

$$= \text{Shs.}7,500 \text{ (F)}$$

SALES VARIANCES

These can be used to analyze the performance of the sales function or revenue centers.

N.B. Sales variance calculations are calculated in terms of profit or contribution margin rather than sales values. If sales values are used (actual sales compared to budgeted) there is the risk of ignoring the impact of the sales effort on profit. The term profit margin is used when absorption costing approach of determining profit is applied, whereas the term Contribution Margin is used when Marginal costing approach is applied.

Total sales margin variance

It is the total difference between the actual margin and the budgeted margin from sales when cost of sales is valued at standard cost of production.

$$\text{A.C} - \text{B.C}$$

Sales margin price variance

It is that portion of total sales margin variance, which is the difference between the standard margin per unit and actual margin per unit for the number of units sold in the period.

$$(\text{A.M} - \text{S.M}) * \text{A.Q}$$

Sales margin volume variance

It is the difference between the actual sales volume and the budgeted volume multiplied by the standard margin per unit.

$$(\text{A.V} - \text{B.V}) * \text{S.M}$$

Ideally, the above variances are assuming that there's only one product being sold. In reality, organizations will have a portfolio of different products each with different prices and costs and consequently profits or contributions.



The sales margin volume variance could, therefore, be further analyzed into:

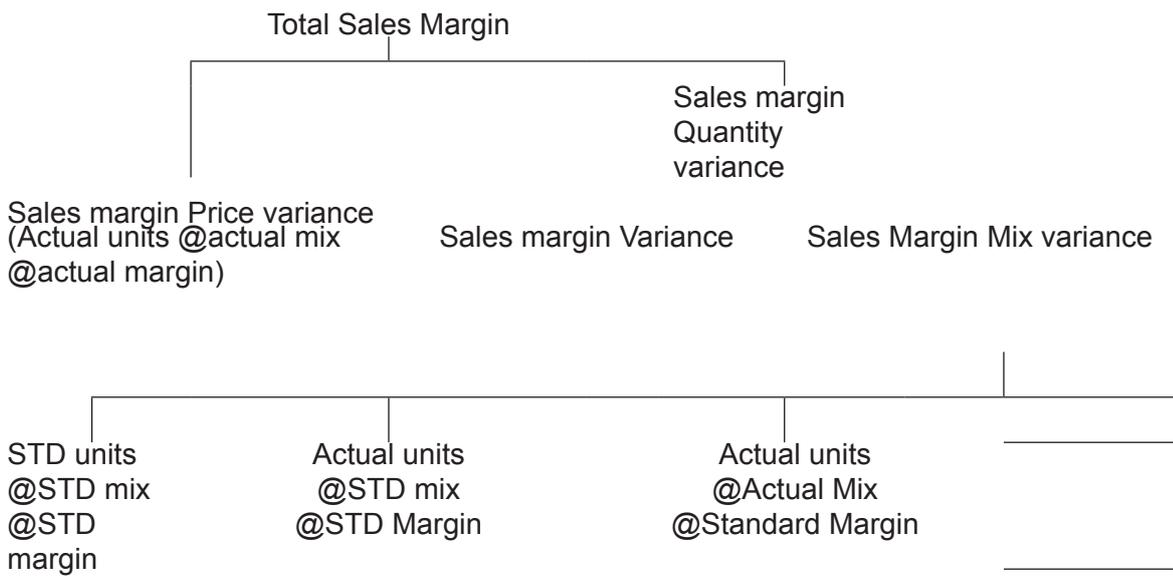
Sales mixture variance

This is the portion of sales margin volume variance that's the difference between the total number of units at the actual mix and the actual total number of units at standard mix valued at standard margin per unit.

Sales margin volume variance

This is the portion of sales margin quantity variance, which is the difference between the actual total quantities of units sold and the budgeted total number of units at standard mix valued at standard margin per unit.

STUDY TEXT



>>> Illustration:

Provided below is data for three products A, B and C.

	Total Sales	UNITS			Total margin	Total sales	UNITS			Total margin
		Volume	Price	Margin			Volume	Price	Margin	
A	10000	500	20	5	2500	10560	480	22	8	3840
B	8000	200	40	20	4000	6120	170	36	15	2550
C	9000	300	30	15	4500	8500	250	34	20	5000
	27000	1000			11000	25180	900			11390

Required:
Sales Margin volume variance

a) Sales margin volume variance

Actual usage		STD units
@STD mix	-	@STD mix
@STD margin		@STD margin

Total actual units is 900
Standard mix is **50%**, **20%** and **30%**

$$(450 \times 5) + (180 \times 20) + (270 \times 15) = 9900$$

$$\text{Sales margin volume variance} = 9900 - 11000 = 1100 \text{ (A)}$$

b) Sales margin mix variance

Actual usage		Actual usage
@Actual mix	-	@STD mix
@STD margin		@STD margin (9900)

The actual units in the actual proportion and standard margin is calculated as:

$$(480 \times 5) + (170 \times 20) + (250 \times 15) = 9550$$

$$\text{Sales margin mix variance} = 9900 - 9550 = 350 \text{ (A)}$$

c) Sales margin price variance

Actual usage		Actual usage
@Actual mix	-	@actual mix
@Actual margin		@STD margin

$$= 11390 - 9550 = 1840 \text{ (F)}$$

N.B. Sales margin quantity variance = sales margin mix variance + sales margin volume variance.

$$= 1100 \text{ (A)} + 350 \text{ (A)} = 1450 \text{ (A)}$$

Total variance could be confirmed by getting the difference between the budgeted margin and the actual margin.

$$11390 - 11000 = 390 \text{ (F)}$$



Criticisms of sales margin variances

The purpose of variance analysis is to see if there are any deviations for the budget. If there are and it is within the control of the manager, he is to take steps to correct the situation to avoid further deviations. The manager has very little control over the sales and thus some writers would find the usefulness of the variances doubtful.



However, they could be useful in a situation where the organization has some control over the sales price. It could also be useful where a manager is in charge of two substitute products where he can use the mix variances.

Mix and quantity variances provide useful information only when there is an identifiable relationship between the products sold. If there is no relationship, sales variance analysis should be done on the separate products. Providing managers with mix and quantity variances for products that have no relationship is misleading as it implies that the possible cause of sales volume variance is change in the mix (Gibson, 1990).

He gave examples of where relationships might exist:

- Similar products differentiated by single characteristics e.g. size where sales of individual products are expected to vary proportionately with total sales.
- From the sale of complementary products where sales of one product are expected to result in increased sales in another
- From the sale of substitute products where the increased sales of one product leads to a decrease in sales of another
- Sale of heterogeneous products quantities of which are limited by factors of production e.g. sale of product with lower contribution margins per limiting factor is made only if products with higher margins cannot be sold.



Mix Variances

In the previous section, we looked at variances where we assumed that we only had one product. However, we have focused on mix variances to some extent while calculating the sales variances. This section focuses on material variances assuming more than one type of material input.

N.B. Mix and yield analysis will only give meaningful results where there is some degree of interchangeability between materials and products.

Variation from the standard input of materials may arise where one material may be over-utilized while the other is under-utilized, evaporation of some input materials, breakages and machine inefficiency.

Three variances will be observed in a scenario:

- a) **Material price variance:** This would arise where the materials have been bought at different prices for the standard.

- b) **Mix variance:** This arises where the materials have been used in different proportions from the standard.
- c) **Yield variance:** This arises where a different total quantity of materials from standard (for actual output) have been used.

The sum of the mix variance and yield variance make up the **Total Usage Variance**.

Formulae

$$\text{Price variance} = \text{Actual quantity @actual mix @actual prices} - \text{Actual quantity @actual mix @STD prices}$$

$$\text{Mix variances} = \text{Actual quantity @actual mix @STD prices} - \text{Actual quantity @STD proportion @STD prices}$$

$$\text{Yield variances} = \text{Actual quantity @STD mix @STD prices} - \text{STD quantity @STD mix @STD price}$$

The above variances will be explained well using an example.

>>> Illustration

Standard material cost for 990 tons of production

Material	Tons	Price/ton	Total
X	550	\$6.00	3300
Y	330	\$5.00	1650
Z	<u>220</u>	\$4.50	<u>990</u>
Total	1100		5940
Normal loss (10%)	<u>110</u>		<u>-</u>
	<u>990</u>		<u>5940</u>

The average material cost per ton $\frac{\text{Shs.5,940}}{990} = \text{Shs.6.00}$



The actual production of 990 tons used materials at prices as follows.

Material	Tons	price/ton	Total
X	444	\$7.5	3330
Y	446	\$6.0	2676
Z	<u>240</u>	\$4.5	<u>1080</u>
	1130		7086
	<u>140</u>		<u>-</u>
	990		7086

i. Material price variance

Actual Quantity	X	444*6	=	2664
@actual mix	Y	446*5	=	2330
@STD prices	Z	<u>240*4.5</u>	=	<u>1080</u>
		1130		5974

Actual quantity				
@actual mix				
@actual prices				<u>7086</u>
				1112 (A)

ii. Material mix variance

Actual quantity				
@actual mix				5974
@STD prices				

Actual quantity	X	565*6 = 3390		
@STD mix	Y	339*5 = 1695		
@STD prices	Z	226*4.5=1017		<u>6102</u>

128 (F)

iii. Material yield

Actual quantity				
@STD mix				6102
@STD prices				

STD quantity				
@STD mix				
@STD prices				<u>5940</u>
				162 (A)

Usage variance = Yield variance + mix variances

$$128 (A) + 162 (A) = \$34 (A)$$

☐ Causes of mix variances

a) Mix variances

Favorable Mix variance arises when less of more expensive material and more of the cheaper materials are used. For instance, in the example above, 128 (F) arises because less of more expensive material X has been used and more of the cheaper materials Y and Z

b) Yield variance

Favorable yield variance arises when the output is less than expected: when the actual loss exceeds the normal loss. Use of cheaper but low quality materials may result to a drop in good production. For instance, the change to a cheaper mix of material has resulted in the drop in yield of good production in relation to the standard.

The material mix variance could be further analyzed to splitting and getting the variances for the individual products.

	Actual	Actual quantity In STD mix	Variance	STD price	Mix variance
X	444	565	121 (F)	6	726 (F)
Y	446	339	107 (A)	5	535 (A)
Z	<u>240</u>	<u>226</u>	14 (A)	4.5	<u>63 (A)</u> 128 (F)

The total mix variance is made up of a series of favorable and adverse variances. Using smaller quantities of the more expensive material gave us a favorable variance whereas the more use of the cheaper material gave an adverse variance.

Without further analysis, a manager might conclude that using more of material X is good and increasing the levels of Y and Z is quite detrimental in terms of adverse variances. There is a danger in simply looking at mix variances in isolation from yield variances.

☐ Problems in using conventional mix and yield variances

Conventional mix and yield variances are based on assumptions some of which might be considered absurd or impracticable. The reliance, however, on mix and yield variances should be done together with a good understanding of principles and objectives of variance analysis and not just the mechanical application of a few formulae.

The variances just show the effect of changes from the original standard but doesn't show whether the results were optimal given relative prices, qualities and availability of materials. Where materials can be substituted, where characteristics of material are variable and where there are relative price changes, the optimal mix may be continually changing and static conventional variance calculation is unlikely to be appropriate. Getting the optimal mix requires one that gives us the maximum contribution based on a limiting factor. Where limiting factors are many, linear programming is usually applied on a continuous basis.



It also assumes a constant correlation between physical inputs and outputs regardless of the mix of output i.e. if the mix of output changes, some relationship is assumed between the new mix and output as between original standard mix and output.

Technical acceptability of the output is ignored as it is assumed that output is acceptable regardless of the input mix of materials.

Linear substitutability of material is ignored. For example, if they reduce A by one unit, they should increase B by one unit. Further substitution would result in a mix consisting of one material only; the cheapest.

Assuming the technical acceptability of the output based on the premise that the standard represents the optimum position, we should never get a favorable mix variance because the lower standard cost of actual mix means that it should have been the original standard in the first place.

In addition to the variances, technical and commercial factors affecting the process being considered should be done. This could include:

- Relative prices, availability and technical characteristics of input material at the time of the mix.
- The extent of technical substitutability of material
- Planned yield format given actual mix of material not merely the yield form standard mix.
- Interdependencies between material variances and other process inputs e.g. what effect does it have on labor costs?

CHAPTER SUMMARY

This chapter has covered the various types of variances. The formula used to calculate the variances include.

Note:

SQ = Standard quantity

SP = Standard price

AQ = Actual quantity

AP = Actual Price

AR = Actual rate

SR = Standard rate

VOAR = Variable overhead absorption rate

AH = Actual hours

Material variance = $SQ \times SP - AQ \times AP$

Material price variance = $SP \times AQ - AP \times AQ$

Material usage variance = $SQ \times SP - AQ \times SP$

Labour rate variance = $SR \times AQ - AR \times AQ$

Labour efficiency variance = $SQ \times SR - AQ \times SR$

Variable overhead efficiency variance = $SH \times VOAR - AH \times VOAR$

Variable overhead expenditure variance = $SR \times AH - AR \times AH$



CHAPTER QUIZ

1. What is a variance?
2. Distinguish between capacity ratio and efficiency ratio.
3. Define total sales margin price variance.
4. Highlight the possible causes of labour rate variance

ANSWERS TO CHAPTER QUIZ

1. A variance is a deviation from the expected.
2. Efficiency ratio is the standard hours equivalent to the work produced, expressed as a percentage of the actual hours spent in producing that work. The efficiency ratio measures the efficiency in the utilization of hours available.
3. Capacity ratio is capacity ratio is the relationship between the budgeted number of working hours and the maximum possible number of hours in a budget period. Capacity measures whether there is enough resources as was budgeted for
4. Sales margin price variance = (Actual Margin – Standard Margin) * Actual Quantity
5. Possible causes of labour rate variance include; negotiation of wages, unexpected overtime and misallocation of workforce.

PAST PAPER ANALYSIS

Questions from this chapter have been examined in the following examination sittings.

06/ 07 Q5; 05/ 06 Q1; 05/ 06/ Q6(b); 05/ 05 Q2; 06/ 04 Q3; 06/ 03 Q2; 12/01 Q1(b); 05/ 01 Q2; 12/00 Q5; 06/ 00 Q4



REVIEW QUESTIONS

Question One

Whitaker plc has obtained the following information regarding costs and revenue for the past financial year:

Original budget:

Sales	10,000 units
Production	12,000 units

Standard cost per unit:	Shs
Direct materials	5
Direct labour	9
Fixed production overheads	<u>8</u>
	<u>22</u>
Selling price	30

Actual results:	
Sales	9,750 units
Revenue	Shs.325,000
Production	11,000 units
Material cost	Shs.65,000
Labour cost	Shs.100,000
Fixed production overheads	Shs.95,000

There were no opening stocks.

Required:

- Produce a statement showing the flexed budget and actual results. Calculate the variances between the actual and flexed figures for the following:
 - Sales;
 - Materials;
 - Labour; and
 - Fixed production overhead (7 marks)
- Explain briefly how the sales and materials variances calculated in (a) may have arisen.

Question Two

T-mo plc manufactures and sells product CD95. The company operates a standard marginal costing system. The standard cost card for CD95 includes the following:

	Shs. per unit
Direct material	20
Direct labour (6 hours at Shs.7.50 per hour)	45
Variable production overheads	<u>27</u>
	<u>92</u>

The budgeted and actual activity levels for the last quarter were as follows:

	Budget Units	Actual Units
Sales	20,000	19,000
Production	20,000	21,000

The actual costs incurred in last quarter were:

	Shs
Direct material	417,900
Direct labour (124,950 hours)	949,620
Variable production overheads	565,740

Required:

- Calculate the *total* variances for direct material, direct labour and variable production overheads (3 marks)
- Provide an appropriate breakdown of the total variance for direct labour calculated in (a) above (3 marks)
- Suggest TWO possible causes for EACH variance calculated in (b) (4 marks)

Question Three

Mwaniki Ltd manufactures a single product which has a standard selling price of Shs22 per unit. It operates a standard marginal costing system. The standard variable production cost is Shs9 per unit. Budgeted annual production is 360,000 units and budgeted non-production costs of Shs1,152,000 per annum are all fixed. The following data relate to last month:

	Budget Units	Actual units
Production	30,000	33,000
Sales	32,000	34,000

Last month, the budgeted profit was Shs200,000 and the actual total sales revenue was Shs731,000.

Required:

- Calculate the sales price and sales volume contribution variances for last month showing clearly whether each variance is favorable or adverse. (4 marks)
- Explain how the two variances calculated in (a) could be interrelated. (3 marks)
- Calculate the BUDGETED profit for last month assuming that the company was using absorption costing. (3 marks)



Question four

Last month, Isaac’s Company’s budgeted sales were 5,000 units. The standard selling price was Shs6 per unit with a standard contribution to sales ratio of 60%. Actual sales were 4,650 units with a total revenue of Shs.30,225 What were the favorable sales price and adverse sales volume contribution variances?

	Sales price	Sales volume contribution	
	Shs	Shs	
A	2,325	1,260	
B	2,500	1,260	
C	2,325	2,100	
D	2,500	2,100	(5 marks)

Question five

Woodeezer Ltd makes quality wooden benches for both indoor and outdoor use. Results have been disappointing in recent years and a new managing director, Peter Beech, was appointed to raise production volumes. After an initial assessment Peter Beech considered that budgets had been set at levels which made it easy for employees to achieve. He argued that employees would be better motivated by setting budgets which challenged them more in terms of higher expected output. Other than changing the overall budgeted output, Mr Beech has not yet altered any part of the standard cost card. Thus, the budgeted output and sales for November 2002 was 4,000 benches and the standard cost card below was calculated on this basis:

	Shs.	
Wood	25 kg at Shs3·20 per kg	80·00
Labour	4 hours at Shs8 per hour	32·00
Variable overheads	4 hours at Shs4 per hour	16·00
Fixed overhead	4 hours at Shs16 per hour	64·00
		<hr/>
		192·00
Selling price		220·00
		<hr/>
Standard profit		28·00
		<hr/>

Overheads are absorbed on the basis of labour hours and the company uses an absorption costing system. There were no stocks at the beginning of November 2002. Stocks are valued at standard cost. Actual results for November 2002 were as follows:

	Shs	
Wood	80,000 kg at Shs.3·50	280,000
Labor	16,000 hours at Shs.7	112,000
Variable overhead		60,000
Fixed overhead		196,000
		<hr/>
Total production cost (3,600 benches)		648,000
Closing stock (400 benches at Shs192)		76,800
		<hr/>
Cost of sales		571,200
Sales (3,200 benches)		720,000
		<hr/>
Actual profit		148,800
		<hr/>

STUDY TEXT

The average monthly production and sales for some years prior to November 2002 had been 3,400 units and budgets had previously been set at this level. Very few operating variances had historically been generated by the standard costs used.

