

CPA

CERTIFIED PUBLIC ACCOUNTANTS

PART 1

SECTION 2

MANAGEMENT ACCOUNTING

STUDY TEXT

MANAGEMENT ACCOUNTING

GENERAL OBJECTIVE

This paper is intended to equip the candidate with knowledge, skills and attitudes that will enable him/her to apply management accounting principles and concepts in business

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Estimate the cost of goods and services
- Analyse product costs for manufacturing and non-manufacturing activities
- Prepare marginal and absorption cost statements
- Analyse an organisation's activities through budgetary control process
- Analyse variances for decision making
- Use computers in cost management

CONTENT

1. Nature and purpose of cost and management accounting

- The nature of cost accounting and costing terms
- The role of cost accounting in management
- The purposes of cost accounting information
- Scope of cost accounting
- Meaning of management accounting, scope, limitations, applications
- Relationship between cost, financial and management accounting
- Selection of an ideal cost accounting system

2. Cost classification

- Definition and purpose of cost classification
- Methods of cost classification: By nature/elements of manufacturing costs; Functional classification; Behavioral classification; Controllability; Time; Financial accounting; Identification with inventory; For decision making

3. Cost estimation

- Meaning of cost estimation
- Methods of estimating cost; non-mathematical methods like engineering method, accounts analysis method and high-low method; mathematical methods like scatter graph method, OLS regression method (simple linear regression only)

4. Cost accumulation

- Accounting for materials and inventory; material cost records, purchasing procedures, receipt and issues of material, methods of valuing material issues, inventory control procedures; economic order quantity (EOQ) and economic batch quantity (EBQ) models and back flush
- Accounting for labour: Methods of labour remuneration, labour control procedures, maintenance of labour records
- Accounting for overheads: Types of overheads, manufacturing, distribution and administration, service departmental cost allocation and apportionment, overheads analysis, overhead absorption rates, over or under absorption
- Activity based costing

5. Cost bookkeeping

- The flow of costs in a business enterprise
- Cost bookkeeping- interlocking and integrated ledger systems

6. Costing methods

- Job order costing
- Batch costing
- Process costing (including work in progress; joint and by-products)
- Service costing
- Unit costing

7. Marginal and absorption costing.

- Distinction between marginal and absorption costing
- Valuation of products under marginal and absorption costing
- Preparation of marginal and absorption statements; cost of production and profit determination
- Applications of marginal costing: Break-even analysis and charts (single product)
- Simplified decision problems; accept or reject, special order, dropping a product, make or buy
- Operating statements

8. Budgeting and budgetary control

- Nature and purposes of budgets
- Preparation of budgets; master budgets, functional (department budgets, cash budgets), proforma financial reports (income statements and balance sheets)
- Purpose of budgetary control; operation of a budgetary control system, organisation and coordination of the budgeting function
- Distinction between budgeting and budgetary control in the private and public sectors

9. Standard costing

- Types of standards
- Principles of setting standards
- Standard cost card

- Behavioural aspects of standard costing
- Generation of standard cost information
- Materials, labour and overheads variances; price and efficiency variances

10. Cost management

- Value chain-research and development-design-production-marketing distribution and customer care
- Just in time (JIT)
- Use of computers in costing; job costing, inventory management, labour costing, cost centre analysis, costing, budgeting and decision making

11. Overview of Performance Measurement

- Purpose of performance measurements
- Financial performance measures: profitability, liquidity, activity and gearing
- Non-financial performance measures. The balanced score card perspective

12. Emerging issues and trends

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TOPIC 1

NATURE AND PURPOSE OF COST AND ACCOUNTING

THE NATURE OF COST ACCOUNTING AND MANAGEMENT ACCOUNTING

Cost accounting is a type of accounting process that aims to capture a company's costs of production by assessing the input costs of each step of production as well as fixed costs such as depreciation of capital equipment. Cost accounting will first measure and record these costs individually, then compare input results to output or actual results to aid company management in measuring financial performance.

The nature of cost accounting can be brought out under the following headings:

1. **Cost accounting is a branch of knowledge:** Though considered as a branch of financial accounting, cost accounting is one of the important branch of knowledge, i.e., a discipline by itself. It is an organised body of knowledge consisting of its own principles, concepts and conventions. These principles and rules vary from industry to industry.
2. **Cost accounting is a science:** Cost accounting is a science as it is a body of systematic knowledge relating to not only cost accounting but relating to a wide variety of subjects such as law, office practice and procedure, data processing, production and material control, etc. It is necessary for a cost accountant to have intimate knowledge of all these field of study in order to carry on his day-to-day activities. But it is to be admitted that it is not a perfect science as in the case of natural science.
3. **Cost accounting is an art:** Cost accounting is an art in the sense it requires the ability and skill on the part of cost accountant in applying the principles, methods and techniques of cost accountancy to various management problems. These problems include the ascertainment of cost, control of costs, ascertainment of profitability, etc.
4. **Cost accounting is a profession:** In recent years cost accounting has become one of the important professions which has become more challenging.

While cost accounting is often used within a company to aid in decision making, financial accounting is what the outside investor community typically sees. Financial accounting is a different representation of costs and financial performance that includes a company's assets and liabilities. Cost accounting can be most beneficial as a tool for management in budgeting and in setting up cost control programs, which can improve net margins for the company in the future.

One key difference between cost accounting and financial accounting is that while in financial accounting the cost is classified depending on the type of transaction, cost accounting classifies costs according to information needs of the management. Cost accounting, because it is used as an internal tool by management, does not have to meet any specific standard and as result varies in use from company to company or from department to department.

Development of Cost Accounting

Scholars have argued that cost accounting was first developed during the industrial revolution when the emerging economics of industrial supply and demand forced manufacturers to start tracking whether to decrease the price of their overstocked goods or decrease production.

During the early 19th century when David Ricardo and T. R. Malthus were developing the field of economic theory, writers like Charles Babbage were writing the first books designed to guide businesses on how to manage their internal cost accounting.

By the beginning of the 20th century, cost accounting had become a widely covered topic in the literature of business management.

Types of Cost Accounting

Standard Cost Accounting

This type of cost accounting uses ratios to compare efficient uses of labor and materials to produce goods or services under standard conditions. Assessing these differences is called a variance analysis. Traditional cost accounting essentially allocates cost based on one measure, labor or machine hours. Due to the fact that overhead cost has risen proportionate to labor cost since the genesis of standard cost accounting, allocating overhead cost as an overall cost has ended up producing occasionally misleading insights.

Some of the issues associated with cost accounting is that this type of accounting emphasizes labor efficiency despite the fact that it makes up a comparatively small amount of the costs for modern companies.

Activity Based Costing

Activity based accounting is defined as, "an approach to the costing and monitoring of activities which involves tracing resource consumption and costing final outputs, resources assigned to activities, and activities to cost objects based on consumption estimates. The latter utilize cost drivers to attach activity costs to outputs."

Activity based costing accumulates the overheads from each department and assigns them to specific cost objects like services, customers, or products. The way these costs are assigned to cost objects are first decided in an activity analysis, where appropriate output measures are cost drivers. As result, activity based costing tends to be much more accurate and helpful when it comes to helping managers understand the cost and profitability of their company's specific services or products. Accountants using activity based costing will pass out a survey to employees who will then account for the amount of time they spend on different tasks. This gives management a better idea of where their time and money is being spent.

Lean Accounting

Lean accounting is an extension of the philosophy of lean manufacturing and production developed by Japanese companies in the 1980s. Most accounting practices for manufacturing work off the assumption that whatever is being produced is done in a large scale. Instead of using standard costing, activity based costing, cost-plus pricing, or other management accounting systems, when using lean accounting those methods are replaced by value-based pricing and lean-focused performance measurements, for example, using a box score to facilitate decision making and create simplified and digestible financial reports.

Marginal Costing

Considered a simplified model of cost accounting, marginal costing (sometimes called cost-volume-profit analysis) is an analysis of the relationship between a product or service's sales price, the volume of sales, the amount produced, expenses, costs and profits. That specific relationship is called the contribution margin. The contribution margin is calculated by dividing revenue minus variable cost by revenue. This type of analysis can be used by management to gain insight on potential profits as impacted by changing costs, what types of sales prices to establish, and types of marketing campaigns.

Types of Costs

Fixed Costs are costs that don't vary depending on the amount of work a company is doing. These are usually things like the payment on a building, or a piece of equipment that is depreciating at a fixed monthly rate.

Variable costs are tied to a company's level of production. An example could be a coffee roaster, who after receiving a large order of beans from a far-away locale, has to pay a higher rate for both shipping, packaging, and processing.

Operating costs are costs associated with the day-to-day operations of a business. These costs can be either fixed or variable depending.

Direct costs is the cost related to producing a product. If a coffee roaster spends 5 hours roasting coffee, the direct costs of the finished product include the labor hours of the roaster, and the cost of the coffee green. The energy cost to heat the roaster would be indirect because they're inexact, hard to trace.

THE ROLE OF COST ACCOUNTING IN MANAGEMENT

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.

THE PURPOSES OF COST ACCOUNTING INFORMATION

Functions and objectives of cost and management accounting include the following:

1. Planning
2. Decision Making
3. Monitoring & Control
4. Accountability

1. Planning

Planning is an important function of management accounting which is most effectively performed by the preparation of budgets and forecasts.

Forecasting is the process of estimation of the expected financial performance and position of a business in the future. Common types of forecasts include cash flow forecast, projected profit and loss and balance sheet forecast. Forecasts assist in determining the likely change in the financial performance and position of a business when considered in the context of the various assumptions used in forming the projections. Forecasting is the starting point in determining the resource requirements of a business which are quantified into budgets.

Budgets quantify the financial targets to be achieved by the management of an organization. Budgeting process often begins with the preparation of a master budget which is then used as a basis for the preparation of departmental and operational budgets. Budgeting helps in the effective allocation of resources of an organization between competing needs (e.g. departments, products, etc) in order to achieve the financial goals of a business. Budgets and forecasts help businesses to deal with potential problems proactively and avoid foreseeable bottlenecks in business resources.

2. Decision Making

Management accounting facilitates the provision of financial information to management for decision making. Management accounting also involves the evaluation of alternative strategies and actions by the application of techniques and concepts such as relevant costing, cost-volume-profit analysis, limiting factor analysis, investment appraisal techniques and client / product profitability analysis.

3. Monitoring & Control

Control process in management accounting system starts by defining standards against which performance may be measured such as standard costs and budgets. Actual results are measured and any variance between targets and results are analyzed and where necessary, corrective actions are taken. Management accounting plays a vital role in the monitoring and control of cost and efficiency of the routine processes and as well as one-off jobs and projects undertaken by an organization.

4. Accountability

Management accounting lays great emphasis on accountability through effective performance measurement. By setting targets for strategic business units and as well as for departments, management accounting assists in the assignment of responsibility for the achievement of business targets by individual managers. Responsibility accounting is achieved by appraising the performance of managers responsible for their business units while giving due consideration for factors not within their control or influence.

COST ACCOUNTING DEPARTMENT AND ITS RELATION WITH OTHER DEPARTMENTS

Cost accounting department records, classifies and present cost information for manufacturing and other activities of the organisation. It makes an analysis of cost of manufacturing, marketing and administration and provides control reports and other decision making data to all levels of management for the purpose of controlling and reducing costs.

It is, therefore, necessary that cost accounting department should have a proper coordination with other departments of the organisation. All departments should help each other so that the objective of minimum possible cost may be achieved without too many bottle-necks.

1. Cost Accounting Department and Production Department:

Cost accounting department and production department are closely related to each other. Production department is concerned with the conversion of raw materials into finished products. Cost accounting department helps in estimating the various costs involved in the manufacturing process like material cost, labour cost and other expenses involved for manufacturing a product.

As per cost estimates, production department makes timely arrangement of material, labour and other services required for the manufacturing process so that production may go on smoothly without any interruption. Cost accounting department is concerned with ascertaining, controlling and reducing cost of the manufacturing process.

The required information regarding costs relating to the manufacturing process both budgeted and actual is collected by cost accounting department from the production department and sent to the management for exercising cost control.

In a competitive world for facing competition effectively, reducing cost of production is a very important function. Both production department and cost accounting department can help each other in reducing cost of production which is the crying need of the competitive economy.

2. Cost Accounting Department and Purchases Department:

Purchase department is to ensure that right type of material is purchased at a reasonably low price at a right time from a right supplier and there is no excessive investment in materials. Continuous availability of material is to be ensured so that production may not be held up for want of materials.

In these respects cost accounting department can help purchase department by setting various levels of materials like minimum level, maximum level, reordering level, economic order quantity etc. Various types of material control suggested by the cost accounting department will be helpful in ensuring minimum possible cost of materials.

3. Cost Accounting Department and Personnel Department:

Personnel Department concerned with proper recruitment, selection, training labour turnover, time keeping, time booking, fixing of wage rate, preparation of payroll, idle time and over time works with close co-ordination of cost accounting department to get effective results of the personnel policies. Cost accounting department suggest ways and means for reducing costs relating to employees working in the organisation.

Cost accountant can recommend incentive plans for remunerating employees, which will be attractive to the employees for earning more wages and salaries and at the same time reducing labour cost per unit. In this way both departments personnel and cost accounting can be helpful in developing a contented labour force which will be willing to work for the organisation.

4. Cost Accounting Department and Finance & Accounts Department:

A close coordination is required between cost accounting department and finance and accounts department for reducing and controlling costs. Finance department is dependent upon the cost accounting department for making an estimate of funds required for production and marketing purposes. Similarly, materials and other supplies cannot be purchased at the minimum possible prices if the finance department does not provide the required finance at the time it is required.

Cost accounting department helps financial accounting department in preparing budgets. It also helps financial accounting department to make the payment of the bills by duly approving them. Past figures are provided to the cost accountant by financial accounting for making estimates for the future. Cost accounting department and financial accounting department depend on each other for reconciling profit as per cost accounts and profit as per financial accounts.

5. Cost Accounting Department and Marketing Department:

Marketing department is mainly concerned with marketing of products at competitive prices. Marketing department gets cost information from cost accounting department for fixing reasonable selling prices which may be acceptable to consumers. For considering alternative methods of marketing, information of various types of costs involved in various methods is provided by the cost accountant to the marketing manager.

Similarly, on the basis of information provided by the marketing department, cost accounting department will suggest the cheapest and effective method of marketing a particular product.

SCOPE OF COST ACCOUNTING

Scope refers to the various areas of study included in that subject. As regards the scope of cost accountancy is concerned, it has vast scope. The following topics fall under the preview of cost accountancy:

- 1) Costing
- 2) Cost Accounting
- 3) Cost Control Techniques
- 4) Budgeting and
- 5) Cost Audit

1. Cost ascertainment

Costing is the technique and process of ascertaining the cost. Costing is the process of determining the costs of products, services or activities.

The above definition is very significant in as much as it carries the main theme of cost accountancy. This definition emphasizes two important aspects, viz

- (a) ***The technique and process of costing:*** The technique of costing involves two distinct steps, namely,
 - (i) collection and classification of costs according to various elements and
 - (ii) allocation and apportionment of the expenses which cannot be directly charged to production. As a process, costing is concerned with the routine ascertainment of cost with a formal procedure.
- (b) ***Ascertainment of cost:*** It involves three steps;-
 - (i) Collection and analysis of expenses,
 - (ii) Measurement of production at different stages and
 - (iii) Linking up of production with the expenses.

To achieve the first step, costing has developed different systems such as Historical, Estimated and Standard Cost. For achieving the second step, costing has developed different methods such as single or output costing. Job costing, contract costing, etc. Finally, for achieving the last step costing has developed important techniques such as Absorption Costing, Marginal Costing and Standard Costing.

The three terms indicated as ‘systems’, ‘methods’, ‘techniques’ are independent factors but co-exist together. Ascertainment of cost of production is based on all these terms. For example, continuous type of industries may use process costing as a method, using actual cost as a system, under Standard Costing Technique.

2. Cost Accounting

Cost Accounting is the branch of accounting dealing with the classification, recording, allocation, summarization and reporting of current and prospective costs.

The above definition reveals the following aspects of cost accounting:

- a) Cost classification: This refers to grouping of like items of cost into a common group.
- b) Cost recording: This refers to posting of cost transactions into the various ledger maintained under cost accounting system.
- c) Cost allocation: This refers to allotment of costs to various products or department.
- d) Cost determination or cost finding: This refers to the determination of the cost of goods or services by informal procedure, i.e. Procedures that do not carry on the regular process of cost accounting on a continuous basis.
- e) Cost reporting: This refers to furnishing of cost data on a regular basis so as to meet the requirements of management

3. Cost Control

Cost control represents the employment of management devices in the performance of any necessary operation so that pre-established objectives of quality, quantity and time may be attained at the lowest possible outlay for goods and services. The terminology published by ICMA, London, defines cost control as “The guidance and regulation by executive action of the cost of operating an undertaking.” According to this definition, cost control aims at guiding the actuals towards the lines of target and regulates the actuals if they deviate from the targets. This guidance and regulation is done by the executive who is responsible for causing the deviation. This process will become clear by enumerating the steps involved in any cost control technique.

- a) Fixation of targets in terms of cost and production performance.
- b) Ascertaining the actual cost and production performance.
- c) Comparison of actuals with the targets.
- d) Analysing the variance by causes and the person responsible for it.
- e) Taking remedial steps to set right unfavourable variations.

Cost control is exercised through a variety of techniques such as inventory control, quality control, budgetary control, standard costing, etc. The advantages of cost control are as follows:

- a) It helps in utilizing the resources to the full extent.
- b) It helps in reduction of prices which are benefited by customers.
- c) It helps in competing successfully in the market.
- d) It increases the profit earning capacity of the business.
- e) It increases the goodwill of the business.

4. Budgetary control

It is the establishment of budgets relating to the responsibilities of executives to the requirements of a policy and the continuous comparison of actual with budgeted results either to secure by individual

action the objectives of that policy or to provide a basis for its revision. In short, it involves the fixation of budgets or estimated cost and comparison of actual cost with the budget fixed.

5. Cost Audit

Cost Audit is the verification of the correctness of cost accounts and a check on the adherence to the cost accounting plan. Its purpose is not only to ensure that cost accounts and other records are arithmetically correct but also to see that the principles and rules have been applied correctly.

MEANING OF MANAGEMENT ACCOUNTING, SCOPE, LIMITATIONS, APPLICATIONS

Management Accounting is the process of identification, measurement accumulation, analysis, preparation, interpretation and communication of financial information used by management to plan, evaluate and control within an organization and to ensure appropriate use of and accountability for its resources.

The scope or field of management accounting is very wide and broad based and it includes a variety of aspects of business operations. The main aim of management accounting is to help management in its functions of planning, directing, controlling and areas of specialization included within the any organization. The scope of management accounting can be studied as follows:

1. Financial accounting

Financial accounting forms the basis for analysis and interpretation for furnishing meaningful data to the management. The control aspect is based on financial data and performance evaluation, on recorded facts and figures. So, management accounting is closely related to financial accounting in many respects.

2. Cost accounting

Cost accounting is the process and techniques of ascertaining cost. Planning, decision making and control are the basic managerial functions. The cost accounting system provides the necessary tool for carrying out such functions efficiently. The tools includes standard costing, inventory management, variable costing etc.

3. Budgeting and forecasting

Budgeting means expressing the plans, policies and goals of the firm for a definite period in future. Forecasting on the other hand, is a prediction of what will happen as a result of a given set of circumstances. Forecasting is a judgment whereas the budgeting is an organizational object. These are useful for management accounting in planning.

4. Inventory control

Inventory is necessary to control from the time it is acquire till its final disposal as it involves large sum. For controlling inventory, management should determine different level of stock. The inventory control technique will be helpful for taking managerial decisions.

5. Statistical method

Statistical tools not only make the information more impressive, comprehensive and intelligible but also are highly useful for planning and forecasting.

6. Interpretation of data

Analysis and interpretation of financial statements are important part of management accounting. After analyzing the financial statements, the interpretation is made and the reports drawn from this analysis are presented to the management. Interpreting the accounting data to the authorities in the management is the principal task of management accounting.

7. Reporting to management

The interpreted information must be communicated to those who are interested in it. The report may cover Profit and Loss Account, Cash Flow and Funds Flow statements etc.

8. Internal audit and tax accounting

Management accounting studies all the tax matters to assist the management in investment decisions vis-a-vis tax planning as a resource to enjoy tax relief.

Internal audit system is necessary to judge the performance of every department. Management is able to know deviations in performance through internal audit. It also helps management in fixing responsibility of different individuals.

9. Methods of procedures

This includes maintenance of proper data processing and other office management services. It may have to deal with filing, copying, duplicating, communicating and management information system and also may have to report about the utility of different office machines

Uses of management accounting

Management accounts will enable to:

- compare your accounts with original budgets or forecasts
- manage your resources better
- identify trends in your business
- highlight variations in your income or spending which may require attention

They should be used for the following:

Record keeping

- recording business transactions
- measuring results of financial changes
- projecting financial effects of future transactions
- preparing internal reports in a user-friendly format

Planning and control

- collecting cash
- controlling stocks
- controlling expenses
- co-ordination and monitoring of strategy/performance
- monitoring gross margins

Decision making

- using cost information for pricing, capital investment and marketing
- evaluating market and product profitability
- evaluating the financial effect of strategies and plans

Limitations of Management Accounting

Though management accounting is helpful tool to the management as it provides information for planning, controlling and decision making, still its effectiveness is limited by a number of reasons. Some of the limitations of management accounting are as follows:

1. Based on accounting information

Management accounting is based on data and information provided by financial accounting and cost accounting. As such the correctness and effectiveness of managerial decisions will depend upon the quality of data provided by cost and financial accounts. So, effectiveness of management account is limited to the reliability of sources of information.

2. Lack of knowledge

The use of management accounting requires the knowledge of number of related subjects. Deficiency in knowledge in related subjects like accounting principles, statistics, economics, principle of management etc. will limit the use of management accounting.

3. Management accounting is only a tool

The tools and techniques of management accounting provide only information and not decisions. Decisions are to be taken by the management and implementation of decisions is also done by management.

4. Evolutionary stage

Management accounting is still in a development stage and has not yet reached a final stage. The techniques and tools used by this system give varying and differing results. It is still named as internal accounting and/ or operational accounting.

5. Personal prejudices and bias

The interpretation of financial information may differ from person to person depending upon the capability of the interpreter. Analysis and interpretation of data and information may be influenced by personal basis. As such, the objectivity of decision may be affected by personal prejudices and bias.

6. Psychological resistance

Changes in traditional accounting practices and organizational set up are required to install the management accounting system. It calls for a rearrangement of the personnel and their activities and framing of new rules and regulations which generally may not be liked by the people involved.

RELATIONSHIP BETWEEN FINANCIAL ACCOUNTING AND COST ACCOUNTING

Cost accounting is very closely-related to financial accounting. Some authorities on the subject consider cost accounting to be the branch of financial accounting. But it may be said that cost accounts is complementary to financial accounts, i.e., a subject which is necessary to make financial accounts whole or complete. Financial accounts and cost accounts are both similar in certain respects. But in some other respects they differ from one another. These points of similarities and dissimilarities are enumerated below:

Points of Similarities

- a) The fundamental principles of double entry are applicable in both the systems of accounts.
- b) The invoices and vouchers constitute the common basis for recording transactions under both the systems of accounts.
- c) The results of business are revealed by both the systems of accounts.
- d) The causes for losses and wastages of a business are provided by both these systems of accounts.
- e) The determination of future business policy is guided by both these systems of accounts.
- f) A basis for comparison of expenses is being provided by both the accounting systems.
- g) Accuracy of accounts is maintained under both the systems by means of exercising check over errors and commissions which might creep in either of accounts.

Points of Dissimilarities

Points of differences	Financial Accounts	Cost Accounts
1. Purpose	The purpose of financial accounts is external reporting mainly to owners, reporting, creditors, tax authorities, government, and prospective investors	The purpose of cost accounting is internal i.e., to the management of every business
2. Obligation	This is to be maintained compulsorily The preparation of accounts must be in accordance with the statutory provisions.	Cost accounts are maintained voluntarily In some cases government has directed some companies to maintain cost accounts to improve efficiency.
3. Recording	<ul style="list-style-type: none"> (a) Financial accounts records transactions in a subjective manner, i.e., according an objective manner to the nature of expenditure (b) In financial accounts expenses are recorded in totals (c) Financial accounts records all transactions which takes place in the business. (d) Financial accounts records only historical costs 	<ul style="list-style-type: none"> (a) Cost accounts records transactions in a subjective manner. i.e., according to purpose for which costs are incurred (b) In cost accounts costs are expressed by proper analysis and classification in order to find out cost per unit (c) Cost accounts records only those costs which affect production and sales (d) Cost accounts records both historical and estimated costs
4. Analysis of Profit	Financial accounts disclose profit for the entire business as a whole	Cost accounts show the profitability or otherwise of each product, process or operation so as to reveal the areas of profitability
5. Control	<ul style="list-style-type: none"> (a) It does not make use of any control techniques. (b) techniques such a Marginal Costing any technique (c) Control over labour is not exercised 	<ul style="list-style-type: none"> (a) It makes use of some important control techniques such a Marginal Costing (b) It exercises control over materials using some techniques such as ABC analysis level setting, economic order quantity etc. (c) Control over labour is exercised and efforts are taken to minimise

		idle time, over time etc.
6. Duration of reporting	Generally, financial accounts provides financial information once a year	Cost accounting furnishes cost data at frequent intervals. Some reports are daily. Some are weekly and some monthly
7. Evaluation of efficiency	The information provided by financial accounts is not sufficient to evaluate the efficiency of the business	The cost data helps in evaluating the efficiency of the businesses
8. Pricing	It fails to guide the formulation of pricing policy	It provides adequate data for formulating pricing policy pricing policy.
9. Valuation	Stock is valued at cost or market price of stock whichever is less	Stock is always valued of cost price

DIFFERENCES BETWEEN COST AND MANAGEMENT ACCOUNTING

Management accounting is defined as “the application of appropriate techniques and concepts in processing the historical and projected economic data of an entity to assist management in establishing a plan for reasonable economic objectives and in the making of rational decisions with a view towards achieving these objectives.” It includes the methods and concepts necessary for effective planning for choosing among alternative business actions, and for control through the evaluation and interpretation of performance. Its study involves consideration of ways in which accounting information may be accumulated, synthesized, analyzed and presented in relation to specific problems, decisions and day-to-day tasks of business management.

Management accounting can also be defined as the application of professional knowledge and skill in the preparation and presentation of accounting information in such a way as to assist management in the formulation of policies and in the planning and control of the operation of the undertaking.”

If we examine the above two definitions of management accounting it appears that both the systems of accounts serve the same purpose.

However, they differ from one another in respect of the following

Points of differences	Cost Accounting	Management Accounting
1. Growth of	The history of cost accounting dates back Accounting to fourteenth century	This system of accounting evolved in the middle of 20th century. Hence it is of recent origin where compared to cost accounting
2. Object	The main objects of cost accounts is to ascertain and control cost	The main objective of management accounting is to provide useful information to management for decision-making.
3. Basis of	It is based on both present and future recording transactions for cost ascertainment	It is concerned purely with the transactions relating to future.
4. Scope	Cost accounting has narrow scope as it covers matters relating to ascertainment and control of cost.	It has a wide scope in as much as it covers the areas of financial accounts, cost accounts, taxation, etc.
5. Utility	Cost accounts serves the needs of both internal management and external parties	Management accounting serves the needs of only internal management
6. Types of	It deals only with monetary transactions i.e., it covers only quantitative aspect	It deals with both monetary and non-transactions monetary transactions, i.e., both quantitative dealt with and qualitative aspects
7. Observation	Cost accounts follow a definite principle of principles for ascertaining cost and a format	It does not follow a definite principle and Instead, the data to be presented and format for recording. depends up on the need of the management

COST ACCOUNTS SYSTEM

At the outset it is to be understood that a common cost accounting system cannot be installed for all types of business undertakings. The cost accounting system depends upon the nature of business and the product manufactured. Before a suitable system of cost accounting is installed it is necessary to undertake a preliminary investigation so as to know the feasibility of installing cost accounting system to such business. While introducing a system of cost accounts it should be borne in mind that cost accounting system must suit the business. There should not be any attempt to make the business suit the system. One more consideration that is of practical importance is that the benefits derived from cost accounting system must be more than the investment made on it. This means the system must be simple and it must lead to savings through the control of materials, labour and overheads when

Compared to expenses incurred in maintaining it. For the successful functioning of the costing system, the following conditions are essential:

- a) There must be an efficient system of material control.
- b) A sound and well-designed method of wage payment must be set up.
- c) The existence of sound basis for collection of all indirect expenses and a basis for its apportionment to various production departments.
- d) The integration of cost and financial accounts to facilitate reconciliation of profit as shown by these two systems of accounts.
- e) The use of printed forms so as to facilitate quick compilation of cost reports.
- f) The duties and responsibilities of cost accountant must be made clear.

Factors to be considered before installing a cost accounting system

The following factors are to be considered before installing a cost accounting system:

- 1. History of business unit:** The history of a business unit implies the duration of its existence, position in the industry, the rate of growth, policy and philosophy of management and the like. The history of business unit serves as the basis for designing the cost accounts in respect of necessity, simplicity, and investment involved in installing cost accounts.
- 2. Nature of the industry:** The nature of business such as manufacturing, mining, trading, etc. determines the costing techniques to be applied. Similarly, the type of product manufactured also determines the method of costing that is to be employed. In other words, there is no all-purpose technique and method of costing that can be applied universally.
- 3. Product range:** The range of products manufactured and sold also determines the method of costing to be selected. Accordingly range of products must be analysed in terms of size, models, fashions, area of market, competitors and whether the products are made to customer's specification or for stocking and selling.

4. Technical considerations: Technical considerations that influence the installation of cost accounts are as follows:

- a) Size and layout of the factory
- b) The existence of production and service departments
- c) Flow of production
- d) Capacity of machines and degree of mechanization
- e) Existence of laboratories
- f) Internal transport and material handling equipments
- g) Production control techniques
- h) Inspection and testing of materials and finished goods.

5. Organizational factors: The problem of installing cost accounting is somewhat difficult in case of an existing business when compared to new business. However, the existing set up of the organisation should be least disturbed should the need arise. In order to fix up responsibility to the executives it may be necessary to group the departments. The organisational factors to be considered are :

- 1) Size and the type of organisation such as line, line and staff, functional and committee organisation,
- 2) The levels of management, top level, middle level and bottom level management,
- 3) Extent of delegation and responsibility,
- 4) Extent of centralization and decentralization,
- 5) Extent of departmentation,
- 6) Availability of modern office equipments, and
- 7) Number of managerial and supervisory staff.

6. Selling and distribution method: The chief factors to be considered with regard to distribution process are the warehousing facilities, external transport, market research and other promotional measures, terms of sale and procurement of orders from customers.

7. Accounting aspects: The factors to be considered in respect of accounting are:

- a) Number of financial records,
- b) Existing forms,
- c) Registers used, and
- d) Number of copies required.

8. Area of control to be exercised: The area where cost control is to be exercised is to be identified so that each manager may take action relevant to his activities. If material control occupies significant area of control, it must be given topmost priority for exercising control over materials.

9. Reporting: The cost accounting system to be installed must ensure frequency and promptitude in reporting cost data to all levels of management. It must also to be pointed out that duplication of reporting is to be avoided. Further, only those information which are relevant for the management in a particular context alone should be reported.

10. Uniformity: The practice of adopting uniform costing facilitates inter-firm comparison among various firms belonging to the same industry. Further it also has the benefit of adopting common costing practice if a holding company has number of subsidiaries.

- 11. Use of electronic data processing:** In modern days it has become a common practice to use electronic data processing equipments and computers. In this situation it is essential to ensure that the equipment meets the needs of the system but not the other way round.
- 12. Practical considerations:** The cost accounting system to be installed must be flexible in operation and must be capable of adaptation to changing conditions. The system must be periodically scrutinized so as to make necessary changes owing to development in business.

Practical Difficulties in Installing Cost Accounting

In addition to the above problems, a cost accountant will encounter the following practical difficulties at the time of installation of cost accounting system:

- 1. Lack of support from management:** Wherever costing system is installed. It is essential to seek the support of various departmental managers. Very often the managers show hostile attitude towards the costing system. They feel that this system will interfere in their routine work and probably as a means of checking their efficiency. Under such circumstances it is better to convince them about the utility of costing system for the business as a whole.
- 2. Resistance by existing accounting staff:** Very often the existing accounting staff resists the installation of the cost accounting system on two grounds. Firstly, they feel that the new system of accounting might lead to excess work. Secondly, they are afraid of their job security. But this difficulty may be overcome by encouraging them about the usefulness of cost accounting as a supplement to financial accounts and the generation of more employment opportunities from the installation of cost accounting system.
- 3. Non-cooperation from middle and bottom level management:** At times the middle and bottom level managers such as foremen, supervisors and inspectors also fail to extend their wholehearted cooperation fearing additional work which may be entrusted to them.
- 4.** This problem may be overcome by suggesting them about the simplicity of the system and the existence of a separate cost accounting department to look after costing matters. However, they may be required to provide necessary reports concerning their area of activity so as to enable functioning of cost accounting department efficiently.
- 5. Lack of trained staff:** This was no doubt a problem in olden days. Today this problem is overcome, thanks to the establishment of The Institute of Cost and Works Accountant of India in our country which offers professional course in costing and also offers training facilities through various companies to the candidates undergoing the course. In spite of this facility, it is somewhat difficult to get the competent and experienced staff at the time of installation. This problem can be overcome by paying attractive salaries to the cost accountants.
- 6. Heavy expenses in installing and maintaining the system:** The setting up of a separate costing department with staff often poses a problem. In addition to installation, the operating expenses in the form of printing and stationery, heating and lighting, depreciation and insurance, rent and rates are to be incurred. However, as was mentioned earlier, the system of cost accounting must be a useful investment, i.e., benefits derived from it must be more than the investment made on it. If this is not possible, for the time being the system must be discarded.

SELECTION OF AN IDEAL COST ACCOUNTING SYSTEM

The following are the essentials of an ideal cost accounting system:

1. **Accuracy:** The system of cost accounting must provide for accuracy in terms of both cost ascertainment and presentation. Otherwise it will prove to be misleading.
2. **Simplicity:** Cost accounting system involves detailed analysis of cost. To avoid complications in the procedure of cost ascertainment an elaborate system of costing should be avoided and every care must be taken to keep it as simple as possible.
3. **Elasticity:** The cost accounting system should be capable of adopting itself to the changing situations of business. It must be capable of expansion or contraction depending upon the needs of the business.
4. **Economy:** The costs of operating costing system must be less. It must result in increased benefit when compared to the expenditure incurred in installing it.
5. **Comparability:** The records to be maintained must facilitate comparison over a period of time. The past records must serve as a basis to guide the future.
6. **Promptness:** An ideal costing system is one which provides cost data in an analytical form to the management. So all the departments of a factory must analyse and record the relevant items of cost promptly in order to furnish cost information on a regular basis to various levels of management. This helps in checking up the progress of the business on a regular basis.
7. **Periodical preparation of accounts:** With a view to facilitate the comparison of results frequently, it is desirable to prepare accounts periodically. Constant comparison of actual result with standard result enables to spot out areas of inefficiency. This can be set right by taking remedial measures.
8. **Reconciliation with financial accounts:** The system of cost accounts must be capable of reconciling with financial accounts so as to check accuracy of both the system of accounts.
9. **Uniformity:** The various forms and documents used under costing system must be uniform in size and quality of paper. Printed forms must be used to avoid delay in the preparation of reports. This also reduces the burden of clerical staff. Forms of different colours can be used to distinguish different documents.
10. **Equity:** The basis of apportioning indirect expenses to products, departments or jobs must be fair and equitable.

TOPIC 2

COST CLASSIFICATION

DEFINATION AND PURPOSE OF COST CLASSIFICATION

Definition

Cost classification is the process of grouping costs according to their common characteristics. A suitable classification of costs is of vital importance in order to identify the cost with cost centres or cost units. Cost may be classified according to their nature, i.e., material, labor and expenses and a number of other characteristics. The same cost figures are classified according to different ways of costing depending upon the purpose to be achieved and requirements of particular concern.

Purpose of cost classification

1. Preparation of budget: classification of cost helps in preparation of the budget of the organization. For preparing the budget of an organization one must know how and where exactly the expenses have been incurred in relation to manufacturing the product. On the basis of this classification of the cost an organization accordingly prepares its budget.
2. Helps in measuring efficiency: classification of cost helps in measuring the efficiency of the organization. On the basis of the places where the costs have been incurred and the amount of cost that has been incurred the efficiency of the organization can be judged.
3. Controlling cost:
 - Labour cost: with the help of classification of cost an organization can control its labour cost as well. If the labour complete their task well in time and with much efficiency then the organization would be able to reduce its labour cost.
 - Material cost: material cost can be controlled if material wastage is avoided and proper standardization of materials is used. Thus with the help of classification of cost an organization is able to reduce the cost incurred on materials and thus able to control material cost.
 - Overhead cost: overhead comprises indirect expenditure incurred in manufacturing. By knowing the amount that has been incurred under various heads an organization can device ways to reduce the cost. Thus with the help of classification of cost an organization is able to control overhead cost.
4. Expansion of the organization: if an organization knows where exactly it incurs expenditure then it can device ways to control these costs. Once an organization is able to control its cost then it can concentrate on its expansion. Thus with the help of classification of cost an

organization is able to devise ways for its expansion.

Thus, classification of cost is of immense importance for an organization. With the help of classification of cost an organization can make progress and also expand its production by controlling its cost. Thus in the long run an organization can move towards higher productivity and thus higher profits and can achieve its goals.

METHODS OF COST CLASSIFICATION

MANUFACTURING COSTS

Definition and Explanation of manufacturing cost:

Manufacturing costs are those costs that are directly involved in manufacturing of products and services. **Examples of manufacturing costs** include raw materials costs and salary of labor workers. Manufacturing cost is divided into three broad categories by most companies.

1. Direct materials cost
2. Direct labor cost
3. Manufacturing overhead cost.

Direct Materials Cost:

The materials that go into final product are called raw materials. This term is somewhat misleading, since it seems to imply unprocessed natural resources like wood pulp or iron ore. Actually raw materials refer to any materials that are used in the final product; and the finished product of one company can become raw material of another company. For example plastic produced by manufacturers of plastic is a finished product for them but is a raw material for Compaq Computers for its personal computers.

Direct Materials are those material that become an integral part of the finished product and that can be physically and conveniently traced to it. Examples include tiny electric motor that Panasonic uses in its CD players to make the CD spin. According to a study of 37 manufacturing industries material costs averaged about 55% of sales revenue.

Sometimes it is not worth the effort to trace the costs of relatively insignificant materials to the end products. Such minor items would include the solder used to make electrical connection in a Sony TV or the glue used to assemble a chair. Materials such as solder or glue are called indirect materials and are included as part of manufacturing overhead, which is discussed later on this page.

Direct Labor Cost:

The term direct labor is reserved for those labor costs that can be essentially traced to individual units of products. Direct labor is sometime called touch labor, since direct labor workers typically touch the product while it is being made. The labor cost of assembly line workers, for example, is a direct labor cost, as would the labor cost of carpenter, bricklayer and machine operator

Labor costs that cannot be physically traced to the creation of products, or that can be traced only at a great cost and inconvenience, are termed **indirect labor** and treated as part of manufacturing overhead, along with indirect materials. Indirect labor includes the labor costs of janitors, supervisors, materials handlers, and night security guards. Although the efforts of these workers are essential to production, it would be either impractical or impossible to accurately trace their costs to specific units of product. Hence, such labor costs are treated as indirect labor.

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

According to a study of 37 manufacturing industries, direct labor averaged only about 10% of sales revenue.

Direct Materials cost combined with direct labor cost is called prime cost.

In equation form:

$$\text{Prime Cost} = \text{Direct Materials Cost} + \text{Direct Labor Cost}$$

For example total direct materials cost incurred by the company is \$4,500 and direct labor cost is \$3,000 then prime cost is \$7,500 (\$4,500 + \$3,000).

Manufacturing Overhead Cost:

Manufacturing overhead, the third element of manufacturing cost, includes all costs of manufacturing except direct material and direct labor. Examples of manufacturing overhead include items such as indirect material, indirect labor, maintenance and repairs on production equipment and heat and light, property taxes, depreciation, and insurance on manufacturing facilities. Indirect materials are minor items such as solder and glue in manufacturing industries. These are not included in direct materials costs. Indirect labor is a labor cost that cannot be trace to the creation of products or that can be traced only at great cost and inconvenience. Indirect labor includes the labor cost of janitors, supervisors, materials handlers and night security guards. Costs incurred for heat and light, property taxes, insurance, depreciation and so forth associated with selling and administrative functions are not included in manufacturing overhead. Studies have found that manufacturing overhead averages about 16% of sales revenue. Manufacturing overhead is known by various names, such as indirect manufacturing cost, factory overhead, and factory burden. All of these terms are synonymous with manufacturing overhead.

Manufacturing overhead cost combined with direct labor is called conversion cost.

In equation form:

$$\text{Conversion Cost} = \text{Direct Labor Cost} + \text{Manufacturing Overhead Cost}$$

For example if total direct labor cost is \$3,000 and total manufacturing overhead cost is \$2,000 then conversion cost is \$5,000 (\$3,000 + \$2,000).

Non-manufacturing Costs:**Definition and explanation of non-manufacturing cost:**

Non-manufacturing costs are those costs that are not incurred to manufacture a product. Examples of such costs are salary of sales person and advertising expenses. Generally non-manufacturing costs are further classified into two categories.

1. Marketing and Selling Costs
2. Administrative Costs

Marketing or Selling Costs:

Marketing or selling costs include all costs necessary to secure customer orders and get the finished product into the hands of the customers. These costs are often called order getting or order filling costs. **Examples of marketing or selling costs** include advertising costs, shipping costs, sales commission and sales salary.

Administrative Costs:

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

FUNCTIONAL CLASSIFICATION

Production, Administration, Selling & Distribution are three important functions of a business concern. Taking these functions into consideration, costs have been classified by:

- a) **Production or Manufacturing Cost:** Manufacturing costs are those costs which are incurred in the course of manufacture. It includes cost of raw material, cost of labour, other direct cost and factory indirect cost. Example of production or manufacturing costs may be power, lighting, heating, rent, depreciation etc.
- b) **Office and Administration Cost:** These costs are incurred for the general administration of the enterprise. It includes office costs as well as administration cost. For example, salary of office staff, rent of office building, electricity charges, audit fee, printing and stationeries etc.
- c) **Selling and Distribution Cost:** It includes both selling cost as well as distribution cost. Selling costs are those costs which are incurred in connection with the selling of goods and services. Distribution costs are those costs which are incurred on despatch of finished goods to the consumers. Example of selling and distribution costs are: sales men salary, packing charges, carriage, out ward, advertisement, ware house charges etc.

BEHAVIORAL CLASSIFICATION

Cost behavior means how costs will respond or react to changes in the activity level. ie. 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:

Costs will be classified according to nature or behavior in relationship to change in the levels of production such as:

- i) **Variable costs**
- ii) **Fixed costs**
- iii) **Semi fixed costs**

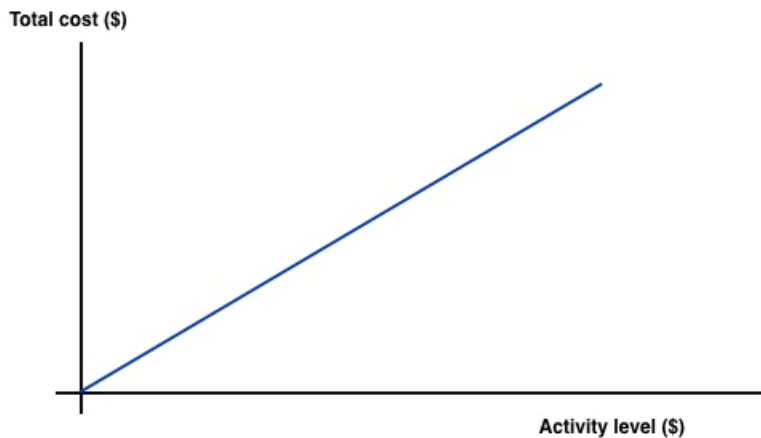
Variable costs

These are directly proportional to the level of activity.

If the number of units produced doubles, then variable production costs will double also. An example would be the cost of material used to produce units.

If the number of units sold increases by 20% then variable selling and distribution costs would increase by 20% also.

On a graph, variable costs would look like:



Fixed costs

Constant over a wide range of activity

An example would be the factory rent. It does not matter how many units are made, the rent is fixed.

On a graph, fixed costs would appear as:



Note that the cost per unit will decrease as the activity level decreases. For example, say that the rent was \$10,000 and 1,000 units were made. Then you could argue that it takes \$10 rent to make a unit ($\$10,000/1,000$).