Mr Beech has made some significant changes to the operations of the company. However, the other directors are now concerned that Mr Beech has been too ambitious in raising production targets. Mr Beech had also changed suppliers of raw materials to improve quality, increased selling prices, begun to introduce less skilled labour, and significantly reduced fixed overheads.

The finance director suggested that an absorption costing system is misleading and that a marginal costing system should be considered at some stage in the future to guide decision-making.

Required:

- (a) Prepare an operating statement for November 2002. This should show all operating variances and should reconcile budgeted and actual profit for the month for Woodeezer Ltd. (14 marks)
- (b) In so far as the information permits, examine the impact of the operational changes made by Mr Beech on the profitability of the company. In your answer, consider each of the following:
- (i) Motivation and budget setting; and
 - (ii) Possible causes of variances. (6 marks)
- (a) Re-assess the impact of your comments in part (b), using a marginal costing approach to evaluating the impact of the operational changes made by Mr Beech. *Show any relevant additional calculations to support your arguments.* (5 marks)
(25 marks)



CASE STUDY 2

McDermott plc is a manufacturer of beds. It uses a system of standard absorption costing and variances to monitor performance of managers and departments. A standard cost card for one of its models, the Dreamer, is given below.

	£ per unit	£ per unit
Selling price		250.00
Direct material: Wood: 12m @ £1.50 per m	18.00	
Fabric: 6m ² @ £2.00 per m ²	12.00	
Direct labour: 4 hours @ £6.00 per hour	24.00	
Variable overhead: 4 hours @ £15.00	60.00	
Fixed overhead: 4 hours @ £10.00	<u>40.00</u>	
		<u>154.00</u>
Profit		<u>96.00</u>

Budgeted production and sales are 1,000 Dreamers per month.

Actual results for the manufacture and sale of Dreamers for the most recent month are as follows:

Sales: 1,200 units @ £240 each
 Production: 1,300 units
 Wood 16,000m @ £1.40 per m
 Fabric 7,800m² @ £2.10 per m²
 Direct labour: 5,000 hours @ £7.00 per hour
 Variable overhead: 5,000 hours @ £15.10 per hour
 Fixed overhead: £54,600.
 There was no opening stock.

Terminology

Throughout this article, the term 'adverse variance' (Adv) describes a situation where actual results are worse than standard and have a detrimental effect on profit (costs are higher or revenues lower). 'Favorable' (Fav) describes the opposite situation. Many candidates omit these signs and thus lose half of the marks available for calculation. In practice, and in the exam, variances are of little use without a sign. Some candidates use negative signs or brackets for adverse variances, and no signs for favorable variances. This causes marking problems, because it becomes difficult to tell the difference between a favorable variance and one without a sign.

Lesson 1

Always clearly label variances as either adverse or favorable. These labels will represent 50% of the marks available for variance calculations.

Variable Cost Variances

The direct labour variance is usually the simplest variance to calculate. Actual direct labour cost was £35,000 (5,000 hours x £7.00). This needs to be compared with the standard cost. A very common error in candidates' calculations is to make the following comparison:

$$\begin{aligned} \text{Actual hours x actual rate} \\ &= 5,000 \text{ hours x } \pounds 7.00 = \pounds 35,000 \\ &>\pounds 11,000 \text{ Adv labour variance} \end{aligned}$$

$$\begin{aligned} \text{Budgeted hours x standard rate} \\ &= 1,000 \text{ units x } 4 \text{ hours x } \pounds 6.00 = \pounds 24,000 \end{aligned}$$

This is not a sensible comparison. Actual costs relate to producing 1,300 units. Budgeted figures relate to producing 1,000 units. It is important to compare like with like. If labour is a variable cost, then we would expect the extra 300 units to require extra labour hours.

A more sensible, and correct, calculation is to compare the actual labour cost with the flexed budget labour cost of producing 1,300 units, as follows

$$\begin{aligned} \text{Actual hours x actual rate} \\ &= 5,000 \text{ hours x } \pounds 7.00 = \pounds 35,000 \\ &>\pounds 3,800 \text{ Adv labour variance} \end{aligned}$$

$$\begin{aligned} \text{Standard hours for actual production x standard rate} \\ &= 1,300 \text{ units x } 4 \text{ hours x } \pounds 6.00 = \pounds 31,200 \end{aligned}$$

Lesson 2

It is important when calculating variable cost variances that figures are based on flexed budget figures, not original budgeted figures.

The total labour variance of £3,800 adverse has two potential causes – either the firm has paid a different hourly rate to standard, or it has used a different amount of hours per unit to standard, or possibly both. If we insert a third line into the analysis, we can separate out these two causes.

$$\begin{aligned} \text{Actual hours x actual rate} \\ &= 5,000 \text{ hours x } \pounds 7.00 = \pounds 35,000 \\ &>\pounds 5,000 \text{ Adv rate variance} \end{aligned}$$

$$\begin{aligned} \text{Actual hours x standard rate} \\ &= 5,000 \text{ hours x } \pounds 6.00 = \pounds 30,000 \\ &>\pounds 1,200 \text{ Fav efficiency variance} \end{aligned}$$



$$\begin{aligned} &\text{Standard hours for actual production} \times \text{standard rate} \\ &= 1,300 \text{ units} \times 4 \text{ hours} \times \text{£}6.00 = \text{£}31,200 \end{aligned}$$

We can now see that the total variance of £3,800 adverse has two causes. First, a rate (or more generally expenditure) variance, caused by paying more per hour than standard. Second, an efficiency variance, caused by making 1,300 units in 5,000 hours rather than the flexed budget 5,200 hours (1,300 units x 4 hours).

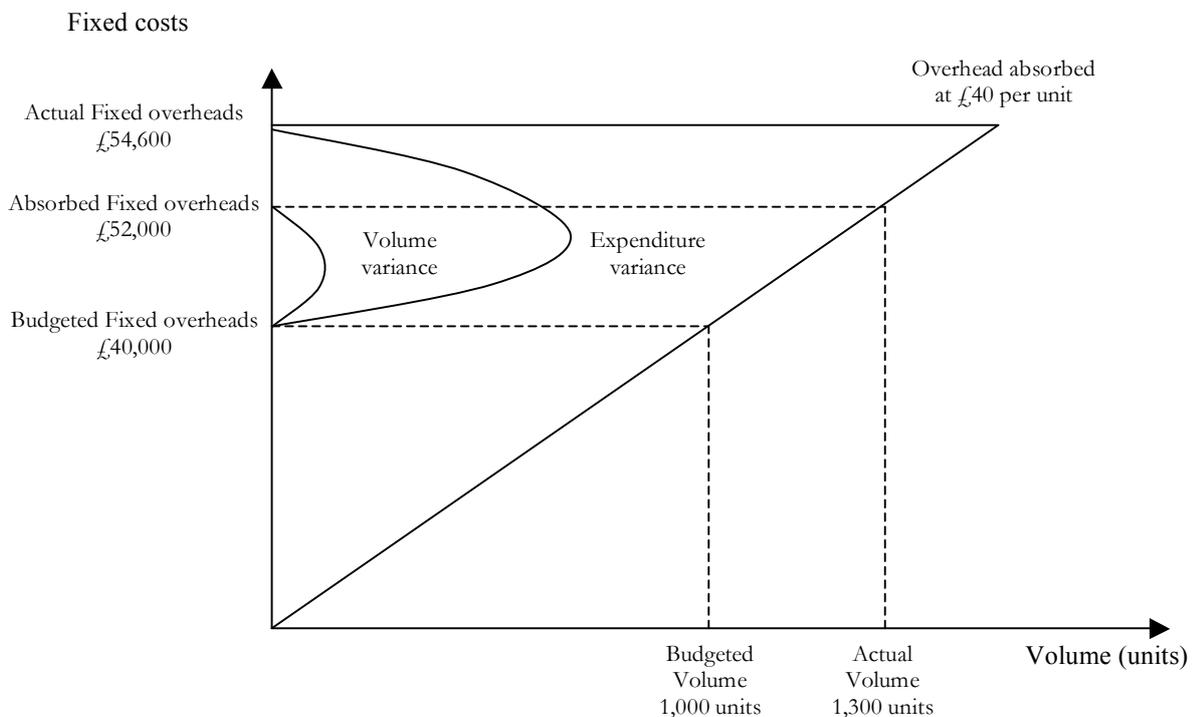
Tabular or formula approach?

Many textbooks present the above calculation in a 'formula' format rather than the tabular layout adopted above. For example, the labour rate variance calculation is often presented as follows:

$$(\text{Actual rate per hour} - \text{Standard rate per hour}) \times \text{Actual hours} = \text{Labor rate variance} = (\text{£}6.00 - \text{£}7.00) \times 5,000 \text{ hours} = \text{£}5,000 \text{ Adv.}$$

This layout is perfectly valid, probably quicker to use, and would attract full marks in an exam. However, in my experience of marking, I find that candidates using the formula approach make far more errors than those using a tabular approach.

STUDY TEXT



CHAPTER THIRTEEN



COST MANAGEMENT



CHAPTER THIRTEEN

COST MANAGEMENT

► OBJECTIVES

After studying this chapter, you should be able to:

- Define a value chain.
- Understand the value chain research methodology.
- Explain Just-In-Time (JIT) inventory management system.
- Explain the advanced Manufacturing technology and material resource planning.
- Understand the importance of computers in cost management.

► INTRODUCTION

This section discusses the importance of cost management and emerging issues in costing. It focuses on recent initiatives and developments in technology that have a positive impact on cost management. Such initiatives include advanced material technology and material resource planning.

► DEFINITION OF KEY TERMS AND ACRONYMS

JIT – Just-in-time Inventory system

AMT – Advanced Materials Technology; an initiative should support research to develop new classes of materials, material systems, material processing, characterization methods and techniques.

Long run average incremental cost (LRAIC); constitutes cost of production of an additional unit plus an allocated share of common costs.

► EXAM CONTEXT

The nature of questions to be set may differ from time to time. Questions set from this topic will primarily be based on current trends in technological developments and initiatives. Note that the answers will not come directly from this book. Further reading is recommended. Let this topic be a guide to what needs to be read further.

► INDUSTRY CONTEXT

This chapter is applicable in almost every industry in today's world. Technology is rapidly changing and firms are forced to adopt the new technologies or they would collapse. They have no option. This topic will also give you the basic knowledge you need to engage into a conversation and understand the technological terms used, their relevance and applicability.

■
■
■ **VALUE CHAIN RESEARCH AND DEVELOPMENT DESIGN**
■ **PRODUCTION, MARKETING – DISTRIBUTION AND**
■ **CUSTOMER CARE**

Definition of value chain

A value chain is used to define the combination of all the activities and resources needed for generating products and services. The value chain often consists of several operators (manufacturing industry, wholesale trade, retail trade, customer, etc.) The value chain ends with the customer.

There are various types of value chain:

- i) **Simple value chain:** The *value chain* describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use.
- ii) **Extended value chain:** In the real world, of course, value chains are much more complex than this. For one thing, there tend to be many more links in the chain. Take, for example, the case of the furniture industry. This involves the provision of seed inputs, chemicals, equipment and water for the forestry sector. Cut logs pass to the sawmill sector which gets its primary inputs from the machinery sector. From there, sawn timber moves to the furniture manufacturers who, in turn, obtain inputs from the machinery, adhesives and paint industries and also draw on design and branding skills from the service sector. Depending on which market is served, the furniture then passes through various intermediary stages until it reaches the final customer, who after use, consigns the furniture for recycling.



- iii) **One or many value chains:** In addition to the manifold links in a value chain, typically intermediary producers in a particular value chain may feed into a number of different value chains. In some cases, these alternative value chains may absorb only a small share of their output; in other cases, there may be an equal spread of customers. But the share of sales at a particular point in time may not capture the full story – the dynamics of a particular market or technology may mean that a relatively small (or large) customer/supplier may become a relatively large (small) customer/supplier in the future. Furthermore the share of sales may obscure the crucial role that a particular supplier controlling a key core technology or input (which may be a relatively small part of its output) has on the rest of the value chain.
- iv) **One or many labels:** There is a considerable overlap between the concept of a value chain and similar concepts used in other contexts. One important source of confusion – particularly in earlier years before the value chain as outlined above became increasingly widespread in the research and policy domain – was one of nomenclature and arose from the work of Michael Porter in the mid 1980s. Porter distinguished two important elements of modern value chain analysis
- The various *activities* which were performed in particular links in the chain. Here he drew the distinction between different stages of the process of supply (inbound logistics, operations, outbound logistics, marketing and sales, and after sales service), the transformation of these inputs into outputs (production, logistics, quality and continuous improvement processes), and the support services the firm marshals to accomplish this task.
 - He complements this discussion of intra-link functions with the concept of the multi-linked value chain itself, which he refers to as the *value system*. The value system basically extends his idea of the value chain to inter-link linkages,

There are six main business functions of a value chain:

- Research and Development
- Design of Products, Services, or Processes
- Productions
- Marketing and Sales
- Distribution
- Customer Service

□ Importance of value chain analysis

There are three main sets of reasons why value chain analysis is important in this era of rapid globalization. They are:

- With the growing division of labour and the global dispersion of the production of components, systemic competitiveness has become increasingly important
- Efficiency in production is only a necessary condition for successfully penetrating global markets. Value chain analysis helps in understanding the advantages and disadvantages of firms and countries specializing in production rather than services.
- Entry into global markets which allows for sustained income growth – that is, making the best of globalization - requires an understanding of dynamic factors within the whole value chain; value chain analysis helps to explain the distribution of benefits, particularly income, to those participating in the global economy. This makes it easier to identify the policies which can be implemented to enable individual producers and countries to increase their share of these gains. This is an especially topical issue at the turn of the millennium and has captured the attention of a wide variety of parties.

□ Value chain as a heuristic and analytical tool

There are three important components of value chains, which need to be recognized and which transform an heuristic device into an analytical tool:

- *Value chains are repositories for rent, and these rents are dynamic*

The value chain is an important construct for understanding the distribution of returns arising from design, production, marketing, coordination and recycling. Essentially, the primary returns accrue to those parties who are able to protect themselves from competition. This ability to insulate activities can be encapsulated by the concept of *rent*, which arises from the possession of scarce attributes and involves *barriers to entry*. There are a variety of forms of rent. The focus of much of the literature, entrepreneurial energies and government policies is on what is called economic rents. The classical economists (such as Ricardo) argued that economic rent accrues on the basis of unequal ownership/access or control over an existing scarce resource (e.g. land). However, as Schumpeter showed, scarcity can be constructed through purposive action, and hence an entrepreneurial surplus can accrue to those who create this scarcity.

- *Effectively functioning value chains involve some degree of 'governance'*

A second consideration which helps to transform the value chain from an heuristic to an analytical concept is that the various activities in the chain – within firms and in the division of labour between firms – are subject to what Gereffi has usefully termed 'governance' (Gereffi, 1994). Value chains imply repetitiveness of linkage interactions. Governance ensures that interactions between firms along a value chain exhibit some reflection of organisation rather than being simply random. Value chains are governed



when parameters requiring product, process, and logistic qualification are set which have consequences up or down the value chain encompassing bundles of activities, actors, roles and functions.

In trying to understand the role of governance in global value chains, we can be informed by the discussion of governance in civil society. Here four elements are relevant:

- There is an important distinction between the three functions of government (the “separation of powers”) - the legislature (making the laws), the executive (implementing the laws) and the judiciary (monitoring the conformance to laws).
- To be effective, the power to govern requires the capacity to sanction behavior; these sanctions are generally negative and are directed against transgressions (the “stick”), but they may also be positive and may reward conformance (the “carrot”).
- In the long run, sustained governance reflects the legitimacy of those in power.
- The remit of power may vary in intensity and in physical and economic space.
- *There are different types of value chains*

Building on this concept of governance, Gereffi has made the very useful distinction between two types of value chains. The first describes those chains where the critical governing role is played by a buyer at the apex of the chain. *Buyer-driven chains* are characteristic of labour intensive industries (and therefore highly relevant to developing countries) such as footwear, clothing, furniture and toys. The second describes a world where key producers in the chain, generally commanding vital technologies, play the role of coordinating the various links – *producer-driven chains*

VALUE CHAINS, INNOVATION AND UPGRADING

There are two paths of insertion into the global economy; the low road, one of immiserating growth, a trajectory in which producers face intense competition and are engaged in a “race to the bottom”. On the other hand, those who trod a high road, and exhibit the ability to enter a virtuous circle of participation in the global economy, realising: sustained income growth. What explains the difference between these two paths is the capacity to *innovate*, and to ensure continuous improvement in product and process development. If this is the case, then the emphasis in production needs to be placed on the ability to learn and this has implications not just for the productive sector itself, but also for the whole National System of Innovation (Lundvall, 1992; Nelson and Winter, 1993).

But innovation in itself may not be adequate. If the rate of innovation is lower than that of competitors, it may result in declining value added and market shares. In the extreme case, it may also involve immiserising growth. Thus innovation has to be placed in a relative context – how fast compared to competitors - and this is a process, which can be referred to as one of *upgrading*. The concept of upgrading (as distinct from innovation) explicitly recognizes relative endowments, and hence the existence of rent.

Different types of upgrading

- **Process upgrading:** increasing the efficiency of internal processes such that they are significantly better than those of rivals, both within individual links in the chain, and between the links in the chain.
- **Product upgrading:** introducing new products or improving old products faster than rivals. This involves changing new product development processes both within individual links in the value chain and in the relationship between different chain links.
- **Functional upgrading:** increasing value added by changing the mix of activities conducted within the firm (for example, taking responsibility for, or outsourcing accounting, logistics and quality functions) or moving the locus of activities to different links in the value chain (for example from manufacturing to design).
- **Chain upgrading:** moving to a new value chain (for example, A firm moving from the manufacture of transistor radios to calculators, to TVs, to computer monitors, to laptops and now to WAP phones).

Firms need to examine their capabilities to determine those of its attributes which provide value to the final customer, are relatively unique in the sense that few competitors possess them and are difficult to copy, that is where there are barriers to entry.

Value chain research methodology

There is no mechanistic way of applying value chain methodology. Each chain will have particular characteristics, whose distinctiveness and wider relevance can only be effectively captured and analyzed through an understanding of the broader issues which are involved.

The methodology adopted should address the following issues:

- ***The point of entry for value chain analysis possible points of entry***
Value chains are complex, and particularly in the middle tiers, individual firms may feed into a variety of chains. Which chain – or chains – is/are the subject of enquiry, therefore, very much depends on the point of entry for the research inquiry. Some of the possible points of entry into the value chain research include the final consumer, supermarkets or retail chains, independent buyers or wholesalers, home based workers, generally large firms and small firms.



The primary area of research interest based on the examples above would be; the global distribution of income; the role of retailers, the role of independent buyers and wholesalers, informal economy producers and buyers, second and third tier producers and commodity producers respectively.

- **Mapping value chains**

Having identified the value chain in question, the task is then to put numbers and values to the variables under investigation. Here, which variables are chosen will reflect the primary questions being addressed in the research – for example, a gender focus may suggest that a *specific* gender-lens be utilized to collect issue-specific data which identify the role played by women throughout the chain. But, leaving aside these specific interests, it is likely that all value chain analysis will gain from constructing a “tree” of input-output relationships, which include most of the following primary *general* accounting identities; gross output values, net output values, the physical flow of commodities along the chain, the flow of services, consultants and skills along the chain.

- **Product segments and Critical Success Factors in final markets**

One of the distinctive features about contemporary production systems is that they tend to be “market-pulled”, as opposed to the “supplier-push” nature of protected and low-competition value chains in previous decades. This puts a primacy on the characteristics of final product markets in every chain, and generally represents a high-order priority in all value chain studies

Contemporary global markets comprise a number of key characteristics which will need to be analyzed to understand value chain dynamics. The critical components are that

- they are segmented
- they are referred to as critical success factors
- they are increasingly volatile
- they can either be ‘order qualifying’ or ‘order winning’

- **How producers access final markets**

One of the powers of value chain analysis is that it goes beyond firm-level analysis. That is a narrow focus on the competitiveness of individual producers, or indeed even a chain of producers, may not explain their success in global markets. This is because each of these producers needs a point of entry into global markets, that is they need to be connected. The point is that different forms of connecting intermediaries will affect the terms of entry into global markets and the capacity of individual producers to upgrade. In terms of orders of importance, therefore, knowledge of the ways in which disparate producers are connected into different final markets is of particular importance to value chain analysis; this links, as we shall see below, to the ability to characterize value chains as being either “buyer-driven” or “producer driven”.

- ***Benchmarking production efficiency***

Having charted the dynamic nature of final markets, and the ways in which producers are inserted into these markets, it is then necessary to analyze the productive efficiency of different parties in the value chain. This is referred to as “benchmarking”.

- ***Governance of value chains***

The power which any party may have in the chain may paradoxically be reflected in two seemingly contradictory attributes. The first is obvious and arises from the power to force other parties to take particular actions, for example to limit themselves to assembly rather than to involve themselves in design. But, secondly, it may also reflect the capacity to be deaf to the demands of others, that is to refuse the demand to confine activities to assembly alone. These contradictory effects also arise from the fact that parties are often involved in different value chains and these may result in cross-cutting power between value chains with the demands of one dominating the other with detrimental effects down the chain.

The extent of chain power may be related in complicated ways to the relative size of a particular firm in the chain. In general, the larger the firm, the more influential its role.

One of the distinctive features of value chain analysis is its focus on governance; both power relations in the chain and the institutions which mould and wield this power. We also argued that this function of governance was best understood through the lens of civic governance, with its analysis of: Different functions associated with the “regime of rule-making and rule-keeping”— that is, making the rules (“legislative governance”), implementing the rules, (“executive governance”) and enforcing the rules (“judicial governance”); the positive and negative sanctions which are used to enforce these rules; the legitimacy of the power of the rule-makers; the extent of governance of the rule-makers, that is, its reach. Associated with this is the issue of boundaries, that is whether the rules are a product of relations between different parties in the chain, or whether external parties are also involved.

- ***Upgrading in value chains***

The process of upgrading in the value chain cannot be easily separated from those of rent, barriers to entry and distribution which are covered in the next section of this methodological discussion. This is because, by definition as we have seen, upgrading has a comparative component, and in this sense it is distinctive from innovation. However, for the moment, in this discussion of methodology we will treat upgrading in isolation from the experience of other firms in the chain, and other chains.

There are four forms of upgrading. These are with regard to:

- Improvements in process, either within a firm, or as a result of a series of linked actions in the relationships between firms.
- Improvements in product, either within a firm, or as a result of a series of linked actions in the relationships between firms.



- Changing functional positions, by adjusting activities undertaken within a particular link, or moving to activities taking place in other links.
- Moving out of the value chain, into a new value chain.

There are various factors that block and others that enable upgrading activities in a firm. These factors may be found within or without the firm.

Blockers inside the firm include resistance from middle management to new work practices, failure of senior management to commit resources to new product development and lack of adequate skills. The enablers inside the firm will include, top management commitment to upgrading, effective research and development management and structured processes for continuous improvement.

The blockers outside the firm will include buyers who block suppliers from using new designs, intellectual property rights, lack of skills in the economy and poor IT infrastructure. The enablers on the other hand will include chain governor which promotes and assists upgrading by chain members, well established and proactive business service providers allied to facilitative government programmes, new legislation forces firms to upgrade and rising process for inputs and/or increased competition.

- ***Distributional issues***

Distribution has both power and income components. The former concerns the balance of leverage which different parties have in determining the distribution of who does what in the chain and the returns which accrue to different parties. In pursuing this distributional research agenda, it is necessary to work through the following components of value chain analysis:

- what are the different forms of rents and barriers to entry which are the underlying determinants of the distribution of the returns from global production chains?
- the unit of account, that is which currency is utilized to measure income?
- in what circumstances value added and turnover data illuminate the analysis?
- how is profitability to be measured, and are profits an appropriate measure of distributional outcomes?
- the locational dimensions of global value chain distribution - global, national and local
- decomposing income streams - class, income groups, gender and ethnicity.
- how a knowledge focus can be incorporated into the analysis, opening up the distribution between skills.

JUST IN TIME INVENTORY SYSTEM

This concept advocates zero inventory and stockless production through just-in-time purchasing and just-in-time production. Organizations create a closer relationship with the suppliers and arrange for more frequent deliveries of small quantities. The objective of just-in-time purchasing is to purchase goods so that delivery is made immediately before their use.

JIT is considered economical since it eliminates the cost of carrying inventory and reduces the inefficiencies that the inventories create. JIT purchasing increases the number of orders as the enterprises order more frequently and in smaller quantities. Holding cost is reduced by a significant proportion as it only arises due to waste and inefficiency created by inventory. It calls for 100 per cent quality. Some of the major features of JIT include:

- a) Frequent and reliable deliveries to avoid inventory build up. Penalties are imposed on those who do not meet the deadline.
- b) Strategic location of firms. This may be closeness to suppliers and/or customers.
- c) Improved communication between companies and suppliers through the use of computerized purchasing systems that allows for online ordering.
- d) Single sourcing and building long-term relations with a few trusted suppliers.
- e) Increased supplier involvement in the design aspects of a product to ensure that they meet the company's quality requirements.
- f) Maintenance of strict quality control by all parties. Suppliers guarantee the quality of stock items.

Benefits of JIT inventory system

The benefits include lower inventory level, emphasis on strict quality control by all parties, faster market response, smaller manufacturing facilities and lower set up costs.

1. *Set up times are significantly reduced in the factory.* Cutting down the set up time to be more productive will allow the company to improve their bottom line to look more efficient and focus time spent on other areas that may need improvement. This allows the reduction or elimination of the inventory held to cover the "changeover" time.
2. *The flows of goods from warehouse to shelves are improved.* Having employees focused on specific areas of the system will allow them to process goods faster instead of having them vulnerable to fatigue from doing too many jobs at once and simplifies the tasks at hand. Small or individual piece lot sizes reduce lot delay inventories which simplifies inventory flow and its management.



3. *Employees who possess multiple skills are utilized more efficiently.* Having employees trained to work on different parts of the inventory cycle system will allow companies to use workers in situations where they are needed when there is a shortage of workers and a high demand for a particular product.
4. *Better consistency of scheduling and consistency of employee work hours.* If there is no demand for a product at the time, workers don't have to be working. This can save the company money by not having to pay workers for a job not completed or could have them focus on other jobs around the warehouse that would not necessarily be done on a normal day.
5. *Increased emphasis on supplier relationships.* No company wants a break in their inventory system that would create a shortage of supplies while not having inventory sit on shelves. Having a trusting supplier relationship means that you can rely on goods being there when you need them in order to satisfy the company and keep the company name in good standing with the public.
6. *Supplies continue around the clock keeping workers productive and businesses focused on turnover.* Having management focused on meeting deadlines will make employees work hard to meet the company goals to see benefits in terms of job satisfaction, promotion or even higher pay.

ADVANCED MANUFACTURING TECHNOLOGY (AMT)

Rapidly changing needs for materials and innovative manufacturing systems are creating new opportunities for small business and industry in today's global marketplace. For a country to become competitive, grow existing and develop new industries, an initiative on advanced manufacturing is of the utmost importance. This initiative should support research to develop new classes of materials, material systems, material processing, characterization methods and techniques as well as tools to help make the manufacturing base more competitive. History has proved that in almost every case, the discovery of a new material has led to the establishment of new industries and a resultant rapid economic growth.

Advanced manufacturing` technology results in new product development, material beneficiation and improvement in the performance of production and manufacturing systems. The main aim is to transform scientific discovery into social benefits and to realize private sector commercialization, thereby opening up new opportunities.

The AMT hinge not just on policies and investments at a national level of a country but also on capacity to foster clusters of innovation in the provinces across a country and to identify market opportunities from the technological applications.

Materials Technology is an enabling tool that must work in conjunction with the main industry drivers to promote value addition. Besides this, Advanced manufacturing technology has the following advantages:

- Development of new and advanced materials for product or process development
- The beneficiation of existing raw materials
- Coordinated effort in research and development concerning fundamental or applied research in a laboratory, field, or research facility in order to create longer term opportunities.

MATERIAL RESOURCE PLANNING

Proper management of materials makes production tasks go more quickly. When employees are able to look up the status of all necessary materials at any given time, they can more accurately plan and execute daily manufacturing activities. The use of accounting software with numerous modules aid in the overall process of planning for and managing materials.

For instance, most accounting software enable management of the materials for any given job (via bills of materials) and of the entire stock of materials owned by a company. While certain pieces of information are more often used in one particular module, the information on the system can be used and accessed by many different modules for comprehensive materials management. The ways in which information about materials is stored on the system allows many tasks to be connected and refined.

The Purchasing Module of an accounting system provides an excellent example of the benefits of this computing structure. While purchasing is certainly an element of materials management, many companies alert the purchasing department only when supplies are low. With an accounting software's Purchasing module, those creating POs can look at the Planned Materials Requirement report in order to compare company inventory with estimated material needs, thus preventing supply shortages.

This sort of integrated functionality is a big reason that accounting software has become so popular in the manufacturing industry.

Material resource planning has three main uses;

- To control and plan the types and amounts of materials a manufacturer produces.



- To ensure that all products meet the customer's demands for the product, the customer's deadlines, and at an inexpensive cost.
- To plan an expedient and growth-driven accounting process.

To ensure effective material resource planning when using an accounting software, some of the action steps that should be followed include:

- i. Inputting information for output schedules; you input the master production schedule, inventory status records, bills of materials, and planning data, then you receive the output of recommended production and purchasing schedules.
- ii. Double check your numbers; remember that the dependability of your outputs depends on the accuracy of your input numbers and information. Take the extra time to train your employees to ensure their attention to detail. If you input garbage, then you will get garbage in return. (GIGO – Garbage-in-garbage-out).
- iii. Combine the best material resource planning with the best employees; MRP is not without its downside, because it's only as accurate as the people who input the data. Ensuring accurate data entry is vital to its success.
- iv. Use all of your resources for planning; make sure you have appropriate provisions to accommodate your resource requirements, including sales goals that fit, vendor relationships, ability to foresee inventory shortages, audits, accurate cash flow estimations, and quality control enforcement and inspection.

USE OF COMPUTERS IN COSTING

As the world is turning electronic, companies have no option other than to adapt to the technology. Such adoption enhances not only efficiencies but also controls.

Computers have been widely used in costing. Many manufacturers use accounting software customized to fit their industries. For instance, a manufacturer in a cable manufacturing firm will need different data input and categories from one manufacturing packaging materials.

Effective costing is attained when the correct data is input and the system processes it correctly. It highly depends on the accuracy and effectiveness of the staff involved in the whole exercise. Use of accounting software enables tracking of a specific job from initialization to completion. Cost accounting software provides methods for saving you time and money by accurately estimating and tracking project costs, including labor, materials, equipment, overhead, and more. A wide variety of reports is available to help you budget, control, and manage jobs to achieve greater profit potential. The tracking feature of the job cost module gives you pinpoint details regarding

every job and project so that you can make informed decisions and more effectively manage internal and external projects. The cost accountant is also able to compare actual costs with estimated costs throughout all the stages of the projects. This ensures that expenses fall within the budget and the organization generates profit from every job.

Since accounting for labour is the most cumbersome activity, computers make work easier by providing modules with solutions that facilitate monitoring of labour and accounting for labour.

For instance, in case of labour distribution, employees may use their bar coded and/or magnetic striped badge to activate the data capture terminals to track progress throughout the day, specific operation changes and time spent on particular tasks. Supervisors can also track these changes by using a hand-held portable unit to record their employee's production.

The cost accountant can specify job, departments, operations, e.t.c. to capture information based on your operational needs. All the information captured (either from the terminals or the portable units) is transmitted to your PC via software created by American Standard Code.

The captured job and labor information is then easily and immediately accessible to supervisors and management personnel so that informed decisions can be made on a timely basis. Meaningful reports can be produced that will easily and clearly pinpoint areas for improvement in production, efficiency, cost control, job costing, and labour.

In case of job order tracking, using electronic data collectors, any job order can be scanned in or out at each work station -- from beginning to end. This allows any manufacturer or service company to vastly improve customer service by calling up the customer's order status on your PC and viewing its status.

Data is then ready for editing and viewing. Completed, pending, and/or terminated job records can be reviewed, edited and reports generated per used specifications. Job order status is quickly obtained and reports can be generated that will assist all the departments that are involved.

The PC entries can be facilitated. Employees can enter time, attendance, job, labor and project information right from their desktop PC and data is uploaded to the network for processing. The PC entry can be used as a replacement for, or in conjunction with electronic time clocks, intranet and internet for real cost savings, efficiency and convenience.

Automating time and attendance data collection has various advantages:

- Hours now spent on processing time and attendance reconciliation are reduced to minutes.
- Start and stop times, breaks, and time off are automatically calculated minimizing the chance of human error.



- Employee productivity increases as a result of accurate and indisputable timekeeping.
- Time and job information are recalled for immediate reporting or gathered into meaningful formats and used for long term planning.
- Measuring efficiency, down time, productivity and cost control is simplified. All the attendance and job information you need is available at the touch of a key.
- Cost controls are in place when manpower is utilized more effectively.
- Projected labor costs can easily be formulated by using historical data that has been captured. Excellent report formats are available.
- Budget information can be compiled from various reports and accurate planning is simplified.
- Quotas for performance and production standards are established through reports tracking labor management. Job standards and actual labor is compared.

Most of the software adapt to the manufacturer's environment and process rather than the other way round. This is because they can be customized to suit the data available for processing given the unique manufacturing process of each organization.

Note that use of computers simplifies the costing process since only correct data input is required in order to obtain the correct output. Each of the input is keyed in at the different terminals at cost centers. All the cost accountant has to do is print the report of the compiled cost information and verify whether the output corresponds to what is expected. However, the verification may to a greater extent be a formality especially if the computer software has proper controls instituted within it.

The benefits of using computers and computer software in job costing include:

- **Improve visibility to increase profitability.** The computer facilitates the analysis information maintained for each job cost against estimated costs such as labour, machine use, material, overhead and shipping, to help reveal unacceptable trends that contribute to costs.
- **Gain a detailed understanding of costs;** the computer enables definition of types of transactions that are tracked per job, giving the cost accountant a deeper insight into the costs for the job.
- **Identify job costs right then.** Use of computers helps remove doubt about what a job really costs. It links transactions from anywhere in the system to capture the true cost of the job.
- **Collect job costing data with greater flexibility, speed and accuracy.** Computers and computer software streamline data entry and make it easy for the employees to assign transactions to jobs when entry is required, eliminating redundant and error-prone duplicate entries.

Computer software used in manufacturing may have the following features which are relevant in job costing. (An example of Microsoft Dynamics GP software)

Feature

- Job link maintenance
- Automatic application of costs
- Variance analysis
- Revenue and expense coding
- Comprehensive capture

Job costing

Aggregate all unlinked job cost data into a single job basket by using the graphical linking tool with drag and drop functionality.

Link transactions from anywhere in the system to a job to capture the true cost of the job.

Automatically perform variance analysis per job.

Assign unlimited revenue and expense codes to jobs within the system allowing for more detailed financial analysis of each project.

Enable the employees to identify where and when to capture costs upfront, avoiding the possibility of double-booking costs.

CHAPTER SUMMARY

This chapter mainly focuses on the technological trends and impact of the change on cost management. The main subtopics covered in here include:

Value chain research and development design production, marketing – distribution and customer care. This focuses on the process of conducting research and coming up with a supply chain that adds value to the various stakeholders. Critical issues to be observed when developing a research methodology have been discussed.

Just in time inventory management system - this analyses the inventory system that operates on a just in time basis. The whole concept focuses on minimizing costs of holding inventory and improving efficiency in production.

Advanced manufacturing technology. This topic focuses on rapidly changing needs for materials and innovative manufacturing systems that create new opportunities for business and industry in today's global marketplace

Material resource planning: This has focused on proper management of materials that makes production tasks go more quickly.

Use of computers in costing: The topic focuses on the use of computers in costing with a bias in job costing.



CHAPTER QUIZ

1. What is a value chain?
2. List the six main business functions of a value chain.
3. State eight issues that should be addressed by a value chain research methodology.

ANSWERS TO CHAPTER QUIZ

1. A value chain is a chain of activities
2. There are six main business functions of a value chain:
 - Research and Development
 - Design of Products, Services, or Processes
 - Productions
 - Marketing and Sales
 - Distribution
 - Customer service
3. State eight issues that should be addressed by a value chain research methodology
 - The point of entry for value chain analysis possible points of entry
 - Mapping value chains
 - Product segments and critical success factors in final markets
 - How producers access final markets
 - Benchmarking production efficiency
 - Governance of value chains
 - Upgrading value chains
 - Distributional issues

PAST PAPER ANALYSIS

This chapter has not been tested in past sittings. It has been newly introduced in the syllabus.