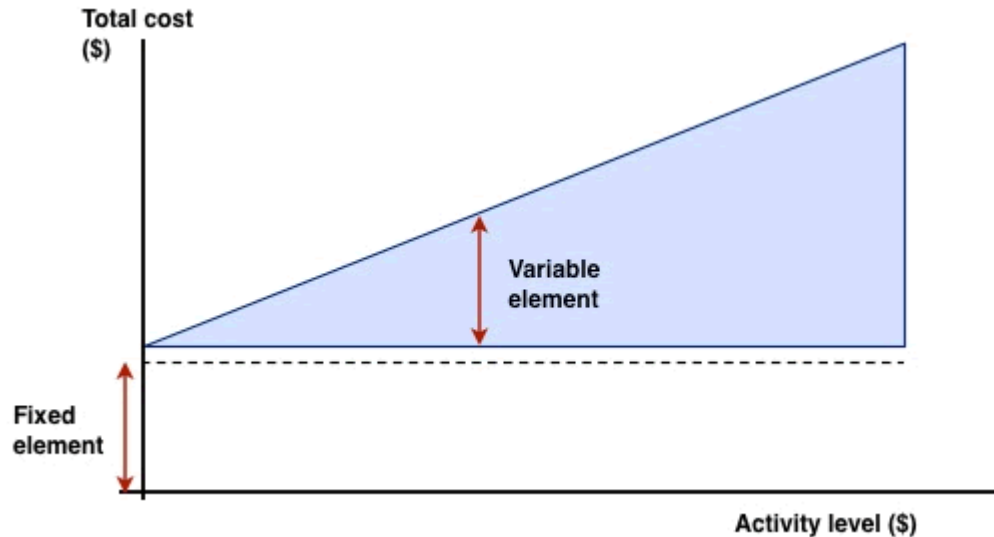
If, however, 10,000 units were made, the rental cost per unit would be only \$1 ($\$10,000/10,000$). Higher production volumes are making better use of the fixed resource.

Semi-variable costs

Have a fixed element and a variable element.

An example would be a telephone bill. Usually there is a fixed cost for the line rental then each minute of telephone calls causes an additional cost.

On a graph, fixed costs would appear as:



COST CLASSIFICATION

CLASSIFICATION OF COST ACCORDING TO CONTROLLABILITY

Under this method, costs are classified according to whether or not they are influenced by the action of a given member of the undertaking. On this basis cost is classified into two categories.

1. **Controllable cost:** Controllable costs are those which can be influenced by the action of a specified member of an undertaking. Generally speaking all direct costs including direct materials, direct labor and some of the overhead expenses are controllable by the lower level management.
2. **Uncontrollable cost:** These are the cost which cannot be influenced by the action of a specified member of undertakings. Most of fixed costs such as rent of buildings, salary to managerial persons, wages of skilled workers, etc. are uncontrollable.

CLASSIFICATION ACCORDING TO TIME

Costs can be classified in to historical or actual costs and predetermined or future cost.

- Historical cost- It relates to the usual method of determining actual cost of operation based on actual expenses incurred during the period. Such evaluation of costs takes longer time, till the accounts are closed and finalized, and figures are already for use in cost calculations.
- Predetermined cost- It is prepared in advance before the actual operation starts on the basis of specializations and historical cost data of the earlier period and all factors effecting cost. Predetermined cost is therefore future cost and may be either estimated or standard.
- Estimated cost is prepared before accepting an order for submitting price quotation. It is also used for comparing actual performance.
- Standard cost is scientifically predetermined cost of a product or service applicable during a specific period of immediate future under current or anticipated operating conditions. The method consists of setting standards for each elements of cost, evaluating the variance from standard cost and finding reasons for such variance, so that remedial steps can be taken promptly to check inefficient performance.

CLASSIFICATION BY RELATIONSHIP WITH ACCOUNTING PERIOD

Classifications are measured by the period of use and benefit. The capital expenditure and revenue expenditure are classified under it. Revenue expenses relate to current accounting period. Capital expenditures are the benefits beyond accounting period. Fixed assets come under category of capital expenditure and maintenance of assets comes under revenue expenditure category.

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:

STUDY TEXT

(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 Shs2,000 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 e.g 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 weresold.
- 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.

TOPIC 3

COST ESTIMATION

MEANING OF COST ESTIMATION

A cost estimate is the approximation of the cost of a program, project, or operation. The cost estimate is the product of the cost estimating process. The cost estimate has a single total value and may have identifiable component values. A problem with a cost overrun can be avoided with a credible, reliable, and accurate cost estimate. An estimator is the professional who prepares cost estimates.

METHODS OF ESTIMATING COST

Non mathematical methods

These include;

1. Engineering method
2. Accounts analysis
3. High-low method

Mathematical methods

These include;-

4. Scatter graph method
5. Ordinary Least Squares Regression Method

Cost estimation methods are necessary only for costs that are identified as mixed costs. There is no need to apply an estimation method to break a cost into fixed and variable portions if you have already determined it is solely fixed or solely variable. All four methods produce *estimates* of amounts of fixed and variable costs.

The Goal of Cost Estimation

The ultimate goal of cost estimation is to determine the amount of fixed and variable costs to create a cost formula to be used to predict future costs. The cost formula, or cost equation, is the output of the cost estimation process. Because you have only one variable (number of units), the formula will be a straight line, or linear equation. (You should remember the concept of functions from your middle school math classes.) The formula that represents the equation of a line will appear in the format of:

$$Y = mx + b$$

where Y = total cost

m = the slope of the line, i.e., unit variable cost

X = the number of units of activity

b = the y-intercept, i.e., total fixed costs

Recall that the $Y = VCx + TFC$ is the equivalent equation used in accounting for estimating costs. The total cost side of the equation (Y) can also be expressed as $f(x)$ so that the formula appears as:

$$f(x) = VCx + TFC$$

As such, the equation is often referred to as a function. In accounting, it is referred to as a cost function because the 'Y' equates to total cost.

Determining a linear function is useful in predicting cost amounts at different levels of activity. This is useful because managers must be able to predict costs to plan for future operations. This is often accompanied by what-if analysis that assists with the preparation of budgets, pricing of products or services, and other key management functions.

Cost Equation Components

Your goal is to determine the cost equation for a particular cost, so that managers can estimate 'total' costs at various activity levels. The cost equation will contain the variable cost per unit and total fixed costs. These two amounts remain the same at all levels of activity within the relevant range.

The variable cost component of the cost equation is displayed with two decimals in standard form because it is a unit cost (and unit costs are always displayed with two decimal places). The total fixed cost component of the cost equation is displayed with no decimals.

1. ENGINEERING METHOD

The Engineering Cost Estimating method builds the overall cost estimate by summing detailed estimates done at lower levels of the Work Breakdown Structure (WBS). It's a technique where the system being costed is broken down into lower-level components (such as parts or assemblies), each of which is costed separately for direct labor, direct material, and other costs. Engineering estimates for direct labor hours may be based on analyses of engineering drawings and contractor or industry-wide standards.

Engineering estimates for direct material may be based on discrete raw material and purchase part requirements. The remaining elements of cost (such as quality control or various overhead charges) may be factored from the direct labor and material costs. The various discrete cost estimates are aggregated by simple algebraic equations (hence the common name "bottoms-up" estimate). The use of engineering estimates requires extensive knowledge of a system's (and its components') characteristics, and lots of detailed data.

Because of the high level of detail, each step of the work flow should be identified, measured, and tracked, and the results for each outcome should be summed to make the point estimate.

The several advantages to the Engineering Cost estimating method include:

- The estimator's ability to determine exactly what the estimate includes and whether anything was overlooked,
- Its unique application to the specific program and manufacturer,
- That it gives good insight into major cost contributors, and
- Easy transfer of results to other programs.

Some disadvantages of the Engineering Cost estimating method include:

- It can be expensive to implement and it is time consuming
- It is not flexible enough to answer what-if questions
- New estimates must be built for each alternative
- The product specification must be well known and stable
- All product and process changes must be reflected in the estimate

2. ACCOUNT ANALYSIS

Under account analysis method, 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.

This is with a view to develop a cost function in the form $y = a + bx$

Illustration

Suppose a company ABC has the following costs with a value of 7000 units.

	Amount	Variable	Fixed
Direct labour	150,000	150,000	-
Materials	125,000	125,000	-
Repairs and maintenance	5,000	5,000	-
Depreciation	15,000	-	15,000
Administration overheads	1,000	-	1,000
Indirect labour	4,000	-	4,000
	300,000	280,000	20,000

Required:-

Determine the cost equation using account classification method and determine the cost of producing 1,400 units

Solution

$$\text{Variable cost } b = \frac{280,000}{7,000} = \text{Shs } 40$$

$$a = \text{shs } 20,000$$

Substituting in the Equation $y = a + bx$

$$Y = 20,000 + 40x$$

Hence the cost of producing 1400 units is

$$Y = 20,000 + 40(1,400)$$

Shs. 76,000

Illustration

In the year 2012 VIP incurred the following expenses to maintain 1500 lecturers.

	Sh
Administration expenses (40% variable)	4,000,000
Lecturing pay (60% variable)	8,000,000
Airtime allowance (fixed)	1,000,000
Sundry expenses (50% fixed)	500,000
Soda allowance (variable)	300,000

Required;-

- Using accounts analysis method, express an equation in form $y = a + bx$
- Using the equation expressed above, estimate the total cost of 2000 lecturers incurred to be employed in 2013.

Solution

	Total cost	Variable	Fixed
Administration expenses	4,000,000	1,600,000	2,400,000
Lecturing pay	8,000,000	4,800,000	3,200,000
Airtime allowance	1,000,000	-	1,000,000
Sundry expenses	500,000	250,000	250,000
Soda allowance	300,000	300,000	
		6,950,000	6,850,000

$$b = \frac{6,950,000}{1500} = 4633.33 \quad a = 6,850,000$$

$$(a) \ y = a + bx \therefore y = 6,850 + 4633.33x$$

(b) For 2000 lecturers

$$\text{Total cost } y = 6,850,000 + 4,633.33 \times 2,000 = \text{Shs. } 16,116,660$$

3. HIGH –LOW (OR RANGE) METHOD.

In this method the highest and lowest activity together with their corresponding costs is identified. The two points i.e. the lowest and the highest are used to derive a cost function in the form of

$$y = a + bx$$

This method is based on an analysis of historical information of costs at different activity levels. The high-low method finds the equation of the straight line joining the two points corresponding to the

highest and lowest activity levels. What we need to do is to separately identify the fixed and variable cost elements so that each can be predicted for anticipated future activity levels.

The variable cost is estimated by calculating the average unit cost between the highest and lowest volumes and the fixed and total cost function can then be derived.

For example, if the costs of producing the highest and lowest levels of production (10 units and 12 units) are shs.30 and shs.35 respectively then the variable costs per unit are sh. 5/2 units or sh. 2.50.

The fixed costs are thus £5 and the total cost = sh.5 + sh. 2.50x where x = production level.

Illustration

	Production (units)	Total cost sh.
High	120	3,500
Low	100	3,000
Change	20	500

$$\text{Variable cost} = \frac{\text{sh.}500}{20} = \text{sh.}25 \text{ per unit}$$

$$\text{Fixed cost} = \text{sh. } 3,000 - (100 \times \text{sh. } 2.5) = \text{sh.}500$$

$$\text{Total cost} = \text{sh.}500 + \text{sh.}25 \times \text{units}$$

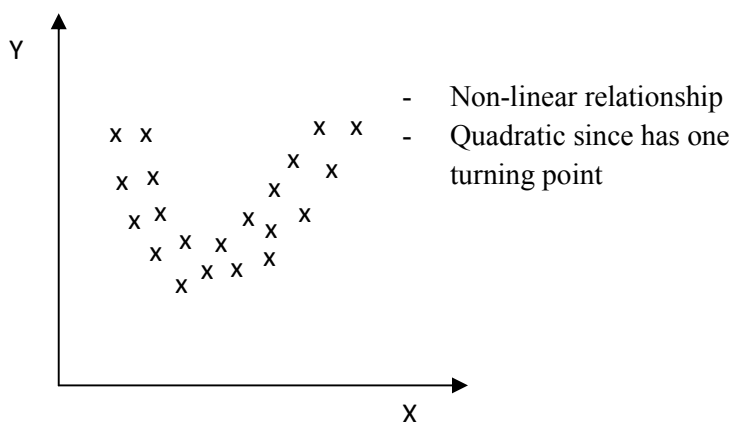
Limitations

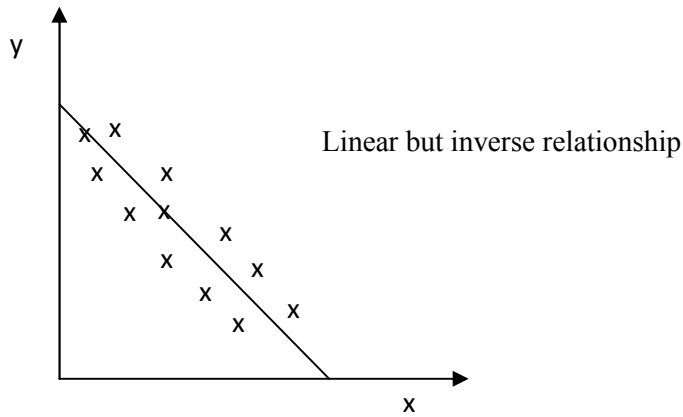
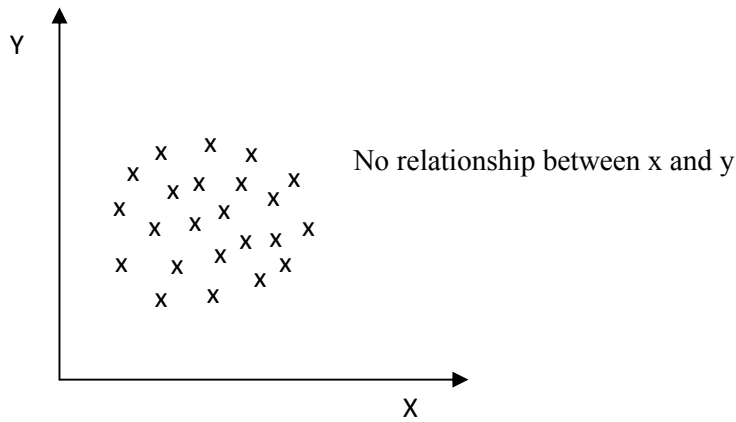
The limitations of the high-low method are as follows

- Its reliance on historical data, assuming that (i) activity is the only factor affecting cost and (ii) historical costs reliably predict future costs.
- The use of only two values, the highest and the lowest, means that the results may be distorted because of random variations in these values.

4. THE SCATTER GRAPH METHOD

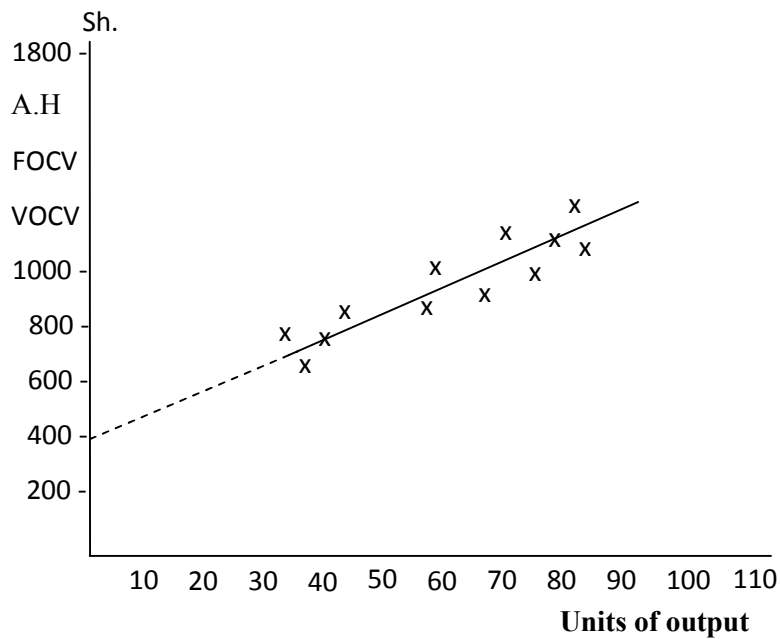
For this method a scatter diagram is constructed which is used to visually i.e. by inspection deduce a relationship from observed pattern if there is any. By obtaining any two points on constructed graph, we can fit a straight line if the pattern suggests a linear relationship.





Illustration

Cost and activity data are plotted in a similar manner to that above and a line drawn at an angle which is judged to be the best representation of the slope of the plotting.



Scatter graph showing visual line of best fit.

The dotted line is drawn to show the intersection with the vertical axis and thus gives an estimate of the fixed content of the cost being considered, in this case 6400. The slope of the line, i.e. the variable element, is found as follows:

$$\text{Cost @ zero activity} = \text{sh.400}$$

$$\text{Cost @ 100 units activity} = \text{sh.1,250}$$

$$\frac{1,250-400}{100-0} = \text{sh. 8.5}$$

Therefore the estimate cost function = sh. 400 + 8.5x where x = units of output, i.e. the independent variable.

The graphical method is simple to use and provides a visual indication of approximate cost behavior. Because each individual is likely to draw a different line with a different slope the method is subjective and approximate. A more objective and accurate approach is to calculate the line of best fit mathematically using the least squares method.

Advantages of visual fit method

1. It takes into account all the observations unlike the high low method.
2. It is easy to apply.

Disadvantages of visual –fit method

1. It cannot be used for two or more independent variables
2. We cannot measure the size of probable error.
3. It is subjective to some extent.

5. ORDINARY LEAST SQUARES REGRESSION METHOD

Regression analysis is a technique that uses a statistical model to measure the amount of change in one variable (dependent variable) that is associated with changes in amounts of one or more variables.

This method is used to determine the equation of the line of best fit by minimizing the sum of the squares of the vertical

When it has been established that a causal relationship exists in the data and that a linear function is appropriate the statistical technique known as least squares is frequently used to establish values for the coefficients a and b (representing fixed and variable cost respectively) in the linear cost function.

$$y = a + bx$$

where y is total cost – the dependent variable

and x is the agreed measure of activity – the independent variable

The values of a and b are determined after substituting data.

i) In the normal equation below.

$$\sum y = n a + b \sum x \dots\dots\dots(i)$$

$$\sum xy = a \sum x + b \sum x^2 \dots\dots\dots(ii)$$

ii) In the formulas below

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2} \quad a = \frac{\sum y - b \sum x}{n} \quad \text{or} \quad a = \bar{y} - b \bar{x}$$

When it has been established that a causal relationship exists in the data and that a linear function is appropriate the statistical technique known as least squares is frequently used to establish values for the coefficients a and b (representing fixed and variable cost respectively) in the linear cost function.

$$y = a + bx$$

Where y is total cost – the dependent variable and x is the agreed measure of activity – the independent variable

Characteristics of linear regression

1. It is objectively determined.
2. It makes use of all the data or observations
3. It minimizes the sum of squares of the error terms
4. If there is a linear relationship between the dependent and independent variable, this method gives the best predictions within the relevant range.

Illustration

The following table shows the number of units of a good produced and the total costs incurred.

Units produced	Total costs
100	40,000
200	45,000
300	50,000
400	65,000
500	70,000
600	70,000
700	80,000

Calculate the regression line for y and n .

Solution

Notes on the calculation

The calculation can be reduced to a series of steps as follows:-

Step 1:

Tabulate the data and determine which is the dependent variable, y, and which the independent x.

Step 2:

Calculate $\sum x$, $\sum y$, $\sum x^2$, $\sum xy$ (leave room for a column for $\sum x^2$ which may well be needed subsequently)

Step 3;

Substitute in the formation in order to find b and a in that order.

Step 4;

Substitute a and b in the regression equation.

The calculation is set out as follows, where x is the activity level in units of hundreds and y is the cost in units of sh.1, 000.

x	y	xy	x ²	
1	40	40	1	
2	45	90	4	
3	50	150	9	
4	65	260	16	
5	70	350	25	
6	70	420	36	
7	80	560	49	
28	420	1,870	140	n = 7

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

Try to avoid rounding at this stage since, although $n \sum xy$ are large, their difference is much smaller.

$$= \frac{(7 \times 1,870) - (28 \times 420)}{(7 \times 140) - (28 \times 28)} = \frac{13,090 - 11,760}{980 - 784} = \frac{1,330}{196} = 6.79$$

$$a = \frac{\sum y}{n} - \frac{b \sum x}{n} = \frac{420}{7} - \left(6.79 \times \frac{28}{7} \right) = 60 - 27.16 = 32.84$$

Therefore the regression line for y on x is:

$$y = 32.84 + 6.79x \quad (x \text{ in hundreds of units produced, } y \text{ in sh.1,000}).$$

(Always specify what x and y are very carefully)

This line would be used to estimate the total costs for a given level of output. If, say, 250 units were made we can predict the expected yield by using the regression line where $x = 2.5$.

$$y = 32.84 + 6.79 \times 2.5 = 32.84 + 16.975 = 49.815$$

i.e. we predict total costs of sh.49,815 for production of 250 units.

Using the regression line for forecasting

In the previous example, having found the equation of the line of best fit, we used this to forecast the total cost for a given level of activity.

The validity of such forecasts will be dependent upon two main factors.

- Whether there is sufficient correlation between the variables to support a linear relationship within the range of the data used.
- Whether the forecast represents an interpolation or an extrapolation

Illustration

The following data have been collected on costs and output:

Output (000s)	1	2	3	4	5	6	7
Costs (sh.000s)	14	17	15	23	18	22	31

Required;-

Calculate the coefficients in the linear cost function.

$$y = a + bx$$

Using

i) The Normal Equation and (ii) the coefficient formulae

Solution

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

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

i) Using the normal equations

$$\begin{aligned} 140 &= 7a + 28b \quad \text{.....I} \\ 624 &= 28a + 140b \quad \text{..... II} \end{aligned}$$

And eliminating one coefficient thus

$$\begin{aligned} 624 &= 28a + 140b \quad \text{.....I} \\ 560 &= 28a + 112b \quad \text{..... 1 x 4} \\ 64 &= 28b \end{aligned}$$

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

\therefore Regression line is $y = 10.86 + 2.26x$

ii) Using the coefficient formulae

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

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

When the coefficients have been calculated the cost function can be used for forecasting simply by inserting the appropriate level of activity i.e. a value for x , and calculating the resulting total cost.

For example, what are the predicted costs at output levels of:

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

$$y = 10.86 + 2.286 (4.5) = \text{sh. } 21,147$$

Note: A prediction within the range of the original observations (1 to 7 in Example 1) is known as an interpolation.

$$y = 10.86 + 2.286 (8) = \text{sh. } 29,148$$

Note: A prediction outside the range of original observations is known as an extrapolation.

REVISION QUESTIONS

QUESTION ONE

The management of Limuru Processing Company Limited wishes to obtain better cost estimates to evaluate the company's operations more effectively.

The following information is provided to you for analysis:

Year 2004	Equivalent production	Overheads
Month	Units ('000')	Sh.'000'
January	1,425	12,185
February	950	9,875
March	1,130	10,450
April	1,690	15,280
May	1,006	9,915
June	834	9,150
July	982	10,133
August	1,259	11,981
September	1,385	12,045
October	1,420	13,180
November	1,125	13,180
December	980	10,430

Additional information:

1. In November, the opening work in progress inventory contained 1,000,000 units that were 30% complete with respect to conversion costs.
2. During the same month of November, the manufacturing department transferred 1,500,000 units.
3. The closing inventory for the month of November was 1,200,000 units and the units were 30% incomplete with respect to conversion costs
4. Using the above information, you have obtained the following variables by applying simple regression analysis.

	Sh. '000'
Constant	3,709
Slope	6,487

Required:

- i) Use the high-low method to estimate the overhead cost function.
- ii) Use the regression method to determine the overhead cost function.
- iii) Compute the equivalent units of production with respect to conversion costs for the month of November using the FIFO method.

- iv) Use the regression function formulated in (ii) above to estimate the overhead cost for the month of November.

Solution:

i) Use the high-low method to estimate the overhead cost function

Highest cost (OHs) - 15,280 level of activity 1690

Lowest cost (OHs) - 9150 level of activity 834

$$\text{Range} = \frac{15,280 - 9,150}{1690 - 834} = \frac{6130}{856} = 7.16$$

$$Y = a + bx \quad \text{where } b = 7.16$$

$$Y = 15,280$$

$$\text{Therefore } 15,280 = a + 7.16 \times 1690$$

$$a = 15,280 - (7.16 \times 1690)$$

$$a = 3180$$

$$\text{Therefore } y = 3,180,000 + 7160x$$

ii) Use the regression method – determine the overhead cost function

$$y = a + bx \quad \text{where } a = 3,709,000$$

$$b = 6487$$

$$\text{Therefore } y = 3,709,000 + 6487x$$

iii) Equivalent units of production

Looking at the output side using FIFO method

		Completion %	Conversion
Opening stock (WIP)	1,000,000	70	700,000
Completely processed during production	500,000	100	500,000
Closing stock (WIP)	1,200,000		1,199,695
Equivalent units with respect to conversion costs			2,399,695

iv) Estimate on cost for the month of November

$$Y = 3,709,000 + 06487x \quad \text{where } x = 1125$$

$$\begin{aligned} \text{Therefore } y &= 3,709,000 + 6487 \times 1125 \\ &= 11,006,875 \end{aligned}$$

QUESTION TWO

- (a) Explain the advantages and disadvantages of the high-low method of cost estimation.
- (b) Central Machinery Ltd. is preparing its budget for the year ending 30 June 2004. For the fuel expenses consumption it is decided to estimate an equation of the form, $y = a + bx$, where y is the total expense at an activity level x , a is the fixed expense and b is the rate of variable cost.

The following information relate to the year ended 30 June 2003:

Month	Machine hours	Fuel Oil expense	Month	Machine hours	Fuel oil expense
2003	(Sh. '000')	(Sh. '000')	2004	(Sh. '000')	(Sh. '000')
July	34	640	January	26	500
August	30	620	February	26	500
September	34	620	March	31	530
October	39	590	April	35	550
November	42	500	May	43	580
December	32	530	June	48	680

The annual total and monthly average figures for the year ended 30 June 2003 were as follows:

	Machine hours	Fuel oil expense
	('000')	(Sh. '000')
Annual total	420	6,840
Monthly average	35	570

Required:

- Using the high-low method, estimate and interpret the fixed and variable cost elements of the fuel oil expense.
- Using the results in (i) above, predict the fuel oil expense for November 2004 if experience indicates that 41,000 machine hours will be used.
- Briefly explain any two limitations of High-low method of cost estimation that may be overcome by using simple linear regression analysis.

Solution:**(a) Advantages of high-low method**

- Method is easy to use
- Not many data are needed
- Visually it gives the general direction of the trend

Disadvantages

- Choice of the high and low points is subjective
- Method does not use all available data
- Cannot be used for more than one independent variable
- Not possible to defend the results statistically
- If the two points are outliers, the predictive equation will be wrong.
- Method may not be reliable

(b) (i) High-low method

	Machine hours Sh. '000'	Fuel oil expense Sh. '000'
High-point (June 2004)	48	680
Low-point (January, 2004)	26	500
Difference	22	180

Variable cost per machine hour = $\frac{180,000}{22,000}$
= Sh.8.182 per hour

Substituting for January 2004
 Variable costs (26×8.182) = 212,730
 Fixed cost (difference) 287,270
 500,000

Interpretation:

Within the relevant range, Sh.282,270 will be incurred irrespective of the machine hour usage of the unit i.e. 282,270 is fixed.

The total fuel consumption will thereafter vary at the rate of Sh.8.182 for each machine hour usage.

(ii) Fuel expense in November, 2004

= $287,264 + 8.182 \times 41,000$
= Sh.622,726

(iii) Limitations of high-low method

- Relies only on two data points – highest and lowest which may be outside and therefore not representative of the entire data set.
- The method does not use robust statistical techniques, to measure the predictive quality of the resultant function.

TOPIC 4

COST ACCUMULATION

DEFINITION

Cost accumulation is the use of an accounting system to collect and maintain a database of the expenses incurred by a business in the course of its operation.

The two main forms of cost accumulation are

- a) a job order system where direct materials, staffing and overhead costs are collected under assigned job number
- b) A process costing system where costs are maintained and associated with a particular cost center.

ACCOUNTING FOR MATERIALS AND INVENTORY

MATERIAL COSTING

Inventory consists of raw materials, W.I.P, consumer goods and spare parts etc.
Material costing entails the study of the inventory control systems of the items.

Stock costs

i) Purchase costs

Actual amount paid to the supplier of the stock item.

ii) Ordering costs

Costs of obtaining inventory Include

- a) Clerical and admin cost associated with purchasing and receiving goods.
- b) Transportation costs from supplier

iii) Holding costs

Are costs incurred as a result of keeping inventories of stores

It depends in quantities held may include:-

- a) Cost of storage and stores operation e.g. rent and storage spares, salaries for staff.
- b) Insurance costs – the higher the rate for inventory held the higher the premium.
- c) Cost of capital – opportunity cost of capital held in the stocks
- d) Risks of deterioration / deterioration cost.

iv) Stock – out costs.

Arises where stocks kept are low which may lead to the company not being able to satisfy demand since stocks are not enough

These costs include:-

- a) Lost contribution due to unrealized sales.
- b) Loss of future sales due to dissatisfied customers.
- c) Loss of goodwill
- d) Cost of production stoppage
- e) Extra cost of urgent orders.

v) Optimal stock level

Stocks held should be maintained at optimal levels to help regulate the GNL of costs due to problem of overstocking and undertaking.

This levels will help determine when the order, how much to order, the quantity to be held. These levels include:-

a) The re-order level

This is that point once reached and order was to be placed with the supplier. It is the quantity in stocks that goods will be ordered to avoid stock-outs. It is determined by considering the expected the expected demand during re-order or lead time.

This is the amount that will be consumed during the time for waiting for deliveries. It should satisfy the highest demand.

Recorder = max .consumption × max. Reorder period.

b) Maximum Stock level

The highest quantity of stock that can be held at any particular time .Stocks may not be allowed to go beyond this level.

Max. Stock Level = re-order level + orderquantity - (Minimum consumption × Min.re-order period)

c) Minimum stock levels

This is the lowest quantity of stocks that should be held. Stocks should not be allowed to fall below this level. Also known as buffer level

Max. Stock = re-order + re-order - (Normal × Normal)
Level level quantity consumption lead time

Reorder level = Maximum Consumption x Maximum Re-order period

$$280000 \times 5 = 1,400,000 \text{ units}$$

Minimum Stock Level = Re-order level (Normal cons. \times Normal lead-time)

$$1,400,000 - (200,000 \times 4) = 600 \text{ units}$$

Maximum Stock level = Reorder level + Qty. demanded – (Min stock \times Min. lead-time)

$$= 1,400,000 + 5,000 - (50,000 \times 3)$$

$$= 1,381,000 \text{ units}$$

STOCK VALUATION

In a period stocks are normally purchased at different price and for product costing purposes and profit determination stock have to be appropriately valued. This is because when stocks are transferred to the stores they lose their identity and the issue price may not be accurately determined because they are many in the store.

There are two systems of stock valuation i.e.

a) Periodic stock take system /physical stock takes

This involves actual counting, checking and verification of stock available in the stores at the end of the period. The stock will normally be determined after stock take to enhance accuracy, normally close down for the stock take exercise.

b) Perpetual / Continuous system

A transaction system where stock records are maintained as per transaction each receipt or issue of stock is recorded and stock records. Therefore readily available and this helps address the problem of overstocking/under stocking.

To enhance accuracy each stock item must have its own stock record where the transactions will be recorded. There are several methods which can be used to maintain records for valuation purposes. These methods have been discussed below.

1) First in first out (FIFO)

Accounting: Method of inventory valuation based on the assumption that goods are sold or used in the same chronological order in which they are bought. Hence, the cost of goods purchased first (first-in) is the cost of goods sold first (first-out). During periods of high inflation-rates, the FIFO method yields higher value of the ending inventory, lower cost of goods sold, and a higher gross profit (hence the higher taxable income) than that yielded by the last-in first-out (LIFO) method. The 'in' office basket is an illustration of FIFO method

Illustration

NyaliMbali Ltd. are retailers who sell ceramic tiles. During the months of July to September 2000, there were price fluctuations. Due to the above problem the company had to adjust its selling prices.

The following transactions took place during the period.

3 July	Opening stock was 5,000 tiles valued at Sh 825,000.
10 July	Orders placed with the company increased, so extra tiles had to be obtained from Mombasa. Therefore 22,000 tiles were purchased at a cost Sh 140 each but in addition, there was a freight and insurance charge of Sh 5 per tile.
31 July	During the month 20,000 tiles were sold at a price of Sh 220 each.
4 August	A new batch of 14,000 tiles was purchased at a cost of Sh 175 per tile.
30 August	The sales for the month of August were 14,000 tiles at a selling price of Sh 230 each.
1 September	A further 24,000 tiles were purchased at a cost of Sh 195 each.
30 September	270,000 tiles were sold during September at price of Sh 240 each.

The cost accountant of NyaliMbali Ltd decided he would apply first-in-first-out basis.

Required:

- (i) A stores ledger account using first-in-first-out method and showing stock values at 30 September 2000.

Solution**NyaliMbali Ltd****Stores Ledger Account for July to September 2000 (Using FIFO Basis)**

DATE	RECEIPTS			ISSUES			BALANCES		
Year 2000	Units	Cost/unit	Value (Shs)	Unit	Cost/unit	Value (Shs)	Units	Cost/unit	Value (Shs)
July 3							5000	165	825,000
July 10	22,000	145	3,190,000				22,000	145	3,190,000
							27,000		4,015,000
July 31	-	-	-	5,000	165	825,000			
				15,000	145	2,175,000			
				20,000		3,000,000	7,000	145	1,015,000
Aug 4	14,000	175	2,450,000				14,000	175	2,450,000
							21,000	-	3,465,000
Aug 30				7,000	145	1,015,000			
				7,000	175	1,225,000			
				14,000		2,240,000	7,000	175	1,225,000
Sept 1	24,000	195	4,680,000				24,000	195	4,680,000
							31,000		5,905,000
Sept 30				7,000	175	1,225,000			
				20,000	195	3,900,000			
				27,000		5,125,000	4,000	195	780,000
Totals	60,000		10,320,000	61,000		10,365,000			

Sales: 31 July: 20,000 x 220

4,400,000

30 August: 14,000 x 230

3,220,000

30 September: 27,000 x 240

6,480,000

14,100,000

2) Last in first out (LIFO)

Accounting: Method of inventory valuation based on the assumption that the goods purchased most recently (the last in) are sold or used first (the first out). The remaining items are assumed to have been purchased at successively-earlier periods. In this method, value of the inventory at the end of an accounting period is based on the value of items purchased earliest. During periods of high inflation rates, the LIFO method yields lower value of the ending inventory, higher cost of goods sold, and a lower gross profit (hence lower taxable income) than that yielded by the application of the first-in, first-out (FIFO) method. During prolonged inflationary periods, however, LIFO method can seriously understate the value of inventory because the cost of replacing it would be much higher than the value shown in accounts. The 'Out' office-basket is an illustration of LIFO method.

Illustration

The following information relates to item P003 stocked by 2000 products Ltd for the month of April 2012:

	Receipts	Issues	
Date	Units	Units	Unit cost (Sh)
April 3	2,400		18
4		3,200	
6	2,600		20
12		2,700	
14	3,000		22
18	2,800		21
20		2,200	
22	2,600		23
25		3,800	
26	3,100		24
27	2,500		25
28	3,200		26
29		6,900	

The closing balance for March 2012 was a batch of 3,000 units received at a unit price of Sh 19.

Required:

- Stores perpetual inventory record for item P003 for May 2012 under LIFO system of stores issues.
- Closing stock valuation.

Solution

(a)

2000 Products Ltd**Store Perpetual Inventory Record for item P0003 for April 2000 Using LIFO**

DATE	RECEIPTS			ISSUES			BALANCE		
Year 2000	Units	Cost/Unit	Value	Units	Cost/Unit	Value	Units	Cost/Unit	Value
April		Shs	Shs		Shs	Shs		Shs	Shs
1							3,000	19	57,000
3	2,400	18	43,200	-	-	-	2,400	18	43,200
							5,400		100,200
4	-	-	-	2,400	18	43,200			
				800	19	15,200			
				3,200		58,400	2,200	19	41,800
6	2,600	20	52,000	-	-	-	2,600	20	52,000
							4,800		93,800
12	-	-	-	2,600	20	52,000			
				100	19	1,900			
						53,900	2,100	19	39,900
14	3,000	22	66,000	-	-	-	3,000	22	66,000
							5,100		105,900
18	2,800	21	58,800	-	-	-	7,900	-	164,700
20	-	-	-	2,200	21	46,200	5,700	-	118,500
22	2,600	23	59,800	-	-	-	8,300	-	178,300
25	-	-	-	2,600	23	59,800			
				600	21	12,600			
				600	22	13,200			
				3,800		85,600	4,500	-	92,700
26	3,100	24	74,400	-	-	-	7,600		167,100
27	2,500	25	62,500	-	-	-	10,100		229,600
28	3,200	26	83,200	-	-	-	13,300		312,800
29	-	-	-	3,200	26	83,200			
				2,500	25	62,500			
				1,200	24	28,800			
				6,900		174,500	6,400	-	138,300
TOTALS	22,200	-	499,900	18,800		418,600			

c) Valuation of Closing Stocks

Units	Cost/Unit	Amount
	Shs	Shs
2,100	19	39,900
2,400	22	52,800
1,900	24	45,600
6,400		138,300

3) Weighted Average

Under this method the price of material issued is determined by computing the average price of all items held in stock.

The quantity for each batch are considered when calculating the average price, the average price is calculated by dividing the total cost of stock items held by the total quantities available.

$$\text{Weighted average price} = \frac{\text{Total cost of all items held in stock}}{\text{Number of stocks items available in store}}$$

Illustration

NyaliMbali Ltd. are retailers who sell ceramic tiles. During the months of July to September 2000, there were price fluctuations. Due to the above problem the company had to adjust its selling prices.

The following transactions took place during the period.

- 3 July Opening stock was 5,000 tiles valued at Sh 825,000.
- 10 July Orders placed with the company increased, so extra tiles had to be obtained from Mombasa. Therefore 22,000 tiles were purchased at a cost Sh 140 each but in addition there was a freight and insurance charge of Sh 5 per tile.
- 31 July During the month 20,000 tiles were sold at a price of Sh 220 each.
- 4 August A new batch of 14,000 tiles was purchased at a cost of Sh 175 per tile.
- 30 August The sales for the month of August were 14,000 tiles at a selling price of Sh 230 each.
- 1 September A further 24,000 tiles were purchased at a cost of Sh 195 each.
- 30 September 270,000 tiles were sold during September at price of Sh 240 each.

The cost accountant of NyaliMbali Ltd decided he would apply weighted average method

Required:

- (i) A stores ledger account using weighted average method and showing stock values at 30 September 2000.

Solution**NyaliMwali Ltd****Stores Ledger Account for July to September 2000 (Using the Weighted Average Approach)**

Date	RECEIPTS			ISSUES			BALANCES		
Year 2000	Units	Cost/ unit	Value (Shs)	Unit	Cost/ unit	Value (Shs)	Units	Cost/ unit	Value (shs)
July 3	-	-	-	-	-	-	5,000	165	825,000
July 10	22,000	145	3,190,000	-	-	-	22,000	145	3,190,000
							27,000	149	4,015,000
July 31	-	-	-	20,000	149	2,974,074	7,000	149	1,040,926
Aug 4	14,000	175	2,450,000	-	-	-	14,000	175	2,450,000
							21,000	-	3,490,926
Aug 30	-	-	-	14,000	166	2,327,284	7,000	166	1,163,642
Sept 1	24,000	195	4,680,000				24,000	195	4,680,000
							31,000	188	5,843,642
Sept 30	-	-	-	27,000	188	5,089,624	4,000	188	754,018
Totals	60,000		10,320,000	61,000		10,390,982			

4) Simple Average cost

The price of material issued is determined as an average prices existing in stocks. Quantities will not be considered when calculating average price.

Issued quantities reduces quantity of earlier purchases receipt once the issued quantity is more than the quantity in the patch, the price of the patch is removed from the existing prices.

$$\text{Average price} = \frac{\text{Total of Existing Price}}{\text{No of prices}}$$

Illustration

A company records the following transactions concerning the major products during the first quarter of the year 2012

Date	RECEIPTS Quantity	Price
January 2	2000	25
February 7	1000	27.50
March 25	1600	30
	ISSUES	
January 9	800	
February 14	800	
February 17	600	
March 9	400	
March 28	800	

Required:-

A stores ledger card using the simple average method

STORES LEDGER CARD USING SIMPLE AVERAGE METHOD

Date	Quantity	RECEIPT S Price/unit	Amount	Quantity	ISSUES Price/unit	Amount	Quantity	BALANCE S Amount
January 2	2000		50000	-	-		2000	
9	-	25	-	800	25	20000	1200	50000
February 7	1000	-	27500	-	-	-	2200	30000
	-	27.5	-	800	26.5	20800	1400	57500
14	-	-	-	600	26.5	15600	800	36700
	-	-	-	400	27.5	11000	400	21100
17	1600	-	48000	-	-	-	2000	9750
March 9	-	30	-	800	28.75	23000	1200	57750
		-						34750
25								
28								

Standard Cost Method

It is a predetermined cost at the beginning of the period.

All issues during the period will be valued at the standard price. The standard price will only consider the expected purchase price. If the expected purchase is expected to be 20.25 the standard price of 23/= can be set and this is the price of all issues

Illustration

Consider the following

January	Details	Units	Cost/Unit
4	Receipt	5200	80
6	Issue	4800	-
9	Receipt	4800	92
15	Issue	3600	-
16	Receipt	3600	96
17	Issue	2880	-
19	Issue	1920	-
23	Receipt	4800	104
25	Issue	1840	-
27	Receipt	3200	108
31	Issue	6000	-

The opening balance was 2000 units valued at sh.80 per unit

Required

Stores ledger card using standard price method if the standard issue price is sh.95

Solution

Date	Quantity	RECEIPT Cost/Unit	Amount	Quantity	ISSUE Cost/Unit	Amount	BALANCE Quantity	Amount
January 1	-	-	-	-	-	-	2000	160000
2	5200	80	416000	-	-	-	7200	576000
6	-	-	-	4800	95	456000	2400	120000
9	4800	92	441600	-	-	-	7200	561600
15	-	-	-	3600	95	342000	3600	219600
16	3600	96	345600	-	-	-	7200	565200
17	-	-	-	2880	95	273600	4320	291600
19	-	-	-	1920	95	182400	2400	109200
23	4800	104	499200	-	-	-	7200	608400
25	-	-	-	1840	95	174800	5360	433600
27	3200	108	345600	-	-	-	8560	739200
31	-	-	-	6000	95	570000	2560	209200

Special cases in stock valuation

1) Carriage Inwards

The cost of stock includes the purchases cost plus any other incidental cost incurred to bring stock to their current or saleable state which includes insurance of goods in transit.

2) Returns

a) Sales Returns / Returns in words

Sales are issues to production recorded on the issue side of the stocks ledger and therefore when returned should be recorded at the receipt side at the price issued.

b) Purchases Returns/ Return outwards

Purchases are recorded on the receipt side. The returns should be recorded on the issue column at the price purchases.

3) Losses

Stock losses if identified after stock counts should be adjusted so that the a/c reflects the actual quantity losses will be recorded on the issue column and valued consistently with the method in use.

INVENTORY CONTROL PROCEDURES

Major Types of Inventory Control Systems

There are two broad of inventory control systems, the Reorder Level and the Periodic Review systems. These systems are examined below but naturally many hybrid systems exist in practice and many variants of the basic types will be found.

Reorder Level System.

This system is also known as the two-bin system. Its characteristics are as follows:

- a) A predetermined re-order level is set for each item.
- b) When the stock level falls to the re-order level, a replenishment order is issued.
- c) The replenishment order quantity is invariably the EOQ.
- d) The 'two-bin' system comes from the simplest method of operating the system whereby the stock is segregated into two bins. Stock is initially drawn from the first bin and a replenishment order issued when it becomes empty.
- e) Most organizations operating the re-order level system maintain stock records with calculated re-order levels which trigger off the required replenishment order.

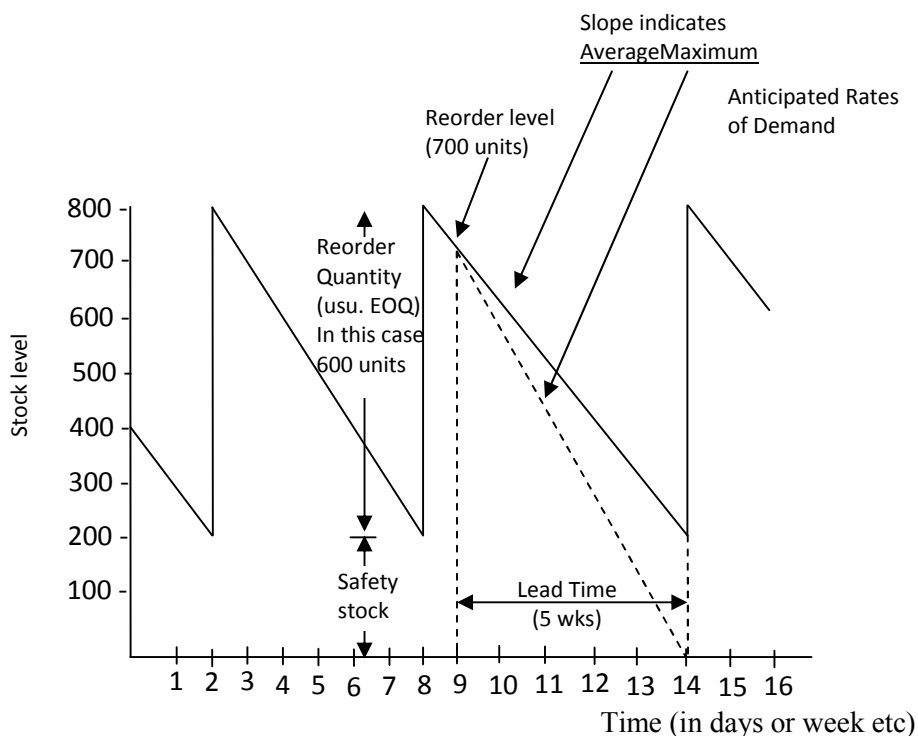
Basic Terminology

Brief definitions of common inventory control terms are given below

- a) Lead or procurement time. The period of time, expressed in days, weeks, months, etc. between ordering (either externally or internally) and replenishment, i.e. when the goods are available for use.
- b) Demand. The amount required by sales, production, etc. Usually expressed as a rate of demand per week, months or year. Estimates of the rate of demand during the lead time are critical factors in inventory control systems.
- c) Economic Ordering Quantity (EOQ) or Economic Batch Quantity (EBQ). This is a calculated ordering quantity which minimizes the balance of cost between inventory holding costs and reorder costs.
- d) Physical stock. The number of items physically in stock at a given time.
- e) Free stock. Physical stock plus outstanding replenishment orders minus unfulfilled requirements.
- f) Buffer Stock or Minimum Stock or Safety Stock. A stock allowance to cover errors in forecasting the lead time or the demand during the lead time.
- g) Maximum Stock. A stock level selected as the maximum desirable which is used as an indicator to show when stocks have risen too high.
- h) Recorder level. The level of stock at which a further replenishment order should be placed. The reorder level is dependent upon the lead time and the demand during the lead time.
- i) Reorder Quantity. The quantity of the replenishment order. In some types of inventory control systems this is the EOQ, but in some other systems a different value is used.