REVIEW QUESTIONS

Question one

Discuss the benefits of JIT inventory system (10 marks)

Question two

Highlight the advantages of advanced manufacturing technology (10 marks)

Question three

Discuss the advantages of automating time and attendance data collection (10 marks)

QUESTION FOUR

List the conditions that must be met for advanced manufacturing technology to be applied. (10 marks)

CHAPTER FOURTEEN



ANSWERS TO EXAM &
REVIEW QUESTIONS



ANSWERS TO EXAM & REVIEW QUESTIONS

CHAPTER ONE

Question 1

Cost accounting is utilized for a number of purposes, some of which are briefly described in the following points:

- a) **Accounting for costs**
This may be seen as a record keeping or score keeping role. Information must be gathered and analyzed in a manner which will help in planning, control and decision making.
- b) **Planning and Budgeting**
This involves the quantification of plans for the future operations of the enterprise; such plans may be for the long or short term, for the enterprise as a whole or for the individual aspects of the enterprise.
- c) **Control of the operations of the enterprise**
Control may be assisted by the comparison of actual cost information with that included in the plan. Any differences between planned and actual events can be investigated and corrective action implemented as appropriate.
- d) **Decision Making**
Cost accounting information assists in the making of decisions about the future operations of the enterprise; such decisions making may be assisted by the information from cost techniques and cost-volume - profit analysis.
- e) **Resource allocation decisions**
For example, product pricing in determining whether to accept or reject jobs: This is based on cost and revenue implications of the relevant decisions
- f) **Performance evaluation**
Cost accounting information is used to measure and evaluate actual performance so as to make a decision of the degree of optimality or efficiency of resource utilization.

Question 2

A responsibility centre is part of an organization for whose activities a manager is deemed to be responsible. The type of responsibility centre depends on the type of activities for which responsibility is carried.

Cost Centre

A cost centre or expense centre can be defined as a responsibility centre where a manager is accountable only for costs which are under his control. It is a production or service location for which costs can be identified or accumulated prior to allocation to cost units. Cost centers may be either standard cost centers, where output can be measured and the input needed for a given output can be specified, or discretionary cost centers, where output cannot be measured easily and the relationship between inputs and outputs cannot be specified. An example of a standard cost centre is a production unit within a factory, while an example of a discretionary cost centre is a health and safety department within a university. A cost centre manager is responsible for the cost of inputs to the organization. The performance of the manager of a cost centre can be assessed by comparing actual performance with budgeted targets for price, usage and efficiency.

Revenue Centre

A revenue centre is a responsibility centre where a manager is accountable solely for the revenue generation that is under his control. An example would be a sales team with a target geographical area which is under the control of a sales manager. The manager would have no responsibility for the production cost of the items his team is selling, but has responsibility for meeting sales targets in terms of sales volume, sales revenue or market share. A revenue centre manager has responsibility for the revenue generated by outputs from the organization. The performance of the manager of a revenue centre can be assessed by comparing actual performance with budgeted targets for price, mix and volume.

Profit Centre

A profit centre is a combination of a cost centre and a revenue centre where a manager has responsibility for both production costs and revenue generation. The degree of responsibility carried by a manager can be higher with a profit centre than with a cost centre or a revenue centre, and the manager may be responsible for purchasing, production planning, product mix and pricing decisions. The performance of the manager of a profit centre is unlikely to be assessed on the fine detail of cost and revenue data but by the extent to which agreed targets for overall cost, revenue and profit have been achieved.

Investment Centre

With an investment centre, the manager of a profit centre is given additional responsibility for investment decisions regarding working capital and the purchase and replacement of fixed assets. The manager of an investment centre is likely to be assessed with an aggregate measure that links periodic profit to the assets employed in the period to generate that profit. An example of such an aggregate measure is return on capital employed.



Question 3

Controllable and Non-controllable Factors

It is a cardinal principle of responsibility accounting that managers can only be assessed on the cash flows that are under their control. If a manager has no control over a cash flow, he cannot influence its size or timing and so cannot be held responsible if either of these values change. The performance of the manager of a cost centre can thus only be assessed on the controllable costs over which he exercises control. In the case of a production cost centre, the manager may be able to control material usage but could have no influence over the price at which materials are bought by the purchasing department. For the production cost centre manager, material usage is a controllable factor whereas material purchase price is not.

With a revenue centre, a sales manager can be held responsible for generating revenue against agreed sales volume targets but may have no control over the selling price of his products as this is determined by market conditions. In this case, sales volume is a controllable factor whereas selling price is not.

The manager of a profit centre will have control of operating costs but will not be able to influence the financing costs rising from investment decisions. The manager may thus have responsibility for operating profit but his performance should not be assessed on profit before tax since interest charges are outside of his control.

The manager of an investment centre could have his performance assessed on profit before tax, but the profit on which he is assessed should exclude non-controllable elements such as overhead costs that he cannot influence, for example allocated head office charges.

Chapter two

Question one

- Material costs: for instance, when manufacturing a motor car, the direct materials are metal sheets and tyres.
- Direct labour cost: these are expenses directly identifiable (traceable) to a specific product. In the manufacture of the motor vehicle, the assemblers constitute the direct labour
- Manufacturing overheads: these are the costs that cannot be traced to the product with ease or would cause a lot of inconvenience. In the manufacture of the motor vehicle above, supervisors salary would be a good example.

Question two and three are effectively discussed in the chapter

Chapter Three (Cost Estimation)

Question one

C. Sh165,000

The relevant net machine cost for the contract is the cost incurred to acquire and install the machine net the recoverable cost (salvage value).

This is calculated as

$$\text{Shs.}(150,000 + 25,000 - 10,000) = \text{Shs.}165,000$$

Question two

1. High - Low method

Here, cost estimation is based on the relationship between past cost and past level of activity. Variable cost is based on the relationship between costs at the highest level of activity and the lowest level of activity. The difference in cost between high and low activity level is taken to be the total variable cost from which the unit variable cost can be computed by dividing it by the change in output level. This is indicated below:

$$\text{Total Variable Cost} = \text{Cost at high activity level} - \text{Constant low activity level}$$

Therefore,

$$\text{Unit Variable cost} = \frac{\text{Variable cost}}{\text{Output units}} = \frac{\text{Cost at high level activity} - \text{Cost at low level activity}}{\text{Units at high level activity} - \text{Units at low level activity}}$$

The variable cost per unit so calculated forms the 'b' of the straight line equation mentioned earlier. By substituting for 'b' into the equation, we can obtain 'a', the fixed cost.

Advantages

- (i) This method is easy to use
- (ii) Assumes that costs can be classified as either fixed or variable.
- (iii) It is easily understood

Disadvantages

- (i) Prone to give estimations with a high variance since it does not consider all the points in the data provided.

2. Account Analysis (Inspection of Accounts)

Using account analysis, the accountant examines and classifies each ledger account as variable, fixed or mixed. Mixed accounts are broken down into their variable and fixed components. They base these classifications on experience, inspection of cost



behavior for several past periods or intuitive feelings of the manager.

Advantage

- (i) It considers all the points in the data spectrum
- (ii) It is more reliable than high low method

Disadvantage

- (i) It has some technicality since it can only be done by people with basic knowledge in accounting

3. Engineering method

This method is based on a detailed study of each operation where careful specification is made for materials, labour and equipment necessary to produce a product. It involves identifying the level of input required of an activity in form of raw material and labour while total cost is based on the cost of each input. This approach is applicable where no past data exist.

Disadvantage: The main setback of the approach is that it requires a complex analysis of all the constituents of an activity and the requirements of an activity in terms of costs detailed into materials, labour, overheads and time.

4. Visual fit (scatter graph method)

Cost estimation is based on past data regarding the dependent variable and the cost driver. The past data on cost levels and the output levels is plotted on a graph (called a **scatter graph**) and a line of best fit is drawn. A line of best fit is a line drawn so as to cover the most points possible on a scatter graph. It can also be defined as 'a straight line used as a best approximation of a summary of all the points in a scatter-plot'. Its intersection with the vertical axis indicates the fixed cost while the gradient indicates the variable cost per unit.

This method takes into account all observations and is easy to apply. However, it cannot be used with two or more independent variables and is subjective to some extent as different lines of best fit may be drawn by different analysts

Question three

Any variable overhead costs associated with the contract would be relevant because they would represent additional or incremental costs caused directly by the contract.

Fixed overhead costs would only be relevant if the total fixed overhead costs of the company increased as a direct consequence of the contract being undertaken. In that case, the relevant amount would be the specific increase in the total fixed overhead costs caused by the acceptance of the contract.

Arbitrary apportionments of existing fixed overhead costs would not be relevant. Similarly, sunk and committed costs would not be relevant

QUESTION FOUR

a) Using the high-low method:

Units	Total cost (£)
120,000	(W1) 700,000
102,000	619,000
<hr/>	<hr/>
18,000	81,000
<hr/>	<hr/>

Working (W1)

Full capacity = $102,000 \div 0.85 = 120,000$

- (i) Variable cost per unit = $81,000 \div 18,000 = £4.50$
- (ii) Total fixed costs = $700,000 - (120,000 \times 4.50) = £160,000$
- (iii) Selling price per unit = Variable cost per unit $\div (1.00 - 0.40)$
 $= 4.50 \div 0.6 = £7.50$
- (iv) Contribution per unit = $(7.50 - 4.50) = £3.00$

b) New business: £ per unit

Selling price	(0.80×7.50)	6.00
Less variable cost		(4.50)
		<hr/>
Contribution		1.50
		<hr/>
£		
Contribution from 15,000 units		($15,000 \times 1.50$) 22,500
Less opportunity cost ($15,000 \div 6$) \times £3.00		(7,500)
		<hr/>
Net increase in contribution (and profit)		15,000
		<hr/>

- (c) An opportunity cost is the cost of the best alternative forgone in a situation of choice. Opportunity costs are relevant costs. In the situation of Jamline Ltd, if it goes ahead with the new business (that is the decision) then it will lose (forgo) the contribution from some existing sales. This lost contribution is an opportunity cost relevant to the decision.

Question five

A **stockout** occurs when a company runs out of stock. There are costs associated with this – lost contribution from lost sales, for example. In order to avoid a stockout, the company could set a **buffer stock** – in effect a safety level of stock to cover emergency situations such as demand and/or lead times exceeding their average levels. The holding of a buffer stock involves an additional cost.



Jackie plc should consider having a buffer stock if either the usage of component RB starts to fluctuate from period to period (at present it is constant) and/or the lead time starts to fluctuate from its present constant level of 21 days.

CHAPTER FOUR

QUESTION ONE

- (i) **Material requisition:** the material requisition form that details the materials required for production must be authorized by appropriate personnel before the material(s) requisitioned are issued
- (ii) **Stores records cards:** these cards are prepared and updated promptly to show the full identification of the material and its location in the store, quantities on order received and issued together with a running balance of the quantity in the store, prices and values of all receipt and issues in the store and all material control quantities.
- (iii) **Stocktaking:** frequent stocktaking must be done to ensure that the stock balances as per the records and physical count agree. Any differences found must be investigated and appropriate action taken.
- (iv) **Stores control:** quantities must be established to ensure that over and under stocking are avoided. This involves the setting of maximum stock level, minimum stock level, reorder level, reorder quantity and estimating the lead-time.
- (v) **Costs of storage:** the storage costs must be established and be controlled to a minimum level. Control of holding or carrying costs is one of the ways of minimizing total inventory costs since holding cost accounts for a significant proportion of the inventory costs.
- (vi) **Cost of purchasing:** purchases must be made competitively from the cheapest supplier. Suppliers' prices must be reviewed before purchases are made. The aim should be to get the best quality materials and highest quantity at the lowest price.

QUESTION TWO

Mwaura

Given data:

Ordering cost = Shs55; annual demand = 4,000 units, Holding costs = Shs1.70 per unit p.a

$$\begin{aligned}
 \text{EOQ} &= \sqrt{\frac{2DC_o}{C_h}} &= \sqrt{\frac{2 \times 4,000 \times 55}{(1.55 + 0.20)}} &= \sqrt{\frac{8000 \times 55}{1.70}} &= \text{Shs}508.74 \\
 & & & & &= \text{Shs}.509 \text{ units} \\
 & & & & &= \text{Shs}508.74 \\
 & & & & &= \text{Shs}.509 \text{ units}
 \end{aligned}$$

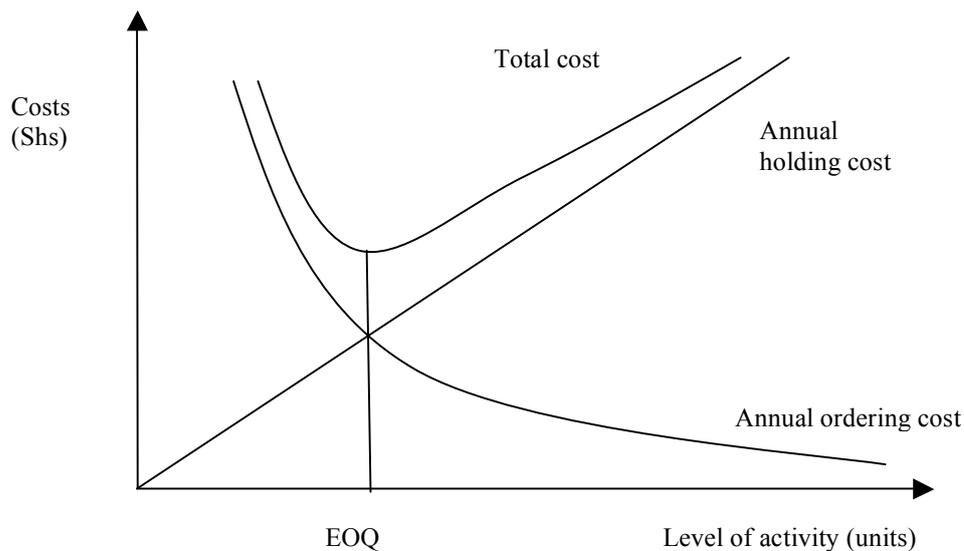
Question three

Using the tabulation method, you must carry out a trial and error with different units until the moment you obtain equal annual and holding costs. This approach, however, might be cumbersome and time wasting.

Units(Q)	Average stock (Q/2)	Annual holding cost $Q/2 \times C_h$	Number of orders (D/Q)	Annual ordering costs $D/Q \times C_o$	Total cost
0	0	0	∞	∞	∞
1000	500	1000	50	5000	6000
2000	1000	2000	25	2500	4500
3000	1500	3000	16.67	1667	4667
4000	2000	4000	12.50	1250	5250

(II) Using the graphical method

This approach uses the data obtained in the tabulation process. The results are plotted on a graph and the EOQ determined by reading the corresponding value on the X axis at the intersection point between the annual holding costs and annual ordering costs.





Question Four

Data given: demand for the year = 144,000, ordering cost per order = Shs.12,500 and holding cost per unit Shs.100 p.a

$$(i) \quad EOQ = \sqrt{\frac{2DC_o}{C_h}}$$

$$= \sqrt{\frac{2 \times 144,000 \times 12,500}{100}}$$

$$= 6000 \text{ units}$$

$$(ii) \quad \text{Number of orders} = \frac{\text{Annual demand}}{EOQ} = \frac{144,000}{6,000} = 24 \text{ orders}$$

(iii) Total cost of ordering and holding material B42000 per year
Total annual cost = Annual holding cost + Annual ordering cost

$$\begin{aligned} &= \frac{Q}{2} \times C_h + \frac{D}{Q} \times C_o \\ &= \frac{6,000}{2} \times 100 + \frac{144,000}{6,000} \times 12,500 \\ &= 300,000 + 300,000 \\ &= \text{Shs}600,000 \end{aligned}$$

Question five

Advantages of centralized systems of maintaining stores:

- Lower stocks on average which lowers the holding costs.
- Less risk of duplication of costs and efforts.
- Closer control of stocks and costs is possible at the central site.
- Higher quality staff may be efficiently employed to specialize in various aspects of store keeping.
- Reduced paperwork
- Bulk purchasing reduces the purchase cost due to quantity discounts
- Stock taking is facilitated
- It is cost effective to employ expensive and advanced technology.
- Standardization of procedures is possible and easily enforced.

a) Economic Order Quantity (EOQ) refers to the quantity of purchase of stocks or materials that minimizes the holding costs and the ordering costs. It is, therefore, the optimal ordering amount. It is computed as:

$$EOQ = \sqrt{\frac{2DC_o}{C_h}}$$

Where: D = Annual demand
 Co = Cost of Ordering per unit
 Ch = Cost of holding one unit of stock per annum.

b) Assumptions behind EOQ:

- Constant and known holding costs.
- Constant and known ordering costs.
- Annual demand and the rate of demand per given period of time is known.
- Know and constant purchase price per unit.
- Instantaneous replenishment of stocks i.e. a whole batch is delivered to stores at once.

c) Material Y-20

$$\begin{aligned} \text{Re-order level} &= \text{Maximum consumption} \times \text{Maximum Re-order period} \\ &= 1,200 \times 24 = 28,800 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Minimum Stock Level} &= \text{Re-order level} - [\text{Normal consumption} \times \text{Normal R-order period.}] \\ &= 28,800 - \left[900 \times \frac{(12 + 24)}{2} \right] = 12,600 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Maximum stock level} &= \text{Re-order Level} - \left[\frac{\text{Minimum Consumption}}{\text{Re-order period}} \times \text{minimum Re-order period} \right] + \text{Re-order Quantity} \\ &= 28,800 - [800 \times 12] + 32,000 = 51,200 \text{ units.} \end{aligned}$$

**CHAPTER FIVE****Question one**

Bonus payable to each employee

	Employee A	Employee B
Units	35 units	60 units
Standard hours	<u>2 hours</u> 70 hours	<u>1.5 hours</u> 90 hours
Actual time	<u>49 hours</u>	<u>46 hours</u>
Time saved	21 hours	44 hours
Bonus payable	$21 \times \frac{50}{100} \times 200$ =Shs.2,100	$44 \times \frac{50}{100} \times 200$ =Shs.4,400
Total Gross wages		
Total overtime pay	$(49-40) \frac{4}{3} \times 200=2,400$	$(46-40) \frac{4}{3} \times 200=$ 1600
Gross pay	$40 \times 200 =$ 8,000	$40 \times 200 =$ 8,000
Total pay	$=(2,100 + 2,400 + 8,000)$ =12,500	$=(4,400 +1,600+8,000)$ =Shs14,000
Wage cost per unit	$\frac{\text{Shs}12,500}{32 \text{ units}}$	$\frac{\text{Shs}14,000}{57 \text{ Units}}$
<u>total wage</u> units	= Shs.390.625	=Shs.245.614
Good units	32	57

Question two

60 direct workers

Bonus = the excess of time allowed 75%

Percentage of hours saved to hours taken

Total hours	Time allowed (total)
1 = 20 x 30 = 600 hours	$= \frac{320 \times 63}{60} = 336 \text{ hours}$
2 = 8 x 64 = 512 hours	$= \frac{640 \times 120}{60} = 1,280 \text{ hours}$
3 = 32 x 50 = 1600 hours	$= \frac{1200 \times 100}{60} = 2,000 \text{ hours}$
2,712 hours	3,616 hours

$$\begin{aligned} \text{Hours saved} &= 3616 - 2712 \\ &= 904 \text{ hours} \end{aligned}$$

$$\frac{904}{2712} \times 100\% = 33.33\%$$

Bonus due to the group

	Time allowed (total)
Grade 1	$= \frac{33.33}{100} \times 600 \times 0.75 \times 30 = 4499.55$
Grade 2	$= \frac{33.33}{100} \times 512 \times 0.75 \times 27 = 3455.6544$
Grade 3	$= \frac{33.33}{100} \times 1600 \times 0.75 \times 24 = 9599.24$
Total Bonus	Shs.17,556

Gross earnings due to the group

	Basic Pay	Bonus	
Grade 1	=600 hr x 30 = 18,000	+ 4499.55	= 22499.55
Grade 2	=512 hrs x 27=13824	+ 3455.65	= 17279.65
Grade 3	=1600 hrs x 24 = 38,400	+ 9599.04	= 47999.24
	70,224	17554.24	
	Total earnings= 87,778.24		

Question three

a) Ardhi Company

i) Basic guaranteed hourly rates used to calculate earnings

	Mambo	Saidi	Mbogo	Zainabu
Actual hours worked	38	36	40	34
Basic hourly rate of pay	<u>30</u>	<u>20</u>	<u>25</u>	<u>36</u>
Earnings (Basic x actual hours worked)	<u>1140</u>	<u>720</u>	<u>1000</u>	<u>1224</u>

ii) Piecework rates used to calculate earnings for employees

	Mambo	Saidi	Mbogo	Zainabu
Number of minutes worked	2280	2160	2400	2040
Rate per minute	<u>0.5</u>	<u>0.5</u>	<u>0.5</u>	<u>0.5</u>
Earnings (rate x number of minutes)	<u>1140</u>	<u>1080</u>	<u>1200</u>	<u>1020</u>



iii) Premium bonus, given that an employee earns the premium bonus at a rate of 2/3 of the time saved.

	Mambo	Saidi	Mbogo	Zainabu
Hours allowed	38	23.4	12.5	52.5
Hours taken	38	36	40	34
Hours saved	-	-	-	18.5
Bonus hours (2/3 x hours saved)				<u>12.33</u>
Bonus wage (bonus hours x hourly rate)				<u>444</u>

a) **Ushindi company**

- i) Calculate amount of bonus payable
- ii) The total gross wage payable
- iii) The wage cost per unit

	Mbotela	Juma
Wage rate (Shs)	18	18
Units produced	186	210
Hours allowed (hrs)	$(186 \times 0.5) = 93$	$(210 \times 25/60) = 87.5$
Hours worked (hrs)	44	39
Hours saved (hrs)	49	48.5
Bonus (hours saved x 20% x basic wage) – Shs	176.4*	174.6*
Basic wage rate (wage rate x hours worked upto max)	720*	702*
Overtime hours worked (hrs)	4	-
Overtime rate (18 x 1.67)	30	-
Overtime pay (Shs)	<u>120</u> *	<u> </u>
Total gross wage payable (*) Shs.	<u>1016.4</u>	<u>876.6</u>

Wage cost per unit

For;	Mbotela	Juma
Total wages		
Units produced	$\frac{1,016}{186} = \text{Shs.}5.465$ per unit	$\frac{876.6}{210} = \text{Shs.}4.174$ per unit

CHAPTER SIX

Question one

- (a) A service centre is a department that does not directly produce units but is required to support the other departments.

Examples include maintenance departments, stores or a canteen.

A production centre is a centre where units are actually made, examples being a machining department or a welding department.

Although a service will have overheads allocated and apportioned to it, these will be reapportioned to the production centers so that, at the end of a period, all overheads are included in the production centers only. Once all the overheads are included in the production centers, they can be absorbed into production.

- (b) Activity based costing uses a number of different cost drivers to absorb different overheads, whereas traditional absorption costing only uses one, for example labour hours, machine hours or per unit.

In activity based costing, fixed overhead costs may include machine set-up costs. These costs will not be incurred on a per unit basis but will be incurred each time the machine has to be set-up. It would not, therefore, be sensible to allocate costs per unit since that is not how the cost is incurred. It is, however, better to use the number of set-ups for this particular cost to allocate costs to units.

Question two

	Shs
Overheads directly incurred in department G	40,000
Overheads apportioned: department J (30% x (31800))	9,540
Overheads apportioned department K (50% x 18,000)	<u>9,000</u>
	<u>58,540</u>

Alternatively,

The method that recognizes the reciprocal nature of the service cost centers is the repeated distribution method.

	G	H	J	K
Cost prior to allocation	Shs.40,000	Shs.50,000	Shs.30,000	Shs.18,000
Reallocation of service cost centers overhead costs				
Service cost center K (5:4:1)	Shs.9,000	Shs.7,200	Shs.1,800	(Shs.18,000)
Total so far	Shs.49,000	Shs.57,200	Shs.31,800	-
Service cost center J (3:7)	Shs.9,540	Shs.22,270	(Shs.1,800)	-
	Shs.58,540	Shs.79,470	-	



Question three

Absorption rate based on	Product A	Product B
Unit method	$\frac{20000}{30000} \times \frac{240,000}{20,000} = \text{Shs}8 \text{ per unit}$	$\frac{20000}{30000} \times \frac{240,000}{20,000} = \text{Shs}8 \text{ per unit}$
% on material cost	$\frac{\text{Shs}15}{40} \times 240,000 = 90,000$ i.e. Shs.4.5 per unit or $\frac{\text{Shs}90,000}{15,000} \times 100\% = 600\% \text{ of material cost}$	$\frac{\text{Shs}25}{40} \times 240,000 = 150,000$ i.e. Shs.15 per unit or $\frac{\text{Shs}150,000}{25,000} \times 100\% = 600\% \text{ of material cost}$
% on labour cost	$\frac{\text{Shs}17.5}{40} \times 240,000 = \text{Shs}150,000$ i.e. Shs5.25 per unit or $\frac{\text{Shs}105,000}{17,500} \times 100 = 600\% \text{ on labour cost}$	$\frac{\text{Shs}22.5}{40} \times 240,000 = \text{Shs}135,000$ i.e. Shs13.5 per unit or $\frac{\text{Shs}135,000}{22,500} \times 100 = 600\% \text{ on labour cost}$
% on prime cost	$\frac{32500}{80,000} \times 240,000 = \text{shs}97,500$ i.e. Shs4.875 per unit or $\frac{\text{Shs}97,500}{32,500} \times 100 = 300\% \text{ on prime cost}$	$\frac{47,500}{80,000} \times 240,000 = \text{Shs}142,000$ i.e. Shs14.25 per unit or $\frac{\text{Shs}142,500}{47,500} \times 100 = 300\% \text{ on prime cost}$
Labour hour rate	$\frac{\text{Shs}20}{40} \times 240,000 = \text{Shs}120,000$ i.e. Shs6 per labour hr/Sh6 per unit	$\frac{20000}{30000} \times 240,000 = \text{Shs}120,000$ i.e. Shs6 per labour hr/Sh6 per unit
Machine hour rate	$\frac{\text{Shs}45}{60} \times 240,000 = \text{Shs}180,000$ i.e. Shs.4 per machine hr/Sh9 per unit $\frac{45,000}{20,000} = 2.25 \text{ machine hours required to make one unit}$	$\frac{15}{60} \times 240,000 = \text{Shs}60,000$ i.e. Shs4 per labour hr/Sh6 per unit $\frac{15,000}{10,000} = 1.5 \text{ machine hours required to make one unit}$

Question four

ABC Company

Overhead absorption rate

a. Department A

$$\frac{\text{Factory overhead}}{\text{Machine hours}} = \frac{\text{Shs.600,000}}{120,000 \text{ machine hours}} = \text{Shs.5 per machine hour}$$

Department B

$$\frac{\text{Factory overhead}}{\text{Direct labour cost}} = \frac{\text{Shs.400,000}}{500,000 \text{ machine hours}} \times 100\% = 80\%$$

Absorption rate therefore = 80% of the direct labour cost

b.

	Department A	Department B
Materials	5,000	15,000
Labour	4,800	4,000
Factory overheads	<u>7,500</u>	<u>3,200</u>
	<u>17,300</u>	<u>22,200</u>

$$\text{Total cost} = 17,300 + 22,200 = 39,500$$

c. Cost per unit

$$\frac{39,500}{50} = \text{Shs.790}$$

d. Over absorbed

Department A	110,000 hours @shs5	550,000
Department B	Shs540,000 labour cost x 80%	<u>432,000</u>
		982,000
Overhead incurred		<u>975,000</u>
Over absorption favorable		<u><u>7,000</u></u>

**Question five****EQUATOR GARMENTS**

a. Absorption rate of the cutting department = $\frac{\text{Shs.1,500,000}}{60,000 \text{ hours}}$ = Shs.25 per hour

60,000 hours

Absorption rate for stitching department = $\frac{\text{Shs.1,620,000}}{40,000 \text{ hours}}$ = Shs.40.5 per hour

40,000 hours

b. Cost statement for job at A4

Direct materials	1250
Direct labour Cutting 30 hrs x Shs20/hr	600
Stitching 10 labour hrs x Shs25	250
Factory overhead Cutting 30 hrs x Shs25	750
Stitching 40.5 hrs x Shs20	<u>810</u>
Total production cost	3,660
Administration cost @ 25%	<u>915</u>
Total cost	4575
Profit markup 33.5%	<u>1,525</u>
Price to customer	<u>6,100</u>

c. Absorption obtained

Cutting 68,000 x Shs25	1,700,000
Overhead incurred	<u>1,600,000</u>
Overheads over absorbed	<u>100,000</u>
Stitching 17,000 x Shs40.5	688,500
Overheads incurred	<u>760,000</u>
Overheads under absorbed	<u>(71,500)</u>
Factory total over absorbed	28,500

CHAPTER SEVEN**Question One**

(a) **Financial accounting:** this is the analysis, classification and recording of financial transactions and the ascertainment of how such information will be reported to various users. It involves the development of reporting. These statements are developed in accordance with standards imposed by the public (through professional accounting bodies such as the Institute of Certified Public Accountants of Kenya (ICPAK) and the International Accounting Standards Board (IASB) as well as the requirements of the Companies Act.

Management accounting: This is the part of accounting that provides special purpose statements and reports to management, and other persons inside the organization. The information generated by a management accounting system is therefore for internal requirements. Management accounting, unlike financial accounting is proactive i.e. it is future oriented. It is required in making decisions that affect the organization.

Cost accounting: it is that part of management accounting which establishes budgets, standard costs and actual costs of operations, processes, departments and products. It also involves the analysis of variances from standards and profitability. In a nutshell, cost accounting enables a business to not only find out what various jobs or processes have cost, but also what they should have cost. It indicates where losses are occurring before the work is finished and therefore corrective action can be undertaken.

(b)

General ledger adjustment account: it is sometimes called the cost ledger control account. All the items extracted from the financial account are recorded in this account. The balance in this account represents the total of all the balances of the impersonal accounts extracted from the financial books. It completes the double entry in the cost accounts.

Stores ledger control account: this account shows all the transactions of materials e.g. purchases, issuance of materials, returns to suppliers, e.t.c. The balance of this account represents the total of the detailed balance of the stores account.

Work in progress ledger account: it shows the total work in progress at any particular time

Finished goods ledger control account: receipts from production and transfer to distribution department are entered in this account and the balance of this account shows the total value of finished goods in stock.

Question two

The following factors cause the profit shown by the cost accounting books and that shown by the financial accounting books to be different.

(i) **Items shown only by one set of accounts** i.e. Items appearing in the financial accounts and not in the cost books and vice versa.

Item shown only in the financial books include:

- Losses on disposal of assets
- Stamp duty and other expenses on issues and transfers of capital stock (shares, bonds, debentures, e.t.c.).
- Losses on investment
- Interest on bank loans
- Discounts on bonds and debentures
- Dividends received
- Profits arising from sale of fixed assets
- Dividends paid
- Rent receivable but excluding that portion receivable from sub-letting part of the business premises if it has been included in the cost accounts.



Items shown only in the cost books: These are normally notional charges therefore not real. They include:

- Interest on capital employed in production
- Notional rental charges of premises owned

The above two notional costs represent the opportunity cost of employing the capital in the business rather than investing it outside the business.

(ii) Different bases of Stock Valuation

Stocks are valued differently, in cost accounts and financial accounts; the financial stock is valued at the lower cost and net realizable value (mark value). The valuation of stocks in cost accounts is either based on LIFO, FIFO or weighted average. This use of different bases in valuing stocks will affect the profit/losses shown in the financial or cost accounts hence the need for reconciliation of the two.

(iii) Different Treatment of Overheads

In cost accounts, indirect expenses are recovered as overheads based on estimated expenditure and aligned with the estimated level of production. This results in under or over-absorption of overheads and this must be taken into account when reconciling the profits of the two sets of accounts. In the financial accounts, however, indirect expenses are recorded at the actual cost and charged to the production account.

Question three

Reconciliation of financial and cost accounting profits as at 31 March 2004

Reconciliation statement		
	Shs'000	Shs'000
Profits as per financial accounts		11,287
Add: Depreciation difference		694
Less: Items not included in the Costing Books		
Difference in stock valuation of opening stock	(2,010)	
Difference in stock valuation of Closing stock	(532)	
Dividends received	(2,635)	
Profit on sale of assets	(850)	
Imputed rent charge	(3,250)	(9,277)
Profit as per the Cost Accounts		2,704

Question four

Reconciliation of the costing and financial accounting profits

Reconciliation Statement		
	Shs'000	Shs'000
Profits as per financial accounts		18,592
Add: Loss on sale of milling machine	1,750	
Difference in stock valuation of Closing stock (Finished goods)	299	
Difference in stock valuation of opening stock (Raw materials)	438	
Difference in stock valuation of Closing stock (raw materials)	<u>355</u>	
		2,842
Less: Items not Credited in the Costing Books		
Difference in stock valuation of opening stock (finished goods)	386	
Dividends and interest received	<u>552</u>	
		<u>(938)</u>
		<u>20,496</u>

CHAPTER EIGHT

Question one

Oathall

Absorption costing	Shs.000	Shs.000
Sales (Shs.50 × 100,000)		5,000
Cost of sales:		
Opening stock	—	
Production costs		
Variable (Shs.19 × 120,000)	2,280	
Fixed (Shs3(w) × 120,000)	360	
	<u>2,640</u>	
Closing stock (Shs22 × 20,000)	(440)	
Under/over absorption	(60)	
		<u>(2,140)</u>
Gross profit		2,860
Selling costs		
Fixed		(150)
Variable (Shs2 × 100,000)		<u>(200)</u>
Net profit		<u>2,510</u>

**Working**

Overhead absorption rate = Shs.300,000/100,000 = Shs.3 per unit

(b)

Marginal costing	Shs.000	Shs.000
Sales (Shs.50 × 100,000)		5,000
Cost of sales:		
Opening stock	–	
Production costs		
Variable (Shs.19 × 120,000)	2,280	
	<hr/>	
	2,280	
Closing stock (Shs.19 × 20,000)	(380)	
Variable selling costs 200		(2,100)
		<hr/>
Contribution		2,900
Fixed costs		
Production		(300)
Selling		(150)
		<hr/>
Net profit		2,450
		<hr/>

Question two

KNL

	Firing	Finishing
Total overheads incurred	Shs.120,000	Shs.103,125
Total time taken		
K (0.75 × 7500; 0.52 × 7500)	5625	3900
L (1 × 9375; 0.73 × 9375)	<u>9375</u>	<u>6836</u>
	15,000	10745
	<hr/>	<hr/>
Absorption rate	$\frac{120,000}{15,000}$	$\frac{103,125}{10,745}$
	= Shs.8 per hr	Shs.9.60 per hr

Fixed overhead cost per unit

	K	L
Overheads absorbed in firing dept.	Shs.6.00	Shs.8.00
Overheads absorbed in Finishing	<u>Shs.4.99</u>	<u>Shs.7.00</u>
	<u>Shs.10.99</u>	<u>Shs.15.00</u>

Question three

Langdale

- (a) Fixed production overhead costs (finishing section) 241,320
+
Reapportionment of general service centre costs
Shs.82,800 x (32 ÷ 46) 57,600

298,920

Direct labour hours in finishing section: hours

Lang 7,200 units x (42 ÷ 6) 50,400

Dale 10,400 units x (36 ÷ 6) 62,400

112,800

Direct labour hour absorption rate for the finishing section:

$$\text{Shs.}298,920 \div 112,800 = \text{Shs.}2.65$$

- (b) **Cost per unit for a Dale:**

	Shs. per unit	Shs. per unit
Direct material		44.00
Direct labour		
– machining department	40.00	
– finishing section	<u>36.00</u>	
		76.00
Prime cost		120.00
Production overhead costs:		
– machining department (3 x Shs.3.10)		9.30
– finishing section (6 x Shs.2.65)		15.90
		<u> </u>
Total cost per unit for Dale		<u>Shs.145.20</u>

- (c) For both products – Lang and Dale – production is greater than sales for the coming year. In other words, stocks of finished products will be increasing. In this situation, profits calculated using marginal costing principles will be lower than the profits calculated using absorption costing principles.

Fixed production costs are written off as they arise under marginal costing whereas under absorption costing, they form part of the product cost and the inventory valuation. Therefore, in the coming year with stocks increasing and using absorption costing, a higher amount of fixed production cost will be carried forward at the year end than was brought forward in any opening stocks. The effect is that some of the costs that would have been written off and would have reduced the profit under marginal costing are being carried forward under absorption costing to be written off against profits in later years.

**Question four**

(a) Overhead Absorption Rates Using:

	P r e p a r a t i o n Department		Finishing Department
Direct labour hours: OAR =	Shs. <u>240,000</u> 120,000 hours	= Shs. 2/hr	<u>180,000</u> = Shs. 4/hr 45,000
Machine hours: OAR =	Shs. <u>240,000</u> 60,000 hours	= Shs 4/hr	<u>180,000</u> = Shs. 6/hr 30,000

Cost of Job 31:

(i) Using Direct Labour Hours:

	Preparation Department	Finishing Department	Total
Material	60,000	120,000	180,000
Labour	24,000	18,000	42,000
Factory overheads	<u>50,000</u>	<u>6,400</u>	<u>56,400</u>
Total cost	<u>134,000</u>	<u>144,400</u>	<u>278,400</u>

(ii) Using Machine hours

Material	60,000	120,000	180,000
Labour	24,000	18,000	42,000
Factory overheads	<u>80,000</u>	<u>12,000</u>	<u>92,000</u>
Total cost	<u>164,000</u>	<u>150,000</u>	<u>314,000</u>

Comment: The cost increases by Shs.35,600 when the machine hours are used as the basis of absorbing overheads.

(b) The overhead absorption basis that should be selected is the one that closely represents the rate at which overhead costs are incurred. There should be at least some close relationship between the occurrence of overhead costs and the basis used.