A Simple Stock Situation Illustrated.

The figure below shows a stock situation simplified by the following assumptions: regular rates of demand, a fixed lead time, and replenishment in one batch.



Notes:

- a) It will be seen from figure above that the safety stock in this illustration is needed to cope with periods of maximum demand during the lead time.
- b) The lead time as shown is 5 weeks, the safety stock 200 units, and the reorder quantity 600 units.
- c) With constant rate of demand, as shown, the average stock is the safety stock plus $\frac{1}{2}$ Reorder quantity, for example, in figure above the average stock is:
$$200 + \frac{1}{2} (600) = 500 \text{ units.}$$

Illustration

A simple manual reorder system illustrated.

The following data relate to a particular stock item.

Normal usage	110 per day
Minimum usage	50 per day
Maximum usage	140 per day
Lead time	25-30 days
EOQ (Previously calculated)	5000

Required;

Calculate various control levels

Solution

Using this data the various control levels can be calculated

$$\begin{aligned}\text{Re-order Level} &= \text{Maximum Usage} \times \text{Maximum Lead Time} \\ &= 140 \times 3 \\ &= 4,200 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{Minimum Level} &= \text{Re-order Level} - \text{Average Usage for Average Lead Time} \\ &= 4,200 - (110 \times 27.5) \\ &= 1,175 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{Maximum Level} &= \text{Re-order Level} + \text{EOQ} - \text{Minimum Anticipated Usage in Lead Time} \\ &= 4,200 + 5,000 - (50 \times 25) \\ &= 7,950 \text{ units}\end{aligned}$$

ECONOMIC ORDER QUANTITY (EOQ)

This is that quantity that is most economical to order. It is the quantity that minimizes the total inventory cost of holding and ordering.

It is that size of an order that gives the maximum consumption.

It is obtaining and maintaining inventory at optimal levels.

NB: purchase cost is part of inventory cost. However under EOQ purchase price is assumed to be constant irrespective of quantity ordered.

It is also assumed that the company will not experience stock out therefore the purchase cost and stock-out will be ignored under EOQ

To be able to calculate a basic EOQ certain assumptions are necessary.

- a) That there is a known, constant stockholding cost.
- b) That there is a known, constant order cost.
- c) That rates of demand are known and constant.
- d) That there is a known, constant price per unit, i.e. there are no price discounts.
- e) That replenishment is made instantaneously, i.e. the whole batch is delivered at once.

NOTE:

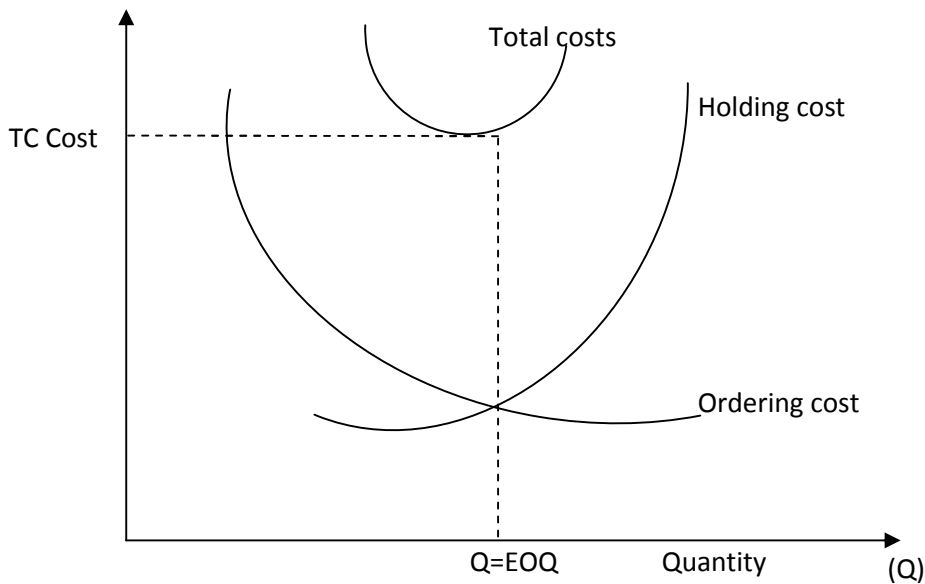
- a) It will be apparent that the above assumptions are somewhat sweeping and they are good reason for treating any EOQ calculation with caution.
- b) The rationale of EOQ ignores buffer stocks which are maintained to cater for variations in lead time and demand.

The EOQ Formula

It is possible, and more usual, to calculate the EOQ using a formula. The formula method gives an exact answer, but do not be misled into placing undue reliance upon the precise figure. The calculations are based on estimates of costs, demand, etc. which are, of course, subject to error. The derivation of the EOQ formula is given below;-

Derivation of EOQ model

a) Graphic method



Total cost will be minimized when:-

Holding cost = ordering cost

$$\frac{Q}{2} C_l = \frac{D}{Q} C_o$$

$$Q^2 = \frac{2DC_o}{C_l}$$

$$\text{Therefore EOQ model} = \left[Q = \sqrt{\frac{2DC_o}{C_l}} \right]$$

b) Calculus approach

Total cost = ordering cost + purchase costs + holding costs

$$TC = \frac{D}{Q} C_o + Dc + \frac{Q}{2} C_l$$

$$\text{FOC } \frac{\delta TC}{\delta Q} = -\frac{DC_o}{Q^2} + \frac{1}{2} C_l = 0$$

$$\frac{1}{2} C_l = \frac{DC_o}{Q^2}$$

$$Q^2 = \frac{2DC_o}{C_l}$$

$$= Q = \sqrt{\frac{2DC_o}{C_l}}$$

$$\text{SOC} = \frac{\delta^2 TC}{\delta Q^2} = \frac{2DC_o}{Q^3}$$

But $D, Co, Q \geq 0$

Thus $\frac{\delta^2 TC}{\delta Q^2} > 0$ (+ve)

TC is minimized when

$$Q = \sqrt{\frac{2DCo}{cl}}$$

Illustration

A company uses 50,000 widgets per annum which are sh.10 each to purchase. The ordering and handling costs are sh.150 per order and carrying costs are 15% of purchase price per annum, i.e. it costs sh.1.50 p.a. to carry a widget in stock (sh.10 x 15%).

To graph the various costs involved the following steps are necessary:

Where

Total Costs per annum = Ordering Cost per annum + Carrying Cost per annum.

Where

Ordering cost per annum = No. of orders × sh. 1.50

$$\text{No. of orders} = \frac{\text{Annual Demand}}{\text{Order Quantity}}$$

(For example, if the order quantity was 5,000 widgets,

$$\text{No. of orders} = \frac{50,000}{5,000} = 10$$

Ordering cost per annum = $10 \times \text{sh}150 = \text{sh}.1,500$

And

Carrying cost per annum = average stock level × sh. 15

$$\text{Average stock level} = \frac{\text{order quantity}}{2}$$

(For example if the order quantity is 5,000)

$$\text{Carrying costs p.a.} = \frac{5,000}{2} \times \text{sh. 1.15} = \text{sh. 3,750}$$

Based on the above principles, the following table gives the cost for various order quantities.

Column I	II	III	IV	V	VI
Order Quantity	Average No. of orders p.a.	Annual Ordering Cost	Average Stock	Stock Holding Cost p.a.	Total Stock
	50000 Col. I	Col. II x sh.150 Sh.	Col. I 2	Col. IV x £1.5 Sh.	Cols III + V Sh.
1,000	50	50×150=7,500	1000/2=500	500×1.5=750	7500+750=8,250
2,000	25	25×150=3,750	2000/2=1,000	1000×1.5=1,500	3750+1500=5,250
3,000	16 ² / ₃	16 ² / ₃ ×150=2,500	3000/2=1,500	1500×1.5=2,250	2500+2250=4,750
4,000	12 ¹ / ₂	12 ¹ / ₂ ×150=1,875	4000/2=2,000	2000×1.5=3,000	1875+3000=4,875
5,000	10	10×150=1,500	5000/2=2,500	2500×1.5=3,750	1500+3750=5,250
6,000	8 ¹ / ₃	8 ¹ / ₃ ×150=1,250	6000/2=3,000	3000×1.5=4,500	1250+4500=5,750

We have $C_o = \text{sh. } 150$; $D = 50,000$ widgets; $C_c = \text{sh. } 10 \times 15\% = \text{sh. } 1.50$ per widget.

$$\text{This gives EOQ} = \sqrt{\frac{2 \times 150 \times 50,000}{1.5}}$$

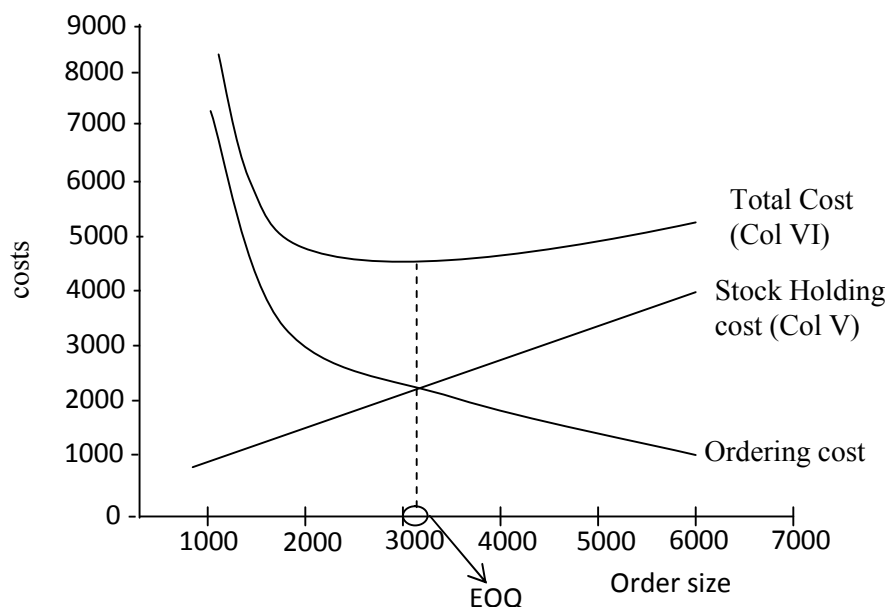
$$= \sqrt{10,000}$$

$$= 3162 \text{ widgets.}$$

Graphically

Table 1 Ordering and stock Holding Costs for various Order Quantities

The costs in Table 1 can be plotted in a graph and the approximate EOQ ascertained.



The figure above represents a Graph of data in the Table above

From the graph it will be seen that the EOQ is approximately 2,300 widgets, which means that an average of slightly under 16 orders will have to be placed a year.

Notes:

- From a graph closer accuracy is not possible and is unnecessary anyway.
- It will be seen from the graph that the bottom of the total cost curve is relatively flat, indicating that the exact value of the EOQ is not too critical.

Illustration

A company had annual demand of 800,000 units the purchase per unit is 80 while the cost of pressing are order is Sh.4,000. The annual inventory holding cost is 5% of the inventory value. Currently the company has been purchasing 20000 units time, they place an order.

Required;

- Calculate the total cost of current inventory policy
- Calculate the EOQ
- Calculate the cost savings if the company adopts EOQ policy

Solution

- Total inventory cost = ordering cost + purchasing + holding cost for stocks out cost.

$$TC = \frac{D}{Q}Co + DC + \frac{Q}{2}ch + \text{stockout cost}$$

$$= \left(\frac{800,000}{80,000} \times 4000 \right) + \left(\frac{80,000}{2} \times (5\% \times 80) \right) + (800,000 \times 80)$$

$$= 40,000 + 160,000 + 64,000,000 = 64,200,000$$

$$EQQ = \sqrt{\frac{2Dco}{ch}} = \sqrt{\frac{2 \times 800,000 \times 400}{4}} = 40,000 \text{ units}$$

- Cost selling = Total Cost using – Total Cost using
Current policy EOQ

$$T.C = \left(\frac{800,000 \times 4000}{40,000} \right) + (800,000 \times 80) + \left(\frac{40,000}{2} \times 5\% \times 100 \right)$$

$$= 64,160,000$$

$$\text{Cost saving} = 64,200,000 - 64,160,000$$

$$= \text{Sh}40,000$$

Economic Order Quantity in the Presence of Discounts

A company may qualify for quantity discounts if it purchases stock items in bulk. This will have an effect of rendering the effective purchase cost.

In determining whether the company should take advantage of quantity discount we compare the total cost of using the E.O.Q without discount and the total cost after taking the advantage of discount.

A particularly unrealistic assumption with the basic EOQ calculation is that the price per item remains constant. Usually some form of discount can be obtained by ordering increased quantities. Such price-discounts can be incorporated into the EOQ formula, but it becomes much more complicated. A simpler approach is to consider the costs associated with the normal EOQ and compare these costs with the costs at each succeeding discount point and so ascertain the best quantity to order.

Steps

1. Compute EOQ without discounts and hence use the EOQ to compute total costs.
2. Using the discounted purchase cost and more stock to qualify for it compute the total cost (C.
3. Compare the Total Cost in step 1 or 2 and make recommendations

Financial Effects of Discounts

Price discounts for quantity purchases have three financial effects, two of which are beneficial and one adverse.

- a) Lower price item.
- b) The larger order quantity means that fewer orders need to be placed so that ordering costs are reduced.

Adverse Effects

- a) Increased costs arise from the extra stockholding costs caused by the average stock level being higher due to the larger order quantity.

Illustration

EOQ with Discounts

A company buys 400 units of an item at the cost of Sh. 5000 at unit at an ordering cost of Sh 2000 at order. The carrying cost has been determined to be 20% of the costs of average cost. The company then received 2% discount offer for purchases of 100 or more unit.

Required;**Step I**

Determine the best inventory for these items.

$$EOQ = \frac{\sqrt{2Dco}}{Ch}$$

$$Ch = \frac{20}{100} \times 5000 = 1000$$

$$E.O.Q = \frac{\sqrt{2 \times 400 \times 2000}}{1000} = 40 \text{ Units}$$

$$T.c = \frac{Dco}{Q} + 2cb + \frac{Q}{2}Ch$$

$$\left(\frac{400}{40} \times 2000\right) + (400 \times 5000) + \left(\frac{40 \times 1000}{2}\right) = 2,040,000$$

Step II**Taking the discount**

$$C = 0.9 \times 5000 = 4900$$

$$Ch = 0.2 \times 4900 = 980$$

$$Q = 100 \text{ units}$$

$$Co = 2000$$

$$T.c = \frac{Dc}{Q} + Dc + \frac{Q}{2}Cl$$

$$T.c = \left(\frac{400}{100} \times 2000\right) + (400 \times 4900) + \left(\frac{100 \times 980}{2}\right) = 2,017,000$$

Step III

Recommendation – The Company should take advantage of the discount.

Illustration

Bora Supermarket carries on its operation in Nakuru Town. On annual basis, it orders 480,000 pens from a Nairobi based distributor. A packet of twenty four pens delivered to Bora's warehouse costs Sh.480 including transport charges. The supermarket borrows money from BCD Bank at an interest rate of 10% per annum to finance its inventories.

The supermarket also incurs Sh.1,500 to place an order for the pens and Sh.8 carrying costs for each pen

Required:

- i) Economic order quantity (EOQ) for the pens.
- ii) Total costs at the economic order quantity.
- iii) For orders of 72,000 pens and above, the distributor has offered a discount rate of 10% on the delivery price

Advise the management of the supermarket on whether to take advantage of the discount offer.

Solution

i) $D = 480,000$ pens

$$C = \frac{480}{24} = 20$$

$$C_o = 1500$$

$$Ch. = 8 + (10\% \times 20) = \text{Sh. } 10$$

$$EOQ = \frac{\sqrt{2Dco}}{Ch}$$

$$E.O.Q = \frac{\sqrt{2 \times 480,000 \times 1500}}{10} = 1,200 \text{ Units}$$

Total cost. = Purchase cost. + Ordering cost. + Holding cost

ii) Total cost = Purchase Cost + Ordering Cost + Holding Cost

$$\begin{aligned} E.O.Q &= 48,000 \times 20 + \frac{480,000}{12} \times 1,500 + \frac{1200 \times 10}{2} \\ &= \text{Sh } 9,720,000 \end{aligned}$$

iii) Advice to the management

$$P = 0.9 \times 20 = 18$$

$$D = 480,000$$

$$C = 18$$

$$Q = 7,200$$

$$Ch. = 8 + (10\% \times 18) = 9.8$$

$$\text{Total cost} = \left(\frac{480,000}{100} \times 18 \right) + \frac{480,000}{72} \times 1500 + \frac{72,000 \times 9.8}{2} = 9,002,800$$

$$\text{Difference} = \text{sh.}9,720,000 - 9,002,800 = \text{sh.}717,200$$

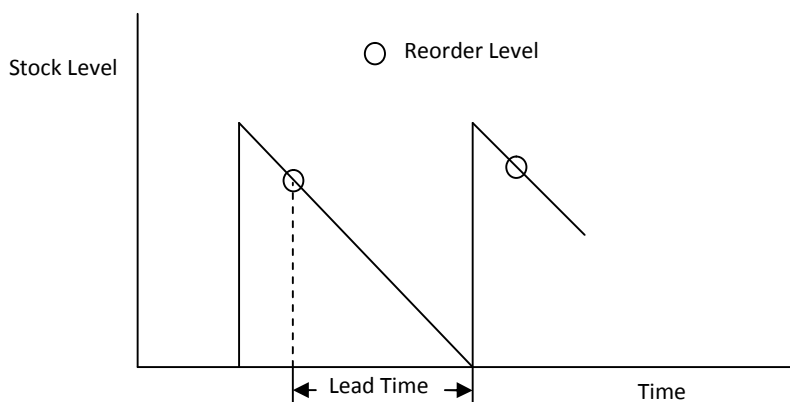
The company should take advantage of the discount because it is more economical

Safety Stock and Re-Order Levels

So far it has been assumed that the demand and the lead time have been known with certainty. In such circumstances the re-order level is the rate of demand times the lead time.

This means that regardless of the length of the lead time or of the rate of demand no buffer stock is necessary when there are conditions of certainty.

This results in a stock profile as follows:



Re-order level in conditions of certainty (no safety stock)

It will be seen from the graph above that, in conditions of certainty, the re-order level can be set so that stock just reaches zero and is then replenished. When demand and/or lead time vary, the re-order level must be set so that, on average, some safety stock is available to absorb variations in demand and/or lead time. In such circumstances the re-order level calculation can be conveniently considered in two parts:

- The normal or average rate of usage times the normal or average lead time (i.e. as the re-order level calculation in conditions of certainty) Plus.
- The safety stock.

Safety Stock Calculation by Cost Tabulation

The amount of safety stock is the level where the total costs associated with safety stock are at a minimum. That is, where the safety stock holding plus the stock-out cost is lowest. (It will be noted

that this is a similar cost situation to that previously described in the EOQ derivation). The appropriate calculations are given below based on the following illustration.

Illustration

An electrical company uses a particular type of thermostat which costs £5. The demand averages 800 p. a. and the EOQ has been calculated at 200. Holding costs are 20% p.a. and stock out costs have been estimated at sh.2 per item that is unavailable. Demand and lead times vary, but fortunately the company has kept records of usage over 50 lead times as follows:

(a) Usage in lead time	(b) Number of times Recorded	(c) Probability $\frac{b}{50}$
25-29 units	1	.02
30-34 units	8	.16
35-39 units	10	.20
40-44 units	12	.24
45-49 units	9	.18
50-54 units	5	.10
55-59 units	5	.10
Total	50	1.00

From the above the re-order level and safety stock should be calculated

Solution

Using the mid- point of each group calculate the average usage in the lead time.

x	t	tx
27	1	27
32	8	256
37	10	370
42	12	504
47	9	423
52	5	260
57	5	285
	50	2,125

$$\text{Average usage} = \frac{2125}{50} = 42.5$$

ECONOMIC BATCH QUANTITY (EBQ)

This is a model for manufacturing firms which produces component for use in the production of a finished product.

The production technology is such that the production rate of the component is higher than the usage rate. The balance of stock at the end of each day is put in storage facilities and it assumed to the max. Stock level at the end of the production

The components are these produced in batches. Production stop for some time then started again hence forth.

EBQ is the quantity to be produced per production run in order to minimize total cost model policy variables include:-

- i) Economic batch quantity
- ii) Length of production run
- iii) Max stock level
- iv) Length of the break between production runs
- v) Reorder level
- vi) Associated costs including
- vii) Variable cost of production
- viii) Holding cost of inventory items
- ix) Set-up costs i.e. cost of mobilizing production resources e.g. order of Rm.

Derivation of EBQ

Let R = set up costs per set up

S = Set up cost per set up

C = variable production cost per unit

Ch= Holding cost per unit per annum

i = Holding cost as a percentage of variable production costs per units

Ch = Ci

Q = economic batch quantity

P = production rate in units per day or any other period

U = usage rate in units per day or any other period

d = Length of production run in days or any other period

B = Length of the break between production runs

Then:

TC = Total variable production costs + set up costs + holding costs

$$TC = RC + \frac{R}{Q}S + \text{Average inventory} \times Ci$$

$$\text{But average inventory} = \frac{\text{Maximum stock level}}{2}$$

$$\text{Maximum stock level} = (P-U)d^2$$

$$d = Q/P$$

$$\text{Therefore maximum stock level} = (P - U) \frac{Q}{P} \text{ or } \left(1 - \frac{U}{P}\right) Q$$

$$\text{Therefore average inventory} = \frac{\left(1 - \frac{U}{P}\right) Q}{2}$$

$$TC = RC + \frac{R}{Q} S = \frac{Q}{2} C_l \left(1 - \frac{u}{P}\right)$$

$$\text{FOC } \frac{\delta TC}{\delta Q} = \frac{-RS}{Q^2} + \frac{1}{2} C_l \left(1 - \frac{U}{P}\right) = 0$$

$$= \frac{1}{2} C_l \left(1 - \frac{U}{P}\right) = \frac{RS}{Q^2}$$

$$Q^2 = \frac{2RS}{Cl\left(1 - \frac{U}{P}\right)}$$

$$EBQ = \sqrt{\frac{2RS}{Ch\left(1 - \frac{U}{P}\right)}}$$

Illustration

ABC Ltd manufactures components X for use in an assembly the usage rate of the component is lower than the production rate.

The following data has been used for the components.

Production rate = 4000 Units per day

Usage rate = 1200 unit

Inventory holding cases = Sh. 20 @ unit @ annum

Unit variable production costs = Sh. 2000

Set-up cost = Sh. 110,000

Acquisition lead time = 10 Working days

Days in a year = 250 working days

Required;-

Formulate the best inventory policy for component X

Solution

Inventory Policy

$$1) \quad EBQ = \sqrt{\frac{2Rs}{Cl(1-u/p)}} = \sqrt{\frac{2 \times 300,000 \times 110,000}{200(1-1200/4000)}} = \text{Sh } 68,660.65 \text{ Units}$$

$$2) \quad \text{Length of production run}$$

$$d = \frac{Q}{P} = \frac{68,660}{4000} = 17 \text{ days}$$

- 3) Max. stock level = $(p-u) d$
 $(4,000 - 12,000) 7$
 436,000 Units
- 4) Length of break = $\frac{\text{Max stock level}}{\text{Usage rate}} = \frac{47,600}{1,200} = 29 \text{ days}$
- 5) Re-order level = Usage during lead time
 = Usage rate \times lead time
 = $1,200 \times 10$
 = 12,000 Units
- 6) Total costs = Set-up cost + Production cost + Holding cost
 $= \frac{R}{Q} s + RC + \frac{Q}{2} CL (1 - u/p)$
 $= (300,000 \times 110) + (20 \times \frac{68,660}{2}) + 20 \left(1 - \frac{1,200}{4,000}\right)$
 = Sh33,686,614

Assumption of EBQ

- 1) The annual requirements are assumed to be constant.
- 2) The variable production cost are assumed to be constant
- 3) The holding cost are assumed to be constant
- 4) The usage rate in units per day and the production rate in units per day to be constant.
- 5) They are assumed to be no stock out hence no stock out cost

BACK FLUSH

Back-flush accounting is a costing short-cut. It relies on businesses having immaterial amounts of work-in-progress and it is therefore particularly suitable for businesses operating just-in-time inventory management. If the amount of work-in-progress is negligible, what is the point in meticulously valuing it? Fretting that some products might be 25% complete and others 60% complete, and then adding carefully calculated labour and overheads to these (immaterial) items is a complete waste of time and effort. That type of accounting is perhaps the modern-day equivalent of alleged ancient arguments about how many angels could dance on the point of a needle.

In back-flush accounting costs are not associated with units until they are completed or sold. Back-flush accounting is sometimes called delayed costing, which is a helpful name, as costs are not allocated to production until after events have occurred.

Standard costs are then used to work backwards to flush out manufacturing costs into production, splitting them between stocks of finished goods (if any) and cost of sales. No costs, whether material or conversion costs, are allocated to work-in-progress.

Basically, back flush accounting is when you wait until the manufacture of a product has been completed, and then record all of the related issuances of inventory from stock that were required to create the product. This approach has the advantage of avoiding all manual assignments of costs to products during the various production stages, thereby eliminating a large number of transactions and the associated clerical labor.

Back flush accounting is entirely automated, with a computer handling all transactions. The back flushing formula is:

$$\begin{aligned} & \text{Number of units produced} \times \text{unit count listed in the bill of materials for each component} \\ &= \text{Number of raw material units removed from stock} \end{aligned}$$

Backflushing is a theoretically elegant solution to the complexities of assigning costs to products and relieving inventory, but it is difficult to implement. Backflush accounting is subject to the following problems:

- ***Requires an accurate production count.*** The number of finished goods produced is the multiplier in the backflush equation, so an incorrect count will relieve an incorrect amount of components and raw materials from stock.
- ***Requires an accurate bill of materials.*** The bill of materials contains a complete itemization of the components and raw materials used to construct a product. If the items in the bill are inaccurate, the backflush equation will relieve an incorrect amount of components and raw materials from stock.
- ***Requires excellent scrap reporting.*** There will inevitably be unusual amounts of scrap or rework in a production process that are not anticipated in a bill of materials. If you do not separately delete these items from inventory, they will remain in the inventory records, since the backflush equation does not account for them.
- ***Requires a fast production cycle time.*** Backflushing does not remove items from inventory until after a product has been completed, so the inventory records will remain incomplete until such time as the backflushing occurs. Thus, a very rapid production cycle time is the best way to keep this interval as short as possible. Under a backflushing system, there is no recorded amount of work-in-process inventory.

Back flushing is not suitable for long production processes, since it takes too long for the inventory records to be reduced after the eventual completion of products. It is also not suitable for the production of customized products, since this would require the creation of a unique bill of materials for each item produced.

The cautions raised here do not mean that it is impossible to use backflush accounting. Usually, a manufacturing planning system allows you to use backflush accounting for just certain products, so you can run it on a compartmentalized basis. This is useful not just to pilot test the concept, but also

to use it only under those circumstances where it is most likely to succeed. Thus, backflush accounting can be incorporated into a hybrid system in which multiple methods of production accounting may be used.

ACCOUNTING FOR LABOUR

Labour costing

Entails analysis of labour related costs, labour remuneration, and recording of labour costs to products

It entails an analysis of the cost of purchasing labour hours and employees services rendered to an organisation and other cost related to labour. Categories include:-

- i. Direct labour
- ii. Indirect labour

Direct labour

Refers to employees engaged in the production process and are the ones who make the products. Their cost form part of direct cost of production e.g. machine operators in a factory etc.

Indirect labour

Refers to employees not engaged in direct production, they support the process. Their costs do not form part of labour cost of production and treated as production overhead e.g. indirect employees in the office.

Labour related costs

It may not include actual pay but also other indirect cost related to the organization labour cost includes:-

- 1) Cost of labour turnover
- 2) Cost of idle time
- 3) Cost of fraud in payroll.

WAGES ALLOCATION

Gross rate represents the total pay to an employee however the entire amount paid to direct workers is to be part of costs for part of product cost purposes because some elements of gross rate will be treated as labour costs. The elements have been discussed below;-

1. Basic wage

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 **Earnings = Output (units) x 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.

- i) Differential piece rate
- ii) Straight piece rate with a guaranteed minimum pay
- iii) Straight piece rate

i) 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

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

ii) 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.

iii) 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.

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 contains 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;

Total earnings = Basic rate per hour × 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

= Shs100 per hour x 200 hours

= Shs20,000

LABOUR COSTS

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

2. 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.

3. 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 output 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

4. 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.

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

Illustration

Patanisho Quarry Ltd remunerates its casual workers based on each day's work. Workers are graded into various efficiency bands after training and then paid a fixed sum according to efficiency bands as follows.

Efficiency band	Wage rate per week
%	Sh.
81-90	800
91-100	900
101-110	1,000
111-120	1,100

Additional information;

- Workers are guaranteed of their fixed pay within their efficiency bands irrespective of the output achieved.
- A wage rate of Sh. 700 per week is paid for efficiency levels below 81%.
- Any excess units of production beyond the upper efficiency band limit are paid at Sh. 5 per unit.
- A 100% efficiency level repressing 1,200 units per week.
- The data for a four-week period for three workers in a given time was as follows:

Worker	Efficiency band %	Weeks			
		1 Units	2 Units	3 Units	4 Units
1	81-90	1,210	860	1,280	1,330
2	101-110	1,220	1,240	1,190	1,250
3	11-120	1,500	1,540	1,390	1,460

Required;

Total earnings for each of the three workers for the four-week period

Solution**Patanisho Quarry Ltd****Total earnings for each of the three workers for four week period**

Efficiency band %	Wage rate Per week Sh		Expected Units to be produced Sh
≤ 81	700	$\frac{1,200}{100} \times 80$	960
81-90	800	$\frac{1,200}{100} \times 90$	1,080
91 – 100	900	$\frac{1,200}{100} \times 100$	1,200
101 – 110	1,000	$\frac{1,200}{100} \times 110$	1,320
111 – 120	1,100	$\frac{1,200}{100} \times 80$	1,440

2)

	Week 1 Bonus	Week 2 Bonus	Week 3 Bonus	Week 4 Bonus	Total
W1 81-90	1,210-1,080 = 130 130×5 650	- - -	1,280-1,080 200×5 1,000	1,330 – 1,080 250 × 5 1,250	3,900
W2: 101 -110	0 0 0	0 0 0	0 0 0	0 0 0	0
W3: 111-120	1,500 – 1,440 60×5 300	1,540-1,440 100×5 500	- - -	1,460-1,440 20×5 100	900

Total earnings = Basic Wage + Bonus

Worker 1 = [(800 x 3) + 700] + 3,900 = shs .6, 000

Worker 2 = (1,000 x 3) + 900 = shs. 3,900

Worker 3 = (1,100 x 4) + 900 = shs .5,300

5. 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.

The overtime premium treatment depends on the cause of overtime.

- If it is normal to work overtime due to general increase in production overtime premium is treated as indirect wage and charged to production. This will help ensure that units completed during normal time units completed during overtime carry the same unit cost.
- If overtime is as a result of customer's request it should be charged to the customer i.e. overtime premium will be treated as part of wages for units produced by the customers.

NB: Overtime cost by abnormal conditions e.g. shortage of materials, machine breakdown is at premium should be expensed transferred to P& L statement

6. Shift Premium

Additional amount paid to an employee for working in a different shift i.e. working night shift instead of day shift.

It is treated as indirect wage and transferred to over debt cost.

7. Idle time Premium

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.

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

PAY OF INDIRECT WORK

Represents pay for hours worked on other jobs. The amount should be treated as an indirect wage for the job in consideration. It should be charged as a job or a/c for in as an O/H cost.

An incentive paid to employee to recognize the employees' efforts during production. For individual bonus, it will be a/c as part of direct wages since it can be identified as an effort for particular job.

For group bonus the bonus is treated as an indirect wage cost since individual efforts cannot be identified and also amount is paid to the entire group.

Indirect workers' pay

Pay to indirect workers e.g. cleaners, supervisors should be treated as indirect wage. However if they happen to participate in production the pay for time at production will be treated as direct wage.

Illustration

Zawadi Ltd is a small company which manufactures a range of plastic commodities.

In order to manufacture a lunch box, the following five manual processes are required:

Process	Time required per lunch box Minutes	Wage rate per hour(sh.)
1	15	65
2	25	50
3	10	40
4	30	35
5	20	30

The weekly production target is 7,200 lunch boxes packed in cartons each containing twelve lunch boxes.

The company's working week has 40 hours.

Required;-

1. Number of casual workers required for each of the processes
2. Labour cost incurred per week to manufacture 7,200 lunch boxes.

Solution**(i) Number of casual workers required for each processes.**

$$1. \quad 15 \times 7200 = 108000 \text{ Min} = 1800 \text{ hrs} \\ \frac{60}{60} \\ = 45 \text{ workers}$$

$$2. \quad 25 \times 7200 = 180,000 = 3000 \text{ hrs.} \\ = 3000 = 75 \text{ workers} \\ 40$$

$$3. \quad 10 \times 7200 = 72000 = 1200 \text{ hrs.} \\ 60 \\ = 1200 \text{ hrs} \\ 40 = 30 \text{ workers}$$

$$4. \quad 30 \times 7200 = \frac{21600}{60} \text{ min} = 3600 \text{ hrs.} \\ = \frac{3600}{40} = 90 \text{ workers}$$

$$5. \quad 20 \times 7200 = \frac{144000}{60} \text{ Min} = 2400 \text{ hrs.} \\ \frac{2400 \text{ Hrs}}{40} = 60 \text{ workers}$$

ii) Labour cost

$$\begin{aligned} \text{Process} = & 1800 \times 65 = 11700 \\ & 3000 \times 50 = 150000 \\ & 1200 \times 40 = 48000 \\ & 3600 \times 35 = 12600 \\ & 2400 \times 30 = 70,000 \end{aligned}$$

$$\text{Total labour cost} = 513000$$

C	Hrs.	Normal	Over	Std.	Time	Time.
Employee	Worked	Time	Time	Time	Taken	Saved
Moraa	45	42	3	63	45	18
Mogaka	42	42	-	51	39	12

- i) Basic Pay = Time worked x Rate/hrs.
 Moraa = $42 \times 400 = 16,800$
 Mogaka = $42 \times 400 = 16,800$
- ii) Overtime pay = Overtime x Overtime rate/hr
 Moraa = $3 \times 400 \times 1 \frac{1}{3} = 1,600$
- iii) Bonus = Time saved x Rate x Hr x 50%
 Moraa = $18 \times 400 \times 50\% = 3,600$
 Mogaka = $12 \times 400 \times 50\% = 2,400$
- iv) Gross wages = Basic pay + Overtime pay + Bonus
 Moraa = $16,800 + 1,600 + 3,600 = 22,000$
 Mogaka = $16,800 + 2,400 + 0 = 19,200$
- v) Cost per flower pot moulded
 Moraa: Basic $42 \times 400 = 16,800$
 Bonus = 3,600
 20,400
 Units produced = $189 - 6 = 183$
 Cost per unit = Total direct wages = 20,400
 Output units 183
 = sh.111.50 per unit
 Mogaka Basic = $39 \times 400 = 15,600$
 Bonus 2,400
 18,000
 Units paid = $204 - 4 = 200$
 Cost per day = 18,000
 200
 = Sh. 90/unit

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.

INCENTIVE SCHEMES

Employees do not put extra efforts if there is no reward for their efforts. Employers reward workers in a direct proportion to work accomplished.

In these schemes, workers can earn more if they produce more output and therefore get incentives to make them produce more.

Grouped into the following categories

- 1) Direct financial plans
- 2) Indirect financial plans
- 3) Plans other than financial

1) Direct financial plans

Are schemes whose compensation is in direct proportion to output efforts.

Compensation of a worker is determined either individually or in a group.

A scheme whose compensation is based on individual performance is known as individual incentive scheme and where it is made with reference to a group working together is known as group incentive scheme.

Individual /Premium Bonus Scheme

Are schemes based on individual efforts and thus they provide greater incentive to an individual effort when compared to group schemes.

The higher the effort, the higher the incentive

It is easier to measure performance since work is individual based. Schemes include:-

Rowan scheme

- a) *David Rowan* of Glasgow (U.S.A) introduced the scheme, under which time wage is guaranteed as in the case of Halsey scheme. For the performance of a job, standard time is fixed; otherwise operation or task is exactly in the same manner as in the case of Halsey scheme. For the hours of his actual work, the worker gets his time wage; on this point also it doesn't differ from the Halsey scheme. The bonus of the worker, who is able to finish the job in less than the allowed time, is equal to his time wage for that proportion of the time taken as the saved time bears to the time allowed. In other words, the ratio between the bonus & the time saved is equal to the ratio between the time taken & the time allowed.

$$\text{i.e., Bonus Hours} = \frac{\text{Time Taken}}{\text{Time Saved}} \times \text{Time Allowed}$$

$$\text{Or Bonus hours: Time Saved:: Time Taken: Time Allowed}$$

Advantages

- a) Because the premium is proportionate to the time saved, if the rate has been wrongly fixed, the effect will be less serious. So Rowan scheme is safer than the Halsey scheme, as far as the point of view of employer is concerned.
- b) The worker is in the most advantageous position when 50% of the time allowed is saved by him, because otherwise his earning per hour will increase at a diminishing rate, if any more time is saved by him. As a result, the chances of wastage, defectives, breakdown etc. will be less as there is a limit to speed.
- c) Fixed overhead per unit will be lower as a result of higher output.
- d) Since both the employer & the employee enjoys the time saved; though proportion is not the same as in the case of the Halsey scheme, to some extent labour cost also diminishes.
- e) Better wage is earned by the employees; their improvement in efficiency is rewarded.

Disadvantages

- a) The workers do not like the idea of sharing the savings by both employer & employee, since the time is saved by the workers. The bonus hours will not exceed the 25% of the time allowed in any case.
- b) Apart from workers efficiency, saving of time depends upon standard of tools, materials & implements & also upon the working conditions. No useful purpose will be served unless the best of these are assured.

Purpose of Rowan Premium Bonus Scheme:

- An incentive scheme to reward direct labor for saving time during the production process
- This method rewards the production worker with a proportion of the time saved

Illustration

Mr. A is being paid sh.9 per hour. The time allowed to complete a task is 12 hours. The actual time taken by Mr. A to complete the task is only 8 hours

Required;

Compute the gross pay of Mr. A after completing the task.

Solution

Mr. A's gross pay

$$= (8 \text{ hours} \times \text{sh.}9) + (\text{Time taken/Time allowed} \times \text{Time saved} \times \text{Rate per hour})$$

$$= (8 \text{ hours} \times \text{sh.}9) + (67\% \times 4 \text{ hours} \times \text{sh.}9)$$

$$= \text{sh.}96.12$$

$$A = \text{Time Wages} - 7875$$

$$\text{Bonus} = 7875$$

$$B. \text{ Time wages} - 8640$$

$$\text{Bonus} - 3/50 \times 8640 = 345.6$$

$$C = 50 \times 185 = 9250$$

$$\text{Bonus } 2/60 \times 9250 = 308.33$$

Halsey bonus scheme (50/50)

F.A. Halsey of the U.S.A. introduced this scheme.

Under this scheme, for performing a job, operation or task, a standard time is specified.

The hourly rate is fixed & the workers are guaranteed so that even if, within the standard time specified, the job is not completed by them, guaranteed time rate may be received by them.

The worker becomes entitled to bonus, if he is in a position to complete the job in less than the specified time; bonus being equal to his time wage for 50% of the time saved in addition to the time wage which he is entitled for the actual time worked.

The total earning is obtained by multiplying the sum of time allowed & time taken by half the hourly rate.

Advantages:

- a) The scheme & the calculation of the remuneration are easily understandable by the worker.
- b) As time wage is guaranteed, penalty is not imposed on the slow workers; whereas rewards are provided to the slow workers for their efficiency.
- c) The workers are encouraged to save as much time as possible due to the bonus, because for the higher time saved bonus will be higher.
- d) Employers are enabled to obtain more output from the workers under the scheme, & as a result of that, per unit fixed overhead get diminished.

Disadvantages:

- a) Since the employers & employees share the savings in time, this may not be liked by many employees' organizations & they argue that the workers should get the entire benefits as the savings is done by them.
- b) Compared to the other incentive plans, the workers are being offered less incentives under this scheme.
- c) Apart from the workers, savings in time also depends upon the tool's standards, materials, and machinery & working conditions. So the desired result cannot be expected unless the best of these are assured.
- d) Chances of more spoilage, wastage, defectives & breakdown of machinery are there under this scheme, as for the purpose of maximizing the bonus, the workers will try to save as much time as possible. As a result, greater supervision cost has to be involved.

ILLUSTRATION

Employees Adam Smith and John are each assigned a job and they each take 3, 2.5 and 2 hours respectively to complete the job. The time rate is sh.40 per hour and the time allowed for each job is 3 hours.

Required

- a) Using the Halsey plan calculate the total earnings of each employee
- b) Calculate the effective hourly rate of pay

Solution**a)**

	Adam	Smith	John
Time allowed	3	3	3
Time taken	3	2.5	2
Time saved	-	0.5	1

Total earnings = 50% × Time saved × Time taken

$$\text{Adams} = (50\% \times 0) + 3 \times 40 = 120$$

$$\text{Smith} = (50\% \times 0.5 \times 40) + 2.5 \times 40 = 110$$

$$\text{Johns} = (50\% \times 1 \times 40) + (2 \times 40) = 100$$

b) Effective hourly rate of pay

$$\text{Adams} = \frac{120}{3} = \text{sh.}40$$

$$\text{Smith} = \frac{110}{2.5} = \text{sh.}44$$

$$\text{Johns} = \frac{100}{2} = \text{sh.}50$$

Halsey weir (33 1/3)

Under the Halsey-Weir scheme, a worker is entitled to bonus which is equal to his time wage for 33 1/3% (often 30%) of the time saved; instead of 50% in case of the Halsey scheme. Thus except the above, there is no difference between the Halsey scheme & the Halsey-Weir scheme.

Illustration

Calculate the total earnings of a worker & the effectively rate of labour wages per hour where payment of bonus is under (a) the Halsey (50%) scheme & (b) the Rowan scheme from the below mentioned particulars:

Basic wage rate per hour – shs.10.80, Time allowed for the job – 48 hours, Actual time taken – 36 hours.

Solution**(a) Under Halsey (50%) Scheme**

Total wages = Normal time wage + 50% of (time saved × time rate)

Normal time wage	= 36 hours @ shs.10.80 =	Shs. 388.80
Bonus =	50% of (Time saved × time rate) = 50%	64.80
Total Wages	(12 × 10.80)	453.60

Effective hourly rate = shs. 453.60/36 = shs.12.60

Alternatively

Total wages = (Time taken+50% of time saved) ×time rate

$$= (36 \text{ hours} + 50\% \text{ of } 12) \times \text{shs.}10.80 = \text{shs.}453.60$$

(b) Under Rowan Scheme:

Total wages = Normal time wage + Time saved ×Time taken×Time rate
Time allowed

Normal time wage	36 hours @ Shs.10.80	Shs. 388.80
Bonus	=Time saved ×(Time taken×Time rate) Time allowed = $12 \times (36 \times 10.80)$ 48	97.20 486.00

Effective hourly rate = shs.486.00/36 = shs. 13.50

Alternatively;

Bonus as a percentage of Time rate = (Time saved/Time allowed)×100
= $(12/48) \times 100 = 25\%$

Bonus = 25% of shs.10.80 = shs. 2.70

Bonus as a fraction of time rate = (Time saved/Time allowed)×Time rate
= $(12/48) \times 10.80 = \text{shs.}2.70$

Effective hourly rate for time taken = shs.10.80+shs.2.70 = shs.13.50

Total Wages = 36 hours×shs.13.50 = shs.486

Illustration

40 hours is taken by a worker to do job for which time allowed is 50 hours. \$. 1.25 per hour is his daily rate. Calculate the works cost of the job under the following methods of payment of wages:

(i) Time rate; (ii) Piece rate; (iii) Halsey plan &(iv) Rowan plan.