Question five

Overhead Absorption Rates:

Blanking:	Shs. <u>8,000</u> 1,500	= Shs. 5.33/hr
Machining:	Shs. <u>23,000</u> 2,500	= Shs. 9.2/hr
Welding:	Shs. <u>10,000</u> 1,800	= Shs. 5.55/hr
Assembly:	Shs. <u>5,000</u> 1,000	= Shs. 5/hr

Costing of Batch B3RR

	Shs
Direct Material:	3,107
Direct expense: hire charges:	525
Direct labour:	
Blanking:	128 x 2.25
Machining:	452 x 2.50
Welding:	90 x 2.25
Assembly:	<u>175 x 1.80</u>
PRIME COST	<u>1,935.50</u>
Add: Production Overheads	5,567.50
Blanking:	128 x 5.33
Machining:	643 x 9.2
Welding:	90 x 5.55
Assembly:	<u>175 x 5</u>
PRODUCTION/FACTORY COST	<u>7,972.34</u>
Add: Selling and administrative cost @ 20% of factory cost	13,539.84
Total cost	<u>2,707.97</u>
Unit cost = <u>16,247.81</u> = Shs 64.99	<u>16,247.81</u>
250	



CHAPTER NINE

Question one

Mutha

Process II account					
	Kg	Shs		Kg	Shs
Opening WIP	2,000	24,600	Output (W4):		
			Ex opening WIP	2,000	
Costs arising:			Started and finished in month	8,000	
Direct materials	12,500	99,600			
Conversion		155,250			
				10,000	221,520
			Normal loss		
			(0.08 x 12,500)	1,000	3,000
			Abnormal loss (W2)	500	11,100
			Closing WIP (W3)	3,000	43,830
	<u>14,500</u>	<u>279,450</u>		<u>14,500</u>	<u>279,450</u>

Workings Cost per equivalent Kg (Eq. Kg)

	Direct materials	Conversion
	Eq. Kg	Eq. Kg
Completion of opening: WIP	—	1,400
Units started and finished in month	8,000	8,000
Abnormal loss	500	500
Closing WIP	3,000	1,350
	<u>11,500</u>	<u>11,250</u>
Work done last month	11,500	11,250
	<u>11,500</u>	<u>11,250</u>
	Shs	Shs
Costs arising last month	99,600	155,250
Less: Scrap value of normal loss	(3,000)	—
	<u>96,600</u>	<u>155,250</u>
Cost per Eq. Kg	Shs8.40	Shs13.80

W2 Valuation of abnormal loss:

$$500 \times (8.40 + 13.80) = \text{Shs}11,100$$

W3 Valuation of closing WIP:

$$(3,000 \times \text{Shs}.8.40) + (1,350 \times \text{Shs}.13.80) = \text{Shs}.43,830$$

W4 Valuation of output:

	Shs
Opening WIP value	24,600
Completion of opening WIP (1,400 x Shs13.80)	19,320
Units started and finished in month [8,000 x Shs (8.40 + 13.80)]	177,600
	<u>221,520</u>

Question two**Production Statement: June 2000**

	Inputs	Total output Units	Material Units	Labour Units	Overhead Units
Baa b/f	5,000	21,000	21,000	21,000	21,000
Mixing Process	<u>20,000</u>	<u>4,000</u>	<u>4,000</u>	<u>1,600</u>	<u>2,400</u>
	<u>25,000</u>	<u>25,000</u>	<u>25,000</u>	<u>22,600</u>	<u>23,400</u>

	Total Cost (Shs)	Equivalent Units of Production (Shs)	(Shs)	(Shs)
Balance b/f (W.I.P)	185,000	100,000	25,000	60,000
Costs Added	<u>278,400</u>	<u>45,300</u>	<u>125,000</u>	<u>108,100</u>
Total Costs to account for:	<u>463,400</u>	<u>145,300</u>	<u>150,000</u>	<u>168,100</u>
Cost per Equivalent Unit:	19.633	5.812	6.637	7.184

Costs Accounted for as follows:

Transfer to finished goods: 21,000 x 19.633	412,291	122,050	139,380	150,859
Closing work in Process:	<u>51,109</u>	<u>23,248</u>	<u>10,619</u>	<u>17,242</u>
Total Costs Accounted for:	<u>463,400</u>	<u>145,300</u>	<u>149,999</u>	<u>168,101</u>

**Refining Process A/C**

	Units	Unit Cost	Value		Units	Unit cost	Value
Bal b/f (W.I.P)	5,000		185,000	Finished goods	21,000	19.633	412,291
Units added	20,000			Closing W.I.P			
Costs added				Bal c/f	4,000	12.777	51,109
Raw material	-		45,300				
Labour			125,000				
overheads			108,100				
	<u>25,000</u>		<u>463,400</u>		<u>25,000</u>		<u>463,400</u>

Question three

Activity based costing is a method of costing products in which an attempt is made to reflect more accurately the product costs of those activities which influence the level of overheads. An activity is defined as an event, task, or unit of work with a specified purpose, for example, operating machines, designing products, setting up machines e.t.c.. An activity can also be defined as a process or procedure that causes work.

Activity based costing (also called transaction based costing) emphasizes the need to obtain a better understanding of the behavior of overhead costs, i.e. what causes overhead costs and how do they relate to products. It recognizes that in the long run, most costs are not fixed, and it therefore seeks to understand the forces that cause overheads to change over time.

ABC appreciates the fact that overhead costs do not necessarily vary with the level of output (as is the belief in traditional costing systems), but most overheads vary with the range of items produced or the complexity of the production process. In ABC, therefore, non-unit related (non-volume) bases are used to absorb overheads into products because they capture the complexity and the diversity of the manufacturing process, such as the relationships between volume, batch size and order size.

The need for ABC may not be clear in labour-paced high volume environments, because the costing errors may not be significant. However, the costing errors will be significant in automated manufacturing processes and in companies that manufacture products in highly varied lot/batch sizes because they have a high percentage of non-volume related costs.

ABC recognizes that performance of activities triggers the consumption of resources that are recorded as costs. It assigns costs to the transaction and activities performed in the organization and allocates them appropriately to the products, according to each products' use of the activities. ABC, therefore, traces costs to the activities identified, then assigns the costs to products using both volume and non-volume related bases.

A common way of applying costs to products in ABC is on the basis of the time the inventory takes to move through a given work cell. A work cell is a product-oriented center including the machines and tools necessary to produce a family of products. Other common basis used in ABC include the number of purchase orders, the number of material handling hours and the number of set up hours.

The ABC System can, therefore, be described as constituting the following stages:

1. Identifying the main activities in the organization: The main organizational activities such as machine related activities, direct labour related activities as well as auxiliary activities (such as ordering, receiving, material handling costs e.t.c.) are identified.
2. Cost Pooling: Involves the assigning of costs to cost centers or cost pools. A cost center is created for each activity e.g. the total costs of all set-ups might constitute one cost center for all set-up related costs.
3. Identifying the cost drivers: Cost drivers are the factors that cause an activity to occur. They, therefore, influence the cost of a particular activity. Cost drivers capture the demand placed on an activity by a product; for example, purchasing department costs may be driven by the number of purchase orders processed.
4. Absorption of overheads to products: Using the selected cost drivers, the overhead costs are applied to or absorbed by the products depending on the level of activities that the product has consumed.

The use of ABC, therefore, requires a change in the way overheads are classified by an organization. In a traditional costing system, overheads would be charged to products using, at the most, two absorption bases usually labour hours and machine hours. ABC System, on the other hand, utilizes many cost drivers to absorb overheads into products. It is, therefore, claimed, and justly so, that the use of ABC produces a more realistic service or product cost, especially for service organizations and organizations with high overhead costs.

Question four

- a) Reasons why construction companies find it prudent to declare profits of uncompleted contracts:
- Contract jobs take long duration before they are finished. It would only be just and fair to report the profit that has accrued on the work done. Investors also need to be rewarded periodically on their invest, which necessitates the periodic recognition of accrued profits.
 - International Accounting Standards 11 recommends that contracts profits can be recognized using the percentage of completion method if contract has been substantially completed.
 - It would be an over-extension of prudence to wait until the contract work e.g. for 15 years, is complete to recognize any profit.



b) Mugoya Construction Company:

i)		Contract Account (Shs. '000)	
Balance b/f: Cost of work done:	158,200	Material Transferred out:	15,000
Material on site:	4,500		
Plant:	150,000	Material sold:	
Material issued from stores:	14,600	19,800	
Plant hiring charges	250		
Material from suppliers:	128,400	Plant c/d @ 88% of:	
Plant purchased:	120,000	(150,000+120,000)	237,600
Sub-contract fees:	18,450	Material c/d:	51,000
Consultancy fees:	49,130	Cost of work done c/d:	485,980
Inspection fees:	500		
Salaries and wages:	161,550		
Head Office expenses:	1,200		
Direct Expenses:	<u>2,600</u>		
	<u>809380</u>		<u>809380</u>
Cost of work done b/d:	485,980.20	Value of work certified:	820,000
Contract profit:	<u>375,019.80</u>	Cost of work not certified c/d:	<u>42,000</u>
	<u>862,000</u>		<u>862,000</u>
Balance b/d:			
Plant:	236,250		
Material:	51,000		
Cost of work not certified:	42,000		

NB: Work certified value = 660,000 + 160,000 = 820,000

ii)	
<u>Valuation of work in progress:</u>	Shs. '000
Costs incurred to 31 st December 2000:	485,980.20
Add: Contract profit realized:	<u>376,019.80</u>
	862,000
Less: Value of Work certified paid for:	<u>(580,000)</u>
	<u>282,000</u>

OR:

Cost of work not certified:	42,000
Add: Money Retained: (820,000-580,000):	<u>240,000</u>
	<u>282,000</u>

iii) Mara Paradise Limited (Contractee) Shs. '000'			
Contract a/c:	820,000	Retention a/c:	82,000
		(10% × 820,000)	
		Cash a/c:	580,000
	<u> </u>	Bal c/d:	<u>158,000</u>
	<u>820,000</u>		<u>820,000</u>
Bal b/d:	158,000		

Question five

(i) **Reasons for allocation of joint costs**

- Inventory cost and cost of goods sold computation for external financial statement.
- Inventory cost and cost of goods sold computation for internal financial reporting such as divisional profitability analysis.
- Cost reimbursement (under contracts) used only when a portion of the separate products/services is sold or delivered to a single customer.

(4 marks)

(ii) **Methods of joint cost allocation**

- Physical measure method – allocation on the basis of relative proportions in physical measure i.e. output in kg/liters, e.t.c. at the split off point.
- Allocation using market selling price data. Methods in this category include:
 1. Sales value of split-off point, i.e. on the basis of the relative sales value (in shillings, dollars, e.t.c.) at the split-off point.
 2. Estimated net realizable value (NRV) method – allocates costs on the basis of the relative estimated net realizable value (expected final sales value in the ordinary course of business minus expected separate cost of production and marketing).
 3. Constant gross-margin percentage net realizable value – allocates joint costs so that the overall gross margin, percentage is identical for each individual product.

(iii) **Factors to be considered in selecting an appropriate method:**

- Simplicity – the method should be simple to work out especially in the phase of multiple products and multiple split-offs.
- Availability of meaningful common denominator to compute the weighting factors for allocation.
- Subsequent management decisions – the method chosen should take into account any anticipation of subsequent decisions intended by management for further processing of the joint products.



CHAPTER TEN

Question one

Production budget

ABC limited

	Product A	Product B	Product C
Units			
Sales (<i>see working</i>)	140,000	190,000	420,000
Closing stock	<u>600</u>	<u>570</u>	<u>1,000</u>
Required units	140,600	190,570	421,000
Less available units (opening stock)	<u>720</u>	<u>540</u>	<u>1,800</u>
Good Units produced (90,80,95% of total)	139,880	190,030	419,200
	=155422.2	=237537.5	=441263.2
Total production = $\frac{\text{Good units}}{\text{Units produced}}$			
% of good units	=155423	=237538	=441263

Working for sales and explanations

To obtain the sales (units), we calculate the price first from the information given. We add the margin element to the cost per unit to get the price per unit.

The profit is calculated as a % of the selling price. Therefore, it means that the cost constitutes the difference between the selling price and the profit, which is, given as a percentage, (100 – Margin).

To calculate price, you divide the cost per unit by the difference calculated

	Product A	Product B	Product C
Units			
Sales revenue	4,200,000	3,800,000	10,080,000
Margin	20%	25%	16 $\frac{2}{3}$
Difference	80%	75%	83 $\frac{1}{3}$
Selling price of products			
Cost per unit	<u>24</u>	<u>15</u>	<u>20</u>
(1 - Margin)	80%	75%	83 $\frac{1}{3}$ %
	=Shs30	=Shs20	=Shs24
Units sold out = $\frac{\text{Sales}}{\text{Selling price}}$	<u>4200,000</u>	<u>3800,000</u>	<u>10,080,000</u>
	Shs30	Shs20	Shs24
	= 140,000	= 190,000	= 420,000

Question two

THORNE CO

(a) Cash budget

	January	February	March	April
	Shs	Shs	Shs	Shs
Receipts				
Cash fees	18,000	27,000	45,000	54,000
Credit fees	36,000	36,000	54,000	90,000
Sale of assets				20,000
Total receipts	54,000	63,000	99,000	164,000
Payments				
Salaries	26,250	26,250	26,250	26,250
Bonus			6,300	12,600
Expenses	9,000	13,500	22,500	27,000
Fixed overheads	4,300	4,300	4,300	4,300
Taxation				95,800
Interest			3,000	
Total payments	39,550	44,050	62,350	165,950
Net cash flow	14,450	18,950	36,650	(1,950)
Opening balance	(40,000)	(25,550)	(6,600)	30,050
Closing balance	(25,550)	(6,600)	30,050	28,100

Workings

Month	December	January	February	March	April
Units sold	10	10	15	25	30
Sales value (Shs000)	1,800	1,800	2,700	4,500	5,400
Cash fees at 1% (Shs)	18,000	18,000	27,000	45,000	54,000
Credit fees at 2% (Shs)	36,000	36,000	54,000	90,000	108,000
Variable costs at 0.5% (Shs)		9,000	13,500	22,500	27,000

Monthly salary cost = $(35,000 \times 9)/12 = \text{Shs}26,250$

Bonus for March = $(25 - 20) \times 140 \times 9 = \text{Shs}6,300$

Bonus for April = $(30 - 20) \times 140 \times 9 = \text{Shs}12,600$

- (b) The number of properties sold each month indicates that Thorne Co experiences seasonal trends in its business. There is an indication that property sales are at a low level in winter and increase as spring approaches. A proportion of any cash surplus is, therefore, likely to be short-term in nature, since some cash will be required when sales are at a low level. Even though net cash flow is forecast to be positive in January, the month with the lowest level of property sales, the negative opening cash balance indicates that there may be months prior to December when sales are even lower.

Short-term cash surpluses should be invested with no risk of capital loss. This limitation means that appropriate investments include treasury bills, short-dated gilts, public authority bonds, certificates of deposit and bank deposits. When choosing between these instruments Thorne Co will consider the length of time the surplus is available for, the



size of the surplus (some instruments have minimum investment levels), the yield offered, the risk associated with each instrument, and any penalties for early withdrawal. A small company like Thorne Co, with an annual turnover slightly in excess of Shs.1m per year, is likely to find bank deposits the most convenient method for investing short-term cash surpluses.

Since the company appears to generate a cash surplus of approximately Shs250,000 per year, the company must also consider how to invest this longer-term surplus. As a new company Thorne Co is likely to want to invest surplus funds in expanding its business, but as a small company, it is likely to find few sources of funds other than bank debt and retained earnings. There is, therefore, a need to guard against capital loss when investing cash that is intended to fund expansion at a later date. As the retail property market is highly competitive, investment opportunities must be selected with care and retained earnings must be invested on a short-to medium-term basis until an appropriate investment opportunity can be found.

- (c) In two of the four months of the cash budget, Thorne Co has a cash deficit, with the highest cash deficit being the opening balance of Shs.40,000. This cash deficit, which has occurred even though the company has a loan of Shs.200,000, is likely to be financed by an overdraft. An advantage of an overdraft is that it is a flexible source of finance, since it can be used as and when required, provided that the overdraft limit is not exceeded. In addition, Thorne Co will only have to pay interest on the amount of the overdraft facility used, with the interest being charged at a variable rate linked to bank base rate. In contrast, interest is paid on the full Shs.200,000 of the company's bank loan whether the money is used or not. The interest rate on the overdraft is likely to be lower than that on long-term debt.

A disadvantage of an overdraft is that it is repayable on demand, although in practice notice is given of the intention to withdraw the facility. The interest payment may also increase, since the company is exposed to the risk of an interest rates increase. Banks usually ask for some form of security, such as a floating charge on the company's assets or a personal guarantee from a company's owners, in order to reduce the risk associated with their lending.

Question three

Acred Ltd: Production budget for 6 months to end of December 2004

July	Aug	Sept	Oct	Nov	Dec	
Sales (units)	10,000	11,000	12,000	13,000	14,000	15,000
Stock increase (units)	200	200	200	200	200	nil
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Production (units)	10,200	11,200	12,200	13,200	14,200	15,000

Acrod Ltd: Cash Budget for 6 months to end of December 2004

Receipts	July	August	September	October	November	December
Cash sales (£)	30,000	33,000	36,000	39,000	42,000	45,000
Credit sales (£)	90,000	90,000	99,000	108,000	117,000	126,000
Total receipts	120,000	123,000	135,000	147,000	159,000	171,000
Payments						
Materials	48,480	51,360	56,160	60,960	65,760	70,080
Labour	18,360	20,160	21,960	23,760	25,560	27,000
Direct expenses	12,240	13,440	14,640	15,840	17,040	18,000
Fixed overheads	22,000	22,000	22,000	22,000	22,000	22,000
Advertising		95,000				
Interest	–	–	30,000	–	–	–
Total payments	101,080	201,960	144,760	122,560	130,360	137,080
Opening balance	50,000	68,920	(10,040)	(19,800)	4,640	33,280
Net cash in/out	18,920	(78,960)	(9,760)	24,440	28,640	33,920
Closing balance	68,920	(10,040)	(19,800)	4,640	33,280	67,200

Workings:**Sales budget for 6 months to end of December 2004**

July	Aug	Sept	Oct	Nov	Dec	
Sales (units)	10,000	11,000	12,000	13,000	14,000	15,000
Sales price (£)	12	12	12	12	12	12
Sales revenue	120,000	132,000	144,000	156,000	168,000	180,000

Calculation of sales receipts

	July	Aug	Sept	Oct	Nov	Dec
Sales revenue	120,000	132,000	144,000	156,000	168,000	180,000
Cash sales (25%) (£)	30,000	33,000	36,000	39,000	42,000	45,000
Credit sales (75%) (£)	90,000	99,000	108,000	117,000	126,000	135,000

Calculation of material purchases:

	June	July	Aug	Sept	Oct	Nov	Dec
Production of stock (units)	10,000	10,200	11,200	12,200	13,200	14,200	15,000
Materials required for production (kg)	20,000	20,400	22,400	24,400	26,400	28,400	30,000
Materials required for production (£)	48,000	48,960	53,760	58,560	63,360	68,160	72,000
Materials received (previous month) (£)	2	4,000	24,480	26,880	29,280	31,680	34,080
**Closing stock of materials (£)		24,480	26,880	29,280	31,680	34,080	36,000
Total purchases in month (£)		48,480	51,360	56,160	60,960	65,760	70,080
Payable in:		July	Aug	Sept	Oct	Nov	Dec

**Stocks of materials at the end of each month are required to be 50% of the materials required for the following month's production.