Additional information: (i) Material cost \$.60; (ii) Factory overhead 125% of wages

Solution: Calculation of wages under different methods:

i) Time Rate: Wages for 40 hours (actual time taken) @ shs. 1.25	=	50.00
ii) Piece Rate: Wages for 50 hours (time allowed for the job) @ shs. 1.25	=	62.50
iii) Halsey Plan: Normal time wage = 40 hours @ shs.1.25	=	50.00
Bonus=50% of (Time saved× Time rate) =50% of (10×1.25)	=	6.25
		Shs. 56.25

iv) **Rowan Plan:** Normal time wage = 40 hours @ shs.1.25 = 50.00

$$\text{Bonus} = \frac{\text{Time saved}}{\text{Time allowed}} \times (\text{Time taken} \times \text{Time rate})$$

$$= \frac{10}{50} \times (40 \times 1.25) = 10.00$$

Shs. 60.00

Grant bonus scheme

In these schemes, employers are rewarded on the basis of efforts applied.

In differential piece work system effort is met by use of graduated rate of payment per unit.

Higher attract higher rates per unit. The other schemes are based on time and their incentive is a share of gains based on employer efforts. The incentive in the aggregate proportion from financial gain of employees effort arising as a result of reduced time on production. Each job or work issued has its own time set and if the employees work for less time he sales on standard time.

The financial adv. from time saved is shared between employee and employer based on agreed proportion.

Incentive = Agreed proportion of time saved x Rate per hour

Time saved = Standard time – Actual time worked.

Group Bonus Scheme

Where individual schemes are not applicable group bonus schemes may be applied, these schemes are appropriate where production is done by a group of employees working together as a team e.g. construction of motor vehicle assembly.

It is difficult to measure individual performance and bonus will be paid to the group. It would be shared equitably by members of the group e.g. it can be shared in proportion to their wage level or time taken by employees on the job.

Group wages are treated as indirect wages.

Illustration

A factory issues a job to two employees, Mark and Markus, paid at the rate of sh.210/hr. and sh.220/hr. respectively. Mark is issued with 400 containers and it takes twelve minutes to produce each. Markus is issued with 240 containers and it takes nine minutes to produce each.

For every hour saved a bonus is paid at the rate of 60% of bonus rate which is sh.240/hr. The factory works 42 hours week and overtime and overtime is paid at the rate of time and one third. At the end of the week Mark and Markus clock cards shows 54 and 50 hours respectively and the work complete. However Mark worked 4 hours on the indirect job given that week. However, 40 and 60 containers of Mark and Markus fail to pass inspection due to faulty materials. It was agreed to credit all output for bonus purposes.

Required;

- i) Bonus due
- ii) Total gross wage due
- iii) Direct wages cost/containers passing inspection. Overtime is worked regularly throughout the year as company policy due to labour shortage

Solution

	Mark	Markus
Expected units	400	640
Expected time	80hrs.	96hrs.
Amount payable	Sh210	sh220
Actual hours	54	50
Time saved	26	46

Bonus due:	
Mark	$26 \times 200 \times 60\% = \text{Sh.}3,120$
Markus	$46 \times 200 \times 60\% = \text{sh. } 5,520$
Total Gross:	
Mark	$3,120 + (42 \times 210) + (12 \times 280) = \text{sh. } 15,300$
Markus	$5,520 + (42 \times 220) + (8 \times 293) = \text{sh}17,104$
Direct Wages:	
Mark	$15,300 - 4 \times 11/3 \times 210 = \text{sh. } 39.39$
	$400 - 40$
Markus	$17,104 = \text{sh}29.49$
	$640 - 60$

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.
- iv) This will motivate the employees to be more efficient since they benefit from the gains made.
- v) The method of calculating the bonus should be known and acceptable to the employees
- vi) 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.

Disadvantages of group bonus schemes

- 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.

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.

MAINTENANCE OF LABOUR RECORDS

Labour costs are accumulated by various departments. These departments are;-

- i) Personnel department
- ii) Production planning department
- iii) Time keeping department
- iv) Wages department

(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.

ACCOUNTING FOR OVERHEADS

OVERHEAD COSTING

Overheads are any cost not directly attributed to any cost unit. They can't be identified with any particular cost unit. They are incurred for the benefit of cost providers.

They include indirect material cost e.g. fuel and lubricant for machine electronics for welding etc.

Also indirect labour

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.

Classification Overheads

i) According to behaviour

Can be classified as semi-variable, fixed or semi-fixed costs, Purpose for this classification is for decision making and cost control.

ii) According to function

This is classification depending with the purpose for which are referred. Is classified into number of production overheads and none production overheads, administration and saving overheads, The purpose for this class is to help for accounting of overhead cost costs for products cost purpose.

Steps involved in accounting for overheads

i) Accumulation of Overheads costs.

Involves identifying the overhead cost and charging them to their respective accounts

ii) Allocation and Apportionment

Refers to charging Overhead to specific departments i.e. dividing the overhead cost among the departments

Allocation is the process of identification of overhead cost with cost centers. It is charging of overhead cost identified as incurred in cost center. An expense identified with a dpt. will be charged that department individually e.g. depreciation, insurance, will be charged on plant departments.

Appointment is charging of proportions of overhead to cost center based on benefits they have used from overhead cost. The overhead cost have been incurred for the benefit of a number of cost centers or for the purpose of entire organization, the amount should be shared among departments hence referred to as appointment.

iii) Re-appointment of service departments Overheads

A service department is one that renders services that contribute in an indirect manner to the manufacture of a product. They don't produce but support production activities e.g. canteen stores. These departments do not exist on their own they help other departments hence their overheads must be shared equitably.

Overhead application

This is charging overhead cost to products that have been manufactured in a cost center.

Cost center – Part of entity where manager are responsible for cost

ALLOCATION AND APPORTIONMENT

- Once overhead cost have been identified and accumulated they will be charged to cost centers. This process involves allocations and appointment, allocation is direct since Overheads can be identified with specific departments or costs centres.
- 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.
- In apportionment costs must be shared to various departments based on how they have benefited from overhead cost
- Proper assessment of benefits received by a department is important since it provides the most equitable basis of apportionment.
- Benefit from each overhead cost will be assessed separately since the measure of benefits cannot be uniform.

The common basis used in measuring

	BASIS	Overheads
1.	Area occupied	- Used for space related overhead.e.g. rent rates, lighting, air conditioning etc.
2.	Book value of building	- Building Overheads e.g. departments, repairs, insurance.
3.	Book value of plant and machine.	- Plant and machine Overheads like insurance, depreciation, Maintenance etc.
4.	No. of employees	- Canteen Overheads, supervision, staff welfare cost etc.
5.	Direct wages/salaries	- Staff training, pension contribution, employee's liability etc.
6.	Technical estimates e.g. Kgs/ltr	- Electricity, water etc.
7.	Value of materials	
8.	Direct of labour/machine hrs	- All Overheads relating to material cost e.g. material handling store keeping storage.
		- General Overheads

Illustration

A company has the following costs

Overhead	Amount (sh.)
Consumables Department P ₁	250,000
P ₂	150,000
S ₁	100,000
S ₂	50,000
Depreciation of factory	1,000,000
Supervision	1.5M
Depreciation of equipment	800,000
Canteen	900,000
Heat & Air Conditioning	500,000
Insurance of Equipment	200,000

The information relating to department is as follows:-

Dpt.	Area occupied	No. of employees	Bk. Value of equipment's.
P ₁	1,200	30	3,000,000
P ₂	1,600	30	2,500,000
S ₁	800	15	1,000,000
S ₂	400	15	500,000

Required

Calculate the amount that will be distributed to each department.

Solution

Overheads	Basis	Ratios	Amount	P₁	P₂	S₁	S₂
Consumables	Allocation	-	550,000	250,000	150,000	100,000	50,000
Depreciation of factory	Area occupied	3:4:2:1	1,000,000	400,000	400,000	200,000	100,000
Supervision	No. of Employees	2:2:1:1	1,500,000	500,000	500,000	250,000	250,000
Depreciation of equipment	Book value of Equipment	6:5:2:1	800,000	243,857	285,714	114,265	37,142
Canteen	Number of Employees.	2:2:2:1	900,000	300,000	300,000	130,000	150,000
Heating	Area.	3:4:2:1	500,000	150,000	200,000	100,000	50,000
Insurance	Book. Value of equipment	6:5:2:1	200,000	85,714	71,429	28,571	14,286
			3,950,000	1,928,571	1,907,143	942,856	671,428

Overheads of service department

Service department is one which exists to support the production activities.

It does not contribute directly in the conversion of r/m to finished products. Since there is no production that takes place in the department the overheads will be shared by the department that have benefited from service department.

Reapportionment 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.

Apportionment is based on proportion of benefits received from service dpt. measured using the following basis.

Service dpt.	Basis
Stores	No. of requisition, materials consumed etc.
Maintenance	Maintenance hrs.
Canteen	No. of employees
Purchase dpt.	No. of orders, materials purchased etc.

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:
 1. **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.
 2. **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.

Service department providing services to other service department.

Where service department providing services to production and to other service departments the OC will be after the service department have received their share and then other amount charged to production department. This will ensure that each department shares its equitable share of O/H costs of services department it has benefited from.

METHODS USED IN RE-APPORTIONMENT OF OVERHEADS

The following method may be used to re-apportion overhead of service department. In this case

1. Direct allocation method
2. Step wise allocation/elimination method
3. Repeated distribution method
4. Simultaneous/algebraic equation method

Direct allocation Method

In this method, services provided by services to each other are ignored. Overheads from service department will only be apportioned to production department i.e. only production department shared the cost not recommended as it ignores services provided by service department for themselves which may lead to some department having unfair share of overhead cost

Step wise allocation/elimination method

In this method the service department that provides most services to the other service department is identified and its overheads will be re-apportioned first. Once the app. no further re-apportion will be made to other departments i.e. close down.

The 2 is department providing most services to remaining services to remaining service department will be re-apportioned next then close down, this procedure is repeated until the last service department is re-apportioned.

Illustration

MMC Ltd. produces machine parts on a job-order basis. Majority of the business contracts are obtained through bidding. Business firms competing with MMC Ltd. bid full cost plus 20 per cent mark up. Recently, with the expectation of increase in sales MMC Ltd. reduced its mark up from 25 per cent to 20 per cent.

The company operates two support departments and two production departments. The budgeted costs and the normal activity levels for each department are given below:

	Support Departments		Production Departments	
	Maintenance	Power	Grinding	Assembly
Overhead costs (Shs.)	1,000,000	2,000,000	1,000,000	500,000
Number of employees	8	7	30	30
Maintenance hours	2,000	200	6,400	1,600
Machine hours	-	-	10,000	1,000
Labour hours	-	-	1,000	10,000

Additional information:

1. The direct costs of the maintenance department are allocated on the basis of employees while those of power department are allocated on the basis of maintenance hours.
2. Departmental overhead rates are used to assign costs to products. Grinding department uses machine hours and assembly department uses labour hours.

MMC Ltd. is preparing to bid for a contract, job K, that requires three machine hours per unit produced in grinding and zero hours in assembly department. The expected prime costs per unit are Shs. 670.

Required:

- a) Allocate the support service costs to the production departments using the direct allocation method.
- b) Allocate the service costs to the production departments using the sequential allocation method

Solution**(a) Overhead allocation (direct method)****Profit statement (absorption costing)**

	Production departments		Support departments	
	Grinding	Assembly	Maintenance	Power
	Sh.	Sh.	Sh.	Sh.
Direct costs	1,000,000	500,000	1,000,000	2,000,000
Maintenance	500,000	500,000	(1,000,000)	-
Power	1,600,000	400,000	-	(2,000,000)
	3,100,000	1,400,000	=	=

(b) Overhead allocation (sequential method)

	Production departments		Support departments	
	Grinding	Assembly	Maintenance	Power
	Sh.	Sh.	Sh.	Sh.
Direct costs	1,000,000	500,000	1,000,000	2,000,000
Power department	1,280,000	320,000	400,000	(2,000,000)
Maintenance	700,000	700,000	(1,400,000)	-
	2,980,000	1,520,000	=	=

Workings

MMC Ltd.

(a) Power cost allocated according to maintenance hours

$$6,400 + 1,600 = 8,000$$

$$6,400 \times 2,000,000 = 1,600,000$$

$$8,000$$

$$1,600 \times 2,000,000 = 400,000$$

$$8000$$

(b) Maintenance cost allocated to employees

$$30 + 30 = 60$$

$$30 \times 1,000,000 = 500,000$$

$$60$$

$$30 \times 1,000,000 = 500,000$$

$$60$$

(c) Power apportioned to machine hours

$$2,000 + 6,400 + 1,600 = 10,000$$

$$2,000 \times 2,000,000 = 400,000 \Rightarrow \text{Maintenance}$$

$$10,000$$

$$6,400 \times 2,000,000 = 1,280,000 \Rightarrow \text{Grinding}$$

$$10,000$$

$$1,600 \times 2,000,000 = 320,000 \Rightarrow \text{Assembly}$$

$$10,000$$

Maintenance - Allocated according to number of employees

$$\text{Grinding } 30 \times 1,400,000 = 700,000$$

$$60$$

$$\text{Assembly } 30 \times 1,400,000 = 700,000$$

$$60$$

Repeated Distribution

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.

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

Simultaneous/Algebraic Equation Method

In this method, we form two equations which give the total costs of service departments after sharing overheads from the other service department.

The total overheads cost will be allocated on the basis of the total cost from the equation.

Total cost will be the allocated cost plus a share of other overheads of the other service departments.

Total Overheads = Allocated Overheads + A share of overheads from service department.

Since total overheads are unknown the equation of total overheads will be formed and solved to determine total overheads of service departments.

The total overheads will be shared to departments that have benefited.

Let X = Total overheads of service department 1

Y = Total overheads of service department 2

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

Illustration

Bingwa Ltd. has three production departments and two service departments.

The following are the budgeted factory overheads for the year ended 31 December 2011:

The service department costs are to be apportioned as follows:

	Production departments			Service departments	
	A	B	C	1	2
Service department 1	20%	40%	30%	-	10%
Service departments 2	40%	20%	20%	20%	-

Required:

Re-apportion the service department costs to the production departments using the simultaneous equation method.

Solution

Re-apportioning the service department costs using the simultaneous method

$$S_1 = 30,000 + 20\% S_2$$

$$S_2 = 36,000 + 10\% S_1$$

$$36,000 = S_2 - 10\% S_1$$

$$30,000 = S_1 - 20\% S_2$$

$$36,000 = -10\% S_1 + S_2$$

$$30,000 = S_1 - 20\% S_2$$

$$39,000 = 1.02 S_2$$

$$\text{Therefore } S_2 = 38,235$$

$$\text{And } S_1 = 37,647$$

Overheads reappropriation schedule

	A Shs '000'	B Shs '000'	C Shs '000'	1 Shs '000'	2 Shs '000'
Apportioned and allotted	96,000	84,000	60,000		
Reappropriation as follows					
S2: 38,235 (20%, 40%, 30%)	7,647	15,294	11,471		
S1: 37,647 (40%, 20%, 20%)	15,059	7,529	7,529		
	118,706	106,823	79,000		

OVERHEADS ABSORPTION

Once overheads have been allocated, apportioned and reapportioned to product departments the overheads will be charged to units or to products produced in that department. This is known as recovery/application/absorption of overheads.

It is defined as charging of production overheads to units produced in a production department.

It involves two steps:

- i) Computation of overheads rate (AR)
- ii) Application of the rates to cost unit.

Computation of overheads absorption rates

Overheads are incurred for the benefits of a no. of units or for the entire department and thus a way of sharing the overheads to cost units will need to be determined.

Overhead Absorption Rate (OAR)

Overhead Absorption Rates are usually computed for the purpose of department and units of the base selected for overheads absorption

Only one absorption rate is computed and used for any single group of overheads for each department. It may be based on actual figures or estimated figures.

Actual figures are determined at the end of the period and in this case OAR is based on the actual overheads and actual units of the base selected.

Certain limitations arise from use of actual data and therefore actual rates are not preferable. This is due to:-

- i) Actual data can only be compared at the end of the period delaying computation of the product cost.
- ii) Actual rates may vary from period to period making comparison to be difficult
- iii) It causes delay in determination of selling prices

Estimated data is the budgeted data at the beginning of that period.

Predetermined overhead rates are computed from the data and are based on estimated overheads and estimated units of the base

Determination of suitable method and charging overheads

Adoption of unsuitable method of overheads absorption may lead to misleading results and therefore distort product cost

Generally the following factors should be considered when determining the method of charging overheads.

1) Type of industry

This helps indicate the method of production is whether production is continuous through job orders provision of services etc. Different methods will be appropriate and different industries.

2) Nature of the manufacturing process

This determines whether the manufacturing is manual (labour intensive) or mechanical (machine intensive)

3) Formation of overheads

This refers to the computation of overheads cost and each department.

4) Stability of re-apportionment method prices and labour rates

Material costs and labour costs can only be used as the basis of the rates are stable. This is to ensure that some products are charged with same overheads.

5) Operating capacity

This is analysing whether the company is operating at capacity, under capacity or over capacity. It helps determine the number of units that will share the overheads cost.

6) Policy of the management

The method should not be inconsistent with the management policies or overhead absorption.

Methods of overhead absorption**i) Direct labour hours**

This method gives consideration for time spent in production overheads are charged to cost units based on labour hours required in production.

It is appropriate where production is labour intensive.

$$\text{OAR} = \frac{\text{Budgeted Overhead}}{\text{Budgeted labour hours}}$$

ii) Machine hours

In this method, overheads are charged to cost unit based on machine hours required in production. It is used where production is machine intensive.

$$\text{OAR} = \frac{\text{Budgeted Overhead}}{\text{Budgeted machine hours}}$$

iii) Direct material cost percentage

Overheads are charged as a percentage of direct material cost.

It is appropriate where material data is readily available and where most of the overheads are material related.

$$\text{OAR} = \frac{\text{Budgeted Overhead} \times 100\%}{\text{Budgeted material cost}}$$

iv) Direct labour cost percentage rate

Overheads are charged as a percentage of labour costs. It is used where departments are labour intensive and some rate of payment is paid. It is not appropriate where labour cost is based on pieces produced and where overtime premium and bonuses are paid since they distort labour cost of output.

$$\text{OAR} = \frac{\text{Budgeted Overhead} \times 100\%}{\text{Budgeted labour cost}}$$

Prime cost percentage

This is applicable under the conditions of material and labour percentage above.

$$\text{OAR} = \frac{\text{Budgeted Overhead} \times 100\%}{\text{Budgeted prime cost}}$$

NB

The cost related basis may not be appropriate due to distorted costs where there is regular changes in prices and rates of payment

They will only be appropriate where price and rates are stable

Units of output

Overheads are charged per unit produced. It is appropriate where similar products are produced. It will not be preferred where products of different sizes or different qualities since they require different resources.

$$\text{OAR} = \frac{\text{Budgeted Overhead}}{\text{Budgeted Output}}$$

Illustration

The following information was extracted from the books of ABC Ltd.

Budget	A	B
Machine hours	10,000	12,000
Output unit	1000	1500
Material cost	32,000	28,000
Labour cost	40,000	38,000
Labour hours	18,000	22,000
Budgeted overheads	36,000	42,000

Required

Calculate the overhead absorption rate of a department using

- i) Direct labour hours
- ii) Direct machine cost percentage
- iii) Direct labour cost percentage
- iv) Prime cost percentage
- v) Units of output
- vi) Direct machine hour

Solution

	A	B
i) $\text{OAR} = \frac{\text{Budgeted OH}}{\text{Budgeted labour. Hrs.}}$	$\frac{3,600}{1,800}$ = Sh. 2/hr.	$\frac{42,000}{22,000}$ = Sh. 1.9/hr.
ii) $\text{OAR} = \frac{\text{Budgeted OH}}{\text{Budgeted Machine. Hrs.}}$	$\frac{36,000}{10,000}$ = Sh. 3.6/hr.	$\frac{42,000}{12,000}$ = Sh. 3.5/hr.
iii) $\text{OAR} = \frac{\text{Budgeted OH} \times 100}{\text{Budgeted mgt. cost}}$	$\frac{36,000 \times 100}{32,000}$ = 112.5%	$\frac{42,000 \times 100}{28,000}$ = 150%
iv) $\text{OAR} = \frac{\text{Budgeted OH} \times 100}{\text{Budgeted labour cost}}$	$\frac{36,000 \times 100}{40,000}$ = 90%	$\frac{42,000 \times 100}{38,000}$ = 105%
v) $\text{OAR} = \frac{\text{Budgeted OH} \times 100}{\text{Budgeted Prime cost}}$ Prime cost = direct labour cost + direct mat. Cost A = 40,000 + 32,000 = 72,000 B = 35,000 + 28,000 = 66,000	$\frac{36,000 \times 100}{72,000}$ = 50%	$\frac{42,000 \times 100}{66,000}$ = 63.4%
vi) $\text{OAR} = \frac{\text{Budgeted OH}}{\text{Budgeted Output}}$	$\frac{36,000}{1,000}$ = 36 out unit	$\frac{42,000}{1,500}$ = 28

APPLICATION OF OVERHEAD ABSORPTION RATE TO OUT UNITS

In order to determine the total cost of a product, the overheads are charged to the products on the basis of the computed OAR.

The overheads charged to a cost unit will be the function of the OAR for the department and the units of the base that a product requires.

Overhead charge or absorbed = OAR x Units of base/units

OVER/UNDER ABSORPTION OF OVERHEADS

Overheads are absorbed using predetermined overhead absorption rate based on the budgeted data at the beginning of the period.

Budgeted data may be different from actual at the end of the period i.e. the actual may be more or less than the budget since budget is an estimate.

The difference between the actual and the budgeted data is known as over/under absorption of overheads.

Over absorption arises where absorbed overheads to production is more than actual overheads. This means that more overheads have been charged to production which results in overstatement of cost of production as well as product cost.

Under absorption arises where absorbed overheads is less than actual overheads.

This means that production cost is understated as well as the production cost.

Causes of over/under absorption

1. Poor estimation of cost data (poor budgeting)
2. Adoption of unsuitable method of overheads absorption
3. Changes in method of production during the period
4. Unforeseen changes in product capacity resulting in production of more or less units than budgeted.
5. Seasonal fluctuations in overheads cost due to inflation, deflation etc.

Treatment of over/under absorption

Over/under absorption results in overstatement/understatement of cost of production and therefore adjustment need to be made on production cost of goods sold and inventories.

The treatment depends on whether the amount is substantial or not.

This treatment include

i) Use of supplementary rates.

If the amount is substantial i.e. has a significant effect on cost of production, the cost of goods sold and the cost of inventories at the end of the period will need to be adjusted to reflect the actual.

ii) Write off to P&L statement

If the amount is not substantial and will not have a significant effect on inventory values, the amount will be written on to P&L is expensed as a cost for the period

iii) Carry over to the next period

In this case the amount will be put in an overhead suspense a/c and carried forward to the next year it will be off set with next year's overheads.

The problem with this method is that cost of production will not reflect the actual cost for the period.

iv) Over/under absorption = Absorbed OH – Actual O/H

Illustration

Matatu Auto Spares Ltd. uses budgeted overhead rate in allocating overheads to individual job orders on the basis of machine hours in department A and on the basis of direct labour cost for department B.

The budgeted forecast for the six month period to June 2009 was as follows:

	Department	
	A	B
Material costs (Sh.)	100,000	80,000
Labour costs (Sh.)	80,000	120,000
Machine hours	10,000	30,000
Labour hours	40,000	30,000
Factory overheads (Sh.)	200,000	240,000

The actual results for the period were as follows:

	Department	
	A	B
Factory overheads (Sh.)	95,000	98,000
Labour hours	38,800	41,500
Machine hours	5,000	4,880

The following information relates to job order number B2:

	Department	
	A	B
Material costs (Sh.)	30,000	24,000
Labour costs (Sh.)	40,000	18,000
Machine hours	6,000	8,000
Labour hours	2,400	4,000

Required:

- The budgeted overhead rate for department A and department B.
- The total overhead cost for Job B2.
- The cost per unit for Job B2 given that the output is 10,000 units.

Solution

Matatu Auto Spares Ltd

i) Budgeted overhead rate for department A and department B

Overheads absorption rate =

$$\frac{\text{budgeted overheads}}{\text{units of the base}}$$

Department A

OAR =

$$\frac{\text{budgeted overheads}}{\text{machine hours}}$$

$$\frac{200,000}{10,000}$$

Shs 20/ machine hour

Department B

$$\text{OAR} = \frac{\text{budgeted overheads}}{\text{labour cost}}$$

$$= \frac{240,000}{120,000}$$

$$2 \times 100\% = 200\%$$

ii) Total overhead cost for Job B2

Overheads absorbed = O.A.R \times actual units of the base

Overheads for Job No. B2

	Shs
Department A = $20 \times 2,400$	48,000
Department B = $200\% \times 18,000$	36,000
Total Overheads	84,000

iii) The cost per unit for job B2 given that the output is 10,000 units**Cost Statement**

	Shs
Material cost (30,000 + 24,000)	54,000
Labour cost (40,000 + 18,000)	58,000
	112,000
Add overheads	84,000
Total Cost	196,000

$$\text{Cost per unit} = \frac{\text{Total Costs}}{\text{Units Produced}} = \frac{196,000}{10,000} = \text{shs. 19.6 Per unit.}$$

Illustration

Mjengo Ltd. Is a medium sized company which operates three production departments and two service departments. The three production departments are: Machinery department D, machinery department E and Assembly department. The two service departments are materials procurement and general support department.

The annual overhead costs are as follows:

	Sh.	Sh.
Indirect salaries and wages		
Machinery department: D	2,500,000	
E	2,500,000	
Assembly	3,750,000	
Materials procurement	2,750,000	
General support	3,700,000	15,200,000
Indirect materials	1,250,000	
Machinery department: D	2,012,500	
E	262,500	
Assembly	0	
Materials procurement	25,000	3,550,000
General support		
Others:	1,250,000	
Electricity	2,500,000	
Taxes	375,000	
Insurance of machinery	3,750,000	
Depreciation of machinery	625,000	
Insurance of buildings	2,000,000	10,500,000
Salaries of the workers		2,9250,000

1. The following are additional information is available from books of Mjengo Ltd.

	Book value Machinery	Area occupied (square metres)	Number of employees	Direct labour hours	Machine hours
Machinery department : D	20,000,000	25,000	750	2,500,000	5,000,000
E	12,500,000	12,500	500	2,500,000	2,500,000
Assembly	2,500,000	37,500	750	5,000,000	
Stores	1,250,000	37,500	250		
Maintenance	1,250,000	12,500	250		
	37,500,000	125,000	2500		

2. The total direct and indirect materials issued to the production department are as follows:

Machinery D	10,000,000
E	7,500,000
assembly	2,500,000
	20,000,000

Required:

- (a) Overheads analysis sheet.
- (b) Reallocation of service department costs
- (c) Overhead rates for each production department

Solution:**(a) Overhead analysis sheet**

Item of expenditure	Basis of allocation	Production departments			Service departments		
		Total	Machinery	Machinery	Assembly	Material procurement	General support
		Sh 000	D	E	Sh000	Sh000	Sh000
Indirect wages and salaries	Direct	15,200	2,500	2,500	3,750	2,750	3,700
Indirect materials	Direct	3,550	1,250	2,012	262.5	-	25
Electricity	Area	1,250	250	125	375	375	125
Taxes	Area	2,500	500	250	750	750	250
Insurance of machinery	Book value of machinery	375	200	125	25	12.5	12.5
Insurance of buildings	Area	625	125	62.5	187.5	187.5	62.5
Salaries of site workers	Number of employees	2,000	600	400	60	200	200
Depreciation of machinery	Book value of machinery	3,750	2,000	1,250	250	125	125
		29,250	7,245	6,725	6,200	4,400	4,500

Total allocated and apportioned**Reallocation of service departments costs**

Item of expenditure	Basis of allocation	Total	Production departments			Service departments	
			Machinery	Machinery	Assembly	Materials	General
			D	E	Sh.	procurement	support
		Sh.	Sh.	Sh.	Sh.	Sh.	Sh.
Materials procurement	Value of materials issued	-	2,200,000	1,650,000	550,000	4,400,000	-
General support	Direct labour hours	-	1,125,000	1,125,000	2,250,000	-	4,500,000

Total overhead costs**(b)**

Machinery department D = 7,425,000 + 2,200,000 + 1,125,000

Machinery department D = 10,750,000 = Sh. 2.15 per machine hours
5,000,000

Machinery department E = 6,725,000 + 1,650,000 + 1,125,000

Machinery department E = 9,500,000 = Sh. 3.80 per machine hours
2,500,000

Assembly department = 9,000,000 = Sh. 1.80 per machine hours
5,000,000

ACTIVITY BASED COSTING (ABC)

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.

Guidelines to activity based costing

- (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.

Selecting the cost drivers

In the main, the cost driver will be measured in terms of volume of transactions. However, ABC also tries to identify costs that are not contributing to the value of the product / service so the following questions are relevant:

- What services does this activity provide?
- Who receives the service?
- Why do you require so many people?
- What might cause you to require more/less staff?
- Why does over/idle time exist?

Three types of cost driver emerge;-

Pure activity output volume – where the basic transactions of the activity are identical in terms of their resource demands such as the purchasing of raw materials or a similar range of items.

Activity/output volume/complexity – where the basic transactions differ in terms of their resource demands as when purchases are made from different overseas suppliers.

Situation – where an underlying factor can be identified as driving the workload of an activity such as the number of suppliers when supplier vetting and liaison were vital components of the cost pool.

Example of cost drivers

The following are examples of cost drivers in the manufacturing sector.

Activity	Cost driver
Material procurement	Number of purchase orders
Material handling	Number of movements
Quality control	Number of inspections
Engineering services	Number of change orders
Maintenance	Number of break downs
Line set-up	Number of set-ups

For the service sector the following taken from the field of health care may serve as an example. The cost drivers from the basis of costs charged to patients.

Activity	Cost driver
Patient movement	Number of in-patients
Booking appointments	Number of patients
Patients reception	Number of patients
X-ray:	
Equipment preparation	Time taken
Patient preparation	Time taken
Patient aftercare	Time taken
Film processing	Number of images
Film reporting	Number of images

The Merits of Activity Based Costing

The following are the main claims made regarding ABC:

- More realistic product costs are provided especially in Advanced Manufacturing Technology (AMT) factories where support overheads are a significant proportion of total costs.
- More overheads can be traced to the product. In modern factories there are a growing number of non-factory floor activities. ABC is concerned with all activities so takes product costing beyond the traditional factory floor basis.
- ABC recognises that it is activities which cause cost, not products and it is products which consume activities.
- ABC focuses attention on the real nature of cost behaviour and helps in reducing costs and identifying activities which do not add value to the product.
- ABC recognises the complexity and diversity of modern production by the use of multiple cost

drivers, many of which are transaction based rather than based solely on production volume.

- ABC provides a reliable indication of long-run variable product cost which is relevant to strategic decision making.
- ABC is flexible enough to trace costs to processes, customers, areas of managerial responsibility, as well as product costs.
- ABC provides useful financial measures (e.g. cost driver rates) and non- financial measures (e.g. transaction volumes).
- The principle of using activities to trace costs can be applied across a range of service industries as well as manufacturing firms

Criticisms of ABC

- A full ABC system with numerous cost pools with multiple cost driver undeniably more complex than traditional systems and will thus be expensive to administer.
- Much of work is defense related and pricing is on a cost-plus basis hence the need to show accurate product costs. The applicability of ABC to companies has to use market-based pricing and do not have the same high technology structure has been questioned.
- Many practical problems are unresolved. Examples include: common cost driver selection, non-linearity of cost driver rates etc.

Perhaps the key word in that definition is traceable, whether or not a cost can be traced objectively to the production/delivery of a good/service.

Illustration

Assume that a firm makes four products A, B, C and D. Data for the past period are as follows:

Product	Output units	No. of production runs in period	Direct labour hrs. per unit	Machine hours per unit	Material cost per unit Shs	Material components per unit
A	25	3	2	2	30	8
B	25	4	4	4	75	5
C	250	7	2	2	30	8
D	250	10	4	4	75	6
		24				

Direct labour cost sh.7 per hour.

Overhead costs	Sh.
Short-run variable costs	8,250
Long-run variable costs:	7,680
Scheduling costs	3,600
Material handling costs	7,650
	27,180

Find the unit production cost

- Using conventional product costing using a labour hour or machine hour overhead absorption rate.
- Using ABC with the following cost drivers:

Short-term variable costs	Machine hours
Scheduling costs:	No. of production runs
Set-up costs:	No. of production runs
Materials handling costs:	No. of components
- Compare the results from the two methods

Solution

a) Compare costing

Total machine hours in period

Product	Hours
A	$25 \times 2 = 50$
B	$25 \times 4 = 100$
C	$250 \times 2 = 500$
D	$250 \times 4 = 1,000$
	1,650

OAR based on machine hours = $\frac{\text{sh.}27,180}{1,650} = \text{sh.}16.47$ per machine hours

Cost summary using conventional costing

	A Sh.	B Sh.	C Sh.	D Sh.	Total Sh.
Direct materials	750	1,875	7,500	18,750	
Direct labour	350	700	3,500	7,000	
Prime costs	1,100	2,575	11,000	25,750	40,425
Overheads @ 16.47 per mc hour	824	1,647	8,235	16,470	27,176
Total cost	1,924	4,222	19,235	42,220	67,601
Units produced	25	25	250	250	
Cost per unit (rounded)	77	169	77	169	

Calculation of cost driver rates

Short-term variable costs $\frac{\text{sh.}8,250}{1,650}$ machine hours = sh.5 per machine hour

Scheduling costs $\frac{7,680}{24}$ production runs = sh.320 per production run

Set up costs $\frac{3,600}{24}$ production runs = sh.150 per production run

Material handling costs $\frac{\text{sh.}7,650}{3,825}$ components = sh.2 per component

Number of components in period = $25 \times 8 \times 25 \times 5 + 250 \times 8 + 250 \times 6 = 3,825$.

b) Using ABC**Cost summary using ABC**

	A Sh.	B Sh.	C Sh.	D Sh.	Total Sh.
Prime cost	1,100	2,575	11,000	25,750	40,425
Short run variable costs @ sh.5 per machine hour	250	500	2,500	5,000	8,250
Scheduling @ sh.320 per run	960	1,280	2,240	3,200	7,680
Set-up @ sh.150 per run	450	600	1,050	1,500	3,600
Materials handling @ sh.2 per component	400	250	4,000	3,000	7,650
Total cost	3,160	5,205	20,790	38,450	67,605
Units produced	25	25	250	250	
Costs per unit	126.4	208.2	83.16	153.8	

Slight difference in total cost due to rounding of figures

c) Comparing the results we obtain

Products

	A Sh.	B Sh.	C Sh.	D Sh.
Unit cost: conventional	77	169	77	169
Unit cost: ABC	126.4	208.2	83.16	153.8
Percentage change using ABC	+64%	+23	+8%	-9%

It will be seen that ABC charges more overheads to lower volume production and tends to charge relatively less to higher volume production, especially product D in this case.

The above example has deliberately been kept simple in order to show the principles of the ABC method.

REVISION QUESTIONS

QUESTION ONE

Wangu Manufacturing Company Ltd. is located at the industrial area in Nairobi. The company uses four different machine groups, A, B, C and D in its manufacturing process.

The overhead costs budget for the year ending 31 December 2003 is as follows:

	Sh. '000'
Indirect wages	12,000
Holiday pay and national insurance	10,200
Supervision	16,680
Machine maintenance (wages)	14,000
Supplies	2,600
Power	4,200
Tooling costs	13,300
Insurance of machinery	2,520
Insurance of buildings	1,600
Depreciation	10,500
Rent and rates	12,400
	100,000

At present, overheads are absorbed into the cost of the company's products by means of a single direct wages percentage of 70 percent. The company wishes to change to machine hour overhead absorption rate for each of its four different machine groups.

The following data is available for each of the four machine groups:

Machine groups					
	A	B	C	D	Total
	Sh. '000'	Sh. '000'	Sh. '000'	Sh. '000'	Sh. '000'
Tooling costs	5,400	4,100	2,600	1,200	13,300
Supervision	5,170	4,720	3,630	3,160	16,680
Supplies	1,200	800	200	400	2,600
Cost of machines	32,000	24,000	10,000	18,000	84,000
Machine maintenance hours	3,000	2,000	4,000	1,000	10,000
Number of direct workers	6	6	2	2	16
Total number of workers	26	34	15	10	85
Floor space (square feet)	3,000	2,400	1,600	1,000	8,000
Machine running hours	30	60	25	10	125
Machine power rating (kilowatts)	55,000	27,000	8,000	15,000	105,000

Required:

- Machine hour overhead absorption rate for each of the four groups of machines.
- The overhead cost to be absorbed by product XY123 if:

(i) It utilizes the following time resources of the indicated machine groups:

Hours	Machine group
8	A
3	B
1	C
4	D

(ii) Direct labour cost is Sh. 22,000,000 and the direct wages percentage method is used.

Solution:

(a) Computation of Overhead Absorption Rates per Machine Hour

Overhead	Absorption basis	A Sh.'000'	B Sh.'000'	C Sh.'000'	D Sh.'000'	Total Sh.'000'
Indirect wages	No. of indirect workers	3,478	4,870	2,261	1,391	12,000
Holiday pay & National Insurance	No. of workers (Total)	3,210	4,080	1,800	1,200	10,200
Supervision	Actual	5,170	4,720	3,630	3,160	16,680
Machine maintenance (wages)	Machine maintenance hours	4,200	2,800	5,600	1,400	14,000
Supplies	Actual	1,200	800	200	400	2,600
Power	Machine power	2,200	1,080	320	600	4,200
Tooling costs	Actual	5,400	4,100	2,600	1,200	13,300
Insurance – Machinery	Cost of machines	960	720	300	540	2,520
Insurance – buildings	Floor space	600	480	320	200	1,600
Depreciation	Cost of machines	4,000	3,000	1,250	2,250	10,500
Rent & rates	Floor space	4,650	3,720	2,480	1,550	12,400
Total		34,978	30,370	20,761	13,891	100,000
Therefore No. of machine hours:		30	60	25	10	
Absorption rate per machine hour		1,165.93	506.17	830.44	1,389.1	

(b) Product XY 123

(i)	Absorption rate	No. of Hours	Overhead Absorbed Sh.'000'
A	1,165.93	8	9,327.44
B	506.17	3	1,518.51
C	830.44	1	830.44
D	1,389.10	4	5,556.40
			17,232.79

(ii) Overhead:

= 70% of direct wages

= 70% x 22,000,000 = 15,400,000

QUESTION TWO

The following budget and actual results relates to Cypo Ltd. for the last three quarters for the year ended 31 March 2004.

Budget:	Quarter 2 to 30/9/2003	Quarter 3 to 31/12/2003	Quarter 4 to 31/3/2004
Sales (units)	10,000	14,000	12,200
Production (units)	8,000	14,200	12,400
Fixed overheads (Sh. '000')	10,400	19,170	17,360

Actual results

Sales (units)	9,600	12,400	10,200
Production (units)	8,400	13,600	9,200
Fixed overheads (Sh. '000')	11,200	18,320	16,740

The value of the opening and closing stock of the units produced is arrived at by using the FIFO stock valuation method. The budgeted and actual opening stock for the quarter ended 30 June 2003 was 2,600 units and its valuation included Sh. 3,315,000 of fixed overheads. The company absorbs its fixed overheads using a pre-determined fixed overhead absorption rate per unit which is the same for each quarter. It is assumed that variable costs per unit and selling price per unit remained the same for each of the three quarters.

Required:

- Calculate the under or over-recovery of fixed overheads for each quarter and indicate how it will affect the profit or loss for the year ended 31 March 2004.
- Using the actual results given above, explain whether absorption costing gives a higher profit figure than marginal costing.
- Explain briefly why absorption costing is usually considered to be unsuitable as an aid to decision making.

Solution:**(a) Calculation of fixed overhead absorption rates**

	Quarter 2	Quarter 3	Quarter 4
	Sh.	Sh.	Sh.
Budgeted FOH	10,400,000	19,170,00	17,360,000
Budgeted Production (units)	8,000	14,200	12,400
FOH absorption rate (per unit)	1,300	1,350	1,400
FOH absorbed (actual units x rate)	10,920,000	18,360,000	12,880,000
	11,200,000	18,320,000	16,740,000
Less actual FOH	280,000	40,000	3,860,000
	Under absorbed	Over absorbed	Under absorbed
	Deduction	Add back	Deduct
Effects on Profit & Loss A/c	Profit & Loss	In Profit & Loss	In Profit & Loss
		Loss	

(b) Units in Closing Stock

	Quarter 2	Quarter 3	Quarter 4
	Sh.	Sh.	Sh.
Units	2,600	2,400	2,600
Opening stock	8,400	13,600	9,200
Add: Production	11,000	15,000	11,800
Less: Sales	9,600	12,400	10,200
Closing stock	1,400	2,600	1,600

Whether marginal costing or absorption costing produces a higher profit in a given period depends entirely on the amount of fixed overheads in opening and closing stocks. Fixed overhead content of stocks.

	Quarter 2	Quarter 3	Quarter 4
	Sh.	Sh.	Sh.
F.O content of closing stock	1,820,000	3,510,000	2,240,000
	(1,400 x 1,300)	(2,600 x 1,350)	(1,600 x 1,400)
Less F.O Content of opening Stock (given)	3,315,000	1,820,000	3,510,000
Difference	(1,495,000)	1,690,000	(1,270,000)

Note that opening stock in quarter 3 is the closing stock in quarter 2 and opening stock in quarter 4 is closing stock in quarter 3.

Absorption costing profit is therefore higher than margin profit in quarter 3 but lower in quarter 2 and 4.

- (c) Absorption costing is a product convention with many arbitrary assumptions and subjective assessments e.g. analysis apportionment and absorption of overheads, treatment of under/over absorption, the way cost centres are determined, the treatment of service cost centres
In consequence, information based on absorption costing principles is not suitable for use in decision making.

QUESTION THREE

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;

- i) Piecework rates;
- ii) Premium bonus, given that an employee earns the premium bonus at the rate of two thirds of the time saved.

Solution:

Ardhi Company

- i) Basic guaranteed hourly rates used to calculate earnings

	Mambo	Saidi	Mbogo
Actual hours worked	38	36	40
Basic hourly rate of pay	30	20	25
Earnings (Basic x actual hours worked)	1140	720	1000

- ii) Piecework rates used to calculate earnings for employees

	Mambo	Saidi	Mbogo
Number of minutes worked	2280	2160	2400
Rate per minute	0.5	0.5	0.5
Earnings (rate x number of minutes)	1140	1080	1200

- iii) Premium bonus, given that an employee earns the premium bonus at a rate of 2/3 of the time saved.

	Mambo	Saidi	Mbogo
Hours allowed	38	23.4	12.5
Hours taken	38	36	40
Hours saved	-	-	-
Bonus hours (2/3 x hours saved)	-	-	-
Bonus wage (bonus hours x hourly rate)			

QUESTION FOUR

MMC Ltd. produces machine parts on a job-order basis. Majority of the business contracts are obtained through bidding. Business firms competing with MMC Ltd. bid full cost plus 20 per cent mark up. Recently, with the expectation of increase in sales. MMC Ltd. reduced its mark up from 25 per cent to 20 per cent.

The company operates two support departments and two production departments. The budgeted costs and the normal activity levels for each department are given below:

	Support Departments		Production Departments	
	Maintenance	Power	Grinding	Assembly
Overhead costs (Shs.)	1,000,000	2,000,000	1,000,000	500,000
Number of employees	8	7	30	30
Maintenance hours	2,000	200	6,400	1,600
Machine hours	-	-	10,000	1,000
Labour hours	-	-	1,000	10,000

Additional information:

1. The direct costs of the maintenance department are allocated on the basis of employees while those of power department are allocated on the basis of maintenance hours.
2. Departmental overhead rates are used to assign costs to products. Grinding department uses machine hours and assembly department uses labour hours.

MMC Ltd. is preparing to bid for a contract, job K, that requires three machine hours per unit produced in grinding and zero hours in assembly department. The expected prime costs per unit are Shs. 670.

Required:

- a) Allocate the support service costs to the production departments using the direct allocation method.
- b) What will be the bid for job K if the direct allocation method is used?
- c) Allocate the service costs to the production departments using the sequential allocation method.
- d) What will be the bid for job K if the sequential allocation method is used?
- e) Briefly explain the problems encountered in setting overhead cost standards.
- f) Distinguish between cost allocation and cost apportionment

Solution:**(a) Overhead allocation (Direct method)**

	Production departments		Support departments	
	Grinding	Assembly	Maintenance	Power
	Shs.	Shs.	Shs.	Shs.
Direct costs	1,000,000	500,000	1,000,000	2,000,000
Maintenance	500,000	500,000	(1,000,000)	-
Power	1,600,000	400,000	-	(2,000,000)
	3,100,000	1,400,000	-	-

- (b) Overhead Allocation Rate = $\frac{3,100,000}{10,000}$ = Shs. 310/machine hour i.e. Maintenance Department.

Job K cost statement

	Shs.
Prime cost	670
Overhead (3 x 310)	930
Total unit cost	1,600
∴ Bid price Shs. 1,600 x 1.2 =	Shs. 1,920

(c) Overhead allocation (sequential method)

	Production departments		Support departments	
	Grinding	Assembly	Maintenance	Power
	Shs.	Shs.	Shs.	Shs.
Direct costs	1,000,000	500,000	1,000,000	2,000,000
Power department	1,280,000	320,000	400,000	(2,000,000)
Maintenance department	700,000	700,000	(1,400,000)	-
	2,980,000	1,520,000	-	-

- (d) Maintenance department Overhead Allocation Rate = $\frac{2,980,000}{10,000}$ = Shs. 298 per machine hour.

Job K cost statement

	Shs.
Prime cost	670
Overhead (3 x 298)	894
	1,564

∴ Bid price Shs. 1,564 x 1.2 = Shs. 1,876.80

- (e) Problems exist in setting overhead cost standards in three important areas, namely; setting cost standards, selecting a standard overhead rate and determining the standard volume for fixed overhead cost recovery.

The setting of cost standards implies that resources have been acquired at the best price and that they have been used in the most efficient manner. Since overheads costs are not directly

related to products, the problem is selecting a measurement of activity that can be used as a surrogate for the output expressed as product volume.

The selection of a standard overhead rate depends on which measurement of activity should be used. Also, fixed overhead costs, unlike variable overhead costs, do not vary with output.

- (f) Cost allocation is the allotment of whole items of cost. Cost apportionment is the sharing of a common cost amongst cost centres.

Workings

MMC Ltd.

- (a) Power cost allocated according to maintenance hours

$$6,400 + 1,600 = 8,000$$

$$\frac{6,400}{8,000} \times 2,000,000 = 1,600,000$$

$$\frac{1,600}{8,000} \times 2,000,000 = 400,000$$

- (b) Maintenance cost

Maintenance cost allocated according to employees

$$30 + 30 = 60$$

$$\frac{30}{60} \times 1,000,000 = 500,000$$

$$\frac{30}{60} \times 1,000,000 = 500,000$$

- (c) Power

Apportioned according to machine hours

$$2,000 + 6,400 + 1,600 = 10,000$$

$$\frac{2,000}{10,000} \times 2,000,000 = 400,000 \Rightarrow \text{Maintenance}$$

$$\frac{6,400}{10,000} \times 2,000,000 = 1,280,000 \Rightarrow \text{Grinding}$$

$$\frac{1,600}{10,000} \times 2,000,000 = 320,000 \Rightarrow \text{Assembly}$$

Maintenance – Allocated according to number of employees

$$\text{Grinding} \quad \frac{30}{60} \times 1,400,000 = 700,000$$

$$\text{Assembly} \quad \frac{30}{60} \times 1,400,000 = 700,000$$

TOPIC 5

COST BOOKKEEPING

Introduction

Bookkeeping involves the recording, storing and retrieving of financial transactions for a company, nonprofit organization, individual, etc.

Common financial transactions and tasks that are involved in bookkeeping include:

- Billing for goods sold or services provided to clients.
- Recording receipts from customers.
- Verifying and recording invoices from suppliers.
- Paying suppliers.
- Processing employees' pay and the related governmental reports.
- Monitoring individual accounts receivable.
- Recording depreciation and other adjusting entries.
- Providing financial reports.

Today bookkeeping is done with the use of computer software.

COST Book keeping refers to a system of recording various cost information in the books of account. There two main systems of cost book keeping. That is:

1. **Integrated cost 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
2. **Interlocking cost accounting system.** - Interlocking accounting system; this is an accounting system where separate cost accounting and financial

THE FLOW OF COSTS IN AN A BUSINESS ENTERPRISE

Flow of costs refers to the manner in which costs move through a firm. Typically, the flow of costs is relevant to a manufacturing environment where accountants must quantify what costs are in raw materials, work in process, finished goods inventory and cost of goods sold. Flow of costs does not only apply to inventory, but also to factors in other processes to which a cost is attached such as labor and overhead.

We say that costs flow through an accounting system. That is because they accumulate as the product progresses through the various stages of production. Let's look at a typical product.

Before a product is started, no costs have been incurred. Workers stand ready to make the product, inventory waits patiently in the warehouse, and the manufacturing plant contains all the resources necessary to perform the manufacturing operation.

We first add materials into production, from the inventory. At the same time the accounting department transfers the cost of inventory items to the Work in Process account, and the product or job now has a value.

Next the workers start to convert the raw inventory into a product. As labor is added, the accounting department transfers payroll costs to the Work in Process account, increasing the value of the product or job.

Overhead costs are allocated to the product or job, based on the costing method used. As work progresses on the product or job, it accumulates labor, materials and overhead costs. Finally, the total finished product or job cost is transferred to Finished Goods, and when it is sold the cost is transferred to cost of goods sold

COST BOOK KEEPING – INTERLOCKING AND INTEGRATED LEDGER SYSTEMS

There are two systems of cost book keeping

1. Non- integrated/inter locking system
2. Integrated system

INTERLOCKING LEDGER SYSTEMS

Interlocking accounting system is a system in which company records his transactions on the basis of financial accounting principles and cost accounting principles separately. It means, there will be two records of accounts. One is financial accounts record and second is cost accounts record.

Features of Interlocking Accounting System

1. In interlocking accounting system, two set of accounts are prepared.
2. In interlocking accounting system, all big organisation, take benefits of cost accounts separately from financial accounts. So, it can more control on cost.
3. In interlocking accounting ledger, cost accounts are maintained in cost ledger and financial accounts are maintain in financial ledger.

Advantages of Interlocking Accounting System

Main benefit of interlocking accounting system is for big companies. Big companies keep double record by independent accountants. So, there is less chance of fraud and mistake because in reconciliation process, such fraud and mistake can be found by auditor. So, both cost and financial accountants will be more careful about this.

Disadvantages of Interlocking Accounting System

1. Because we keep double set of accounts, so there is more need of reconciliation of cost and financial accounts for finding the reason of not matching cost accounts records with financial accounts records. So, this time may be saved in integrated accounting system.
2. This is costly system because we need separate accounting staff for keeping separate set of two accounts.
3. Sometime, all the users of our accounting records may be confused by seeing cost profit and financial profit in our interlocking accounting system.

INTEGRATED LEDGER SYSTEMS

This is a system where cost accounts and financial accounts are combined in one set of accounts.

Features/Advantages

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 movement 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

1. Only one set of account is maintained and therefore there would be one profit results hence no need of reconciling.
2. There is no duplication of work hence a saving in clerical cost.
3. Information obtained can be used by the management for decision making as well as for financial reporting purposes.
4. Integrated account system help to coordinate the various forms of an organization.
5. It facilitates the use of IT systems.
6. Cost data can be obtained without delay as cost accounts are posted directly from the basics of original entry.

Disadvantages

- 1) Differences in the valuation of stock – In financial accounting stock is valued base on the lower of cost and net realizable value whole in cost accounting stock is valued based on the input cost. The difference in the valuation often brings a challenge in integrated accounts.
- 2) Problems associated with items appearing in cost accounting only e.g. overhead absorption, notion cost and changing of depreciation based on the usage.

Items of expenditure that is unique to the two systems of accounting.

- i. Appropriations of profits not dealt within the costing systems e.g. corporations tax, dividends paid and proposed etc.
- ii. Expenditure of a purely financial nature (i.e. nothing to do with manufacturing e.g. losses on sale of fixed assets, interest on bank loans, bank charges etc.

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.
- ii) 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.
- iii) **Stores Ledger Control Account:** This account shows all the transaction of materials e.g. purchases, issuance of materials, returns to suppliers, etc. The balance of this account represents in total the detailed balance of the stores account.
- iv) **Work in Progress Ledger Control Account:** It shows the total work in progress at any particular time.
- v) **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.
- vi) **Production Overheads Control Account:** It gives the total production overheads incurred in the manufacture or production of goods in question.
- vii) **Wages Control Account:** It shows the total wages incurred in the production of goods.
- viii) **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 etc.
- ix) **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

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.

Difference between Integrated and Interlocking system

Integrated and interlocking system is two cost book keeping methods. Interlocking system maintains two set of ledger which allows detail analyses of costs and cost related processes. Integrated system keeps only one set of ledgers and both financial and cost accounting information needs are met from the same books.

1. Duplication of record

In Integrated system there is no duplication of record due to single set of ledgers where in interlocking system there is duplication of record due to two set of ledgers.

2. Cost

Interlocking system require more resources than integrated system. More time is required to maintain the interlocking system similarly interlocking system requires more human effort than integrated system. More resources require more cost therefore interlocking system is deemed to be more costly than integrated system.

3. Detailed analyses

Interlocking system allows more detail analyses of cost and other cost related process. These analyses can be performed without any difficulty and delay due to separate set of ledger.

4. Avoid confusion

Interlocking system creates much confusion due to two set of ledger and too much information is being produced from different record and therefore the information management is more difficult in interlocking system. In integrated system this confusion can be avoided.

5. Computerized environment

Integrated system is the only system followed in computerized environment and detail cost analyses are controlled through coding system (Charts of accounts). Interlocking system has no relevance in the computerized system

DOUBLE ENTRY SYSTEM IN INTEGRATED A/C**To record purchase on materials**

Dr: stores control/raw materials A/C

Cr: Bank/creditors A/C

To record materials returned to suppliers

Dr: Suppliers/Creditors

Cr: Stores control/Raw materials

To issue materials to production

Dr: Work in progress A/C Direct materials

Dr: Production overhead A/C- (for indirect materials)

Cr: Stores control A/C

To record wages

Dr: Wages A/C

Cr: Bank/Wages payable A/C

To change wages in production

Dr: Work in progress A/C (Direct wages)

Dr: Production wages A/C (Indirect wages)

Cr: Wages A/C

To record manufacturing expenses

Dr: Production OHDs A/C

Cr: Bank/Expenses payable A/C

To change overheads to production

Dr: Work in progress A/C

Cr: Production OHD A/C

N/B

If the actual overheads is different from the OHD absorbed there is a case of over or under absorption and the difference should be posted to in OHD adjustment A/C and later transferred to the part A/C

To record the cost of goods produced

Dr: Finished goods A/C

Cr: Work in progress A/C

6. The staff wages were analyzed as follows:

	Sh.
Work in progress department A	300,000
Work in progress department B	260,000
Administration overheads	25,000
Production overheads item	42,500
Selling overheads	47,500
	675,000

7. Accruals as at 30 May 2005 were Sh.26, 000 for security of productions facilities and Sh.39, 000 for consultancy on production procedures.

8. The costs of finished goods were:

	Sh.
Department: A	570,000
Department : B	555,000

9. Sales on credit amounted to Sh. 870,000 and the cost of these credit sales was Sh. 700,000.

10. Depreciation on production plant and equipment was Sh. 15,000.

11. Cash received from debtors totaled Sh. 520,000 and payments made to creditors totaled Sh.150,000.

Required:

- Using integrated cost accounting system, record the above transactions for the three months ended 30 May 2005.
- Profit and loss account for the period ended 30 May 2005 and balance sheet as at 30 May 2005.

Solution

a) i)

Fixed assets a/c				Selling overhead a/c			
	Sh.		Sh.		Sh.		Sh.
Bal b/d	275,000	Bal c/d	275,000	Bank	40,000	P & L	87,500
	275,000		275,000	Wages	47,500		
					87,500		87,500
Creditors a/c				Stores a/c			
	Sh.		Sh.		Sh.		Sh.
Bank	150,000	Stores	525,000	Creditors	525,000	WIP: A	180,000
Bal c/d	488,500	Production				B	192,000
		Overhead	48,500			Production	
		Production				Overhead	65,000
		Overhead	65,000			Bal c/d	87,500
	638,500		638,500		525,000		525,000

Cash book

	Sh.		Sh.
Bal b/d	225,000	Wages	500,000
Debtors	520,000	Creditors	150,000
		Overheads:	
		Production	20,000
		Selling	40,000
		Administration	25,000
		Bal c/d	10,000
	745,000		745,000

Production overhead a/c

	Sh.		Sh.
Creditors	48,500	WIP: A	110,000
Depreciation	15,000	B	120,000
Bank	20,000	P&L	26,000
Stores	65,000		
Wages	42,500		
Creditors	65,000		
	256,000		256,000

Wages a/c

	Sh.		Sh.
Bank	500,000	WIP: A	300,000
		B	260,000
		Overhead	
		Production	42,500
		Selling	47,500
		Administration	25,000
	675,000		675,000

Administration overhead a/c

	Sh.		Sh.
Bank	25,000	P&L	50,000
Wages	25,000		
	50,000		50,000

WIP A a/c

	Sh.		Sh.
Stores	180,000	Finished goods	570,000
Wages	300,000	Bal c/d	20,000
Production overhead	110,000		
	590,000		590,000

WIP B a/c

	Sh.		Sh.
Stores	192,500	Finished goods	555,000
Wages	260,000	Bal c/d	17,500
Production Overhead	120,000		
	572,500		572,500

Debtors

	Sh.		Sh.
Sales	870,000	Bank	520,000
		Bal c/d	350,000
	870,000		870,000

Depreciation

	Sh.		Sh.
Bal c/d	15,000	Production Overhead	15,000
	15,000		15,000

ii)

Profit and Loss Account for the period ended 30 May 2005

	Sh.		Sh.
	700,000	Sales	870,000
Cost of sales	170,000		
Gross profit	870,000		870,000
		Gross profit	170,000
Administration cost			
cost	50,000		
Selling cost	87,500		
Production expenses	26,000		
Net profit	6,500		
	170,000		170,000

Balance sheet as at 30 May 2005

	Sh.		Sh.
Fixed assets	260,000	Capital	500,000
Finished goods	425,000	Profit	6,500
WIP: A	20,000	Creditors	488,500
B	17,000	Wages Owings	175,000
Debtors	350,000		
Bank	10,000		
Stores	87,500		
	1,170,000		1,170,000

Causes of Difference between Financial Accounting and Cost Accounting Profits Results

- Purely financial expenses e.g. bud debts, discount allowed, interest expenses, losses on disposals of assets etc.
- Purely financial incomes e.g. dividends received, gain on sale of assets, decrease in provision for bad and doubtful debts etc.
- Appropriation of profits e.g. dividend paid, transfer to reserved, tax
- Differences in the valuation of stock
- Differences in depreciation charged.
- Notional cost appearing in cost accounting
- Over under absorption of overheads in cost accounting
- Timing differences

REVISION EXERCISE

QUESTION ONE

More Ltd. is a medium size manufacturing company and it maintains separate cost and financial accounting books. The financial accountant provided the following statement for the year ended 31 March 2004.

More Ltd
Manufacturing, trading and profit and loss account for the year ended 31 March 2004

	Sh.	Sh.
Direct materials		
Opening stock	150,000	
Add: purchases	1,800,000	
	1,950,000	
Less: closing stock	200,000	
Direct materials cost	1,750,000	
Add: direct wages	250,000	
Prime cost		2,000,000
Add: factory overheads		300,000
		2,300,000
Add: opening work-in-progress		125,000
		2,425,000
Less: closing stock		130,000
Production cost carried forward		2,295,000
Sales		4,500,000
Less cost of goods sold		
Opening stock	240,000	
Production cost brought forward	2,295,000	
	2,535,000	
Less: closing stock	255,000	
Gross profit		2,280,000
		2,220,000
Other incomes		
Discount received	45,000	
Income from investment	1,094,000	1,139,000
		3,359,000
Expenses		
Depreciation	280,000	
Interest on loan	36,000	
Debenture interest	25,000	
Administration expenses	600,000	941,000
Net profit		2,418,000

The records from cost accounts showed the following:

1. Stock valuation as at 31 March were as follows:

	2003 Sh.	2004 Sh.
Raw materials	160,000	196,000
Work-in-progress	121,000	125,000
Finished goods	258,000	260,000

2. Factory overheads were absorbed at 15% of direct material costs.

3. Other costs included:

	Sh.
Interest on capital	140,000
Notional rent	420,000
Administration over absorbed	32,000
Selling and distribution over absorbed	25,000
Depreciation	242,000

4. Profit as per cost was Sh. 2,328,400

Required:

Prepare a profit reconciliation statement for the year ended 31 March 2004. (20 marks)

Solution:

Workings:

	Cost Sh.	Financial Sh.	Difference Sh.
Opening stock of raw materials	160,000	150,000	10,000
Opening stock of work in progress	121,000	125,000	4,000
Opening stock of finished goods	258,000	240,000	18,000
Closing stock of raw materials	196,000	200,000	4,000
Closing stock of work in progress	125,000	130,000	5,000
Closing stock of finished goods	260,000	255,000	5,000
Factory overheads	262,500	300,000	37,500
Discount received	-	45,000	45,000
Income from investment	-	1,094,000	1,094,000
Depreciation	242,000	280,000	38,000
Interest on loan (expenses)	-	36,000	36,000
Debenture interest	-	25,000	25,000
Administration expense	632,000	600,000	32,000
Interest on capital (not)	140,000	-	140,000
Notional rent	420,000	-	420,000

Profit reconciliation statement for the year ended 31 March 2004

	Shs.	Shs.
Net profits as per financial account		2,418,000
Add: Depreciation in financial accounts	280,000	
Interest on loan	36,000	
Debenture interest	25,000	
Overstatement in opening stock of work in progress	4,000	
	5,000	
Understatement in closing stock of finished goods	37,500	387,500
Overstatement in factory overheads		2,805,500
	32,000	
	25,000	
Less: Over absorbed administration expense	242,000	
Selling and distribution overhead applied	45,000	
Depreciation in cost accounts	1,094,000	
Discount received	10,000	
Income from investment	18,000	
Understatement in opening stock of raw materials	4,000	
	5,000	1,475,000
Understatement in opening stock of finished goods		4,280,500
Overstatement in closing stock of raw materials		
Overstatement in closing stock of work in progress		

Note: Notional charges in cost accounts should be ignored.

ALTERNATIVE**RECONCILIATION STATEMENT**

	Shs.	Shs.
Profit as per cost accounts		2,328,400
Add: Overabsorbed Adm.	32,000	
Overabsorbed S/D	25,000	
Discount received	45,000	
Income Invest	1,094,000	
Opening stock Raw Materials	10,000	
Opening stock Finished goods	18,000	
Closing stock Raw Materials	4,000	
Closing stock Work in progress	5,000	1,233,000
Less: Depreciation	38,000	
Loan interest	36,000	
Debenture interest	25,000	
Opening stock work in progress	4,000	
Closing stock finished goods	5,000	
Overheads	37,500	(145,500)
Profit as per final accounts		3,415,900

TOPIC 6

COSTING METHODS

Introduction

Manufacturing costing methods are accounting techniques that are used to help understand the value of inputs and outputs in a production process. By tracking and categorizing this information according to a rigorous accounting system, corporate management can determine with a high degree of accuracy the cost per unit of production and other key performance indicators. Management needs this information in order to make informed decisions about production levels, pricing, competitive strategy, future investment, and a host of other concerns. Such information is primarily necessary for internal use, or managerial accounting.

JOB ORDER COSTING

Job order costing or *job costing* is a system for assigning manufacturing costs to an individual product or batches of products. Generally, the job order costing system is used only when the products manufactured are sufficiently different from each other. (When products are identical or nearly identical, the *process costing system* will likely be used.)

Since there is a significant variation in the products manufactured, the job order costing system will create a job cost record for each item, job or special order. The job cost record will report the direct materials and direct labor actually used plus the manufacturing overhead assigned to each job.

An example of an industry where job order costing is used is the building construction industry since each building is unique. The manufacturers of custom equipment or custom cabinetry are also examples of companies that will keep track of production costs by item or job.

The job cost records also serve as the subsidiary ledger or documentation for the cost of the work-in-process inventory, the finished goods inventory, and the cost of goods sold

ACCOUNTING FOR JOB ORDER COSTING

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 XX

Cr Cash A/c XX

To record cash purchases

Dr Stores ledger control A/ c XX

Cr Creditors A/ c - for credit purchasers XX

To record credit purchases

(b) Return of materials to suppliers

Dr Cash A/ c or creditors control A/ c XX

Cr Stores ledger control A/ c XX

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. XX

To record issue of direct materials from the store

Dr Factory overheads control A/ c XX

Cr Stores ledger control A/ c XX

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 STING

Below are the journal entries passed to record direct and indirect labour.

2. (a) Direct Labor

Dr W.I.P. Control A/c XX

Cr Cash a/c XX

To record direct labour Paid in cash

(b) Accrued Direct Wages

Dr W.I.P. Control A/c XX

Cr Wages Control A/c XX

To record direct wages to be paid (accruing at a specific)

(c) Indirect Wages

Dr Factory overheads control A/c XX

Cr Wages Control A/c XX

To record indirect wages (labour cost) incurred

Production overheads go along with direct materials and direct labour in determining the cost per unit or in batch processing or the cost of a particular job. However, it is difficult to

3. Production Overheads

- After the allocation of manufacturing overheads, total cost for a job can then be determined and summarized in a job Cost Sheet or job cost account. Examples of the above are shown below

OTHER TRANSACTIONS

Dr Finished goods stock control A/c XX
 Cr W.I.P Control A/c XX
 To record transfer of finished goods to the store

(i) On Credit: Dr Debtors control A/c XX
 Cr Sales A/c XX
 To record credit sales

- (ii) In Cash: Dr Bank/Cash A/c XX
Cr (Sales A/c XX
To record cash sales

Dr Cost of sales A/c XX
 Cr Finished goods control A/c XX
 To record cost of goods sold to customers

7. (i) When there is over absorption of production overheads:

Dr Factory overheads control A/c XX

Cr P & L A/c XX

To record over absorption of production overheads

(ii) When there is under absorption of production overheads:

Dr P & L A/c XXX

Cr Factory overheads control A/c XXX

To record under absorption of production overheads

8. When there are non-manufacturing overheads:

Dr P & L A/c XXX

Cr Non-manufacturing overheads control A/c XXX

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.

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:

- a) Pass the necessary journal entries to record the above transactions.
- b) Prepare a costing profit and loss account for the period above.

Solution

		Dr SHS	Cr SHS
1	Materials Cash	100,000	100,000
2	Work in Progress Manufacturing overheads Materials	70,000 5,000	75,000
3	Factory Labour Cash To record labour costs incurred	250,000	250,000
4	Work in progress Manufacturing overheads Factory labour	220,000 30,000	250,000
5	Manufacturing overheads Cash	72,800	72,800
6	Work in Progress (<i>see working below</i>) Applied manufacturing overhead To record applied overheads	110,000	110,000
7	Finished goods; Job 2.2 Finished goods; job 2.3 Work in Progress To record transfer of jobs to finished goods	152,500 117,500	270,000
8	Cash Sales To record sale of job 2.3	200,000	200,000
9	Cost of goods sold Finished goods To record transfer of job 2.3 to cost of sales	117,500	117,500
10	Applied manufacturing overheads Manufacturing overheads Cost of sales To record over absorbed overheads	110,000	107,800 2,200

Costing profit and loss account

	SHS	SHS	SHS
Sales			200,000
Cost of goods sold			
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	110,000	400,000	
		400,000	
Less: Closing Raw materials		0	
Closing W.I.P		(130,000)	
Cost of goods manufactured		270,000	
Add Opening Finished goods inventory		0	
Goods available for sale		270,000	
Less Closing Finished goods inventory		(152,500)	
Cost of goods sold		117,500	
Over applied overheads		(2,200)	
Cost of goods sold			115,300
Profit for the period			82,500

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

Overheads absorption rate = Estimated manufacturing overheads
Estimated direct labor cost

= Shs.100,000 × 100%

Shs.200,000

= 50%

Therefore, total manufacturing costs absorbed = 50% × total direct labour cost

= 50% × 220,000 = 110,000

COSTING**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

BATCH COSTING

This is a form of costing which is used where a quantity of identical articles are produced together as a batch. The general procedures are very similar to costing jobs. The batch would be treated as a job during manufacture and the various costs (material, labour and overheads) collected in the usual manner. On completion of the batch the total batch cost would be divided by the number of good articles produced so as to provide the average cost per article. Batch costing procedures are common in a variety of industries including; clothing, footwear, engineering components.

Illustration

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

1. Selling and administering overheads are charged at 10% of total production costs while the profit markup is 25% of total costs:
2. 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

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	Direct labour hr	10	1500
		Dept B	40 @Sh15	600	Direct labour hr	8	320
		Dept B	60 @Sh20	1200	Direct labour hr	6	360
	-	Dept C	100 @Sh10	1000	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

= Total cost of the batch = Sh.103, 708 = Shs.51.86 per unit

Total no of units 2,000 Units

(c) Selling price of the batch; Cost plus 25% markup

	Shs
Cost of the Batch	103,708
Mark up @ 25%	25,927
Selling Price of the Batch	129,635

Selling price per unit

= Selling Price of the Batch= Sh.129, 635 = Shs.64.82 per unit

Total no of units 2,000 Units

PROCESS COSTING

This is a product costing method applicable where similar products are produced continuously in a series of production steps commonly known as processes.

It is used where production is continuous in a series of production steps and similar products are produced.

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.

Common features

1. Similar units are produced continuously
2. The continuous nature of production results in some units being incomplete at the end of the period.
3. Loss is a common feature due to spoilage, wastage, evaporation etc.
4. Costs cannot be identified with individual products.
5. In some cases output may be multiple products.

Definitions

a) Process losses

This represents loss of material due to spoilage, evaporation which arises due to the nature of the product processes.

Process uses can be categorized into:-

- i) **Normal loss:** This is the expected losses and they are unavoidable. They are cost by inherent factors to production processes e.g. evaporation.

Normal loss is based on past experiences and indicates the expected loss under normal working conditions.

No cost is allocated to normal loss. However, any amount realised from sale of normal loss units reduces the cost of good output in unit cost calculation.

- ii) **Abnormal loss**

These are extra units lost above the normal loss units.

It arises due to unfavourable working conditions i.e. substandard materials, accidents, carelessness etc.

It carries its own cost and will be valued a good unit and the amount transferred to P&L

iii) Abnormal gain

This represents the expected loss transferred out as good output.

They are units which were expected to be loss but they were not lost.

It arises due to improved working conditions i.e. high quality material, less accidents etc.

It is also accounted at the cost of good output.

b) Scrap

These are the discarded materials with some recovery value which is either disposed of without further processing or can be reintroduced in place of raw materials.

c) Waste

These are discarded substance with no recovery value and normally they are disposed at a cost i.e. a cost is incurred to dispose the waste. This cost is treated as part of process cost for the process which generated the waste.

Accounting for processes

Process costing is centered on four key steps.

The exact volume of work done in each step will depend on whether there are losses, W.I.P, joint and by-products etc. These steps includes:-

- i) Determination of inputs and outputs
- ii) Calculating cost per unit and outputs
- iii) Calculating the total cost of outputs
- iv) Computing the necessary accounts

The procedure for process costing is as follows:-

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.

Process costing with presence of process losses and gains

Losses in a process are a common feature and they should be well accounted because they have an impact on production cost.

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. Scraps 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.

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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.

Normal loss

Cost of normal loss is absorbed by the cost of good units.

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.

Illustration

1000 kgs at sh.3.60/kg were input to a process and there was a 10% loss due to evaporation.

900 good units should result and their cost per unit would be:

$$1000 \times \text{sh.}3.60/900 = \text{sh.}4/\text{unit}.$$

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 Ltd. 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	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;

- 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.
- 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 1 Account

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

Cost per unit = Total accumulated cost

Expected output

Expected output = Total input (units) – Normal loss (Units)

Thus the cost per unit of production transferred shall be

$$= \text{Cost per unit} = \text{Shs.}70,000 \div \text{Shs.}3.684 \\ 95\% \times 20,000 \text{ units}$$

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

1,000 kgs at sh.4.00/kg were input to a process and there was a 20% loss due to filtration. The materials filtered out could be sold for sh.0.50/kg.

Required;

Prepare a process account.

Solution

800 good units should result and their cost per unit would be:

$$\frac{1,000 \times 4 - 200 \times 0.50}{800} = \text{sh.}4.875/\text{unit}$$

Process account					
	Units	Sh.		Units	Sh.
Material	1,000	4,000	Normal loss	200@ sh.0.5	100
	-	-	To finished goods	800@ sh.4.875	3,900
	1,000	4,000		1,000	4,000

Abnormal losses

Abnormal losses and gains carry their own costs and will be valued at the cost of good output. They are separately analyzed and the amount to P&L.

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, etc. 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.

Abnormal gain

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

In August 2000 kgs of a material were introduced to a process at a cost of sh.6/kg, and 200 hours labor were spent at a cost of sh.15/hour. Overheads are absorbed at the rate of sh.4/ labour hour. Normal losses are incurred at the rate of 5% of input and lost units can be sold for sh.0.9 per Kilogram. 1,800 kgs were produced.

Required:-

Calculate the total absorption cost of the good output, the treatment of any abnormally lost or gained units, and also show the process account and loss account.

Solution

Input costs less sale of normal loss = $(2,000 \times \text{sh.}6) + (200 \times \text{sh.}15) + (200 \times \text{sh.}4) - 100 \times 0.9 = 15,710$

Expected output = $2,000 \times 0.95 = 1,900$ (actual output = 1,800; abnormal loss = 100).

Cost per unit = $\frac{\text{sh.}15,710}{1,900} = \text{sh.}8.2684$

Process account

	Units	Sh.		Units	Sh.
Material	2,000	12,000	To finished goods	1,800 @ 8.2684	14,883
Labour		3,000	Normal loss: sale of		
Overheads		800	scrap	100@0.9	90
-	-	-	Abnormal loss	100@ 8.2684	827
2000	15,800			2,000	15,800

Normal loss account

	Units	Sh.		Units	Sh.
Process account	100	90	Cash	100	90
		-			-
		90			90

Abnormal loss account

	Units	Sh.		Units	Sh.
Process account	100	827	Cash	100	90
		-	Income		
		-	statement		737
		827			827

The net cost of the abnormally lost units is **Sh.737**.

Illustration

In May 5000 kgs of a material were introduced to a process at a cost of sh.9/kg, and labour and overheads amounting to sh.25, 000 were also contributed.

Normal losses are incurred at the rate of 10% of input and lost units can be sold for sh.1 per kilogram 4,700 kgs were produced

Calculate the total absorption cost of the good output, the treatment of any abnormally lost or gained units, and also show the process account and loss account.

SOLUTION

Input costs less sale of normal loss = $(5,000 \times \text{Sh.}9) + \text{Sh.}25,000 - 500 \times 1 = 69,500$

Expected output = $5,000 \times 0.9 = 4,500$ (actual output = 4,700; abnormal gain = 200).

Cost per unit = $\frac{\text{Sh.}69,500}{4,500} = \text{Sh.}15.4444$

Process account

	Units	Sh.		Units	Sh.
Material	5,000	45,000	To finished goods	4,700 @ 15.4444	72,589
Labour and overheads		25,000	Normal loss: sale of scrap	500 @1	500
Abnormal gain	200 @15.4444	3,089		-	-
	5,200	73,089		5,200	73,089

Normal loss account

	Units	Sh.		Units	Sh.
Process account	500	500	Cash	300	300
		-	To abnormal gain account	200	200
		500			500

Abnormal gain account

	Units	Sh.		Units	Sh.
Normal loss account	200	200	Process account	200	3,089
Income statement		2,889			-
		3,089			3,089

Illustration

ABC Chemicals Ltd manufactures a chemical compound branded 'X' used in making plastics. The chemical compound involves two processes; A and B. The output of process A is passed to process B where further material is added to mix. The details of the process costs for the production period ended 30 April were as follows:

Process A:

Direct materials	5,000 kgs at Sh. 10 per kg.
Direct labour	Sh. 40,000
Process plant time	200 hours at Sh. 220 per hour
Overheads	Sh. 20,000

Process B:

Direct materials	3,000 kgs at Sh. 10 per kg.
Direct labour	Sh. 25,000
Process plant time	120 hours at Sh. 220 per hour
Overheads	Sh. 12,000

Additional information:

1. The expected and actual output for the processes was as follows.

	A	B
Expected output	90% of input	95% of input
Actual output	4,200 Kgs	7,340 Kgs

2. Assume no finished stock at the beginning of the period and no work in progress at either the beginning or the end of the period.
3. Normal loss is sold as scrap for Sh.1.00 per kilogramme from process A and Sh.2.00per kilogramme from process 3, for both of which immediate payment is received

Required:

- (i) Process A account.
- (ii) Process B account.
- (iii) Abnormal loss/gain account,
- (iv) Normal loss account

Solution**a) ABC Chemicals Ltd****Process A**

Expected output = $90\% \times 5,000 = 4,500$

Process Plant time = $200 \times 220 = 44,000$

Scrap value = 1

Process B

Expected output = $95\% \times 3,000 = 2,850$

Process plant time = $120 \times 250 = \text{shs}30,000$

Scrap value = 2

Process A Account

	Units	<u>Cost</u> <u>Unit</u>	Amount		Units	<u>Cost</u> <u>Unit</u>	Amount
			Shs				Shs
Direct materials	5,000	-	50,000	Output	4,200	34.111	143,267
Direct labour			40,000	Normal loss	500	1	500
Process plant time			44,000	Abnormal loss	300	34.111	10,233
Overheads			20,000				-
	<u>5,000</u>		<u>154,000</u>		<u>5,000</u>		<u>154,000</u>

$$\text{Valuation} = \frac{\text{Total cost of all units} - \text{Normal loss / scrap value}}{\text{Units introduced} - \text{Normal loss Units}}$$

$$= \frac{154,000 - 500}{5,000 - 500} = \frac{153,500}{4,500} = 34.111$$

Process B Account

	Units	<u>Cost</u> <u>Unit</u>	Amount		Units	<u>Cost</u> <u>Unit</u>	Amount
			Shs				Shs
Process A/c	4,200	34.111	143,267	Output	7,340	37.288	273,691
Direct materials	3,000	15	45,000	Normal loss	360	2	720
Direct labour			25,000				
Process plant time			30,000				
Overheads			12,500				
Abnormal gain	500	37.288	18,644				
	<u>7,700</u>		<u>274,411</u>		<u>7,700</u>		<u>274,411</u>

Abnormal loss/gain account

	Units	<u>Cost</u> <u>Unit</u>	Amount Shs		Units	<u>Cost</u> <u>Unit</u>	Amount Shs
Process A A/c	300	34.111	10,233.3	Scrap value	300	1	300
Scrap value	500	2	1,000	Process B	500	37.288	18,644
Profit and loss			7,710.7				
			18,944				18,944

Normal loss account

	Units	<u>Cost</u> <u>Unit</u>	Amount Shs		Units	<u>Cost</u> <u>Unit</u>	Amount Shs
Process A A/c	500	1	500	Bank			1,220
Process B A/c	360	2	720				-
			1,220				1,220

ACCOUNTING FOR WORK-IN-PROGRESS (WIP)

In industries where process of manufacturing is continuous, some units may be incomplete at the end of the period. A problem arises in unit cost as the complete units.

The solution to this problem is to express output in terms of equivalent units. Equivalent units are assumed complete units output from a production process if a single unit is started and completed before another is started.

It is based on percentage of completion of output e.g. if 10,000 units were started but only 8000 units were completed and the remainder was left in WIP with 60% degrees of completion, the equivalent units which will be used for cost calculation will be given by:

Equivalents Units

Complete units – 100% = 800

W-I-P 2000 @ 60% = 1200

Equivalent unit of output 9200

The cost incurred in a process are not incurred uniformly and therefore equivalent units will not be based on the same percentage of completion i.e. output in a process will carry different degrees of completion for equivalents unit calculation.

Cost items in a process include:-

i) Transfer in cost

This represents cost introduced in a process. These costs are accounted 100% since input is transferred into the process as complete unit.

ii) Material added in this process

The percentage of completion depends on how the materials are added in the process.

iii) Conversion costs

This refers to the direct labour and overheads. The percentage of completion will depend on how the cost is incurred.

Accounting for opening W.I.P

Where there is opening W.I.P the cost data relate to two production period i.e. the previous period costs for opening and the current period costs for work started this period.

There are two methods which can be used in accounting for W.I.P.

i) Weighted Average Method**ii) FIFO Method****i) Weighted Average Method**

In the method, there will be no distinction between input of opening W.I.P and what was transferred in this period. They will be treated as if they were started at the same time.

The units of output from the process will be assumed to have come from the same batch of input of opening W.I.P and transfer in.

The costs to account for will relate to the cost incurred in the two periods i.e. the cost will also be assumed to have been incurred in the same period.

ii) FIFO

In this method, the Opening work in progress and units transferred in this period maintain their identity and are account separately.

Opening work in progress enters the process first and will be assumed to be completed from O.P W.I.P and the units started and transferred this period.

The cost incurred will only be relayed to work computed this period i.e. only current cost will be considered for unit cost calculation.

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.

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.

Illustration

Process 2 received units from process 1 and after carrying out work on the units transferred them to process 3. For one accounting period the relevant data were as follows:

Opening WIP 200 units (25% complete) valued at Ksh. 2,500

800 units received from Process 1 valued at ksh. 4,300

840 units were transferred to process 3

Closing WIP 160 units (50% complete)

The costs for the period were Ksh. 16,580 and no units were scrapped. It is required to prepare the process accounts for process 2 units:

- i) The FIFO method of valuation.
- ii) The average cost method of valuation.

Solution**Using FIFO method**

Calculation of effective units of production

Units

Completed units transferred out	840
+ Work contained in closing WIP (160×50%)	80
	920
- Work contained in opening WIP (200 x 25%)	(50)
Effective units for period	870
Period cost per unit = Total cost for period i.e. process costs + transfers in	
Effective units for period	
= 16,580 + 4,300	
870	
= Ksh. 24.	

This figure is used to give the closing WIP valuation, i.e.

$$160 \times 50\% \times \text{Ksh } 24 = \text{Ksh. } 1,920.$$

The valuation of the number of complete units transferred to process 3 is found from the balance on the process account as follows:

Process 2 Account

	Unit	Ksh		Units	Kshs.
Opening WIP b/f. receipts from process 1	200	2,500	Transfers to process 3	840	21,460
Process costs	800	4,300	Closing WIP c/f	160	1,920
		16,580			
	1,000	23,380		1,000	23,380

Note on illustration (FIFO method):

The transfer value of Ksh. 21,460 is the balance on the account and is Kshs. 1,300 greater than the period cost per unit already calculated i.e. $\text{Kshs. } 21,460 - (840 \times \text{Kshs. } 24) = \text{Kshs. } 1,300$.

This is the amount by which the opening WIP valuation (based on the previous period's costs) is greater than the current period costs i.e.

$$\text{Kshs. } 2,500 - (200 \times 25\% \times \text{Kshs. } 24) = \text{Kshs. } 1,300.$$

Thus, it would be seen that only the current period cost levels, i.e. The Kshs. 24 per unit are carried forward to the next period in the closing WIP valuation.

Using average cost method

Using this system the effective units are the transfers to the next process (840 units) plus the work contained in the closing WIP (80 units i.e. 50% of 160 units) that is a total of 920 units.

The costs involved are the total of the opening WIP valuation + the valuation of units transferred in + the process 2 costs i.e.

$$\text{Kshs. } 2,500 + 4,300 + 16,580 = \text{Kshs. } 23,380.$$

$$\text{Average cost per unit} = \frac{23,380}{920} = \text{Kshs. } 25.413.$$

This is used to value both the closing stock and transfers out thus:

$$\text{Closing stock valuation} = 160 \times 50\% \times \text{Kshs. } 25.413 = \text{Kshs. } 2,033.$$

$$\text{Transfers to process 3} = 840 \times \text{Kshs. } 25.413 = \text{Kshs. } 21,347$$

The process account is as follows:

	Units	Kshs.		Units	Kshs.
Opening WIP b/d	800	4,300	Transfers to Process 3 Closing WIP c/d	840	347
Receipts from Process 1		16,580		160	33
Process costs	1,000	23,380		1,000	380

Note-illustration (average cost method):

1. It will be seen that the effect of the average cost method is, in this example, to increase the value of closing stock and reduce the value of transfers to process 3. This is because the previous period cost levels (as contained in the opening WIP valuation) were higher than the current cost levels. If the previous period cost levels were lower than current levels the average cost method would cause the closing WIP valuations to be lower than when using the FIFO system.
2. The above example has deliberately been kept simple to show clearly the principles involved. Examples follow which show the added complications of abnormal and normal scrap and where the elements material, labour and overheads) or the opening and closing WIP are involved. It must be stressed however. That these added complications merely increase the amount of arithmetic involved, they do not alter the basic principles explained above so it is important that these are thoroughly understood before proceeding further.

Illustration

This example illustrates the treatment of opening and closing WIP where the WIP is broken down into its various elements.

The following data relate to process y for accounting period 2.

At the beginning of period 2, there were 800 units partly completed which had the following values:

	Value Kshs	Percentage complete
Input material (from process x)	8,200	100
Material introduced	5,600	55
Labour	3,200	60
Overheads	2,400	45

During the period 4,300 units were transferred from process x at a value of Kshs. 46,500 and other costs were:

	Kshs.
Material introduced	24,000
Labour	19,500
Overhead	18,200

At the end of the period, the closing WIP was 600 units which were at the following stage of completion:

Input material	100% complete
Material introduced	50% complete
Labour	45% complete
Overheads	40% complete

The balance of 4,500 units was transferred to finished goods.

Calculate the value of units transferred to finished goods and the value of WIP and prepare the process account using

- i) The FIFO method and
- ii) The average cost method

Solution to the above illustration using FIFO method

As previously, the first step is to calculate the effective units of production for the period. This follows identical principles to example 4 except that in this example it is necessary to consider the four elements of the units (input material, material introduced, labour and overheads) instead of simply the units as whole. When the effective production is ascertained the cost per unit, for each element, can be calculated.

Calculation of effective units and cost per unit

Cost element	Completed units	+	Equiv. Units in closing WIP	-	Equiv. units in opening WIP	= Total effective production	Cost Kshs	Cost per unit Kshs
Input	4500	+	600	-	800	= 4300	46500	10.814
Material	4500	+	300	-	440	= 4360	24000	5.505
Material Intro.	4500	+	270	-	480	= 4290	19500	4.545
Labour	4500	+	240	-	360	= 4380	18200	4.155
Overheads								

Closing stock valuation = 600 units

		Kshs.	Kshs.
Input material	= 100% complete	= 600 x 10.814	6,488
Material introduced	= 50% complete	= 300 x 5.505	1,651
Labour	= 45% complete	= 270% x 4.545	1,277
Overheads	= 40% complete	= 240 x 4.155	997
			Kshs. 10,363

This value is used in the process account in the normal way with the value of the transfers to finished goods being the balance on the account.

Process account – process y (FIFO)

	Units	Kshs.		Units	Kshs.
Opening WIP b/d	800	19,400			
Transfer in from Process x	4,300	46,500	Transfers to Finished goods	4,500	117,237
Materials Introduced		24,080	Closing WIP	600	10,363
Labour		19,500	c/d		
Overheads		18,200			
	5,100	127,600		5,100	127,600

Solution to the above illustration using average cost method

Calculation of effective units and cost per unit

Cost elements	Equivalent units in closing WIP +	Fully Complete units	Total = effective production (a)	Opening WIP values	Period +costs	Total = cost (b)	Cost per unit (b) ÷ (a)
Input	600 x 100% = 600	4500	= 5100	Kshs.820	+ 46500	=sh.54700	Sh.10725
material	+	4500	= 4800	0	+ 24000	= 29600	6.167
Material	600 x 50% = 300	4500	= 4770	5600	+ 19500	= 22700	4.759
Intro	+	4500	= 4740	3200	+ 18200	= 20600	4.356
Labour	600 x 45% = 270			2400			
Overheads	+						
	600 x 40% = 240						
	+						
				Sh.19400	+ sh.108200	=sh.127600	Sh.25.997

Value of completed production = 4,500 x Shs. 25.997 = Shs. 116,987.

The value of the closing WIP can be found either by deducting the value of completed production from total costs or, more tediously, by calculating the various element values, as follows:

Value of closing WIP

= total cost – value of completed production

= Shs. 127,600 – 116,987 = Shs. 10,613

Or this can be calculated by using the various element values i.e.

600	x	shs.10.725	=	Shs.6,435.00
300	x	shs.6.167	=	Shs.1,850.10
270	x	shs.4.759	=	Shs.1,284.93
240	x	shs.4.346	=	Shs.10,613.07 (slight rounding error)

The process account can now be completed

Process account – process y (average cost)

	Units	Kshs.		Units	Kshs.
Opening WIP b/d	800	19,400			
Transfers in from Process x	4,300	46,500	Transfers to Finished goods	4,500	117,237
Materials Introduced		24,080	Closing WIP c/d	600	10,363
Labour		19,500			
Overheads		18,200			
	5,100	127,600		5,100	127,600

Illustration

This is more complicated example which brings together the various facets of process costing covered in the chapter. It includes opening and closing WIP and normal and abnormal losses where the scrapped units are not fully complete.

The following data relate to process 2 for one accounting period. Process 2 receives units from process 1 and, after processing, transfers them to process 3.

Opening WIP 600 units

	Value Shs	Percentage complete %
Input material	720	100
Material introduced	500	60
Labour	340	50
Overheads	270	40

Transfers from process 1: 4, 100 units valued at shs.5,200.

Transfers to process 3: 3, 500 units

	Shs
Materials introduced	2,956
Labour	2,200
Overheads	1,900

Closing stock 800 units at the following stage of completion

Input materials	100% complete
Material introduced	60% complete
Labour	50% complete
Overheads	40% complete

400 units were scrapped at the following stage of completion

Input material	100% complete
Material introduced	100% complete
Labour	40% complete
Overheads	30% complete

The normal loss is 10% of production and the scrapped units realized 40p each. It is required to prepare the process account for process 2 using

- The FIFO method,
- The average cost method.

Solution to example 6 using FIFO method

The first stage is to calculate the amount of normal loss to see whether there is any abnormal loss or gain involved.

The production for the period is calculated as follows:

Opening WIP	600 units
+ Transfers in	4,100
	4,700
- closing WIP	800
Production	3,900 units

Normal loss is 10% of 3,900 = 390, and as the actual number scrapped were 400, there were 10 units of abnormal loss.