Calculation of labour cost: production units x £1.80 per unit

Calculation of direct expenses: production units x £1.20 per unit

Calculation of cash fixed overheads: 34,000 – 12,000 = £22,000 per month

Depreciation is excluded as a non-cash item.

(B)

A periodic budget is one that is drawn up for a full budget period such as one year. A new budget will not be introduced until the start of the next budget period, although the existing budget may be revised if circumstances deviate markedly from those assumed during the budget preparation period.

A continuous or rolling budget is one that is revised at regular intervals by adding a new budget period to the full budget as each budget period expires. A budget for one year, for example, could have a new quarter added to it as each quarter expires.

In this way, the budget will continue to look one year forward. Cash budgets are often prepared on a continuous basis. The advantages of periodic budgeting are that it involves less time, money and effort than continuous budgeting. For example, frequent revisions of standards could be avoided and the budget-setting process would require managerial attention only on an annual basis.

A major advantage of continuous budgeting is that the budget remains both relevant and up to date. As it takes account of significant changes in economic activity and other key elements of the organization's environment, it will be a realistic budget and hence is likely to be more motivating to responsible staff. Another major advantage is that there will always be a budget available that shows the expected financial performance for several future budget periods.

It has been suggested that if a periodic budget is updated whenever significant change is expected, a continuous budget would not be necessary. Continuous budgeting could be used where regular change is expected, or where forward planning and control are essential, such as in a cash budget.

Question four

(a)

CASH BUDGET FOR 3 MONTHS TO 31 MARCH 2006

	January Shs.	February Shs.	March Shs.
Cash balance b/f	8,400	-492,500	-555,500
Receipts:			
Sales: Cash	100,000	150,000	145,000
Debtors	375,000	255,000	300,000
Loan			2,500,000
Sale of machinery		250,000	
Total cash available	483,400	162,500	2,389,500
Payments:			
Purchases	480,000	464,000	464,000
Accrued expenses	20,000		
	45,000	60,000	55,500
Staff wages $\frac{3}{4}$	15,000	15,000	20,000
Sales commission $\frac{1}{4}$	3,400	4,000	6,000
	165,000	175,000	175,000
Overhead expenses			
Machinery			1,200,000
Rent	240,000		
Taxes	3,500		
Proposed dividends	4,000		
Total payments	975,900	718,000	1,920,500
Cash balance c/f	-492,500	-555,500	469,000

(b) BUDGETED PROFIT AND LOSS ACCOUNT FOR THE PERIOD TO 31 MARCH 2006

	Shs.	Shs.
Sales		1,580,000
Less cost of goods sold		
Opening stock	320,000	
Purchases	<u>1,408,000</u>	
	1,728,000	
Less: closing stock	<u>464,000</u>	<u>1,264,000</u>
Gross profit		316,000
Expenses:		
Rent	240,000	
Overheads (including depreciation)	590,000	
Staff wages	214,000	
Sales commission	<u>15,800</u>	<u>1,059,800</u>
Net loss		(743,800)
Retained profits b/d		<u>452,900</u>
Loss c/f		<u>(290,900)</u>

(c) BUDGETED BALANCE SHEET AS AT 31 MARCH 2006

	Cost Shs.	Depreciation Shs.	Net Book Value Shs.
Fixed assets	<u>2,950,000</u>	<u>275,000</u>	2,675,000
Current assets:			
Inventory		464,000	
Trade Debtors		885,000	
Cash and bank balances		<u>469,000</u>	
		1,818,000	
Current liabilities			
Trade creditors	28,000		
Accrued expenses	<u>5,900</u>	<u>33900</u>	<u>1,784,100</u>
			<u>4,459,100</u>
Financed by:			
Ordinary share capital			1,000,000
Share premium			500,000
Retained profits			(290,900)
Long term liabilities			
Loans			<u>3,250,000</u>
			<u>4,459,100</u>

**Workings:**

Accrued expenses = $15,000 - 3,400 + 5,800 + 18,500 = 5,900$ (8 marks)
 (20,000 prepayments were made in January)

Question five

	PRODUCTS	
	A	B
	Sh.	Sh.
Material 1	100.0	40.0
Material 2	80.0	120.0
	180.0	160.0
Direct labour L1	240.0	300.0
L2	240.0	100.0
	660.0	560.0
Production overheads @ 1.60	32.0	24.0
	692.0	584.0
Selling and distribution 20%	138.4	116.8
	830.4	700.8
Profit margin 25%	<u>207.6</u>	<u>175.2</u>
Selling price per unit	<u>1,038.0</u>	<u>876.0</u>

Units to be sold:

A	B
<u>13,494,000</u>	<u>18,816,000</u>
1,038	876
<u><u>13,000</u></u>	<u><u>21,479</u></u>

Opening stock finished goods in units:

A	B
<u>1,730,000</u>	<u>1,176,000</u>
692	584
<u><u>2,500</u></u>	<u><u>2,014</u></u>

Closing stock finished goods in units:

A	B
<u>1,038,000</u>	<u>1,568,000</u>
692	584
<u><u>1,500</u></u>	<u><u>2,685</u></u>

Ideal Products Ltd.

Production budget in units

	<u>A</u>	<u>B</u>	<u>TOTAL</u>
Sales in units	13,000	21,479	34,479
Closing stock	<u>1,500</u>	<u>2,685</u>	<u>4,185</u>
Less: Opening stock	14,500	24,164	38,664
Production in units	<u>(2,500)</u>	<u>(2,014)</u>	<u>(4,514)</u>
	<u>12,000</u>	<u>22,150</u>	<u>34,150</u>

(b) Direct materials cost budget:

	<u>M1</u> Sh.	<u>M2</u> Sh.	<u>Totals</u> Sh.
Product A	1,200,000	960,000	2,160,000
Product B	—	2,658,000	3,544,000
Total	<u>886,000</u>	<u>3,618,000</u>	<u>5,704,000</u>
	<u>2,086,000</u>		

(c) Purchases budget:

	<u>M1</u> Shs.	<u>M2</u> Shs.	<u>Totals</u> Shs.
Material cost	2,086,000	3,618,000	5,704,000
Closing stock	—	<u>800,000</u>	<u>1,160,000</u>
	<u>360,000</u>	4,418,000	6,864,000
Opening stock	2,446,000	<u>(600,000)</u>	<u>(1,240,000)</u>
Material purchases in Shs.	<u>(640,000)</u>	<u>3,818,000</u>	<u>5,624,000</u>
Material purchases in Kg.	<u>1,806,000</u>	190,900	381,800
	180,600		

(d) Direct labour cost budget:

	<u>L1</u> Shs.	<u>L2</u> Shs.	<u>Totals</u> Shs.
Product A	2,880,000	2,880,00	5,760,000
Product B	<u>6,645,000</u>	<u>2,215,000</u>	<u>8,860,000</u>
	9,525,000	5,095,000	14,620,000

(b)**Material usage budget**

Prod. A: 12000 units	M1 X10kg = 120,000kg	M2 X4kg = 48,000kg
B: 22151 units	X4kg = <u>88,604kg</u>	X6kg = <u>132,906kg</u>
	208,604kg	180,906kg
Cost per unit	<u>X Sh.10</u>	<u>X Sh. 20</u>
	<u>Shs. 2,086,040</u>	<u>Shs.3,618,120</u>



CHAPTER ELEVEN

Solutions to part (a) – (d) are clearly discussed in the book.

- b) **State advantages of using standards costs in the manufacturing industry**
- c) It is an effective cost control tool as it compares expected performance with actual performance and it takes action on the basis of the variances for controlling costs.
- d) It aids in planning i.e. it instills in management a habit of thinking in advance
- e) It helps in fixing of selling prices and formulating of policies since standard costs are used
- f) It facilitates delegation of authority i.e. responsibilities are assigned and performance evaluation will be based on the set responsibilities.
- g) Valuations of stocks is simplified i.e. stocks are valued at a standard cost irrespective of their actual production cost.
- h) It helps in motivation as after performance evaluation, employees with favorable variances will be rewarded.
- i) It helps eliminate waste as only enough will be provided in the standards.
- j) It helps instill an attitude in employees of cost control since they have a guide.
- k) It is economical and simple as it results in cost savings through cost control, reduction in paper work.

Suggested solution to (f)

- (a) Standard costing is a method that uses predetermined measurements of assessing the value of cost elements. It is used in providing bases for performance measurement, control and exception reporting.

Budgetary control is the planning and controlling of the budget process to ensure that the budgetary objectives are met. This involves setting up the various budgets for the period and comparing the actual results with the plans.

Budgetary control is the planning and controlling of the budget process to ensure that the budgetary objections are met. This involves setting up the various budgets for the period and comparing the actual results with the plans.

Standard costing and budgetary control differ in the following ways:

- (i) Standard costing considers the value of individual components of costs while budgetary control looks at the total revenue and costs.
- (ii) Standard costs are normally incorporated in the ledger account whereas budgets are memorandum records.
- (iii) Standard costs can be used as regular or routine production process but budgetary costs is used in all the costs of the organization.

(CPA 05/06)

REVISION QUESTIONS XII (Variances)

QUESTION ONE

Whitaker plc

	Flexed Budget	Actual Budget	Variance
Sales	292,500	325,000	32,500(F)
Cost of sales			
Direct Materials	55,000	65,000	10,000 (A)
Direct labour	<u>99,000</u>	<u>100,000</u>	1,000(A)
Prime cost	154,000	165,000	
Fixed Overheads	<u>88,000</u>	<u>95,000</u>	7,000(A)
Total production cost	242,000	260,000	
Less closing stock	<u>(27,500)</u>	<u>(29,545)</u>	
Cost of sales	<u>214,500</u>	<u>230,455</u>	
Net profit	<u>78,000</u>	<u>94,545</u>	

Actual prices may change following a change in the market conditions that cause a general price increase or decrease for the type of materials used. Thus the company may end up paying more or less than the standard price

- Inferior quality materials, which are less expensive, may be bought thus translating to a favorable material price variance. Buying of substitute materials due to unavailability of the planned ones may translate to favorable or unfavorable material price variance
- A shortage in materials which calls for an urgent purchase at short notice may increase the purchase costs where the company may be required to airlift the materials or pay for other costs associated with that order. This will translate to unfavorable material price variance.
- Quantity discounts lost or gained by buying in smaller or larger quantities than planned also translate to a material price variance.
- Careless handling of materials by production personnel or working with untrained workers who are poorly supervised OR extremely high quality labour than expected.
- Inferior quality materials thus requiring more input than budgeted OR higher quality materials than budgeted that reduces the quantity of material input below the budgeted.
- Faulty or inefficient machinery OR efficient machinery.
- Theft and pilferage.

Changes in methods of production and quality control, greater or lower rate of scrap than anticipated.

**Question two****T-mo plc manufacturers**

		Shs.	Shs.	Variance
(a)	Direct material			
	Actual quantity at actual price		417,900	
				2,100 F
	Standard quantity for actual production at standard price			420,000
	Direct labour			
	Actual hours at actual rate		949,620	
				4,620 A
	Standard hours for actual production at standard rate		945,000	
	Variable production overheads			
	Actual expenditure		565,740	
				1,260 F
	Standard cost of actual production		567,000	
				Variance
(b)	Actual hours at actual rate		949,620	
	Rate			12,495 A
	Actual hours at standard rate		937,125	
	Efficiency			7,875 F
	Standard hours for actual production at standard rate		945,000	
(c)	Rate:			
	– Higher graded workers paid at a higher rate.			
	– Higher than expected wage settlement for the company			
	Efficiency:			
	– The higher graded workers being more skilled took less than the standard time.			
	– Highly motivated workers			

Question three**Mwaniki limited**

(a)	Sales price variance:	Shs.	
	Actual sales at standard selling price (34,000 x Shs..22)		748,000
	Actual sales at actual selling price		731,000
	Sales price variance		<u>17,000 A</u>
	Sales volume contribution variance		
	Budgeted sales (units)		32,000
	Actual sales (units)		34,000
	Volume variance (units)		<u>2,000 F</u>
	At standard contribution per unit Shs(22 – 9)		x Shs13
	Sales volume contribution variance		<u>Shs26,000 F</u>

- (b) The actual selling price (Shs21.50) was lower than the standard selling price (Shs22.00) – hence the adverse sales price variance. This reduction in price may have directly encouraged customers to buy more units. The company sold 2,000 more units than planned giving the favorable sales volume contribution variance of Shs26,000. Thus the two variances may be interrelated and if so the variances should be considered together – one partially offsetting the other.

(c)		Shs.
	Budgeted contribution (32,000 x Shs.13)	416,000
	Less: Budgeted profit (marginal costing)	(200,000)
		<hr/>
	Budgeted fixed costs	216,000
	Less: Budgeted non-production fixed costs (1,152,000 ÷ 12)	(96,000)
		<hr/>
	Budgeted fixed production costs	120,000
		<hr/>
	Standard fixed production cost per unit (Shs120,000 ÷ 30,000)	Shs4
	Calculation of absorption costing profit:	Shs
	Marginal costing profit	200,000
	Less: Decrease in stocks at standard fixed production cost per unit [(32,000 – 30,000) x Shs.4]	(8,000)
		<hr/>
	Absorption costing profit	192,000
		<hr/>
	Alternatively:	Shs
	Budgeted absorption costing manufacturing profit	
	32,000 x (13 – 4)	288,000
	Less: budgeted non-production fixed costs	(96,000)
		<hr/>
	Absorption costing profit	192,000
		<hr/>

Question four

Wakuthiis' company

**Question five****Woodeezer**

(a) Operating statement

		Shs
Budgeted profit	(4,000 x Shs.28)	112,000
Sales Volume Profit Variance	(3,200 – 4,000) Shs.28	(22,400) A
		89,600
Standard profit on actual sales		89,600
Selling Price Variance	(220 – 225) 3,200	16,000 F
		105,600
Cost variances		
	Fav	Adv
Material Usage	[(3,600 x 25) ÷ 80,000] Shs.3.2	32,000
Material Price	(3.2 – 3.5) 80,000	24,000
Labour efficiency	[(4 x 3,600) ÷ 16,000] Shs.8	12,800
Labor rate	(8 – 7) 16,000	16,000
Var O/H eff	[(4 x 3,600) – 16,000] Shs.4	6,400
Var O/H exp	(Shs.4 x 16,000) – 60,000	4,000
Fixed O/H exp	(256,000 – 196,000)	60,000
Fixed O/H eff	[(4 x 3,600) – 16,000] Shs.16	25,600
Fixed O/H capacity	[16,000 – (4 x 4,000)] Shs.16	nil
		43,200
		68,800
		112,000
Actual profit		148,800

(B)**Motivation and budget setting**

Absorption costing profit has increased by Shs.53,600 from Shs.95,200 (28 × 3,400) to Shs.148,800.

It would appear that in the past, an expectations budget has been set whereby the target output was set at the level that employees were expected to achieve.

Mr Beech appears to have considered the evidence that suggests that the best budget for motivating employees to maximize achievement (in this case output) is one which is difficult but credible (an aspirations budget). In maximizing actual performance, however, it is normally expected that production will fall short of the budget target. This means that there is an expectation of adverse planning variances.

Explanations of Variances

The sales volume variance and the sales price variance may be inter-related as an increase in price is likely to reduce demand, thus an adverse SVV is consistent with a favorable SPV given the price increase. Better quality materials are being purchased by Mr Beech and, given this was not foreseen at the time of the budget, then it may explain a higher price resulting in an adverse MPV. Conversely, however, with better materials, there may be less waste and thus it may have contributed to the favorable MUV.

The lower skilled labour may account for the favorable LRV but may also account for the adverse LEV as less skilled labour may take longer to complete a given task. Also, if new labour is introduced there may be an initial learning effect. The impact of the LEV is magnified by the variable and fixed overhead efficiency variances as they are merely linear functions of the LEV. Their meaning is questionable, however, as variable overheads seldom vary proportionately to labour hours. By definition fixed overheads do not vary with labour hours and this variance merely 'balances the books' in an absorption costing system.

The fixed overhead expenditure variance is significant and requires further consideration. This is particularly the case if it involves discretionary expenditure which has been reduced but which may have a long-term impact on the business.

(C)

Marginal cost statement (this could be in summarized form by candidates)

		£
Budgeted contribution (4,000 x £92)		368,000
SVV (3,200 – 4,000) £92		(73,600) A
		294,400
Standard contribution on actual sales		294,400
SPV (220 – 225) 3,200		16,000 F
		310,400
Cost variances		
	Fav	Adv
MUV [(3,600 x 25) ÷ 80,000] £3.2		32,000
MPV (3.2 – 3.5) 80,000		24,000
LEV [(4 x 3,600) – 16,000] £8		12,800
LRV (8 – 7) 16,000		16,000
Var O/H eff [(4 x 3,600) – 16,000] £4		6,400
Var O/H exp (£4 x 16,000) – 60,000		4,000
	52,000	43,200
		8,800
Actual contribution		319,200
Fixed overheads		
Budgeted		256,000
Expenditure variance		60,000
		(196,000)
Actual profit		123,200

Reconciliation

Absorption costing profit	148,800
Fixed costs in stock [400 x £64]	
(stock is now restated to variable cost)	(25,600)
	123,200
Variable costing profit	123,200

Thus some of the 'success' of Mr Beech in increasing profit arises from the fact that fixed overheads of £25,600 are not being written off in the current month but are being carried forward



as part of closing stock, notwithstanding that they are period costs and are thus sunk. Unless sales can be increased this position is unsustainable.

Nevertheless, some improvement has been made as the previous contribution was, taking the budget as the historic norm, £312,800 [3,400 x (£220 – 128)], which is lower than the £319,200 achieved by Mr Beech. The difference is, however, much lower than would be implied by the absorption costing statement.

CHAPTER THIRTEEN

Question one

Benefits of JIT inventory system

The benefits include lower inventory level, emphasis on strict quality control by all parties, faster market response, smaller manufacturing facilities and lower set up costs.

1. *Set up times are significantly reduced in the factory.* Cutting down the set up time to be more productive will allow the company to improve their bottom line to look more efficient and focus time spent on other areas that may need improvement. This allows the reduction or elimination of the inventory held to cover the “changeover” time.
2. *The flows of goods from warehouse to shelves are improved.* Having employees focused on specific areas of the system will allow them to process goods faster instead of having them vulnerable to fatigue from doing too many jobs at once and simplifies the tasks at hand. Small or individual piece lot sizes reduce lot delay inventories which simplifies inventory flow and its management.
3. *Employees who possess multiple skills are utilized more efficiently.* Having employees trained to work on different parts of the inventory cycle system will allow companies to use workers in situations where they are needed when there is a shortage of workers and a high demand for a particular product.
4. *Better consistency of scheduling and consistency of employee work hours.* If there is no demand for a product at the time, workers don't have to be working. This can save the company money by not having to pay workers for a job not completed or could have them focus on other jobs around the warehouse that would not necessarily be done on a normal day.
5. *Increased emphasis on supplier relationships.* No company wants a break in their inventory system that would create a shortage of supplies while not having inventory sit on shelves. Having a trusting supplier relationship means that you can rely on goods being there when you need them in order to satisfy the company and keep the company name in good standing with the public.

6. *Supplies continue around the clock keeping workers productive and businesses focused on turnover.* Having management focused on meeting deadlines will make employees work hard to meet the company goals to see benefits in terms of job satisfaction, promotion or even higher pay.

Question two

a) Advantages of advanced manufacturing technology

- Development of new and advanced materials for product or process development
- The beneficiation of existing raw materials
- Coordinated effort in research and development concerning fundamental or applied research in a laboratory, field, or research facility in order to create longer term opportunities.

Question three

Advantages of automating time and attendance data collection

- Hours spent on processing time and attendance reconciliation are reduced to minutes.
- Start and stop times, breaks, and time off are automatically calculated minimizing the chance of human error.
- Employee productivity increases as a result of accurate and indisputable timekeeping.
- Time and job information are recalled for immediate reporting or gathered into meaningful formats and used for long term planning.
- Measuring efficiency, down time, productivity and cost control is simplified. All the attendance and job information you need is available at the touch of a key.
- Cost controls are in place when manpower is utilized more effectively.
- Projected labor costs can easily be formulated by using historical data that has been captured. Excellent report formats are available.
- Budget information can be compiled from various reports and accurate planning is simplified.

Quotas for performance and production standards are established through reports tracking labor management. Job standards and actual labor is compared



Question four

Conditions to be met for advanced manufacturing to be applied.

One or more of the following conditions must be met.

1. Make-To-Order (as distinct from make-to-stock) manufacturing
2. capital-intensive production processes, where plant capacity is constrained
3. products 'competing' for plant capacity: where many different products are produced in each facility
4. products that require a large number of components or manufacturing tasks
5. production necessitates frequent schedule changes which cannot be predicted before the event

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- (b) ACCA study materials
- (c) Internet resources

GLOSSARY



GLOSSARY

Absorption costing: process by which overheads are absorbed into production. It is also known as full costing.

Activity base: a measure of effort, such as production and sales, that operates as a causal factor in the incurrence of variable cost. Also called cost driver.

Administrative costs: Is the sum of costs associated with the overall management of the enterprise which cannot be readily identified with one of the major functional areas.

Break-even point: this is the level of activity at which the firms incurs neither a profit nor a loss.

Budget committee: a group of key management persons who are responsible for the overall policy matters relating to the budget program and for coordinating the preparation of the budget itself.

Budget variance: The difference between the actual amount and the budgeted amount

Budget: is a detailed plan outlining the acquisition and use of financial and other resources over some period of time in the future. Budgets may be prepared for departments, functions or financial and resource items.

Budgeting: refers to the process of quantifying the plans of an organization so as to enable it achieve its objectives in the defined period. The result of the process is budgets

Byproduct: A product that emerges with other products in a common process. However, this product does not have a significant value. (If it had significant value, it would be a joint product.)

Cash budget: a detailed plan showing how cash resources will be acquired and used over some specific period of time

Coefficient of determination: In regression analysis this is a statistic (designated as r-squared) indicating the percentage of the change occurring in the dependent variable that is explained by the change in the independent variable(s). The percent change does not necessarily mean there is a cause-and-effect relationship

Contribution margin: the amount remaining from sales revenues after variable expenses

Control: those steps taken by management to ensure that the objectives set down at the planning stage are attained and to ensure that all parts of the organization function in a manner consistent with organizational policies.

Conversion cost: constitute direct labour cost combined with manufacturing overhead cost.

Cost of goods manufactured: the materials labour and overheads that have gone into the products manufactured during the period.

Cost volume profit analysis: an analysis useful to managers in profit projection and decision making. Analyses how costs, and profit change with change in output (level of activity)

Cost-volume-profit graph: the relationship between revenues, costs and level of activity in an organization, presented in form of a graph.

Curvilinear costs: the economists' expression of the relationship between cost and activity of an organization.

Distribution costs: these are costs associated with warehousing the products and their delivery to customers.

Equivalent unit of production: the number of units that would have been produced during the period if all of a department's efforts had resorted into completed units of a product.

FIFO method: a method of accounting for cost flows in a process costing system in which equivalent units and unit cost relate only to work done during the current period.

Finance costs: These are costs incurred to secure funds to finance the organization's activities.

Finished goods: goods that are completed as to manufacturing but not yet sold to customers

Fixed cost: a cost that remains constant, in total regardless of the changes in levels of output or activity.

High-low method: a method of separating a mixed cost into fixed and variable elements in analyzing the change in activity and cost between the high and the low points of a group of observed data.



Incremental cost: this is also called the differential cost. It is the increase in cost between two alternatives.

Independent variable: a variable that acts as the controlling factor in a situation

Indirect cost: this cost is not directly traceable to a specific product. It must be allocated in order to be assigned to a unit of product.

Indirect labour: the factory labour cost that cannot be traced directly to the creation of the products in a 'hands on' sense.

Indirect materials: these are materials that may become an integral part of a finished product and can only be traced into the product only at great expense or inconvenience.

Least squares method: a method of separating mixed costs into its fixed and variable components.

Manufacturing overhead: these are all costs associated with the manufacturing process except direct costs and direct labor.

Margin of safety: This is the excess of sales over the break-even volume in sales. It states the extent to which sales can drop before losses begin to be incurred in a firm.

Marginal cost: cost of a unit of a product or service which would be avoided if that unit or service was not produced or provided. It represents the additional cost of producing an extra unit of output.

Multiple regression analysis: an analytical method required in those situations where more than one causal factor is involved in the behavior of a variable cost.

Opportunity cost: can be defined as the cost of the next best foregone alternative or the potential benefit that is lost by taking one course of action and giving up the other.

Participative budget: budget prepared using the bottom up approach; where the managers set the standards themselves.

Period costs: these are costs mainly incurred in the ordinary running of the business enterprise. They are expensed in the period they are incurred.

Planning: the development of objectives in an organization and the preparation of various budgets to achieve those objectives

Prime Cost: a term used to describe direct material cost combined with direct labour cost.

Process costing: a costing method used in those industries that produce homogenous products on a continuous basis.

Production report: a report that summarizes all activities in a department's work in progress account during a period and that contains three sections: a quantity schedule, a computation of equivalent units and unit cost and a cost reconciliation.

Regression line: a line fitted to an array of plotted points; may also be referred to as line of best fit

Relevant range: the range of activity within which assumptions relative to variable and fixed costs behavior are valid

Research and development Costs: These are costs that are incurred to invent new products or to modify the existing ones, as well as costs incurred to acquire more information on such products.

Selling Costs: this is the sum of costs associated with the securing of orders from customers.

Standard cost: yardstick that measures how well the organization has achieved its set objectives.

Sunk costs: these are costs which have already been incurred. They cannot be changed by any decision made after incurrence.

Transferred in cost: the amount of cost attached to units of a product that have been received from a prior processing department.

Variable cost: A cost that varies, in total, in direct proportion to changes in the level of activity. A variable cost is constant per unit.

Variance: this is the difference between the expected (standard) output or level of performance and the actual output or level of performance

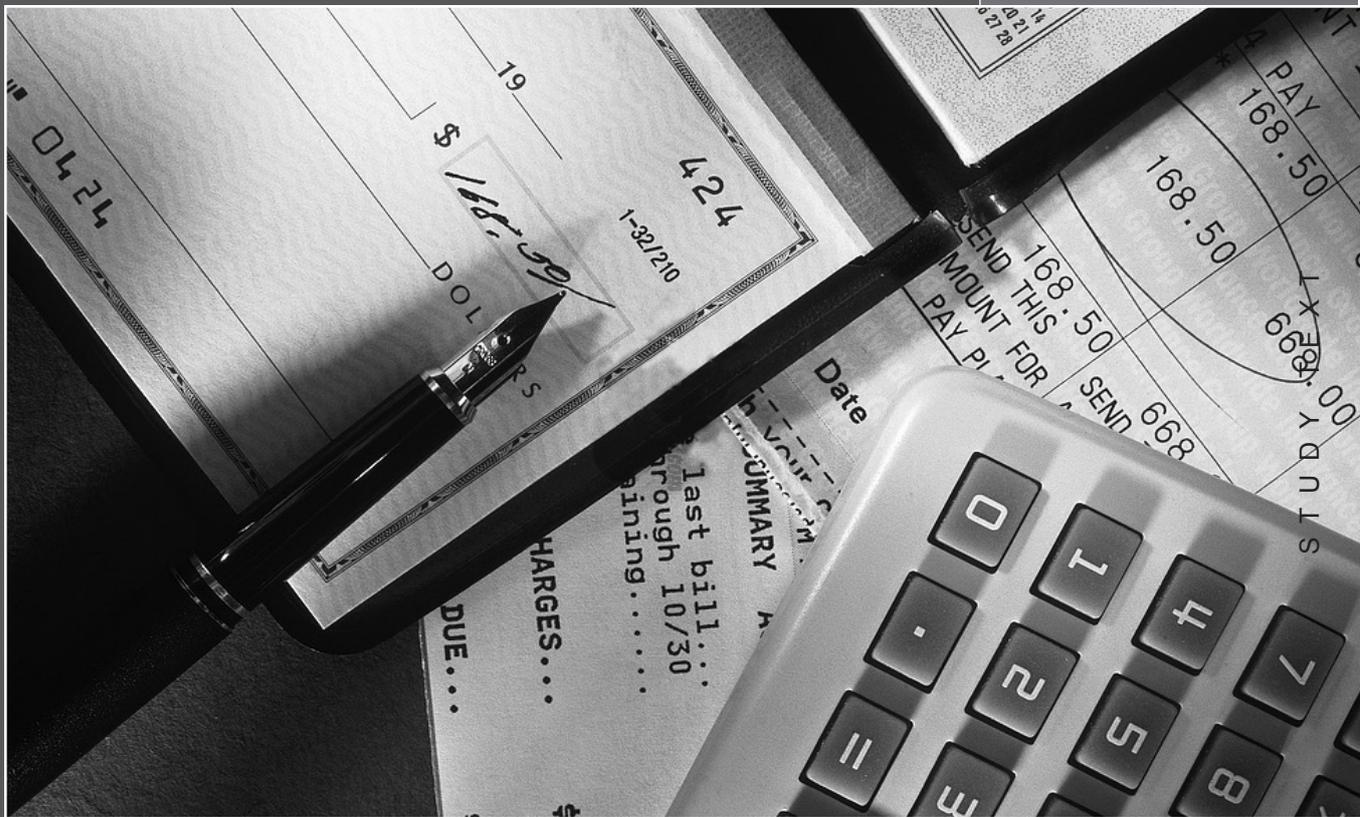


Weighted average method: a method of accounting for cost flows in a process costing system in which units in the beginning work in progress inventory are treated as if they were started and completed during the current period.

Work in progress (process): goods that are partially completed as to manufacturing at the beginning or end of a period and that will need further work before being ready for sale to a customer.

Zero base budget; a method of budgeting in which managers are required to start at zero budget levels every year and to justify all costs as if the programs involved were being initiated for the first time.

INDEX





INDEX

A

- ABC System.** *See* Pareto analysis
- Abnormal gains:** 296
- Abnormal loss:** 287
- Abnormal Spoilage.** *See* Abnormal loss
- Absorption Costing:** 135, 196
- Account Analysis.** *See* Inspection
- Activity based budgeting:** 341
- Activity Based Costing:** 151
- Administration Costs Budget:** 329
- algebraic approach:** 137
- Allocation:** 136
- Annual budgets:** 333
- Anticipation inventory:** 69
- Apportionment:** 136
- Appreciation inventory:** 69
- Architects certificate:** 273, 308
- Attainable standards:** 364

B

- Basic salary or wages:** 105
- Basic Standards:** 364
- Batch Costing:** 269
- Bonus payments:** 111
- Break Even:** 227, 229
- Budgetary control:** 323
- Budgeting:** 7, 318, 322, 323, 326, 344, 435
- Budgeting process:** 321
- Budget committee:** 323
- Budget manual:** 324
- Buffer inventories:** 69

By-product: 303

C

Capacity ratio: 390

Capital expenditure Budget: 329

Carrying cost.: 74

Cash budget: 329

Class A: 86

Class B: 86

Class C: 86

Co-ownership incentive schemes: 117

Coefficient of determination: 56

compromise method: 137

Constant Gross Margin Rate: 299

Continuous budgets: 333

Contract Costing: 272

Contribution: 197

Contribution Margin Ratio (CMR): 219

Correlation: 55

Cost: 5

Cost-Volume-Profit (CVP) Analysis: 212

Cost Accountant: 3, 6

Cost Accounting: 4

Cost accumulation: 62

Cost allocation: 154

Cost Analysis: 4, 6

Cost benefit approach: 6

Cost center: 7

Cost Center Framework: 16

cost comparison Approach: 83

Cost driver: 151

Cost estimation: 44, 56

Cost object. *See* Cost unit,*See* Cost unit

Cost of Work certified: 273, 308



Cost pool: 151

Cost unit: 3, 6

Current Standards: 365

CVP analysis. *See* Cost Volume Profit Analysis

D

Decision Making: 150, 232

Differential piece rate: 107

Direct Materials budget: 327

Direct Method: 137

E

EBQ: 80

Economic batch quantity. *See* EBQ

Economic Order Quantity. *See* EOQ

Efficiency ratio: 390

Engineering method: 50

EOQ: 75

Equivalent units: 278

F

Financial Accounting: 11

First in First out (FIFO): 88

Fixed budgets: 338

Fixed overheads capacity variance. *See* Fixed overheads volume variance

Fixed overheads Efficiency variance. *See* Fixed overheads volume variance

Fixed overheads volume variance. *See* Fixed overheads variances

Fixed overhead expenditure variance. *See* Fixed overhead variances

Fixed overhead variances: 388

Fixed rate. *See* fixed salary

Fixed salary: 105

Flexible budgets: 338

G

Gearing ratio. *See* debt ratio

Gearing ratios. *See* Liquidity ratios

Graduated time rate: 108

Group Bonus plan: 116

H

High - Low method: 46

Holding cost. *See* Carrying cost

I

Ideal Standards: 364

Idle time: 111

Incremental Budgeting. *See* Traditional budgeting

Inspection of accounts: 49

Investment ratios. *See* equity ratios

J

Job Costing: 257

Joint costs: 298

Joint products: 298

Just In Time Inventory System: 422

L

Labour budget: 119, 328

Labour cost: 124

Labour costs: 104

Labour costs Control: 119

Labour Efficiency variance (LEV). *See* Labour variances

Labour rate variance (LRV). *See* Labour variances



Labour turnover: 111

Labour variances: 382

Last in first out (LIFO): 89

Location and layout: 87

Loss: 287

M

Management accounting: 10

Marginal Cost: 197

Margin of safety: 222, 223, 225

Master budget: 325

Materials Purchases Budget. *See* Direct materials budget

Materials Usage Budget. *See* Direct materials budget

Material costs: 67

Material cost control: 70

Material Handling: 87

Material price variance: 395, 400

Material price variance (MPV). *See* Material variances

Material purchase budget: 336

Material Usage variance (MUV). *See* Material variances

Material variances: 377

Maximum stock level: 68, 72

Measured day rate: 108

Minimum stock level: 72

Mix variance: 396

Mix Variances: 395

Mix variances: 398

Multiple Price Break Model: 84

N

Net Realizable Value: 301

Normal Loss: 287

Notional Profit: 273, 308

O

Omission Approach: 288

Opportunity costs: 240

Ordering cost. *See* **procurement cost**

Overhead Allocation. *See* **Allocation**

Overhead Apportionment. *See* **Apportionment**

Overhead variances: 386

Overtime premium: 110

Over Absorption: 146

P

Pareto analysis: 86

Periodic order system: 86

Physical flow of units: 283

Physical Measure/Unit: 299

Physical Units: 283

Piece rate. *See* **piece work**

Piece work: 105

Priority based budgeting. *See* **Zero based budgeting**

Process Costing: 277

Process Cost Report: 283

Process Losses: 286

procurement costs: 75

Production budget: 160, 326, 335

Product pricing: 150

Profit not taken: 273, 308

Profit Sharing Schemes. *See* **Co-ownership incentive**

Program planning budget: 343

Progress payments: 273, 308

Purchase cost: 68, 74

**R**

Re-order level: 68, 73

Re-Order quantity: 73

Regression analysis: 52

Relevant costs: 233

Repeated distribution: 137

Replacement costing: 92

Research and Development Cost Budget: 329

Responsibility center: 6, 7

Retention money: 273, 308

Rework: 286

Rolling budgeting: 343

S

Sales budget: 326, 335

Sales margin price variance: 392

Sales margin variance: 392

Sales mixture variance: 393

Scatter Graph: 50

Scrap: 286

Selling and Distribution Cost Budget: 329

Separable cost: 298

Service Cost Centers: 136

Shift premium: 110

Specific Order Costing: 257

Standards Setting: 359

Standard Cost: 92

Standard Costing: 358

Standard Costing: 359, 366

Standard Cost Card: 367

Stock Valuation: 150

Storage of Material. *See* location and layout

Straight piece rate: 106

T

Time analysis: 109

Time Keeping: 108

Time rate. *See* time work

Time work: 107

Tinuous Review System: 87

Total Usage Variance: 396

Traditional budgeting: 343

U

Under absorption: 146

Uniform Costing: 304

V

Variable overhead Efficiency variance. *See* Variable Overheads variances

Variable overhead Expenditure Variance. *See* Variable overhead variances

Variable overhead variances: 386

Visual fit. *See* Scatter graph

W

Waste: 286

Weighted average method (WAM): 89

Y

Yield variance: 396, 398

Z

Zero based Budgeting: 342