The calculation of effective units for cost calculation purposes follows the same principles as in examples 4 and 5 except that the number of units of abnormal loss must be included in the total effective production because, as explained, abnormal losses are costed on the same basis as good production.

Calculation of effective units and cost per unit

Cost element	Completed units	Equiv. + unit in closing WIP	Equiv. +units in abnormal loss	Equiv. - units in opening WIP	Total = effective production	Costs Shs	Cost per unit Shs.
Input material	3500	+ 800	+ 10	- 600	= 3710	2500	1.402
Material intro.	3500	+ 480	+ 10	- 360	= 3630	2800	0.771
Labour	3500	+ 400	+ 4	- 300	= 3604	2200	0.610
Overheads	3500	+ 320	+ 3	- 240	= 3583	1900	0.530

(This is the cost of the material introduced, Shs. 2,956, less the resale value of the normal loss, Shs.156 i.e. 390 @ 40p each. The resale value of the 10 units of abnormal loss is credited to the abnormal loss account not the process account.)

The costs per unit calculated are then used to evaluate the value of the closing WIP and the abnormal loss.

Input material	Closing WIP valuation	Shs.
Material introduced	800 equivalent units @ Shs. 1.402	1,121.60
Labour	480 equivalent units @ 0.771	370.08
Overheads	400 equivalent units @ 0.610	244.00
	320 equivalent units @ 0.530	169.60
		Shs.1,905.28
		Say Shs. 1,905
Input material	Abnormal loss valuation	Shs.
Material introduced	10 equivalent units @ Shs. 1.402	14.02
Labour	10 equivalent units @ 0.771	7.71
Overheads	4 equivalent units @ 0.610	2.44
	32 equivalent units @ 0.530	1.59
		25.76
		Say shs.26.

The process account can now be prepared.

Process 2 account (FIFO)

	Units	Kshs.		Units	Kshs.
Opening WIP	600	1,830			
Transfers from Process 1	4,100	5,200	Normal loss	390	156
Material	-	2,956	Abnormal loss	10	26
Labour	-	2,200	Transfers to process 3	3500	11,999
Overheads	-	1,900	Closing WIP	800	1,905
	4,700	14,086		4,700	14,086

Solution to illustration above using average cost

Calculation of effective units and cost per unit

Cost element	Equiv. Units in closing WIP	Equiv. + unit in abnormal loss	Complete + units	Effective = production	Opening WIP value Shs.	Period + cost	Total costs Shs.	Cost per unit Shs.
Input material	800	+ 10	+ 3500	= 4310	720	+ 5200	=5920	1.373
Material intro.	480	+ 10	+ 3500	= 3990	500	+ 2800	= 3300	0.827
Labour	400	+ 4	+ 3500	= 3904	340	+ 2200	= 2540	0.651
Overheads	320	+ 3	+ 3500	= 3823	270	+ 1900	= 2170	0.568

The various costs per unit are used to evaluate the closing WIP, abnormal loss and the completed production:

The various costs per unit are used to evaluate the closing WIP, abnormal loss and the completed production:

Closing WIP		Cost per unit		Value
Equivalent units				
800	X	1.373	=	1,098.40
480	X	0.827	=	396.96
400	X	0.651	=	260.40
320	X	0.568	=	181.76
				1,937.52
				Say Shs 1,938.

		Abnormal		
10	×	loss		Shs.13.73
10	×	1.373	=	8.27
4	×	0.827	=	2.60
3	×	0.651	=	1.70
		0.568	=	26.30
				Say Shs.26.

Completed production

3,500	×	1.373	=	4,805.50
3,500	×	0.827	=	2,894.50
3,500	×	0.651	=	2,278.50
3,500	×	0.568	=	1,988.00
				Shs.11,966.50

These values are used in the process account.

Process 2 account (average cost)

	Units	Kshs.		Units	Kshs.
Opening WIP	600	1,830	Normal loss		
Transfers from Process 1	4,100	5,200	Abnormal loss	390	156
Material		2,956	Transfers to process 3	10	26
Labour		2,200	Closing WIP	3500	11,969
Overheads		1,900		800	1,938
	4,700	Sh.14,086		4,700	14,086

Note: if instead of the abnormal loss, there had been an abnormal gain the treatment would be as follows for both average cost and the FIFO methods. The total effective production would be found as in example 5 less the number of abnormal gain units. These units would be evaluated at the cost per unit calculated and the process account debited with the abnormal gain units and their value. It

follows that abnormal gain units will always be fully complete whereas abnormal loss units may be partially or fully complete.

JOINT AND BY PRODUCTS

JOINT PRODUCTS

These are two or more products produced in the same process and separated at a certain separation or split off point.

They are a group of individual products which are produced simultaneously together with each product having a significant sales unless to merit recognition as a main product.

They are identified as individual products at a certain stage of completion where products separate to become individual products.

Features of joint products

1. They are produced in the same process.
2. They cannot be distinguished from each other until split off point.
3. They have substantial sales value.
4. They may require further processing after separation.

Accounting for joint products

Joint products are not separately identified until the split off point. Each product should be casted separately and the main problem is how to account for common costs in the joint costs.

There are several methods that can be used to allocate joint costs which include:

- Units of output
- Sales value at separation point
- Net realizable value

i) Units of output (Physical measures method)

In this method joint cost are allocated on the basis of relative weight of output of each product relative to the total output.

This method is suitable where units of measurement of the products are the same.

Limitations

Products may separate at different states in liquids, gases, solids etc.

In this case the method will be unsuitable since the products have different units of measurement.

It fails to recognize the revenue earning power of individual products and allocates the same costs to all products irrespective of the revenue generated.

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

Solution

Product A =	$700 / (700 + 300) \times 2,400$	1,680
Product B	$300 / 1,000 \times 2,400$	720
		2,400

Income statement

	Product A	Product B	Total
Sales	1,800	1,200	3,000
Cost of Goods Sold	(1,680)	(720)	(2,400)
Gross Margin	120	480	600

Gross Margin %:

Product A = $120 / 1,800 = 7\%$

Product B = $480 / 1,200 = 40\%$

Total = $600 / 3,000 = 20\%$

ii) Sales value at separation point (sales value Method)

In this method, costs are allocated to the products on the basis of revenues generated at separation point.

The method is appropriate where the products become sellable at the split-off point.

Joint costs are apportioned to each product on the basis of proportion that the sales value of the product have relative to the total.

iii) Net Realizable value

Joint product may have no market value at the point of separation because they need further processing for them to be ready for sale or they may be processed further to enhance their value.

Net realizable value is defined as the sales value minus additional processing and disposed costs.

In the method, joint costs to be allocated to individual products will on the basis of individual net realizable value relative to the total net realizable value.

Illustration

A production process has joint costs of Sh.12, 000 for the input of 1,000 kgs of material. Two products are produced from this:

Product A: 600 kgs. Selling price = Sh.25/unit. Separate costs = Sh.4, 000

Product B: 400 kgs. Selling price = Sh.40/unit. Separate costs = Sh.7,000

Required;-

Calculate the inventory value of the production using

- (a) Weight to apportion the joint costs
- (b) Net realisable value to apportion the joint costs

Solution**(a) Joint costs apportioned using weight**

	Product A (600 kg)	Product B (400 kg)
Separate costs	4,000	7,000
Pre-separation costs 60:40 sh.12,000	7,200	4,800
Total costs	11,200	11,800

(b) Joint costs apportioned using net realizable value

	Product A Sh.	Product B Sh.
Sales value	15,000	16,000
Post separation/own costs	(4,000)	(7,000)
Net realizable value	11,000	9,000
Separate costs	4,000	7,000
Pre-separation costs 11000/20,000 and 9/20 of sh.12,000	6,600	5,400
Total costs	10,600	12,400

Illustration

A production process has joint costs of **Sh.12, 000** for the input of 1,000 kgs of material. Two products are produced from this:

Product A: 500 kgs. Selling price = **Sh.25/unit**. Separate costs = **Sh.4,000**

Product B: 400 kgs. Selling price = **Sh.40/unit**. Separate costs = **Sh.7,000**

By product: 100 kgs. Selling price = **Sh.2/kg**

Required;

Calculate the inventory value of the production of the joint products using

- (a) Weight to apportion the joint costs
- (b) Net realizable value to apportion the joint costs

Solution

(a) Joint costs apportioned using weight

Sales of the by-product will produce revenue of Sh.200, so the joint cost is reduced to Sh.11, 800

	Product A (400 kg)	Product B (500 kg)
Separate costs	4,000	7,000
Pre-separation costs 50:40 of Sh.11,800	6,555	5,245
Total costs	10,555	12,245

(b) Joint costs apportioned using net realizable value

	Product A Sh.	Product B Sh.
Sales value 500×25 ; Sh.400 \times Sh.40	12,500	16,000
Post separation/own costs	(4,000)	(7,000)
Net realizable value	8,500	9,000
Separate costs	4,000	7,000
Pre-separation costs 8.5/17.5 and 9/17.5 of Sh.11,800	5,731	6,069
Total costs	9,731	13,069

Illustration

Jitegemee limited company uses a process costing system in its operation. In one of the production processes, two joint products A and B and a by-product C are produced

The following additional information is provided:

- Each processing run requires 12,500 kilograms of output. The costs incurred are as follow:-

	Sh.
Materials	456,250
Labour	295,000
Overheads	268,750

- It is expected that 20% of the input will be damaged in the production process. This is sold as scrap at sh. 10 per kilogram. The damaged items are detected at the end of the production process.

- The output from the production process is as follows:-

Product	Output	Selling price per kilogram
A	50%	200
B	40%	250
C	10%	20

- Product A has to be processed further at a cost of sh. 100 per kilogram before sale
- The joint costs are allocated to the products on the basis of net releasable value

Required:

- i. Determine the total cost of the output from the production process
- ii. Calculate the allocated joint costs for product A and product B
- iii. Prepare a process account for the production process above

Solution**i)****Output units**

Input units 12500

N. loss (20% × 12500) 2500
 = 10,000kgs

Output units per product

A: 50% × 10,000 = 5000

B: 4% × 10000 = 4000

C: 10% × 10000 = 1000

= 10,000

Total process cost

D. materials 456,250

D. labour 295,000

O/Hs 268,750

1,020,000

Less:

Scrap for N. loss (2500 × 10) (25,000)

By-pdt C (1000 × 20) (20,000)

Total cost Joint costs (A&B) 975,000

ii)

NRV = Sales – Further process

A: (5000 × 200 – (5000 × 100) = 500,000

B: (4000 × 250) – 0 = 1,000,000

= 1,500,000

Joint cost allocationA: $\frac{500,000}{1,500,000} \times 975,000 = \text{sh. } 325,000$ B: $\frac{1,000,000}{1,500,000} \times 975,000 = \text{sh. } 650,000$

Process account							
	Units	Cost	Value		Units	Cost	Value
R.	12,500		456,250	Joint product:	5000		325,000
materials			295,000	A	4000		650,000
Labour			268,750	B	1000	20	20,000
O/HS			-	By-product	2500	10	25,000
				N. loss			
	12,500		1,020,000		12,500		1,020,000

BY-PRODUCTS

These are products recovered incidentally from materials used to manufacture main products. They are one or more products produced incidentally during this manufacture of the main product. Examples of by-products; wax, hides, molasses, saw dust and coffee husks

Features of a by-product

1. They have relatively low sales value when compared to the main products.
2. They are not intended to be produced.

Joint cost will only be allocated to the recognized main product.

No costs are allocated to the by-product. However any amount realized from sale of by-products may be accounted for as follows:

- i) The sales value on the net realizable value (NRV) of the by-products is added to the sales of the sales of the main product i.e. it is treated as additional revenue of the main product.
- ii) The sales on the net realizable value of the by-products is deducted from the cost of production of the main product is valued at net cost of production. This is the main method of accounting and by-products.
- iii) The amount realized is treated as a miscellaneous income and transferred to P&L statement.

NB If the method is not given use the amount realized to reduce the product cost of the main product (Method ii)

SERVICE COSTING

Service costing is a cost accounting method concerned with establishing the costs of services rendered.

Despite this definition, we should note immediately that even though we may be dealing with services that are intangible, the cost accounting methods we use are essentially the same as if we were making cars, biscuits or televisions.

When we set up a service cost accounting system, therefore, we would need to keep in mind the fact that the progression, for example, of a cheque through the banking system, can be treated as items of raw material passing through a production process. Similarly, we should readily appreciate that the provision of a transport service has much in common, from the cost accounting point of view, with the manufacture of the lorry or van that is being used to provide the service.

Specific Examples: where is service costing applied?

- ☐ Transport
- ☐ Hotels
- ☐ Tourism
- ☐ Solicitors
- ☐ Education
- ☐ Retail distribution
- ☐ Financial services

Service costing is also applied within a manufacturing setting.

For example, a manufacturer might wish to calculate the costs of the following services:

- ☐ Transport
- ☐ Catering
- ☐ Computing and IT
- ☐ Accounting
- ☐ Human resources

The Differences between Product Costing and Service Costing

- There may be very few, if any, materials to worry about
- Overheads will comprise the most significant portion of any costs of which, labour costs may well comprise as much as 70%

Service Costing: profit or cost centre?

Many organisations simply want to determine the costs of operating its services from a management control and management information point of view. However, there are many organisations now that operate services for their own organisations as well as sub contracting them out to other organisations. For example, there are companies that operate their own payroll section for themselves; and offer this service to other organisations as well. Other organisations sell CPU time on their computers at times when they do not use it themselves: for example, in overnight batch work.

One key factor here is that we might be in the situation of assessing the least cost basis for providing a service, rather than the highest profit possible.

Service Cost Units

What are the cost units for a service? For a manufacturer, cost units would be

- ☐ Motor cars
- ☐ Packets of biscuits or boxes containing, say, 100 packets of biscuits
- ☐ Television sets

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

Illustration

Steer & Wheel Ltd distribute its goods to a regional retailer using a single lorry. The dealer's premises are 40 km away by road. The lorry has a capacity of 10½ tones and makes journeys twice a day fully loaded on the outward journeys and empty on the return journeys. The following information is available for a four week budget control period: period 8 of 2004.

Petrol consumption	8 km per 5 litres of petrol
Petrol cost	Shs 0.36 per litre
Oil	Shs 8 per week
Driver's wages and NI	Shs 140 per week
Repairs	Shs 72 per week
Garaging	Shs 4 per day based on a seven day week
Cost of lorry when new (excludes tyres)	Shs 18,750
Life of lorry	80,00 km
Insurance	Shs 650 per year
Cost of a set of tyres	Shs 1,250
Life of a set of tyres	25,000 km
Estimated sales value of lorry at the end of its life	Shs 2,750
Vehicle licence cost	Shs 234 per year
Other overhead costs	Shs 3,900 per year

The lorry is operated on a five day week basis.

Required:

Prepare a statement to show the total costs of operating the lorry in period 8 2004 analyzed into running costs and standing costs.

Solution

Let's set out an attractive table showing our costs classified according to whether they are running or standing costs:

Cost	Running Cost	Standing Cost
Petrol consumption	X	
Petrol cost per litre	X	
Oil		X
Driver's wages and NI		X
Repairs		X
Garaging		X
Cost of lorry when new (excludes tyres)	X	
Life of lorry	X	
Insurance		X
Cost of a set of tyres	X	
Life of a set of tyres	X	
Estimated sales value of lorry at the end of its life	X	
Vehicle licence cost		X
Other overhead costs		X

NOTE: just in case there is any doubt, the driver's wages and NI are standing costs because they do NOT vary with the number of km driven. Check that you agree with our other classifications.

Statement of Total Costs of Operating the Lorry: Period 8 2004

Vehicle Operating Costs: Period 8
2004

Running Costs

Petrol	720	
Depreciation	640	
Tyres	160	
		1,520

Standing costs

Garaging	112	
Oil	32	
Driver's wages and NI	560	
Repairs	288	
Insurance	50	
Vehicle licence	18	
Other overheads	300	
		1,360
Total Operating Costs		2,880

Workings

Petrol Cost: Km driven: $40 \text{ km} \times 2 \times 2 \times 5 \times 4 = 3,200 \text{ km}$ Petrol consumption: $3200 \text{ km} \div 8 \text{ km} \times 5 \text{ litres} = 2,000 \text{ litres}$ Petrol cost = $2,000 \text{ litres} / \text{Shs } 0.36 \text{ per litre} = \text{Shs } 720$

Depreciation: $(\text{Cost of lorry} - \text{residual value} \div \text{life of lorry}) \times \text{km driven} = (\text{Shs } 18,750 - 2,750 \div 80,000 \text{ km}) \times 3,200 \text{ km} = \text{Shs } 640$

Cost of Tyres: $(\text{cost of tyres} \div \text{life of tyres}) \times \text{km driven} = (\text{£}1,250 \div 25,000 \text{ km}) \times 3,200 \text{ km} = \text{Shs } 160$

Garaging: $\text{Shs } 4 \times 7 \times 4 = \text{Shs } 112$

Repairs: $\text{Shs } 72 \times 4 = \text{Shs } 288$

Insurance: $\text{Shs } 650 \div 52 \times 4 = \text{Shs } 50$

Vehicle licence: $\text{Shs } 234 \div 52 \times 4 = \text{Shs } 18$

Other overhead costs: $\text{Shs } 3,900 \div 52 \times 4 = \text{Shs } 300$

UNIT COSTING

The unit cost of a product or service is obtained by assigning total costs to many identical or similar units.

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.

REVISION EXERCISES**QUESTION ONE**

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:	Sh.
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

Solution:**Timau Ltd****Production Statement: June 2000**

	Inputs	Total output	Material	Labour	Overhead
		Units	Units	Units	Units
Baa b/f	5,000	21,000	21,000	21,000	21,000
Mixing Process	20,000	4,000	4,000	1,600	2,400
	25,000	25,000	25,000	22,600	23,400

	Total Cost	Equivalent	Units of Production	
	(Shs)	(Shs)	(Shs)	(Shs)
Balance b/f (W.I.P)	185,000	100,000	25,000	60,000
Costs Added	278,400	45,300	125,000	108,100
Total Costs to account for:	463,400	145,300	150,000	168,100
Cost per Equivalent Unit:	19.633	5.812	6.637	7.184

Costs Accounted for as follows:

Transfer to finished goods:	412,291	122,050	139,380	150,859
21,000 x 19.633				
Closing work in Process:	51,109	23,248	10,619	17,242
Total Costs Accounted for:	463,400	145,300	149,999	168,101

Refining Process A/C

	Units	Unit Cost	Value		Units	Unit cost	Value
Balb/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 TWO

Tinn Ltd produces a detergent which passes through two processes namely mixing and refining t completion. The following data relate to the refining process for the month of October 2000:

Opening stock 5,000 units

Cost of opening stock:

	Sh
Materials	100,000
Labour	25,000
Overheads	60,000
Total cost	185,000

During the month, 20,000 units were passed from the mixing to the refining process. Costs incurred during the month were:

	Sh
Labour	125,000
Overheads	108,100
Other materials	45,300
Total cost	278,400

At the end of the month, 21,000 units had been completed and passed to finished goods while 4,000 units were still in the process having reached the following stages:

Materials	100%
Labour	80%
Overheads	60%

Required:

Refining process account

Solution:

Refining Process Account

Process Inputs:	Units	Cost	Transferred to:	Units	Cost (Shs)
Opening W.I.P	5,000	185,000	Finished Products	21,000	403,074
Input:	20,000	-	Closing W.I.P	4,000	60,326.20
Conversion Costs	-	125,000			
Labour	-	-			
Overheads	-	108,100			
Other Materials	-	45,300			
	<u>25,000</u>	<u>463,400</u>		<u>25,000</u>	<u>463,400</u>

Valuation of Finished Units:

Equivalent Units of:

Materials: Finished Goods + W.I.P = 25,000 UNITS
 $21,000 + (4,000 \times 100\%)$

Cost per Unit of Raw Material = $\frac{100,000 + 45,300}{25,000} = \text{Sh.} 5.812$

Labour: $21,000 + (4,000 \times 80\%) = 24,200$

Cost per unit of labour = $\frac{25,000 + 125,000}{24,200} = \text{Sh.} 6.1983$

Overheads: $21,000 + (4,000 \times 60\%) = 23,400$ units

Cost per unit of Overhead = $\frac{60,000 + 108,100}{23,000} = \text{Sh.} 7.184$

Cost per finished Unit = $5.812 + 6.1983 + 7.184 = \text{Sh.} 19.194$

Tinn ltd**Production statement****Physical Units:**

Inputs:	Units	Unit Cost
Opening Stock	5,000	-
Units Introduced	20,000	-
	25,000	
Units Accounted for as:		
To finished goods	21,000	-
To work in process	4,000	-
	25,000	

Cost Statement

	Shs.
Opening Stock	185,100
Costs Added	
Labour	125,000
Overheads	108,000
Materials	45,300
Costs to Account for	463,400
Accounted for as follows:	
To finished goods:	
21,000 x 19.194	403,074
To work in process:	
Material: 4000 x 5.812	23,248
Labour: 3,200 x 6.1983	19,836.4
Overheads: 2,400 x 7.184	17,241.6
Valuation of work in process	60,326
Total Costs accounted for:	463,400

TOPIC 7

MARGINAL AND ABSORPTION COSTING

Marginal and absorption **costing** are two different approaches to dealing with fixed production overheads and whether or not they are included in valuing inventory.

Definition of Marginal Costing

Marginal Costing, also known as Variable Costing, is a costing method whereby decisions can be taken regarding the ascertainment of total cost or the determination of fixed and variable cost in order to find out the best process and product for production etc.

It identifies the Marginal Cost of production and shows its impact on profit for the change in the output units. Marginal cost refers to the movement in the total cost, due to the production of an additional unit of output.

In marginal costing all the variable costs are regarded as product related costs while fixed costs are assumed as period costs. Therefore, fixed cost of production is posted to the Profit & Loss Account. Moreover, fixed cost is also not given relevance while determining the selling price of the product or at the time of valuation of closing stock (whether it is finished goods or Work in Progress).

Illustration

Suppose company X makes two products A and B. A takes 2 labor hours each to make and B takes 5 labor hours. What is the overhead cost per unit for A and B respectively if overheads are absorbed on the basis of labor hours?

Solution

Step 1- Estimate overheads for the period.

X estimates it to be shs. 50,000

Step 2- Estimate activity level for the period

X estimates a total of 100,000 direct labor hours will be worked

Step 3- Divide the estimated overhead by budgeted activity level.

Absorption rate = $\frac{\text{Shs.50, 000}}{100, 000 \text{ hours}}$

= shs.0.50 per direct labor hours

Step 4- Absorb overhead into the cost unit by applying absorption rate.

	A	B
Labor hours/unit	2	5
Absorption Rate(SHS)	0.5	0.5
Overhead absorbed/unit	1	2.5

Note: The activity level of 100,000 hours is the basis over which the overheads will be absorbed. Different bases will be used as shown in the table illustration previously.

Advantages of marginal costing

1. Marginal costing is simple to understand.
2. By not charging fixed overhead to cost of production, the effect of varying charges per unit is avoided.
3. It prevents the illogical carry forward in stock valuation of some proportion of current year's fixed overhead.
4. The effects of alternative sales or production policies can be more readily available and assessed, and decisions taken would yield the maximum return to business.
5. It eliminates large balances left in overhead control accounts which indicate the difficulty of ascertaining an accurate overhead recovery rate.
6. Practical cost control is greatly facilitated. By avoiding arbitrary allocation of fixed overhead, efforts can be concentrated on maintaining a uniform and consistent marginal cost. It is useful to various levels of management.
7. It helps in short-term profit planning by breakeven and profitability analysis, both in terms of quantity and graphs. Comparative profitability and performance between two or more products and divisions can easily be assessed and brought to the notice of management for decision making.

Disadvantages of marginal costing

1. The separation of costs into fixed and variable is difficult and sometimes gives misleading results.
2. Normal costing systems also apply overhead under normal operating volume and this shows that no advantage is gained by marginal costing.
3. Under marginal costing, stocks and work in progress are understated. The exclusion of fixed costs from inventories affect profit, and true and fair view of financial affairs of an organization may not be clearly transparent.
4. Volume variance in standard costing also discloses the effect of fluctuating output on fixed overhead. Marginal cost data becomes unrealistic in case of highly fluctuating levels of production, e.g., in case of seasonal factories.
5. Application of fixed overhead depends on estimates and not on the actuals and as such there may be under or over absorption of the same.
6. Control affected by means of budgetary control is also accepted by many. In order to know the net profit, we should not be satisfied with contribution and hence, fixed overhead is also a

valuable item. A system which ignores fixed costs is less effective since a major portion of fixed cost is not taken care of under marginal costing.

7. In practice, sales price, fixed cost and variable cost per unit may vary. Thus, the assumptions underlying the theory of marginal costing sometimes becomes unrealistic. For long term profit planning, absorption costing is the only answer.

Definition of Absorption Costing

Absorption Costing is a method for inventory valuation whereby all the manufacturing expenses are allocated to the cost centers to recognize the total cost of production. These manufacturing expenses include all fixed as well as variable costs. It is the traditional method for cost ascertainment, also known by the name Full Absorption Costing.

In an absorption costing system, both the fixed and variable costs are regarded as product related cost. In this method the objective behind the assignment of the total cost to cost center is to recover it from the selling price of the product.

On the basis of function, the expenses are divided into Production, Administration and Selling & Distribution. The following are the types of Absorption Costing:

- Activity Based Costing
- Job Costing
- Process Costing

Illustration

PQR limited is a manufacturer of sports shoes. The company uses a standard system. The standard cost per pair of sports shoes is as follows:

	Sh.
Direct materials	500
Direct labour: 4 hours × sh. 60 / hour	240
Production overheads	
Variable 4 hours × sh. 30 / hour	120
Fixed	<u>100</u>
Standard production cost	<u>960</u>
Standard selling price	<u>1,500</u>

Additional information

1. During the month of March 2011, production was 10,000 units as planned but the sales made were 8,000 units
2. The total fixed production overhead variance during the month was sh. 100,000 adverse
3. The standard fixed production overhead absorption rate was based on a budgeted activity of 10,000 units
4. There was no opening stock at the beginning of the month

5. All units were sold at the standard selling price
6. Other costs incurred during the month were as follows:

	Variable	Fixed Sh.
Selling and distribution	20% of sales	600,000
Administration		1,000,000

Required:

Income statement for the month of March 2011 using Absorption costing

Solution

PQR Limited		
Income statement (using absorption)		
For the month of March 2011		
	Sh. '000'	Sh. '000'
Sales (1500×8000)		12,000
Cost of sales		
Cost of production (960×10000)	9,600	
Closing stock (2000× 960)	<u>(1,920)</u>	<u>(7,680)</u>
Gross profit		4,320
Expenses		
Selling & distribution: Variable	2,400	
(20%×12000)	<u>600</u>	(3,000)
Fixed		(1,000)
Administration expense		<u>(100)</u>
Fixed production overheads under-absorbed		
Net profit		<u><u>220</u></u>

Advantages of absorption costing

- i) Fixed costs are substantial and increasing proportion of costs in modern industry. It thus forms a significant part of costs of production so it should be included. Marginal costing divorces fixed costs from production.
- ii) It is used preferably where stock building is a necessary part of operations e.g. wine making. Otherwise fictitious losses will be shown in earlier periods to be offset eventually by excessive profits when goods are sold.
- iii) Relying on marginal costs could lead to management setting prices at below total costs but making slight contribution. This is avoided in absorption costing.
- iv) International Financial Reporting Standards suggest that costs and revenues must be matched in the period when revenues arise not when costs are incurred. It also recommends that stock valuation must include production overheads incurred in the normal course of business even if such overheads are time related.

DISTINCTION BETWEEN MARGINAL AND ABSORPTION COSTING

Comparison Chart

Basis for Comparison	Marginal Costing	Absorption Costing
Meaning	A decision making technique for ascertaining the total cost of production is known as Marginal Costing.	Apportionment of total costs to the cost center in order to determine the total cost of production is known as Absorption Costing.
Cost Recognition	The variable cost is considered as product cost while fixed cost is considered as period costs.	Both fixed and variable cost is considered as product cost.
Classification of Overheads	Fixed and Variable	Production, Administration and Selling & Distribution
Profitability	Profitability is measured by Profit Volume Ratio.	Due to the inclusion of fixed cost, profitability gets affected.
Cost per unit	Variances in the opening and closing stock does not influence the cost per unit of output.	Variances in the opening and closing stock affects the cost per unit.
Highlights	Contribution per unit	Net Profit per unit

VALUATION OF PRODUCTS UNDER MARGINAL AND ABSORPTION COSTING

Marginal costing

Product costs	Shs
D. Material	xxx
D. Labour	xxx
V. Production O/H	xxx
	xxx

Absorption costing

Product costs	Shs
D. Material	xxx
D. Labour	xxx
V. Production O/H	xxx
Fixed O/H	<u>xxx</u>
	<u>xxx</u>

PREPARATION OF MARGINAL AND ABSORPTION STATEMENTS

Cost of production and profit determination

Marginal Costing Profit and Loss Statement

Sales		xxx
Less: Cost of sales		
Opening stock	xxx	
Add: production cost		
D. Material	xxx	
D. Labour	xxx	
V. Production O/H	<u>xxx</u>	
	xxx	
Less: Closing stock	(xxx)	<u>(xxx)</u>
Gross contribution		xxx
Less: Other various costs		xxx
Net Contribution		
Less: Fixed costs		
Production	xxx	
Administration	xxx	
Selling and distr.	xxx	(xxx)
N. Profit		xxx

Absorption costing Profit and loss statement

Sales		xxx
Less: <u>Cost of sales</u>		
Opening stock	xxx	
Add: production cost		
D. Material	xxx	
D. Labour	xxx	
V. Production O/H	xxx	
I. Production O/H	<u>xxx</u>	
	xxx	
Less: Closing stock	(xxx)	<u>(xxx)</u>
Gross Profit		xxx
Less: Operating expenses		
Administration	xxx	
Selling and distr.	xxx	<u>(xxx)</u>
Net Profit		<u>xxx</u>

MARGINAL COSTING AND ABSORPTION COSTING

Example 1

In a period, 20,000 units of Z were produced and sold. Costs and revenues were:

	Sh.	
Sales		100,000
Production cost: Variable		35,000
Fixed	15,000	
Administrative + Selling overheads: Fixed		25,000

Required:-

The operating statements for Z

Solution

Operating statements

Absorption costing approach		Marginal costing approach	
	Sh.	Sh.	Sh.
Sales	100,000	Sales	100,000
Less production cost of sales	<u>50,000</u>	Less marginal cost	<u>35,000</u>
= Gross profit	50,000	= Contribution	65,000
Less admin + selling Overheads	25,000	Less Fixed costs	
	=	Production	15,000
	<u>25,000</u>	Admin S + D	<u>25,000</u>
Net Profit		Net Profit	<u>25,000</u>

The above illustration, although simple, illustrates the general characteristics of both approaches.

The key figure arising in the Marginal statement is the contribution of sh.65,000. The total amount of contribution arising from product Z (and other products, if any) forms a pool from which fixed costs are met. Any surplus arising after fixed costs are met becomes the Net profit.

CHANGES IN THE LEVEL OF ACTIVITY

When changes occur in the level of activity, the absorption costing approach may cause some confusion. In example 1 the activity level was 20,000 units and using the absorption approach, the profit per unit and cost per unit can be calculated as follows;

		Sh.
Selling price per unit		5
Less Total cost per unit	<u>Sh.75,000</u>	
	20,000	<u>3.75</u>
Profit per unit		<u>1.25</u>

If these figures were used as guides to results at any activity level other than 20,000, they would be incorrect and may mislead. For example, if the level of activity of example 1 changes to 25,000 units, it might be assumed that the total profit would be 25,000 x sh.1.25 = sh.31,150. However, the results are likely to be as follows:

Operating statement (Absorption approach)

	Sh.
Sales (25,000 x 5)	125,000
Less production cost (£35,000 + 15,000)	<u>58,750</u>
= Gross profit	66,250
Less Admin + Selling overheads	<u>25,000</u>
= Net profit	<u>41,250</u>

The difference is, of course, caused by the incorrect treatment of the fixed cost. In such circumstances the use of the marginal approach presents a clearer picture. Based on the data in

In Example 1

The marginal cost per unit and the contribution per unit are calculated as follows:

Marginal cost per unit = $\frac{\text{Sh}35,000}{20,000}$

= Sh1.75

Contribution per unit = Sales Price – Marginal cost per unit

= sh5 - sh1.75

= sh3.25

If once again, the activity is increased to 25,000 units, the expected profit would be:

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

= (25,000 x sh3.25) - sh40,000

= Sh41,250

And the operation statement on marginal costing lines would be

	Sh.
Sales (25,000 × 5)	125,000
Less marginal cost (£25,000 × 1.75)	<u>43,750</u>
= Contribution	81,250
Less Fixed cost	<u>40,000</u>
= Net profit	<u>41,250</u>

Note: Students will note that the marginal cost and contribution per unit are assumed to be constant and that the fixed costs remain unchanged.

RECONCILIATION OF MARGINAL PROFITS AND ABSORPTION PROFITS

PROFIT RECONCILIATION

There is always a difference between the profits reported using marginal costing and absorption costing. This is brought about by the difference in stock relation.

In marginal costing, stocks are valued at variable cost of production while in absorption cost they are valued at total cost.

This causes differences in the amounts that are charged to cost of sales which affects the profit reported.

Illustration

Langata is a manufacturing company which produces a single product. The following standard unit costs relate to the product.

Cost	Sh.
Variable manufacturing	90
Fixed manufacturing	70
Variable selling and administration	16
Fixed selling and administration	<u>60</u>
	236

Fixed manufacturing costs per unit are based on a predetermined absorption rate established at a normal activity level of 45,000 production unit per period. Fixed selling and administration costs are absorbed into the cost of sales at 20% of selling price.

Under/over absorbed overheads are transferred to the profit and loss account at the end of the period

The following information is available for two consecutive periods.

	Period 1	Period 2
Sales – units	42,500	45,000
Sales – value (Sh.)	12,750,000	13,500,000
Production units	40,000	46,000
Variable manufacturing costs (Sh.)	3,600,000	4,140,000
Variable selling and administration costs (Sh.)	3,200,000	3,150,000
Fixed selling and administration costs (Sh.)	<u>680,000</u>	<u>720,000</u>
	<u>2,700,000</u>	<u>2,700,000</u>

Required

- Income statements for each of the two periods under the absorption costing basis
- Income statements for each of the two periods under the marginal costing basis
- Reconciliation of the profits under the absorption costing and the marginal costing basis for each of the periods.

Solution**Marginal and absorption cost****Product cost**

Marginal		Absorption	
Variable manufacturing	<u>90</u>	Variable manufacturing	90
	<u>90</u>	Fixed manufacturing	<u>70</u>
			<u>160</u>

Income statement using marginal costing

	Period 1		Period 2	
	Sh.	Sh.	Sh.	Sh.
Sales		12,750,000		13,500,000
Less: marginal cost of sales				
Opening stock (2500 x 90)	225,000		-	
Variable manufacturing	3,600,000		4,140,000	
	3,825,000		4,140,000	
Less closing stock	-	(3,225,000)	(90,000)	(4,050,000)
Gross contribution		8,925,000		9,450,000
Less other variables				
Variable distribution	680,000	<u>680,000</u>	720,000	<u>720,000</u>
Net contribution		8,245,000		8,730,000
Less fixed costs				
Fixed manufacturing	3,200,000		3,150,000	
Fixed selling and administration	<u>2,700,000</u>	<u>5,900,000</u>	2,700,000	<u>(5,850,000)</u>
NET PROFIT		<u>2345000</u>		<u>2,880,000</u>

Income statement using absorption costing

PERIOD 1			PERIOD 2	
	Sh.	Sh.	Sh.	Sh.
SALES		12,750,000		13,500,000
LESS COST OF SALES				
Opening stock (2500 x 160)	400,000		-	
Variable manufacturing	3,600,000		4,140,000	
Fixed manufacturing cost	<u>2,800,000</u>		<u>3,220,000</u>	
	6,800,000		7,360,000	
Less closing stock	-	<u>6,800,000</u>	(160,000)	(7,200,000)
		5,950,000		6,300,000
Less Expenses				
Variable selling & distribution	680,000		720,000	
Fixed selling & distribution	2,550,000		2,700,000	
Under absorbed fixed s/distribution	150,000		70,000	
Under absorbed fixed manufacturing cost	<u>400,000</u>	<u>(3,780,000)</u>	=	<u>(3,350,000)</u>
Net profit		<u>2,170,000</u>		<u>2,950,000</u>

	Fixed manufacturing Sh.	Fixed selling & distribution Sh.	Total Sh.
OHD absorbed	2,800,000	25,500,000	5,350,000
Actual OHD	3,200,000	2,700,000	<u>5,900,000</u>
			(550,000)
OHD absorbed	3,220,000	2,700,000	
Actual OHD	<u>2,150,000</u>	<u>2,720,000</u>	
	<u>70,000</u>	0	

Reconciliation statement for the periods

	Shs
Period 1	
Profit as per marginal costing	2,345,000
Less: Understatement of opening stock	<u>175,000</u>
Profit as per absorption costing	<u>2,170,000</u>
Period 2	
Profit as per marginal costing	2,880,000
Add: Understatement of closing stock	<u>70,000</u>
Profit as per absorption	<u>2,950,000</u>

APPLICATION OF MARGINAL COSTING

Marginal costing is applied internally by management in decision making such as:

- i) Cost volume profit analysis (CVP)
- ii) Planning
- iii) Decision making (non-routine)
- iv) cost control
- v) measurement of efficiency
- vi) Evaluation of profitability

Cost Volume and Profit Analysis (CVP)

Cost volume profit (CVP) analysis is the study of the effects on future profit of changes in fixed cost, variable costs, sales price quantity and mix.

The purpose of the C.V.P analysis is to understand the relationship amongst the aforesaid variables to forecast profits, determine the volumes to be achieved to meet target profit, and such other short term decisions. The CVP analysis is based on the premise of marginal costing.

The marginal costing technique recognizes variable cost as the product costs and fixed costs as period costs. The principle is that only variable costs will change with a change in volume of production and sales, but the fixed costs will remain the same.

Cost volume profit (CVP) analysis is a systematic approach of examining the relationship between changes in volume and changes in total sales, expenses and net profit. The underlying objective of CVP is to know the effect of fluctuation in the activity volume on financial results.

The following is a typical cost volume profit diagram that depicts how sales revenue, fixed costs and variable costs respond to changes in the volume of sales and production. The volume of production and sales is measured by the X-axis and revenue, costs and profit (loss) are measured by –axis in the CVP chart.

The short run decisions where CVP analysis may be useful include choice of product mix, product pricing, special order acceptance, shut down of a plant etc.

Assumptions of CVP analysis

1. Revenues, costs and profit functions are assumed to be linear with respect to volumes of output.
2. Costs can be split into fixed and variable statement
3. Fixed costs remain constant throughout the analysis
4. The selling price per unit remains constant
5. Variable cost per unit remains constant
6. The only factor affecting cost and revenue is output i.e. output is the only revenue and cost driver
7. Technology in production and efficiency level remains constant.
8. Only production is produced and sold. In case of multiple productions the sale mixture will remain constant.
9. All units produced will be sold.

Let X: No of units produced and sold/activity level

D= Price per unit

V = Variable cost per unit

F = Fixed costs

R = Total sales revenues in monetary form and activity level in monetary terms.

C = Total costs

TI = Profits

Marginal costs equation

Contribution signifies an alternative measure of profit which is computed as sales less total variable costs of sales

Accordingly **Contribution = Sales – Variables**

Contribution for the period provides a pool (since it recognizes a surplus generated by sale revenue over variable costs) out of which fixed costs for the period are met and any surplus constitutes the profit. It is called contribution because it literally contributes towards fixed costs and profit)

Therefore **Contribution = Fixed costs + Profit**

The elements in tradition break even chart (in a single product situation)

A traditional break even chart records revenues and cost on the vertical axis and volume of activity on other horizontal axis. The lines representing sales revenue and total costs signify break-even point.

At any volume level the space between the total cost line and fixed costs line signifies variable cost. In traditional chart, the fixed cost line is drawn first and thereupon the variable cost is drawn in order to signify total cost

The contribution break even chart (in a single product situation)

The basic elements of a contribution break even chart are the same as that of the traditional break even chart.

The only difference is that it shows the variable cost line instead of the fixed cost line. This is done in order to overcome the major problem with traditional break even chart that it is not possible to read contribution directly from the chart.

The same lines for total costs and sales revenue are shown so the breakeven point and profit can be interpreted in the same way as with convectional chart.

The contribution can read as the difference between the sales revenue line and the variable costs line.

Profit/ volume chart (in simple product situation)

This is yet another mode of presentation of break-even chart. This is also known as **contribution volume graph**. In this, a single a single line is drawn depicting the profit or loss at each level of activity. The point of intersection of the line and the horizontal axis is the breakeven point. The basic feature of this chart is that the vertical axis indicates profits and losses and the horizontal axis is drawn at zero profit or loss.

Cost Volume Profit (C.V.P) analysis by formula

C-V-P analysis can be undertaken by graphical means which are dealt with later in this chapter, or by simple formulae which are listed below and illustrated by examples

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

$$\text{b) C/S Ratio} = \frac{\text{Contribution/unit}}{\text{Sales price/unit}} \times 100$$

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

$$= \text{Fixed Costs} \times \frac{1}{\text{C/S ratio}}$$

- d) Level of sales to result in target profit (in units) = $\frac{\text{Fixed Costs} + \text{Target profit}}{\text{Contribution/unit}}$
- e) Level of sales to result in target profit after tax (in units)

$$= \frac{\text{Fixed Cost} + \left[\frac{\text{Target profit}}{1 - \text{Tax rate}} \right]}{\text{Contribution/unit}}$$

- f) Level of sales to result in target profit £sales)
- $$= \frac{(\text{Fixed Cost} + \text{Target profit}) \times \text{Sales price/unit}}{\text{Contribution/unit}}$$

Note: The above formulae relate to a single firm or one with an unvarying mix of sales. With a multi-product firm it is possible to calculate the break-even point as follows:

$$\text{Break-even point (sh. sales)} = \frac{\text{Fixed Costs} \times \text{Sales Value}}{\text{Contribution}}$$

Illustration

A company makes a single product with a sales price sh10 and a marginal cost of sh6. Fixed costs are sh60,000 per annum.

- Number of units to break even
- Sales at break-even point
- C/S ratio
- What number of units will need to be sold to achieve a profit of sh20,000 p.a.?
- What level of sales will achieve a profit of sh20,000 p.a.?
- As (d) with a 40% tax rate.
- Because of increasing costs the marginal cost is expected to rise to £6.50 per unit and fixed costs to sh70,000 p.a. If the selling price cannot be increased what will be the number of units required to maintain a profit of £20,000 p.a. (ignore tax)?

Solution

Contribution	= Selling price – Marginal Cost
	= sh10 - sh6
	= <u>sh4</u>
a) Break-even point (units)	= $\frac{\text{sh60,000}}{4}$
	= 15,000
b) Break-even point (£sales)	= 15,000 x sh10
	= sh150,000
c) C/S ratio	= $\frac{\text{sh4}}{10}$
	= 40%

$$\begin{aligned} \text{d) Number of units for target profit} &= \frac{\text{sh}60,000 + \text{sh}20,000}{4} \\ &= 20,000 \end{aligned}$$

$$\begin{aligned} \text{e) Sales for target profit} &= 20,000 \times \text{sh}10 \\ &= 200,000 \end{aligned}$$

(Alternatively, this figure can be deduced by the following reasoning. After break-even point the contribution per unit becomes net profit per unit, so that as 15,000 units were required at break-even point, 5000 extra units would be required to make sh.20,000 profit.

Therefore total units = 15,000 + 5,000 = 20,000

$$20,000 \times \text{sh}10 = \text{sh}.200,000$$

$$\begin{aligned} \text{f) Number of units for target profit with 40\% tax} &= \frac{\left(60,000 + \frac{\text{sh}. 20,000}{1-0.4} \right)}{\text{sh}4} \\ &= 23,333 \end{aligned}$$

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

$$\begin{aligned} \text{No. of units for target profit} &= \frac{\text{Sh}70,000 + \text{sh}20,000}{\text{Sh}3.50} \\ &= 25,714 \text{ units} \end{aligned}$$

Note: The C/S ratio is sometimes known as the P/V ratio

LIMITATIONS OF CVP ANALYSIS

1. It can be time consuming
2. The analysis can only be applied to a single product
3. Where there is difficulty in classifying costs between fixed costs variable, it is difficult to apply break even analysis
4. At all levels of output, it assumes that the fixed costs are fixed or constant
5. At all levels of output, it assumes that the per unit variable costs are the same or fixed
6. At all levels of output, it assumes that sales price are fixed or constant
7. Inventory is not taken into consideration
8. It is not useful for production planning

Graphical Approach

This may be preferred

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

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

The Traditional Break-Even Chart

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

a) Draw the axes

Horizontal: showing levels of activity expressed as units of output or as percentages of total capacity.

Vertical: showing values of sh. 's or sh. 00s as appropriate for costs and revenues.

b) Draw the cost lines

Fixed cost. This will be a straight line parallel to the horizontal axis at the level of the fixed costs.

Total cost. This will start where the fixed cost line intersects the vertical axis and will be a straight line sloping upward at an angle depending on the proportion of variable cost in total costs.

c) Draw the revenue line

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

Illustration

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

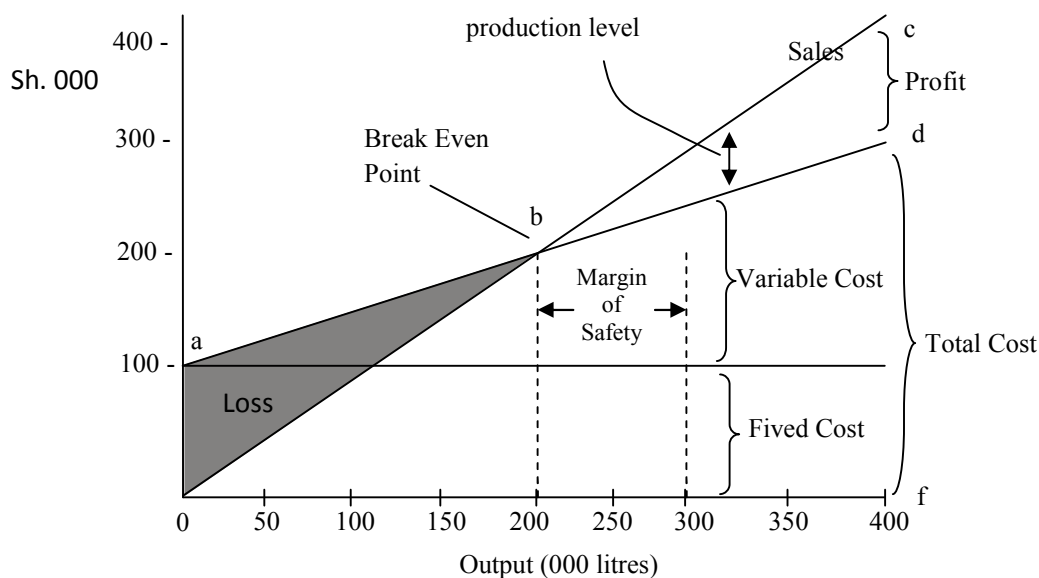
Selling price	sh.1 per litre
Marginal cost	sh.0.50 per litre
Fixed costs	sh.100, 000

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

Solution

From Figure below it will be seen that break-even point is at an output level of 200,000 litres and that the width of the profit wedge indicates the profit at a production level of 300,000. The profit is sh.50,000.

Traditional Break-Even Chart



Notes: The 'margin of safety' indicated on the chart is the term given to the difference between the activity level selected and break-even point. In this case the margin of safety is 100,000 litres.

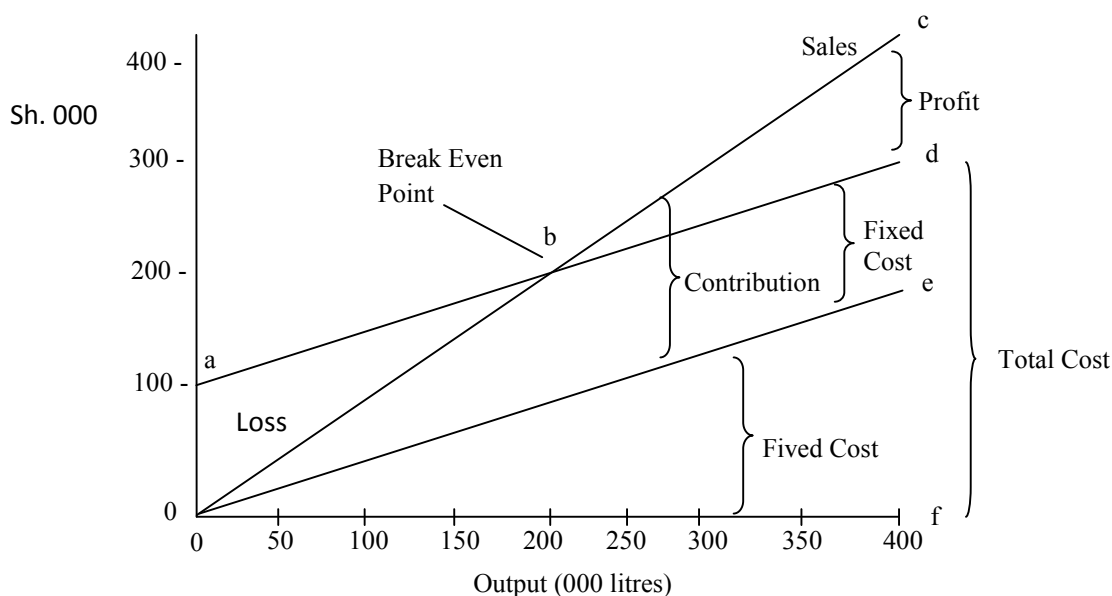
The Contribution Break-Even Chart

This uses the same axes and data as the traditional chart. The only difference being that variable costs are drawn on the chart before fixed costs resulting in the contribution being shown as a wedge.

Illustration

By using the illustration above except that a contribution break-even chart should be drawn.

Solution (see the following figure below)



Notes:

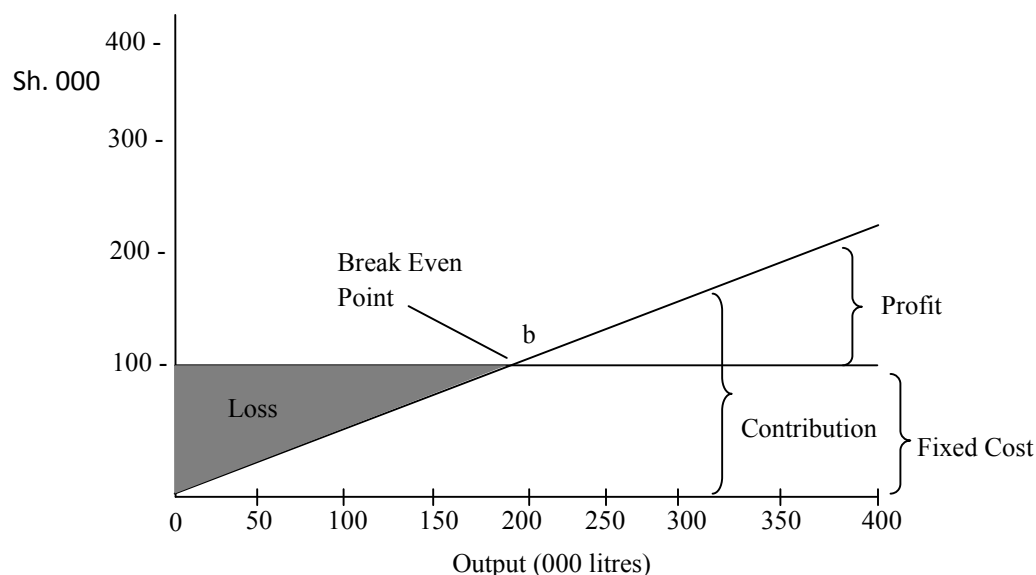
- The area c.o.e represents the contribution earned. There is no direct equivalent on the traditional chart.
- The area of d.a.o.f represents total cost and is the same as the traditional chart.
- It will be seen from the chart that the reversal of fixed costs and variable costs enables the contribution wedge to be drawn thus providing additional information.

An alternative form of the contribution break-even chart is where the net difference between sales and variable cost i.e. total contribution, is plotted against fixed costs. This is shown in Figure below once again using the same data as in the illustration above.

Notes on figure below

- Sales and variable costs are not shown directly.

Both forms contribution chart, figures above and below, show clearly that contribution is first used to meet fixed costs and when these costs are met, the contribution becomes profit

Alternative Form of Contribution Break Even Chart**Optimizing the Level of Activity**

Where the cost and/or revenue functions are non-linear, for example as shown in figure 14.14, then it is possible to determine the optimal level of activity in accordance with the objectives of the firm. This can be done in two ways, either by drawing graphs of the functions as in figure 14.14 and 14.15 or more directly by the use of differential calculus. It will be recalled that the process of differentiation provides a ready means of finding the rates of change of non-linear functions and of their turning points. If the non-linear functions represent cost and revenue then the rates of change are marginal cost and marginal revenue respectively and the turning points of the functions are the point of minimum cost and maximum revenue respectively.

The following example uses differentiation to find the optimal activity level.

Illustration

A firm has the following cost and revenue functions:

$$\text{Variable cost function, } c = \text{sh.} \left(\frac{1}{2} q^2 + 10q \right)$$

$$\text{Demand function, } p = \left(\text{sh. } 150 + \frac{3}{4} q \right)$$

Where P = price in sh.

c = Variable cost in sh's

q = number of units sold per period

The fixed costs are sh.1,000 per period.

It is required to determine

- The price, quantity and resulting profit if the firm's objective is to maximize sales revenue.
- The price, quantity and resulting profit if the firm's objective is to maximize profit.

Solution**a) Let R = revenue**

$$\begin{aligned} \text{Then} \quad R &= p q \\ &= \left(150 - \frac{3}{4} q \right) q \\ &= 150q - \frac{3}{4} q^2 \end{aligned}$$

For maximum revenue, $\frac{dR}{dq} = 0$ (with a negative second derivative).

$$\text{Thus} \quad 150 - 1\frac{1}{2} q = 0$$

(Note that $\frac{d^2R}{dq^2} = -1\frac{1}{2}$ i.e. negative, as required for a maximum point)

$\therefore q = 100$ at maximum revenue point.

$$\begin{aligned} \therefore q &= \text{£} \left(150 - \frac{3}{4} q \right) \\ &= \text{sh.} \left(150 - \frac{3}{4} (100) \right) \\ &= \text{sh. } 75 \end{aligned}$$

$$\begin{aligned} \therefore R &= p q \\ &= (\text{sh. } 75 \times 100) \\ &= \text{sh. } 7,500 \end{aligned}$$

Profit at maximum revenue point is:

		Shs
	Revenue	7,500
Less:	Costs = $\left[\frac{1}{2} (100)^2 + 10(100)\text{sh.} + 1,000 \right]$	<u>(7,000)</u>
	Profit per period	<u>500</u>

b) For maximum profit, marginal revenue should equal marginal cost.

i.e.

$$\frac{dR}{dQ} = \frac{dC}{dQ}$$

$$\left[\text{But } \frac{dR}{dQ} = 150 - 1\frac{1}{2}q \text{ and } \frac{dC}{dQ} = q + 10 \right]$$

$$\therefore 150 - 1\frac{1}{2}q = q + 10$$

Giving, after some re-arrangement : $q = 56$ at maximum profit point

The resulting price per unit is: $p = \text{sh.} \left(150 - \frac{3}{4}q \right)$
 $= \text{sh. } 108$

Profit at maximum profit point is

		Sh.
	Revenue sh. (56 x 108)	6,048
Less:	Costs = sh. $\left[\frac{1}{2}(56)^2 + 10(56) + 1,000 \right]$	<u>3,128</u>
	Profit per period	<u>2,920</u>

SIMPLIFIED DECISION PROBLEM

They are a onetime decisions but once made they remain binding for a long period of time.

In making these decisions it is only the relevant costs that are considered i.e. irrelevant cost are not taken into account.

Relevant costs.

The term relevant pertinent to the decision at hand, Relevant costs represent those future costs that will be changed by a particular decision. They are the costs appropriate to a specific management decision.

Relevant costs are costs that change with respect to a particular decision. Sunk costs are never relevant. Future costs may or may not be relevant. If the future costs are going to be incurred regardless of the decision that is made, those costs are not relevant. Committed costs are future costs that are not relevant. Even if the future costs are not committed, if we anticipate incurring those costs regardless of the decision that we make, those costs are not relevant. The only costs that are relevant are those that differ as between the alternatives being considered.

Including sunk costs in a decision can lead to a poor choice. However, including future irrelevant costs generally will not lead to a poor choice; it will only complicate the analysis. For example, if I am deciding whether to buy a Toyota Camry or a Subaru Legacy, and if my auto insurance will be

the same no matter which car I buy, my consideration of insurance costs will not affect my decision, although it will slightly complicate the analysis.

Rules about relevant costs

1. Only relevant costs should be considered when revaluating the financial consequences of a decision. This is because a decision is forward looking.
2. A relevant cost is a future cash flow that will arise or be reduced as a direct consequence of the decision.
3. A relevant cost is a future cost. This means that any cost that has been incurred in the past (historical cost cannot be relevant to a decision.
4. A relevant cost is a cash flow. Any costs that are not cash flow items are not relevant. E.g. non-cash charges such as depreciation of fixed assets.
 - Notional costs such as notional interest charges and
 - Absorbed fixed overheads.
5. A relevant cost is one that will arise as a direct consequence of decision being taken.
If a decision is a future cash flow that would be incurred anyway regardless of the decision hence should be ignored.
6. As general rule, variable costs are relevant and fixed costs are unchanged regardless of a decision hence irrelevant.

Determination of relevant costs

i) Direct material cost

- a) Expected purchase cost of materials is relevant cost
- b) Stocks that have already been purchased. Their original purchase cost is irrelevant as a sunk cost. However the current purchase price (account paid to replace such stocks) if used is relevant cost
- c) Stocks in store but with no use except
 - i) **Be resold**
The relevant cost is the resale value if the materials are used in a decision disposed.
 - ii) **Be disposed**
If used on a decision, the disposal cost will not be incurred and therefore will be treated as an opportunity savings hence relevant.
 - iii) **Be used as a substitute material for another**
If it is used on a decision the alternative material will have to be purchased; therefore the purchase cost of this material becomes relevant.

ii) Direct labour cost

- a) Amount paid to employee to execute a duty in a decision is relevant cost.
- b) If labour is in short supply that cares, there may be two options
 - Work overtime –relevant cost will be will the normal wages + overtime premium
 - To divert from current production

Relevant cost will be the normal wage + the lost contribution from the fewer units produced in normal production due to labour diversion.

NB: If both are available in a decision, select whichever is cheaper

c) If labour is idle that is excess labour force which is un-utilized

Use of this labour in a decision means utilization of excess hours and the about cost will be irrelevant

iii) Overheads

Variable overheads

It is an incremental cost which varies with activity level and it is therefore relevant

Fixed overheads

It is expected to remain constant irrespective of activity level and therefore irrelevant.

However, if there is actual increase arising from a decision made, the amount of increase is relevant cost

Illustration

A company has spent Sh.100, 000 acquiring patent rights to manufacture a product. It hopes to sell 30,000 units at a selling price of Sh.10 each and the variable costs of production will be Sh.7 per unit.

Should the company proceed with production?

Solution

Sh.100, 000 is known as a past cost or a sunk cost. That money is gone and what the company has to do is to concentrate on future cash flows. The future cash flows will generate a contribution of:

$$30,000 \times (\text{Sh.}10 - \text{Sh.}7) = \text{Sh.}90, 000$$

Therefore, proceeding with production will increase the company's wealth, so it should proceed.

[**Note:** The incorrect approach would be to look at all costs: $30,000 (\text{Sh.}10 - \text{Sh.}7) - \text{Sh.}100, 000 = -\text{Sh.}10, 000$. This incorrect because the business has no control over the past cost of Sh. 100,000. The company has to make the best of what can be done in the future.]

Illustration

A company rents a factory for sh.100, 000 per year. Half of the factory is already occupied by a machine. The company is considering installing an additional machine which would produce 20,000 units for a variable cost of sh.5 per unit. These units would sell for sh.7 each. Half of the factory rent would be apportioned to the new machine.

Should the company purchase new machine?

Solution

The factory rent of sh.100, 000 will be paid irrespective of whether the factory is empty, has one machine or two machines. It is a fixed cost, is non-incremental and is therefore irrelevant to the decision.

The new machine will generate a contribution of $20,000 \times (\text{sh.}7 - \text{sh.}5) = \text{sh.}40, 000$

The new machine should therefore be purchased.

Illustration

A company is considering installing a machine which would produce 20,000 units for a variable cost of sh.5 per unit. These units would sell for sh.7 each. Additional space would have to be rented at a cost of sh.50, 000.

Should the company take on this project?

Solution

Here the rent of sh.50, 000 is an incremental cost and is therefore relevant to the decision.

The new machine will generate a contribution of $20,000 \times (\text{sh.}7 - \text{sh.}5) - \text{sh.}50, 000 = - \text{sh.}10, 000$.

Therefore, the project should not be taken on.

Illustration

A company has some inventory that was bought for sh.10, 000.

- It could be sold for sh.4, 000 or used to make a product that would sell for sh.15, 000.
- There is no other use for the inventory.

Additional costs needed to convert the inventory into the product are sh.9, 000. The material could be bought now for sh.8, 000

Required:-

What should the company do?

Solution

The sh.10, 000 cost of the inventory is irrelevant: it is a sunk or past cost.

The sh.8, 000 current price is irrelevant because the company has no use for the material so would not buy more.

The sh.4, 000 resale value of the inventory is relevant as the company could receive that cash by selling the inventory. Therefore, sh.4, 000 is a future incremental cash flow. If the company keeps the inventory and produces the product sh.4, 000 will not be obtained and the sh.4, 000 is known as an opportunity cost.

If the company proceeds with the new product, the incremental cash flows will be:

	Sh.
Sales revenue	15,000
Conversion costs	(9,000)
Opportunity cost of not selling the material	<u>(4,000)</u>
Contribution	<u>2,000</u>

Illustration

A 1 year contract has been offered which will utilize an existing machine that is only suitable for such contract work. The machine cost shs.25, 000 five years ago and has been depreciated £4,000 per year on a straight line basis and thus has a book value of shs.5,000. The machine could be sold now for shs. 8,000 or in 1 years' time for sh.1000. Four types of material would be needed for the contract as follows:

Units			Price per unit		
Material	In stock	Required for contract	Purchase Price of stock sh.	Current Buying-in Price sh.	Current Resale Price sh.
W	1,200	300	1.80	1.50	1.20
X	200	1,100	0.75	2.80	2.10
Y	3,000	600	0.50	0.80	0.60
Z	1,800	1,200	1.80	2.00	1.90

W and Z are in regular use within the firm. X could be sold if not used for the contract and there are no other uses for Y, which has been deemed to be obsolete.

Required;

What are the relevant costs in connection with the contract (ignoring the time value of money)?

Solution

Machine costs. The historic cost is a sunk cost and is not relevant. The depreciation details given relate to accounting conventions and are not relevant.

The relevant cost is the opportunity cost caused by the reduction in resale value over the one year duration of the contract, i.e. sh.8000 – 1000 = sh.7,000.

Material costs.

W

Although there is sufficient in stock the use of 300 units for the contract would necessitate the need for replenishment at the current market price.

$$\therefore \text{Relevant cost} = 300 \times \text{sh.1.50} = \text{sh.450}$$

X

If the contract were not accepted 200 units of X could be sold at sh. 2.10 per unit. The balance of 900 units required would be bought at the current buying-in price of sh.2.80.

	Sh.
∴ Relevant cost = 200 x sh.2.10 =	420
900 x sh.2.80 =	<u>2540</u>
	<u>2,940</u>

Y

If the 600 units were used on the contract they could not be sold so the opportunity cost is the current resale price of sh.0.60 per unit.

$$\therefore \text{Relevant cost} = 600 \times \text{sh.0.60} = \text{sh.360}$$

Z

Similar reasoning applies to W, i.e. replenishment at current buying in price.

$$\therefore \text{Relevant cost} = 1200 \times \text{sh.2} = \text{sh. 2,400}$$

$$\begin{aligned} \text{No. of units for target profit} &= \frac{\text{sh.70,000} + \text{sh.20,000}}{\text{sh.3.50}} \\ &= 25,714 \text{ units} \end{aligned}$$

Note: The Contribution /Sales (C/S) ratio is sometimes known as the Profit/Volume(C/V) ratio.

Illustration

Plasma plc. deals in plastic buckets and bottles. It uses polystyrene for manufacturing buckets, and polyethylene terephthalate for manufacturing bottles. For every unit of bucket and bottle, it requires 0.5 kg of the required raw material, each.

Plasma has received a bulk order for 1000 buckets and 800 bottles, and is evaluating this order. The data relating to the raw material requirements are as follows

	Polystyrene	Polyethylene terephthalate
Required quantity for the order	500 kg	400 kg
Inventory in hand	150 kg	80 kg
Original cost of inventory in hand (sh./kg)	60	80
Current purchase price of materials (sh./kg)	65	74
Current resale price of the materials (sh./kg)	66	60

Polystyrene is regularly used by the company in the production of buckets. However, plasma has decided to stop using the production of bottles and so polyethylene terephthalate is no longer in use by the company and it has no alternative use within the business.

Required;-

What is the total relevant cost of materials for the project?

Solution

Relevant costs are cost related to a future decision

As mentioned in the given case plasma has stopped the production of bottles and the related raw material has no alternative use. Hence it can be said that those materials can be sold in the market.

However, plasma has received a bulk order for buckets and bottles. Hence those materials will be used for the production of the bulk order.

The relevant cost of the required raw materials can be calculated as follows;-

	Sh.
Cost of raw materials required for the production of buckets (500 kg × sh65)	32,500
Cost of materials required for the production of bottles (320 kg × 74)	23,680
Opportunity cost of the raw materials required for the production of bottles (80 kg × 60)	<u>4,800</u>
Relevant cost	<u>60,980</u>

ACCEPT OR REJECT DECISIONS

Products are normally sold at cost plus profit and capacity may remain un-utilized due to demand constraints at the current selling price.

Companies may consider accepting offers at price below the current price so as to utilize idle capacity

If the revenue covers the relevant cost, the offer should be accepted

Other factors to be considered for an accept or reject decision to be considered. They include;-

- The firms policy regarding the selling price
- Possibility of future demand of the company's product
- Whether the fixed cost will remain constant
- Effect on other sales especially when the existing customers learn about the reduced selling price
- Available idle capacity

Illustration

TSLM Company Ltd. manufactures clothing and sells directly to clothing retailers. One of its departments manufactures T-shirts. The department has a production capacity of 80,000 T-shirts per month.

Currently, the company has excess capacity which has resulted from liquidation of one of its major customers in the month of April 2012. For the next quarter, monthly production and sales volume is expected to be 50,000 T-shirts.

The expected costs and revenues per T-shirt at this activity level are as follows:

	Sh.
Direct materials	35
Direct labour	50
Production overheads: Variable	8
Fixed	30
Marketing and distribution costs	<u>12</u>
Total costs	135
Selling price	<u>160</u>
Profit	<u><u>25</u></u>

Additional

information:

1. TSLM Company Ltd. is expecting an upsurge in demand and considers that the excess capacity is temporary.
2. ABC Ltd. has offered to buy for its employees 2,000 T-shirts each month for the next three months at a price of Sh.95 per T-shirt.
3. ABC Ltd. would collect the T-shirts from TSLM Company Ltd. factory and thus no marketing and distribution costs will be incurred.
4. ABC Ltd. would require its logo to be imprinted on the T-shirts. This would cost TSLM Company Ltd. an extra Sh.5 per T-shirt.
5. TSLM Company Ltd. has an agreement with its employees that entitles the employees at least six months' notice in the event of any redundancies.
6. No subsequent sales to this customer are anticipated.

Required:

Advise TSLM Company Ltd. whether to accept or reject the offer from ABC Ltd.

Solution

Accept or reject offer

Relevant costs

	Sh.
Direct materials	35
Direct labour	50
Variable OHDs	8
Additional cost	<u>5</u>
Total cost	<u><u>98</u></u>

Offer price to ABC = 95

Advice;

Reject the offer because the selling price is below the cost of production

DROPPING A PRODUCT

From time to time management will be faced with the problem of deciding to abandon an unprofitable activity. This is really a least-cost alternative decision and so made on the criterion of relative marginal costs.

It is sometimes suggested that, where a given product is apparently making a loss, manufacture and/or marketing of this product should cease, to improve the company's overall profit performance.

Illustration

A company produces three products for which the following operating statement has been produced:

	Product X	Product Y	Product Z	Total
	Sh.	Sh.	Sh.	Sh.
Sales	32,000	50,000	45,000	127,000
Total Costs	<u>36,000</u>	<u>38,000</u>	<u>34,000</u>	<u>108,000</u>
Profit/(Loss)	<u>(4,000)</u>	<u>12,000</u>	<u>11,000</u>	<u>19,000</u>

The total cost comprise 2/3 variable 1/3 fixed.

The directors consider that as product X shows a loss it should be discontinued.

Required

Based on the above cost data should product X be dropped?

What other factors should be considered?

Solution

First calculate the fixed costs, as: $1/3 (36,000) + 1/3(38,000) + 1/3(34,000) = \text{Sh.}36,000$

Rearrange the operating statement in marginal costing form:

	Product X	Product Y	Product Z	Total
	Sh.	Shs	Sh.	Shs
Sales	32,000	50,000	45,000	127,000
Less marginal Costs	<u>24,000</u>	<u>25,333</u>	<u>22,667</u>	<u>72,000</u>
= CONTRIBUTION	<u>8,000</u>	<u>24,667</u>	<u>22,333</u>	55,000
		Less Fixed Cost		<u>36,000</u>
		= Net Profit		<u>19,000</u>

From this it will be seen that product X produces a contribution of sh. 8,000.

Should it be dropped the position would be:

	Shs
Contribution Product Y	24,667
Contribution Product Z	<u>22,333</u>
Total contribution	47,000
Less Fixed Assets	<u>36,000</u>
=Net Profit	<u>11,000</u>

Thus dropping Product X with an apparent loss of sh.4,000 reduces total profits by sh.8,000 which is, of course, the amount of contribution lost from Product X. Other factors which need to be considered:

- Although Product X does provide some contribution, it is at a low rate and alternative, more profitable products or markets should be considered.
- The assumption above was that the fixed costs were general fixed costs which would remain even if X was dropped. If dropping X results in the elimination of the fixed costs originally apportioned to X, then the elimination would be worthwhile. However, this is unlikely.

MAKE OR BUY DECISIONS

This involves evaluating whether it will be advantageous to manufacture items or to purchase the items from outside suppliers.

Outsourcing is the process of obtaining goods or services from outside suppliers of providing the same services within the organization.

In arriving on such a make or buy decision, the price asked by the outside supplier should be compared with the marginal cost of producing the component parts. Other consideration affecting the decision is:

- Continuity and control of supply e.g. can be the outsource company be relied upon to meet the requirement in terms of quality, delivery dates and price stability.
- Alternatives use of resources. Can resource used make this article be transferred.

The choice between making or buying a given component is one which is likely to face all businesses at some time. It is often one of the most important decisions for management for the critical effect on profits that may ensue. The choice is critical, too, for the management accountant who provides the cost data on which the decision is ultimately based.

A make or buy problem involves a decision by an organisation about whether it should make a product or carry out an activity with its own internal resources or whether it should pay another organisation to carry out the activity. The make option gives management more direct control over the work, but the buy option may have benefits in that the external organisation has expertise and special skills in the work making it cheaper.

There are certain situations where the make or buy decision is not really a choice at all. There can be no alternative to making, where product design is confidential or the methods of processing are kept

secret. On the other hand, patents held by suppliers may preclude the use of certain techniques and then there is no choice other than buying or going without. The supplier who has developed a special expertise or who uses highly specialized equipment may produce better-quality work which suggests buying rather than making. In other cases, the special qualities demanded in the product may not be available outside and so making becomes necessary.

Where technical considerations do not influence the make or buy decision, the choice becomes one of selecting the least-cost alternative in each decision situation. Comparative cost data are necessary, therefore, to determine whether it is cheaper to make or to buy. In general this requires a comparison of the respective marginal costs or, in some cases, the incremental costs of each alternative. Incremental costs are relevant in decisions which include capacity changes. For example, a certain component has always been bought out because the plant and equipment for its manufacture has not been installed in the factory. When considering the alternative to buying, the cost of making comprises all the incremental costs (including additional fixed expenditure) arising from the decision. The incremental cost also includes the opportunity cost of the investment in capital equipment, that is, the expected return from an alternative investment opportunity. A decision to buy a part which has previously been manufactured may release capacity for other uses or for disposal so that the incremental cost of the decision also includes the relevant fixed cost savings

Illustration

The availability of Material B is limited to 8,000 kg

Product	A	B	C
Demand (units)	2,000	2,500	4,000
Variable cost to make (sh. per unit)	12	14	16
Buy-in price (sh. per unit)	15	19	18
Kg of B required per unit (included in variable cost)	3	2	1

Which products should the company make and which should it buy?

Solution

	A Sh.	B Sh.	C Sh.
Buy-in price	15	19	18
Cost to make	<u>12</u>	<u>14</u>	<u>16</u>
Saving (per unit) –sh.	<u>3</u>	<u>5</u>	<u>2</u>
Kg of B	3	2	1
Saving per kg -sh.	1	2.50	2
Ranking	3	1	2

Product		Units	Material B(kg)
B	MAKE	2,500	5,000
C	MAKE	3,000	<u>3,000</u>
			<u>8,000kg</u>
C	BUY	1,000	
A	BUY	2,000	

Illustration

A firm is considering whether to manufacture or purchase a particular component 2543. This would be in batches of 10,000 and the buying in price would be sh6.50 per unit. The marginal cost of manufacturing Component 2543 is sh4.75 per unit and the component would have to be made on a machine which was currently working at full capacity. If the component was manufactured, it is estimated that the sales of finished product FP97 would be reduced by 1000 units. FP97 has a marginal cost of sh60/unit and sells for sh80/unit. Should the firm manufacture or purchase Component 2543

Solution

A superficial view, based on the preceding example, is that because the marginal cost of manufacture is substantially below the buying in price, the component should not be bought in and thus further analysis is unnecessary. However, such an approach is insufficient in this more realistic situation and consideration must be given to the loss of contribution from the displaced product.

Cost analysis - Component 2543 in batches of 10,000

	Sh.
Marginal Cost of manufacturer = sh4.75/unit x 10,000	47,500
+ Lost contribution for FP97 = sh20/unit x 1000	<u>20,000</u>
	67,500
Buying in price = sh6.50/unit x 10,000	65,000

There is a saving of Sh.2,500 per 10,000 batch by buying in rather than manufacture.

Note: The lost contribution of sh.20,000 is an example of an opportunity cost.. This is the value of a benefit sacrificed in favor of some alternative course of action. Where there is no alternative use for the resource, as in Example 4, then the opportunity cost is zero and can thus be ignored.

OPERATING STATEMENTS

An income statement is a core financial statement that presents a company's operating results over a specific period of time, often quarterly or annually. Also known as an operating statement, an earnings report, or a profit and loss statement (P&L), an income statement starts with revenues and then subtracts costs and expenses (such as cost of goods, depreciation, amortization, and taxes) to calculate net income. Along with a balance sheet, a retained earnings statement, and a cash flow statement, an income statement is one of the key financial statements that summarize the finances of a company.

All companies need to generate revenue to stay in business. They use revenues to pay expenses, interest payments on debt, and taxes owed to the government. After these costs of doing business are paid, the amount left over is called net income. Net income is theoretically available to shareholders, though instead of paying out dividends, the firm's management often chooses to retain earnings for future investment in the business.

Anyone interested in active investing, picking stocks or investigating the financial health of a company must know how to read financial statements, including the statement of operations. The importance of the information contained in the statement of operations cannot be overemphasized. A firm's ability or inability to generate earnings over the long term is the key driver of stock and bond prices. Operating profit (EBIT) is the source of debt repayment, and if a company can't generate enough EBIT to pay its debt obligations, it will have to enter bankruptcy or sell itself. Net income is the source of compensation to shareholders (owners of the company), and if a company cannot generate enough profit to compensate owners for the risks they've taken, the value of the owners' shares will plummet. Conversely, if a company is healthy and growing, higher stock and bond prices will reflect the increased availability of profits.

REVISION EXERCISE**QUESTION ONE**

The following information has been extracted from the books of Solarcross Ltd for the year to 31 March 2000:

	Units '000'
Production	30
Sales	24
Production cost incurred:	Sh. '000'
Direct material	7,200
Direct labour	1,800
Variable overheads	1,500
Fixed overheads	2,700
Selling and administrations costs:	
Sales and salaries	450
Variable sales commission	300
Promotion and advertising	480
Other fixed costs	720

The company's unit selling price is Sh 550.

Required:

- Profit and loss statement under direct costing approach.
- Profit and loss statement under indirect costing approach.
- An explanation of the difference in profit or loss in (a) and (b) above

Solution:**a)**

Solacross Limited

Profit and Loss Statement for the year ended 31st March 2000:**Using Direct Costing Approach**

	Shs '000'	Shs '000'
Sales:	(24,000 × 550)	13,200
Cost of Sales		
Direct Material	$\frac{7,200}{30,000} \times 24,000$	5,760
Direct labour	$\frac{1,800}{30,000} \times 24,000$	1,440
Variable Overheads	$\frac{1,500}{30,000} \times 24,000$	<u>1,200</u>
		(8,400)
GROSS CONTRIBUTION		4,800
Less: Variable Sales Commission	$\frac{300}{30,000} \times 24,000$	<u>(240)</u>
Net Contribution		4,560
Expenses: Fixed costs of selling & Administration		
Fixed overheads (of production)		2,700
Sales salaries		450
Promotion and advertising		480
Other fixed costs		<u>720</u>
NET PROFIT		<u>210</u>

b)

Solacross Limited
Profit and Loss Statement for the year ended 31st March 2000
Using the Indirect Costing Method

	Shs '000'	Shs '000'
Sales:		13,200
Less Cost of Sales:		
Production costs: (7,200 + 1,800 + 1,500 + 720)	13,200	
Less: Closing Stock: ($\frac{13,200}{30,000} \times 6,000$)	<u>(2,640)</u>	<u>10,560</u>
Gross profit		2,640
Expenses of Selling and Administration		
Sales Salaries	450	
Variable Selling Commission	300	
Promotion and advertising	480	
Other fixed costs	<u>720</u>	<u>(1,950)</u>
Net profit		<u>690</u>

Differences in the profit using the direct and indirect costing approaches arise due to the valuation of stocks. In the direct method, cost of stocks is only variable costs while in the indirect method, the costs of stocks is made up of both variable costs and the fixed production overheads.

In direct costing, fixed production overheads are fully written off or expensed on period costs. In indirect approach, part of them are carried forward in closing stocks to be written off in the next accounting period.

QUESTION TWO

a) The following data relate to Kenya Ltd for the year ended 31 December 1999.

	Sh. '000'
Sales	24,000
Less: Total costs	<u>20,000</u>
Net profit	<u>4,000</u>

Fixed costs account for 40% of the total costs.

Required:

- i) Margin of safety.
- ii) Break-even point in sales
- iii) Sales required to earn profit of Sh 6,000,000.
- iv) In order to increase sales, the management has the following two options:
 1. To increase sales by 25% on incurring a sales promotion cost of Sh 2,500,000.
 2. To increase sales by 15% on reducing selling price by 5%.

b) Advise the management on which option they should take.

Solution:

Kenya Limited:

	Shs. '000'
Sales	24,000
Less: variable costs @ 60% x 20 million:	<u>(12,000)</u>
Contribution:	12,000
Less: fixed costs @ 40% x 20 million	<u>(8,000)</u>
NET PROFIT	<u>4,000</u>

(i) Margin of Safety = Current Sales – Break even Sales

$$\begin{aligned} \text{But Break Even Sales} &= \frac{\text{Fixed Costs}}{\text{Contribution margin ratio}} = \frac{8,000,000}{[12,000,000/24,000,000]} \\ &= \text{Shs } 16,000,000 \end{aligned}$$

Margin of Safety = 24,000,000 – 16,000,000 = Shs 8,000,000

$$(ii) \quad \text{Break Even point in Sales} = \frac{\text{Fixed Cost}}{\text{Contribution Margin Ratio}} = \frac{8,000,000}{(120,000,000/24,000,000)}$$

(iii) Sales required to earn a profit of Shs 6,000,000. = Shs 16,000,000

$$= \frac{\text{Fixed Costs} + \text{Target Profits}}{\text{Contribution sales ratio}} = \frac{(8,000,000 + 6,000,000)}{(12\text{million}/24 \text{ million})} = \text{Shs } 28,000,000$$

(iv) Option 1: Fixed costs will rise by Sh 2.5m.

2: Variable cost to sales ratio will be 50/95.

Profit Statements

	Option 1	Option 2
	Shs '000'	Shs '000'
Sales	30,000	27,600
Variable costs (50%)	(15,000)	(14,526)
Contribution	15,000	13,074
Fixed costs	<u>(10,500)</u>	<u>(8,000)</u>
NET PROFIT	<u>4,500</u>	<u>5,074</u>

NB: Initial profit was Shs 4,000,000.

Advise to Management: decrease sales price by 5% as this will result in the highest netprofit.

QUESTION THREE

Jamii Company Ltd manufactures and sells a single product. The following information regarding the company's operations for the year ended 30 September 2001 was presented to you.

Profit and loss account for the year ended 30 September 2001

	Sh. '000'	Sh. '000'
Sales		30,000
Less:		
Production costs		
Direct material	6,500	
Direct labour	5,400	
Production overhead	<u>7,000</u>	
variable		
Prime costs		<u>18,900</u>
		11,100

Other expenses;-

Selling – Variable	2,600	
- Cost	1,997	
Administration	<u>2,100</u>	<u>6,697</u>
Net profit		<u>4,403</u>

The following changes are expected to occur during the year ending 30 September 2002:

1. Selling price will be adjusted downward by 3% in order to attract more customers.
 2. Material prices will rise by 2% due to inflation.
 3. There will be a reduction in labour cost of 4%.
 4. Production overheads will increase by 3%.
 5. Increase in the efficiency of sales persons will reduce direct selling costs by 5%.
- All other factors are expected to remain constant.

Required:

- a) Break-even point in sales value
- b) The margin of safety in sales value
- c) The sales value at which profit of Sh. 4.5 million will be achieved
- d) A summary operating statement that shows the net profit of Sh. 4.5 million above.

Solution:

	Sh. '000'	Sh. '000'	Sh. '000'
Sales	$30,000 \times 0.97$		29,100
Less Cost of Sales			
Materials	$6,500 \times 1.02$	6,630	
Labour	$5,400 \times 0.96$	5,184	
Production overhead	$(7,000 \times 1.03)$	<u>7,210</u>	<u>(19,024)</u>
Cost of Sales			10,076
Less other variable costs	$(2,600 \times 0.95)$		<u>(2,470)</u>
Contribution			7,606
Less Expense			
Fixed		1,997	
Administration		<u>2,100</u>	<u>(4,097)</u>
NET PROFIT			<u>3,509</u>

$$\text{a) B.E.P (shs)} = \frac{\text{Fixed Costs}}{\text{C/s ratio}} = \frac{4,097,000 \times 29,100,000}{7,606,000}$$

$$= \text{shs } 15,674,823$$

$$\text{b) Margin of Safety} = \text{Budgeted sales} - \text{Break even sales}$$

$$= 29,100,000 - 15,674,823$$

$$= \text{shs } 13,425,177$$

c) Sales value at which profit of sh. 4.5m will be achieved.

Use:

$$\text{Profit} = (P - V) X - \text{Fixed costs}$$

when X is sales in units.

$$\text{Profit} = C/S X - \text{Fixed Costs.}$$

when X is sales in shs.

P – selling price per unit

V- variable cost per unit

C/S – contribution sales ratio

$$\text{Profit} = C/S X - \text{Fixed costs}$$

$$4,500,000 = \frac{7,606}{29,100} X - 4,097,000$$

$$X = \text{Shs. } 32,891,493.$$

d)	Sales	32,891,493
	Less Cost of Sales	<u>24,294,493</u>
	CONTRIBUTION	8,597,000
	Less Expenses	<u>(4,097,000)</u>
	NET PROFIT	<u>4,500,000</u>

TOPIC 8

BUDGETING AND BUDGETARY CONTROL

Nature and Purposes of Budgets

A budget is a financial plan for the future concerning the revenues and costs of a business. However, a budget is about much more than just financial numbers.

Budgetary control is the process by which **financial control** is exercised within an organisation.

Budgets for income/revenue and expenditure are prepared in advance and then compared with actual performance to establish any **variances**.

Managers are responsible for controllable costs within their budgets and are required to take remedial action if the adverse variances arise and they are considered excessive.

A number of purposes of budgeting have been identified. They include:

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.

PREPARATION OF BUDGETS

MASTER BUDGET

A master budget is a set of interconnected budgets of sales, production costs, purchases, incomes, etc. and it also includes pro forma financial statements. A budget is a plan of future financial transactions. A master budget serves as planning and control tool to the management since they can plan the business activities during the period on the basis of master budget. At the end of each period, actual results can be compared with the master budget and necessary control actions can be taken.

Components of Master Budget

Master budget has two major sections which are the operational budget and the financial budget. They have following components:

Operational Budget

1. Sales Budget
2. Production Budget
3. Direct Material Purchases Budget
4. Direct Labor Budget
5. Overhead Budget
6. Selling and Administrative Expenses Budget
7. Cost of Goods Manufactured Budget

Financial Budget

1. Schedule of Expected Cash Receipts from Customers
2. Schedule of Expected Cash Payments to Suppliers
3. Cash Budget
4. Budgeted Income Statement
5. Budgeted Balance Sheet

Note that all of the above component budgets may not be included in the master budget of every business. Some of these such as production budget and cost of goods manufactured budget are not need by a non-manufacturing business.

FUNCTIONAL BUDGET

Functional budget are prepared for an individual function. For each operation in the organization a budget is prepared

Sales budget, purchases budget, production budget, cash budget etc. are ex ample of functional budget.

This budget are consolidated to arrive at a master budget

Usefulness

- a) A functional budget give target to the individual functional manager
- b) Those who actually implement the budget prepare the functional budget. They are familiar with the problems at the grassroots level. Therefore the budgets are more realistic and motivating.

Problems

- (a) As the functional manager prepares the functional budget, the target may not be in line with the strategic objectives or may conflict with the organizational objectives or inter departmental objectives. This problem can be avoided by encouraging co-ordination between the functional managers.
- (b) Functional budgets are based on forecasts. There are many extern al as well as well as internal environmental factors (such as a change in demand for a product, non-availability of a particular raw material high attrition causing shortages of skilled labour, etc.)that affect the functional budgets. If these factors behave differently than predicted, this may render the budgetary system ineffective

Production budget

The production budget is usually expressed in quantity and represents the sales budget adjusted for opening closing finished stocks and work in progress.

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 and 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:

- 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.

Illustration

ABC Ltd. which deals in products Cee and Dee wishes to prepare an operating budget for the forthcoming period. The information regarding the products, cost and sales level is as follows:

	Department	
	Cee	Dee
Materials required		
Aye (kg)	4	6
Bee (litres)	2	8
Labour hours required		
Skilled (hours)	8	4
Semi-skilled (hours)	4	10
Sales level (units)	4,000	3,000
Opening stock (units)	200	400

The following additional information is relevant:

1. Material Aye costs Sh. 100 per kg and material Bee costs Sh.70 per litre.
2. Skilled and semi-skilled workers are paid Sh.120 and Sh.80 per hour respectively.
3. Opening stocks were 600kg for material Aye and 2,000 litres for material Bee.
4. Closing stock of both materials and finished goods will be enough to meet 10% of demand.

Required;

Compute the Production (units)

Solution

a)

i) Production Budgets

Products	Cee Units	Dee Units
Budgeted closing stock	400	300
10% of sales = $10\% \times 400/300$	4,000	3,000
Budgeted sales	(200)	(400)
Budgeted opening stock	4,200	2,900

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:-

- i. Direct Materials Usage Budget
- ii. Direct Materials Purchases Budget

Direct Materials Usage Budget: it shows the estimated quantities of materials required for budgeted production.

Compute the material usage (kg and litres)

Solution**Material Usage (Kg and litres)**

Materials		Aye Kg		Bee Litres
Cee	(4,200 x 4)	16,800	(4,200 x 2)	8,400
Dee	(2,900 x 6)	17,400	(2,900 x 8)	23,200
		34,200		31,600

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
Budgeted closing stock (units)	xxx
Add: Budgeted material usage (units)	xxx
Less: Budgeted opening stock (units)	(xx)
Budgeted materials purchases in units	xxx a
Material prices	xxx b
Budgeted materials produced in value	xxx a x b

Illustration

Compute the Material purchases (kg. Litres and sh)

Solution**Materials purchase (Kg – Litres and Shs)**

	Aye	Bee
	Kg, shs	Litres, shs
Budgeted closing Stock 10% of demand	3,420	3,160
Budgeted material usage	34,200	31,600
Budgeted opening stock	(600)	2,000
Budgeted material purchase (kg, litres)	37,020	32,760
Material price	×100	×70
Material purchase (shs)	3,702,000	2,293,200

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.

Illustration

Compute the Labour (hours and shillings)

Solution**Labour cost budget (hours and Shs)**

	Skilled		Semi-Skilled	Total
Cee – $4,200 \times 8$	33,600	$4,200 \times 4$	16,800	50,400
Dee – $2,900 \times 4$	11,600	$2,900 \times 10$	29,000	40,600
Labour in (hours)	45,200		45,800	91,000
Labour cost	× 120		× 80	-
Total labour cost (shs)	5,424,000		3,664,000	9,088,000

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, etc.

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 shows the expected receipts and payment of money for a given period.

A cash budget is useful because

- i) Shows the expected surplus in the short run and long run so that the amounts can be invested in a profitable venture
- ii) Shows the expected deficit in the short run and long run so that the necessary arrangement can be made to finance the deficit

Functions or cash budget

- i) It ensures that cash is available for revenue expenditure
- ii) Helps to indicate where, when and how cash will be needed and whether this permanent or temporarily.
- iii) Helps to preserve liquidity throughout the year
- iv) It relieves surplus cash for investment of expansion of facilities
- v) It guides management on financial capital expenditure both internally and externally

CASH BUDGET FORMART

	Jan	Feb.	March
Balance b/d	xxx	xxx	xxx
Sales receipts	xxx	xxx	xxx
Process from sale of assets	-	-	xxx
Dividend income	-	xxx	-
Rent receivable	xxx	xxx	xxx
Total (a)	xxx	xxx	xxx
Less payments			
Payments to supplies	xxx	xxx	xxx
Rent paid	xxx	xxx	xxx
Interest paid	-	xxx	-
Asset paid for	xxx	-	-
Salaries and wages	xxx	xxx	xxx
Total payment B	xxx	xxx	xxx
Balance c/d (a – b)	xxx	xxx	xxx

Preparing the cash budget

A cash budget is a detailed budget of estimated cash inflows and outflows incorporating both revenue and capital items.

The preparation of cash budgets or budgeted cash flow statements has two main objectives:

To provide periodic budgeted cash balances for the budgeted balance sheet.

To anticipate cash shortages / surpluses and thus provide information to assist management in short and medium-term cash planning and longer-term financing for the organisations.

Method of preparation

- Forecast sales
- Forecast time-lag on converting debtors to cash, and hence forecast cash receipts from credit sales.
- Determine stock levels, and hence purchase requirements
- Forecast time-lag on paying suppliers, and thus cash payments for purchases.
- Incorporate other cash payments and receipts, including such items as capital expenditure and tax payments.
- Collate all this cash flow information, so as to determine the net cash flows.

Layout of the cash budget

A tabular layout should be used, with:

- Columns for weeks, months or quarters (as appropriate)
- Rows for cash inflows and outflows.

Illustration

The opening cash balance on 1 January was expected to be sh.30,000. The sales budgeted were as follows:

	sh.
November	80,000
December	90,000
January	75,000
February	75,000
March	80,000

Analysis of records shows that debtors settle according to the following pattern.

- 60% within the month of sale
- 25% the month following
- 15% the month following

Extracts from the purchases budget were as follows:

	sh.
December	60,000
January	55,000
February	45,000
March	55,000

All purchase are on credit and past experience shows that 90% are settled in the month of purchase and the balance settled the month after.

Wages are sh.8, 000 has to be settled in February and the company will receive settlement of an insurance claim of sh.25,000 in March.

Required;

Prepare a cash budget for January, February and March.

Solution

Workings

Receipts from sales

January

cash

Sh.

November (15% x 80,000)	12,000
December (25% x 90,000)	22,500
January (60% x 75,000)	45,000
	79,500

February

cash

sh.

November (15% x 90,000)	13,500
December (25% x 75,000)	18,750
January (60% x 8,000)	45,000
	77,250

March cash

sh.

November (15% x 75,900)	11,250
December (25% x 75,000)	18,750
January (60% x 8,000)	48,000
	78,000

Payments for purchases

January

cash

sh.

December (10% x 60,000)	6,000
January (60% x 50,000)	49,500
	55,500

February

cash

sh.

January (10% x 50,000)	5,500
February (90% x 45,000)	40,500
	46,000

	March
	cash
	sh.
February (10% x 45,000)	4,500
March (90% x 55,000)	49,500
	54,000

Cash budget

	January sh.	February sh.	March sh.
Opening balance	30,000	24,000	17,250
Receipts from sales	79,500	77,250	78,000
Insurance claim	—	—	25,000
= Total cash available	109,500	101,250	120,250
Payments			
Purchases	55,000	46,000	54,000
Wages	15,000	15,000	15,000
Overheads (less depreciation)	15,000	15,000	15,000
Taxation	—	8,000	—
Total payments	85,500	84,000	84,000
Closing balance c/f	24,000	17,250	36,250

Note: The above example has been kept simple to show clearly the underlying principles which must be understood. Typical complications which often appear include the following: purchases, wages, etc., may not be given directly but have to be derived from stock/sales figures and where there are bad debts the receipts from sales are not equal to 100% of sales and so on.

PROFORMA FINANCIAL REPORTS**(INCOME STATEMENTS AND BALANCE SHEETS)**

In business, pro forma financial statements are prepared in advance of a planned transaction, such as a merger, an acquisition, a new capital investment, or a change in capital structure such as incurrence of new debt or issuance of stock. The pro forma models are the anticipated results of the transaction with particular emphasis on the projected cash flows, net revenues and taxes.

Consequently, pro forma statements summarize the projected future status of a company, based on the current financial statements.

For example, when a transaction with a material effect on a company's financial condition is contemplated, the finance department will prepare, for management and board review, a business plan containing pro forma financial statements demonstrating the expected effect of the proposed transaction on the company's financial viability. Lenders and investors will require such statements to structure or confirm compliance with debt covenants such as debt service reserve coverage and debt to equity ratios. Similarly, when a new corporation is envisioned, its founders will prepare pro forma financial statements for the information of prospective investors.

Pro forma figures should be clearly labeled as such and the reason for any deviation from reported past figures clearly explained.

Also, banks will request pro forma statements in lieu of tax returns for a startup business in order to verify cash flow before issuing a loan or line of credit.

Pro Forma Income Statements

A pro forma income statement is similar to a historical income statement, except it projects the future rather than tracks the past. Pro forma income statements are an important tool for planning future business operations. If the projections predict a downturn in profitability, you can make operational changes such as increasing prices or decreasing costs before these projections become reality.

Pro forma income statements provide an important benchmark or budget for operating a business throughout the year. They can determine whether expenses can be expected to run higher in the first quarter of the year than in the second. They can determine whether or not sales can be expected to be run above average in June. They can determine whether or not your marketing campaigns need an extra boost during the fall months. All in all, they provide you with invaluable information—the sort of information you need in order to make the right choices for your business.

How do I create a pro forma income statement?

Sit down with an income statement from the current year. Consider how each item on that statement can or will be changed during the coming year. This should, ideally, be done before year's end. You will need to estimate final sales and expenses for the current year to prepare a pro forma income statement for the coming year.

Pro forma gross profit

Assuming that the expected sales are to increase by 10 percent next year. Multiply this year's sales of sh.1, 000,000 by 110 percent to get sh.1, 100,000. Then, in this case, you assume there will be no increase in the cost of each item you are selling, but you will need 10 percent more items to sell in order to achieve your sales goals. So, you multiply this year's cost of goods sold (let's assume a figure of sh.500, 000), by 110 percent to get sh.550, 000.

To figure the pro forma gross profit for next year, subtract the pro forma cost of goods sold from the pro forma sales. Sh.1, 100,000 minus sh.550, 000 equals gross profit, or sh.550, 000.

Pro forma total expenses

assuming salaries and other expenses will increase by 5 percent. Therefore, multiply historical salaries of sh.200, 000 and historical expenses of sh.100, 000 by 105 percent each. The pro forma salaries for next year will be sh.210, 000 and your pro forma expenses will be sh.105, 000.

Figure the pro forma total expenses by adding pro forma salaries and pro forma other expenses together. In our case the pro forma total expenses will be sh.315, 000.

Pro forma profit before taxes

Pro forma profit before taxes is figured by subtracting the pro forma expenses from the pro forma gross profit, or sh.315, 000 from sh.550, 000 for a pro forma profit before taxes of sh.235, 000.

Pro forma taxes

Pro forma taxes are figured by taking estimated tax rate, in this case 30 percent, and multiplying it by the pro forma profit before taxes of sh.235, 000. This produces a pro forma tax of sh.70, 500.

Pro forma profit after taxes

Pro forma profit after taxes is figured by subtracting the pro forma tax of sh.70, 500 from the pro forma profit before taxes of sh.235, 000. The pro forma profit after taxes, in this case, would be projected at sh.164, 300.

Remember that pro formas are essentially best guesses. Continually update of the projections by recalculating your pro formas using any new and actual financial information as a base should be done. Doing this on a monthly or quarterly basis will help to assure that projections are as close to being accurate as possible.

Pro-forma balance sheets

A pro forma balance sheet is similar to a historical balance sheet, but it represents a future projection. Pro forma balance sheets are used to project how the business will be managing its assets in the future. For example, a pro forma balance sheet can quickly show the projected relative amount of money tied up in receivables, inventory, and equipment. It can also be used to project the overall financial soundness of the company. For example, a pro forma balance sheet can help quickly pinpoint a high debt-to-equity ratio.

Pro forma current assets

- **Cash**

To obtain a company's estimated cash position, there is need to do a careful cash flow projection.

- **Pro forma accounts receivable**

To estimate the accounts receivable on December 31, one needs to take into consideration the average collection time of receivables and the sales projections for prior periods.

- **Pro forma total current assets**

Pro forma total current assets are determined by adding projected cash and projected accounts receivable.

Pro forma fixed assets

- **Pro forma land**

Land is the easiest of pro forma asset values to calculate. Because land does not depreciate, it will always have the same value.

- **Pro forma buildings**

Buildings do depreciate. Let's assume we are depreciating the building over thirty years. A company bought its building for sh.300, 000. Each year the building will depreciate by sh.10, 000. By December 31, 1999, the building will be three years old, so the total depreciation will be sh.30, 000. This will be reflected later in the accumulated depreciation total. Under the building heading we show the original value of the asset or sh.300, 000.

- **Pro forma vehicles**

Vehicles also depreciate. They depreciate over a much shorter period of time than do buildings. Let's assume we are depreciating a company's truck over a seven-year period. The truck was purchased for sh.73, 500 on January 1, 1999. So, each year the truck will depreciate by sh.10, 500. On December 31, 1999, after one year of depreciation, the truck will have an accumulated depreciation of sh.10, 500.

- **Pro forma total assets**

Pro forma total assets are determined by adding up the pro forma total current assets and pro forma total fixed assets.

Pro forma current liabilities

- **Pro forma accounts payable**

Pro forma accounts payable are determined by figuring out how much one will spend on supplies during the last months of the year and how long it takes you to pay your bills.

- **Pro forma accrued payroll**

It should be easy to determine a pro forma accrued payroll. This is by checking the payroll calendar to find out what employee pay periods will remain unpaid by the beginning of the pro forma balance sheet period.

- **Pro forma total current liabilities**

To obtain pro forma total current liabilities, add up pro forma accounts payable, accrued payroll, and notes, or portions thereof, payable, within one year.

Pro forma long-term liabilities

- **Pro forma mortgage payable**

The size of a pro forma mortgage note payable is calculated by taking the mortgage payable at the end of the current year and subtracting the principal, not interest, payments that will be made during the upcoming year. To obtain that portion of the mortgage that will be classified as a long-term liability, subtract what is classified as current liability.

- **Pro forma total liabilities**

Pro forma total liabilities are determined by adding up current and long-term liabilities.

Pro forma owners' equity

- **Pro forma common stock**

The common stock portion of the owners' equity will not change from year to year unless new stock is issued.

- **Pro forma retained earnings**

Pro forma retained earnings can be tricky to determine. They are the last item to be calculated on a pro forma balance sheet.

Total assets must balance the total liabilities and owners' equity.

Also, total liabilities added to total owners' equity must equal total liabilities and owners' equity. So, you can determine total owners' equity by subtracting total liabilities from total liabilities and owners' equity.

Common stock added to retained earnings must equal total owners' equity. So, by subtracting common stock from total owners' equity, retained earnings can be determined. This completes a pro forma balance sheet.

OBJECTIVES OF BUDGETARY CONTROL SYSTEM

1. To plan various activities of the organization

A budget is a formal expression of the future plan. It helps in determining the individual goal of each activity or department and planning their action in achieving the goal. Budgets provide premises for detailed operational plans to be followed during the budget period

2. To coordinate the activities of the organization

Every department may prepare their individual plan believing that they are doing the best for the organization, but this may result in a conflict with the objectives of other departments. The budgetary control system helps to resolve conflicts between departments and therefore helps the organization to progress as a whole

A master budget is a consolidation of all the other functional budgets. While preparing a master budget, all the budgets target are reviewed and any conflict between them is resolved. This system converts the budget into a common plan

3. To devaluate performance of the executives

The budget sets targets for implementation. Such targets are compared with actual performance at regular intervals. The performance of the executives is also evaluated.

4. To identify areas the areas of efficiency and inefficiency

The budget provides a yardstick for measuring performance and identifying deviations. Such deviations are then analyzed to determine the efficiency of the personnel as well as the machines. Once any inefficiencies have been identified, corrective action is taken to overcome these inefficiencies.

After budget has been prepared, feedback on performances is given at a regular interval and any variances are investigated. This helps in achieving the organizational objectives.

5. To provide basis for the control system

Budgeting is a management tool. Its emphasis is on managing costs and revenues. By doing so, it ultimately manages the activities. It provides a guideline of what allowable limit of cost should be.

Again budget provides a good measure of performance. Accordingly top management can resort to select control to concentrate more on areas of weakness. This approach is called management by exception.

It also aids lower level management to evaluate their own performance by comparing it with the budgeted.

6. To motivate managers

Budgets provide challenges as well as incentives for better performance. A budget is used as a tool to measure the performance of managers; it motivates managers to work effectively and efficiently to meet the target. Sometimes, monetary rewards and promotions are given if the targets are achieved. This motivates managers to improve their performance. If achieving higher productivity is linked managers will be encouraged to achieve it.

7. To Increase profitability

While reviewing the budgets before they finalized. If overestimation of expenditure is identified, senior managers will curtail the excess provision for expenditure. Also, by comparing the budgeted expenditure with the actual expenditure, managers can pin point any extravagant expenses and can avoid them in future by avoiding these extravagant, profitability can be increased.

8. To ensure best use of available resources

Men, material, machinery and money are referred to as the four M'Ss and are the factors of production. These factors are vital for production and thus should be optimally utilized. At the time of devising budgets, management identifies current and future limiting factors and manages them in such a way that they will become hindrances in the future

9. To provide a means of communication

Budget targets are the expectations. If the individual functional managers prepare the budget, they communicate the functional objectives through the budget. In the same way, top level management sets the target to be achieved during the budget year. Therefore, the budget acts as a medium of communication (horizontally as well as vertically) between all the levels of management within the organization

OPERATION OF A BUDGETARY CONTROL SYSTEM, ORGANIZATION AND COORDINATION OF THE BUDGETING FUNCTION

The co-ordination and administration of budgets is usually the responsibility of a **budget committee** (with the managing director as chairman). The budget committee is assisted by a budget officer who is usually an accountant. Every part of the organisation should be represented on the committee, so there should be a representative from sales, production, marketing and so on. Functions of the budget committee include the following

- a) Co-ordination of the preparation of budgets, which includes the issue of the budget manual
- b) Issuing of timetables for the preparation of functional budgets
- c) Allocation of responsibilities for the preparation of functional budgets
- d) Provision of information to assist in the preparation of budgets
- e) Communication of final budgets to the appropriate managers
- f) Comparison of actual results with budget and the investigation of variances
- g) Continuous assessment of the budgeting and planning process, in order to improve the planning and control function

The budget preparation process is as follows.

The procedures involved in preparing a budget will differ from organisation to organisation, but the step- by-step approach described here is indicative of the steps followed by many organisations. The preparation of a budget may take weeks or months and the budget committee may meet several times before an organisation's budget is finally agreed.

Step 1**Communicating details of the budget policy and budget guidelines**

The long-term plan is the starting point for the preparation of the annual budget.

Managers responsible for preparing the budget must be aware of the way it is affected by the long-term plan so that it becomes part of the process of meeting the organisation's objectives. For example, if the long-term plan calls for a more aggressive pricing policy, the budget must take this into account. Managers should also be provided with important guidelines for wage rate increases, changes in productivity and so on, as well as information about industry demand and output.

Step 2**Determining the factor that restricts output**

The principal budget factor (or key budget factor or limiting budget factor is the factor that limits an organisation's performance for a given period and is often the starting point in budget preparation. For example, a company's sales department might estimate that it could sell 1,000 units of product X, which would require 5,000 hours of grade A labour to produce.

If there are no units of product X already in inventory, and only 4,000 hours of grade A labour available in the budget period, then the company would be unable to sell 1,000 units of X because of the shortage of labour hours. Grade A labour would be a limiting budget factor, and the company's management must choose one of the following options.

- a) Reduce budgeted sales by 20%.
- b) Try to increase the availability of grade A labour by 1,000 hours (25:1) by recruitment or overtime working.
- c) Try to sub-contract the production of 1,000 units to another manufacturer, but still profit on the transaction.

In most organisations the principal budget factor is sales demand: a company is usually restricted from making and selling more of its products because there would be no sales demand for the increased output at a price which would be acceptable/profitable to the company. The principal budget factor may also be machine capacity, distribution and selling resources, the availability of key raw materials or the availability of cash. Once this factor is defined then the rest of the budget can be prepared. For example, if sales are the principal budget factor then the production manager can only prepare his budget after the sales budget is complete.

However in the public sector, the principal budget factor will not be profit related. You need to think about the limiting factor for these organisations in terms of activity, for insurance consultant availability, cash budget or accommodation.

Remember that state-run organisations providing services free at the point of consumption often face

almost unlimited demand for their services. Therefore resources available usually comprise the limiting factor: -

- a) Cash from government grants and ministries
- b) Trained staff such as nurses and doctors
- c) Equipment such as MRI scanners and hospital beds

Step 3

Preparation of the sales budget

For many organisations, the principal budget factor is sales volume. The sales budget is therefore often the primary budget from which the majority of the other budgets are derived.

Before the sales budget can be prepared a sales forecast has to be made.

Sales forecasting is complex and involves the consideration of a number of factors.

- a) Past sales patterns
- b) The economic environment
- c) Results of market research
- d) Anticipated advertising
- e) Competition
- f) Changing consumer taste
- g) New legislation
- h) Distribution
- i) Pricing policies and discounts offered
- j) Legislation
- k) Environmental factors

Management can use a number of forecasting methods.

- a) Sales personnel can be asked to provide estimates.
- b) Market research can be used (especially if an organisation is considering introducing a new product or service).
- c) Various mathematical techniques can be used to estimate sales levels.
- d) Annual contracts, under which major customers set out in advance monthly ranges of possible sales, can be reviewed.

On the basis of the sales forecast and the production capacity of the organisation, a sales budget will be prepared. This may be subdivided, possible subdivisions being by product, by sales area or by management responsibility.

Step 4

Initial preparation of budgets

Finished goods inventory budget

Decides the planned increase or decrease in finished inventory levels.

Production budget

Stated in units of each product and is calculated as the sales budget in units plus the budgeted increase in finished goods inventories or minus the budgeted decrease in finished goods inventories.

Budgets of resources for production

Materials usage budget is stated in quantities and perhaps cost for each type of material used. It should take into account budgeted losses in production.

Machine utilization budget shows the operating hours required on each machine or group of machines. .

Labour budget or wages budget will be expressed in hours for each grade of labour and in terms of cost. It should take into account budgeted idle time.

Overhead cost budgets

Production overheads

Administration overheads

Selling and distribution overheads

Research and development department overheads

Raw materials inventory budget

Decides the planned increase or decrease of the level of inventories.

Raw materials purchase budget

Can be prepared in quantities and value for each type of material purchased once the raw material usage requirements and the raw materials inventory budget are known.

Overhead absorption rate

Can be calculated once the production volumes are planned, and the overhead cost centre budgets prepared.

Step 5**Negotiation of budgets with superiors**

Once a manager has prepared his draft budget he should submit it to his superior for approval. The superior should then incorporate this budget with the others for which he or she is responsible and then submit this budget for approval to his or her superior.

This process continues until the final budget is presented to the budget committee for approval.

At each stage of the process, the budget would be negotiated between the manager who had prepared the budget and his/her superior until agreed by both parties.

Step 6**Co-ordination of budgets**

It is unlikely that the above steps will be problem-free. The budgets must be reviewed in relation to one another. Such a review may indicate that some budgets are out of balance with others and need modifying. The budget officer must identify such inconsistencies and bring them to the attention of the manager concerned. The revision of one budget may lead to the revision of all budgets. During

this process the budgeted income statement and budgeted statement of financial position and cash budget should be prepared to ensure that all of the individual parts of the budget combine into an acceptable master budget.

Step 7

Final acceptance of the budget

When all the budgets are in harmony with one another they are summarized into a master budget consisting of a budgeted income statement, budgeted statement of financial position and cash budget.

Step 8

Budget review

The budgeting process does not stop once the budgets have been agreed. Actual results should be compared on a regular basis with the budgeted results. The frequency with which such comparisons are made depends very much on the organisation's circumstances and the sophistication of its control systems but it should occur at least monthly. Management should receive a report detailing the differences and should investigate the reasons for the differences. If the differences are within the control of management, corrective action should be taken to bring the reasons for the difference under control and to ensure that such inefficiencies do not occur in the future.

The differences may have occurred, however, because the budget was unrealistic to begin with or because the actual conditions did not reflect those anticipated (or could have possibly been anticipated). This would therefore invalidate the remainder of the budget.

The budget committee, who should meet periodically to evaluate the organisation's actual performance, may need to reappraise the organisation's future plans in the light of changes to anticipate conditions and to adjust the budget to take account of such changes.

The important point to note is that the budgeting process does not end for the current year once the budget period has begun: budgeting should be seen as a continuous and dynamic process.

BENEFITS OF BUDGETING

- a) It is the major formal way in which the organisational objectives are translated into specific plans, tasks and objectives related to individual management and supervisors. It should provide clear guidelines for current operations
- b) It is an important medium of communication for organisational plan, objectives and of the progress towards meeting those objectives.
- c) The development of budgets (done properly) helps to achieve co-ordination between the various departments and functions of the organisation.
- d) The involvement of all levels of management with setting budgets, the acceptance of defined targets, the two way flow of information and other facets of a properly organised budgeting system all help to promote coalition of interest and to increase motivation.

PROBLEMS ASSOCIATED WITH BUDGETING

Various problems and difficulties which may occur in connection with budgeting given below but it does not necessarily follow that they will occur in any given organisation

- a) There may be too much reliance on the technique as a substitute for good management
- b) The budgetary system, perhaps because of undue pressure or poor human relations, may cause antagonism and decrease motivation.
- c) Variances are just as frequently due to changing circumstances, poor forecasting or general uncertainties as due to managerial performance.
- d) Budgets are developed round existing organisational structures and departments which may be inappropriate for current conditions and may not reflect the underlying economic realities.
- e) The very existence of well documented plans and budgets may cause inertia and lack of flexibility in adapting to change.
- f) There is a major problem in setting the levels of attainment to be included in budgets and standards.

DISTINCTION BETWEEN BUDGETING AND BUDGETARY CONTROL IN THE PRIVATE AND PUBLIC SECTORS

Public Sector Budgeting Theory and Strategy

Main Types of Budget

Budgets can cover a variety of activities and purposes. Each budget type will be produced for a specific reason and there will be differences in content and approach:

- budgets can be produced for either capital or revenue; resource budgets (e.g. for labour) can also be produced. This would be seen as a way of planning or controlling labour inputs;
- budgets can be produced for sales, income and revenues;
- working capital budgets, e.g. for stock or cash. It is essential that cash flow is effectively managed and the optimum benefit obtained from cash resources. Budgets for stock, debtors and creditors can be seen as a way of controlling the use of current assets and liabilities;
- aggregate or consolidated budgets can be prepared for the organisation as a whole;
- budgets can be subjective based (i.e. what expenditure is on, e.g. wages, premises or supplies) or objective based (i.e. what the budget is being spent on, e.g. the cost charged to a particular service or activity). The latter is usually preferred as it enables decision makers make rational choices but the former is simpler from the control perspective. These budgets can be produced at multiple levels throughout the organisation for example, at a service level, for a group of services or a single unit.

Environment and Objectives

Public and private sector organisations operate in different environments and some of the approaches taken to budget setting will differ. Some of the essential differences between the two sectors are summarised in the table below.

Private and public sector objectives - a comparison	
Private sector	Public sector
Market driven	Resource constrained (i.e. funded by taxation)
Resources influenced by market demand	Resources controlled by government through grant settlements
Reliance upon external sales	Activity generally determined politically
Need for flexibility	Fixed budgets
Profit oriented	Service/community oriented
Single or limited number of objective(s)	Multi (and often conflicting) objectives
Outputs identifiable and measurable	Outputs subjective and qualitative
Decisions made by: <ul style="list-style-type: none"> • Shareholders • Customers • Workforce • Management • Board 	Decisions made by: <ul style="list-style-type: none"> • Electorate • Service Users • Employees • Management • Politicians

The boundaries between the two sectors have however become less apparent in recent years due to the effects of externalisation, competitive tendering, the development of both internal and external trading activities and an increasing emphasis on partnerships amongst both statutory agencies and the private sector.

Nevertheless these key differences will influence the approach which public sector bodies take to budgeting particularly in relation to the need for processes and procedures to be adapted to reflect the external environment in which they operate and translate this into the setting of budget requirements.

Satisfying external and internal environments

In common with private sector organisations those operating in the public sector must also adapt their budgeting processes to reflect their internal and external environments.

Public sector budget preparation will be influenced by a number of internal factors including:

- the proposed income and expenditure of the organisations services;
- the revenue consequences of any proposed capital expenditure;

- the use of balances and reserves;
- contributions from trading activities and any surpluses or deficits from the collection fund (local authorities only);
- growth and savings.

Public sector bodies do not operate in a vacuum and their actions have a significant effect on the national economy as they are funded by some form of taxation. They also have an effect on the Public Sector Borrowing Requirement (PSBR) by borrowing money to fund expenditure.

By aggregating budgets throughout the public sector central government can then monitor its activities against its plans or targets (as set through Comprehensive Spending Reviews and Public Service Agreements) and take appropriate action to ensure that these are met.

The revenue expenditure of public bodies is funded at national level by either taxation or fees/charges and at local government level by government grants, local taxation and fees/charges. Statutory frameworks also exist to ensure that public sector organisations set balanced budgets. Balanced budgets are ones where the organisation's estimated revenue expenditure can be met from all sources together with contributions from reserves.

Objectives of public sector budgeting

Budgeting in the public sector context shares many similarities with the private sector but contains a greater focus on the relationship with policy development, performance monitoring and statutory objectives. The key objectives of public sector budgeting are:

- assisting in planning expenditure to meet policy requirements;
- policy implementation and control;
- measuring and monitoring performance;
- to determine the total expenditure of the organisation and ensure that it is consistent with total revenues (e.g. fixing the rate of local taxation);
- provide the basis for authorising expenditure and collection of fees and charges;
- provide the basis for budgetary control;
- satisfaction of statutory requirements.

Current developments in the public sector and their impact on budgeting theory

Over recent years the public sector has faced many challenges due to the rapid pace of change both in the way services are delivered and in organisational structures and relationships. These changes have meant that the finance and budgetary function has had to adapt itself to accommodate radically different ways of working and delivering services and to play a key role in developing and maintaining an effective. As new policy developments are introduced the need for effective governance and budgetary control arrangements to ensure probity and sound financial management remain undiminished.

Overview of the Relationship between Budgeting and Strategy Formulation, Long Term Planning and Control

The budget is a financial and quantitative statement of an organisation's activities which is prepared prior to a definitive period of time. It provides managers and policy makers with financial information to assist them in taking strategic decisions for which they are responsible.

In any large organisation, and particularly in the public sector, there will be conflicting policy objectives all of which will have different resource implications which may have either capital or revenue consequences.

An effective budgeting process should allow all of the financial implications of alternative policy objectives to be assessed thereby enabling policy makers to appraise them and compare the costs against available resources.

As External Environment to Budgeting has illustrated, public authorities are not only restricted by resource implications but also by the external environment and political context in which they operate. The budget allows policy makers to assess their alternative plans and identify their priorities within their affordable limits.

Budgets are a key element of effective strategy planning. Medium and Long Term Financial Planning covers the differences between, and objectives of, long term or strategic planning, medium term and short term financial planning.

The budget is a financial/resource representation of corporate objectives and also a plan of action for the period covered. Once the budget is adopted by a public authority its delivery is placed within the remit of the accountable management who will have approval to incur expenditure in line with stated financial regulations and a scheme of delegation.

The budget forms the basis of a controlling mechanism for the various resources of a public authority. Budgetary control can be applied at all managerial levels provided that managers are made accountable for the budgets for which they are responsible. The budget can also highlight variations from expectations so that senior management can take remedial action to ensure that expenditure is contained within the budget and remains consistent with corporate objectives and policies.

REVISION EXERCISE**QUESTION ONE**

The following information has been assembled by Sancross Products Ltd which manufactures and retails products A and B. The details given below relate to the year commencing 1 July 2000:

	Standard	Product	
	Price per kg	A kg	g
Direct material – M1	Sh 4	15	20
M2	Sh 5	14	12

	Standard	Product	
	Rate per hour	A hours	B hours
Direct labour – L1	Sh 8	20	15
L2	Sh 10	22	24

Fixed production overhead is applied on direct labour basis. Administration, selling and distribution expenses are recovered at the rate of 20% of production cost and profit loaded at 25% of standard production cost.

	Product	
	A	B
	Sh ‘000’	Sh ‘000’
Projected sales for the year	12,033	10,053

Finished goods stock position valued at production cost is expected to be as follows:

	Product	
	A	B
	Sh ‘000’	Sh ‘000’
1 July 2000	3,000	2,000
30 June 2001	5,000	4,000

Direct material stocks valued at standard prices are as follows:

	Material	
	M1	M2
	Sh ‘000’	Sh ‘000’
1 July 2000	200	250
30 June 2001	220	270

For the year to 30 June 2001, fixed production overhead has been estimated at Sh 1,800,000 and direct labour at 1,200,000 hours.

No opening or closing work-in-progress is anticipated.

Required:

- Production budget in units.
- Direct materials cost budget.
- Purchases budget in value.
- Direct labour cost budget.

Solution:

Sancross Products Ltd

Cost Per Unit of Product	A	B
Direct Material – M1	60	80
-M2	70	60
Total Material Cost	130	140
Direct Labour:- L1	160	120
L2	220	240
Total Labour Cost	380	360
PRIME COST	510	500
Fixed Production Overheads	380	360
Production Cost	890	860
Administration, selling and Distribution costs @ 20%	178	172
Total Standard Cost of Product	1,068	1,032
Profit @ 25% of Product cost	267	258
Selling Price	1,335	1,290

a) Production Budget (Workings)

	A	B
Projected Sales	12,033,000	10,053,000
Selling Price/Unit	1,335	1,290
Sales Units Projected	9,013	7,793
Opening Stock (Shs)	Shs 3,000,000	Shs 2,000,000
Opening Stock (Units)	3,000,000/890	2,000,000/860
	= 3,371 Units	= 2,326 Units
Closing Stock (Shs)	Shs 5,000,000	Shs 4,000,000
Units	5,000,000/890	Shs 4,000,000/860
	= 5,618 Units	= 4,651 Units

Sancross Products Limited

Production Budget (Units) for the year commencing 1 July 2000

	A	B
Sales	9,013	7,793
Closing Stock	5,618	4,651
Less Opening Stock	14,631	12,444
Production	(3,371)	(2,326)
	11,260	10,118

b) Direct Materials Cost Budget

	M1		M2	
	Shs		Shs	
Product A:	$11,260 \times 15$	675,600	$11,260 \times 14$	788,200
	$\times 4$		$\times 5$	
B:	$10,118 \times 20$	809,440	$10,118 \times 12$	607,080
	$\times 4$		$\times 5$	
		1,463,800		1,416,520

c) Purchases Cost Budget for Raw Materials

	M1	M2
	Shs	Shs
Direct materials Usage	1,463,800	1,416,520
Add: Closing stock	220,000	270,000
	1,683,800	1,686,520
Less Opening stock	(200,000)	(250,000)
	1,483,000	1,436,520

d) Direct Labour Cost Budget

	L1		L2	
	Shs		Shs	
Product A	$20 \times 8 \times 11,260$	1,801,600	$22 \times 10 \times 11,260$	2,447,200
Product B	$15 \times 8 \times 10,118$	1,214,160	$24 \times 10 \times 10,118$	2,428,320
		3,015,760		4,905,520

QUESTION TWO

You are in charge of making forecasts and preparing budgets. You have been supplied with cost and revenue forecasts and details of payment as follows:

1. Forecast of revenue and costs for the quarter ending 31 March 2001

	January Shs.	February Shs.	March Shs.
Direct			
Materials (purchases)	112,000	100,000	135,000
Wages	90,000	80,000	100,000
Overhead			
Production	34,000	32,000	40,000
Administration	22,000	20,000	27,000
Selling and distribution	13,000	11,000	18,000
 Sales	 360,000	 350,000	 440,000

2. Forecast of revenue and costs for the quarter ending 30 June 2001

	April Sh.	May Sh.	June Sh.
Direct			
Materials (purchases)	90,000	67,000	79,000
Wages	72,000	54,000	63,000
Overhead			
Production	45,000	36,000	40,000
Administration	22,000	25,000	27,000
Selling and distribution	13,000	11,000	16,000
 Sales	 350,000	 360,000	 360,000

Cash balance on 1 April 2001

Sh. 90,000

Other details

- Period of credit allowed by suppliers averages two months.
- Debenture to the value of Shs. 125,000 are being issued in May 2001 and the amount is expected to be received during the month.
- A new machine is being installed at the end of March 2001 at a cost of Sh 150,000 and payment is promised in early May 2001.
- Sales commission of 3% is payable within one month of sales.
- A dividend of Sh 100000 is to be paid in June 2001.
- There is a delay of one month in the payment of overheads. There is also a delay in payment of wages averaging a quarter of a month.

- Twenty per cent of the debtors pay cash, receiving a cash discount of 4% and 70% of debtors pay within one month and receive a cash discount of 2 ½%. The other debtors pay within two months.

Required:

A cash budget on a monthly basis from the second quarter of the year 2001.

Solution:**Cash Budget for the 2nd Quarter of Year 2001**

Cash Inflows	April Sh.	May Sh.	June Sh.
Cash from debtors (wk 1)	402,500	351,995	349,820
Debentures issued	-	125,000	-
Total cash inflow (A)	402,500	476,995	349,820
Cash Outflows			
Purchases	100,000	135,000	90,000
Purchase of machine	-	150,000	-
Dividends	-	-	100,000
Production overheads	40,000	45,000	36,000
Administration overheads	27,000	22,000	25,000
Selling and distribution overheads	18,000	13,000	11,000
Wages (wk 2)	79,000	58,500	60,750
Sales commission	13,200	10,500	10,800
Total cash out flows (B)	277,200	434,000	333,500
Net cash flow (A – B)	125,300	42,995	16,270
Add: opening cash balance	90,000	215,300	258,295
Closing cash balance	215,300	258,295	274,565

Workings:**Debtors' collection**

		April Sh.	May Sh.	June Sh.
Sales in:				
February	350,000	35,000	-	-
March	440,000	300,300	44,000	-
April	350,000	67,200	238,875	35,000
May	360,000	-	69,120	245,700
June	360,000	-	-	69,120
		402,500	351,995	349,820

Wages Payment

Month:	Wages	April Shs	May Shs	June Shs
March	100,000	25,000	-	-
April	72,000	54,000	18,000	-
May	54,000	-	40,500	13,500
June	63,000	-	-	47,250
		79,000	58,500	60,750

TOPIC 9

STANDARD COSTING

DEFINITION

A **standard**, as the term is usually used in management accounting, is a budgeted amount for a single unit of output. A **standard cost** for one unit of output is the budgeted production cost for that unit. Standard costs are calculated using engineering estimates of standard quantities of inputs, and budgeted prices of those inputs. For example, for an apparel manufacturer, standard quantities of inputs are required yards of fabric per jean and required hours of sewing operator labour per jean. Budgeted prices for those inputs are the budgeted cost per yard of fabric and the budgeted labour wage rate.

Standard quantities of inputs can be established based on ideal performance, or on expected performance, but are usually based on *efficient and attainable* performance. Research in psychology has determined that most people will exert the greatest effort when goals are somewhat difficult to attain, but not extremely difficult. If goals are easily attained, managers and employees might not work as hard as they would if goals are challenging. But also, if goals appear out of reach, managers and employees might resign themselves to falling short of the goal, and might not work as hard as they otherwise would. For this reason, standards are often established based on *efficient and attainable* performance.

Hence, a standard is a type of budgeted number; one characterized by a certain amount of rigor in its determination, and by its ability to motivate managers and employees to work towards the company's objectives for production efficiency and cost control.

There is an important distinction between standard costs and a standard costing system. Standard costs are a component in a standard costing system. However, even companies that do not use standard costing systems can utilize standards for budgeting, planning, and variance analysis.

Uses of Standard Costing:

- Standard costing is for improving cost /cost control, simplify stock valuation and improving costing and pricing of products.
- Can be applied to jobs, operations, processes and department and are used in manufacturing, engineering, processing and service industries.

Importance/ Advantages of standard costing

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.

TYPES OF STANDARDS

Following are different types of standards:

- Basic standards
- Normal standards
- Current standards
- Attainable (expected) standards
- Ideal (theoretical) standards

Basic standards

These are standards established considering those factors that are basic in nature and remain unchanged over a long period of time and are altered only when the business operations change significantly affecting the very basic foundations of the entity and nature of business. These standards help compare business operations over a longer period of time. Basic standards are used not only to evaluate actual results but also current expected results (current standards). We can say that basic standards work as a standard for other standards. As basic standards are not updated according to latest circumstances thus they are not used often as they cannot help in short term period variance analysis.

Normal Standards

These are such standards which are expected if normal circumstances prevail. Term normal represents the normal conditions of the business in the absence of any unexpected fluctuations (either favourable or unfavourable). Even though normal standards are more of a theoretical in nature as reality cannot be sufficiently predicted with all its fluctuations in advance. Also, circumstances may change in such a way that factors which were expected to be controllable are not so controllable by the managers. Thus it has limited application in today's business environment. However, normal standards acts as a good yardstick that represents challenging yet attainable results and can be used by management in such environment which is simple in nature and is not prone to great fluctuations.

Current standards

These standards are representative of current business conditions. These are mostly short term in nature and are widely used as they are the most relevant standards to be used for control purposes. These standards represent the state that business currently achieving or must achieve.

Attainable standards / Expected standards

These standards are based on current conditions and circumstances and represents what can be attained with the present setup in place and if the current conditions prevail. Current standards may be set lower or easier than expected standards but good managers always try to achieve what is attainable so that no resource is left unused. It means that attainable standards are representative of the potential that business is capable to achieve. For example a machinery is expected to run for

4,000 hours where it can run for 5,000. Thus current standard is 4,000 hours where attainable is 5,000 hours. These standards are useful as they help management to analyze their performance and to use the unused potential at the right time.

Ideal standards / Theoretical standards

These standards represents what business operations would be under ideal set of circumstances where everything is running at the optimum level with an ideal balance. These standards are representative of long term goals rather than for short term performance measurement. But with the advancement of technology and inventions even the ideal standards become attainable over the period of time but with every step taken forward and every question answered, more questions and more complexities pop up and its in human nature that it always extends the way forward with every milestone achieved. Therefore, ideal standards are not meant to be achieved rather to act like a guiding star.

Which type of standard should be selected?

This is not like that one standard is always good and the other always bad. Its all relative. It is a matter of situation and involves judgment to decide which standard is suitable for a particular situation and which can provide relevant and reliable information which is also easily available and applicable. Therefore, it depends on the requirements on the basis of which it is determined what type of standard is suitable for use.

For example, in financial or environmental crisis it will be good if management stick with current standards rather than using attainable standards as even maintaining current standards is sometime difficult.

On the other hand if management is of the opinion that circumstances are favourable and also the resources available are capable of facing a challenge then it may switch to attainable or even normal standards and a bit to the extreme ideal standards where ideal standards may help to motivate staff to perform at its peak.

PRINCIPLES/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 feels 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.

THE STANDARD COST CARD

A standard cost card contains an itemization of the standard amounts of materials, labor, and overhead required to create one unit of a product. The card also multiplies the standard cost of each of these line items to arrive at the total standard cost of a product. The card has two purposes:

- To derive the standard cost of a product
- To serve as the basis for variance analysis when actual costs for the product are compiled

The number of units and their standard costs that are listed on the card should be reviewed and possibly revised regularly, due to all of the following factors. Otherwise, the standard cost card will gradually diverge from the actual results experienced when manufacturing a product.

- The standard cost card is comprised of the expected quantities of materials to be used during the production process, which can vary somewhat from the actual amounts used. For example, it may contain a certain amount of scrap that may be higher or lower than the actual amount experienced. Also, the amount of spoilage encountered during the setup of a production run may also vary from the standard amount listed in the standard cost card.
- The standard costs listed on the card may also vary from actual results. For example, there may be an expectation to purchase a component for \$1.00, but because it was actually purchased in a smaller unit quantity than anticipated when the standard was created, the supplier charges a higher price per unit.
- The standard amount of labor stated on the card may be incorrect, because of changes in worker efficiency, altered equipment configurations, changes in the mix of experience levels used in a production team, and so forth.

- Similarly, the standard cost of the labor stated on the card may be incorrect, because of changes in the wages paid to employees, or in the amount of overtime paid, or in the mix of employees used in the manufacturing process.
- The standard amount of overhead allocated to the product may also vary from actual results, since it is based on a combination of an expected pool of overhead costs and an expected volume of production to be generated during the period. If either estimate varies from actual results, then there will be a difference between the standard overhead cost and the actual overhead cost.

A physical card is rarely used to store standard costs. Instead, this information is stored in the computer system and printed as needed.

Example of a Standard Cost Card

The following is a simplified version of the layout of a standard cost card. An actual card would itemize the individual components in the product.

	Units	Cost	Extension
Materials	3.7	\$7.25	\$26.83
Labor	1.2	5.50	6.60
Overhead	1.0	14.00	14.00
Total			\$47.43

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 : By:	31.12.20XX 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>
					<u>74.50</u>
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>
					<u>63.70</u>
Production overheads					
Machining	11	52.80	101.20	--	154.00
Indirect labour	6	--	--	98.40	<u>98.40</u>
					<u>252.40</u>
Standard cost Summary		Shs			
Direct materials		74.50			
Direct Labour		63.70			
Production overheads		<u>252.40</u>			
Standard cost per unit		<u><u>390.52</u></u>			

BEHAVIOURAL ASPECTS OF STANDARD COSTING

Because of the detailed nature of standard costing and Involvement with foremen and production workers, communication becomes even greater importance. Production workers frequently regard any form of performance evaluation with deep suspicion and if a cost-conscious, positive attitude is to be developed, close attention must be paid to the behavioral aspects of the system. Full participation, realistic standards, prompt and accurate reporting, no undue pressure or censure - all contribute to an acceptable system. Remember if the system is not accepted by the people involved it will be unworkable.

VARIANCES ANALYSIS

Variance analysis deals with the systematic evaluation of variances. Refers to an examination of the conditions of operations which give rise to any cost variance. It also provides management with an explanation as to why the variance has occurred. This indirectly helps the management to take suitable steps to control costs wherever necessary.

Variance can be split into two types; variance showing

- Price difference and/or
- Quantity and volume difference

Standards may be set and variance can be calculated for each element of cost (such as material, labour, and overheads). It is also possible to calculate variance for each of the factors such as (price, volume and so on) which determine the cost.

The variance can either be favorable or unfavorable (adverse). In order to determine whether the variance is favorable or adverse, we need to consider its impact on the profit of the entity.

A cost variance (such as material price or labour rate variance etc.) is favorable if the actual cost is less than the standard cost and vice-versa.

A sales variance such as sales margin price or volume variance etc) is favorable if the actual profit exceeds the standard the cost and vice-versa.

In general there are four causes variance namely

- Inaccurate recording of actual costs and revenues
- Random events (e.g. an accident may damage raw materials used for production causing adverse material variance)
- Operating efficiency
- Setting in appropriate standards

Fundamental concepts in brief

1. There are two basic dimensions to variances: price and quantity
2. A price variance is always calculated for actual quantity
3. A quantity variance is always calculated using standard price
4. The sales variances are favorable (F) when actual figures are greater than standards and are adverse when actual figures are lower than standards
5. The cost variance (except fixed overhead efficiency variances and fixed overhead capacity variance) are favorable when actual figures are lower than standards and are adverse when (A) when actual figures are lower than standards
6. Budgeted (costs or sales) signified estimated total (costs or sales) for a budget period as considered in the budget whereas standards (cost or sales) are budgeted (costs or sales) per unit

7. Wherever standard quantity is mentioned it should be given as budgeted interpreted as standard quantity for actual production. Many times standard quantity may be given as budgeted quantity in exam
8. If standard cost is given per unit, calculate the total standard cost for the actual level of activity
9. For variable and fixed overheads, wherever absorption rates are given the rates are to be presumed as standard rates

BASIC VARIANCES

Material variance

Total direct material cost variance

The direct material total cost variance signifies the difference between the actual material cost and the standard material cost for the actual production

If actual material cost is greater than the standard material for the actual production, the variance is adverse (A); otherwise the variance is favorable (F)

The total material cost variance is made up of two elements

- **The material price variance** ; Which is the difference between the actual price of the materials and the standard price for the actual quantity of goods made
- **The material usage variance**; which is the difference between what has actually used and under standard terms at standard material price

If actual consumption is greater than the quantity of material purchased, actual materials costs for calculation of direct material cost variance) should be derived from as the sum of the actual cost of purchase of raw materials and the extent of opening inventory consumed at standard price

Total direct material cost variance=Standard material cost for actual production – Actual material cost

Where material cost=Actual cost of usage of raw material out of current year's purchase+ Extent of opening inventory consumed at standard price (if there is opening inventory of material)

The total of material purchased is different from the materials actually used and raw materials inventories are valued at standard cost

The material variance will be calculated based on the actual quantity of purchase whereas the material usage variance would signifies the difference between actual usage and standard usage

Direct material price variance

The direct material price variance signifies the difference between the actual price and the standard price multiply by the actual quantity purchased

A direct material price variance occurs when raw materials are purchased at a price different from the standard price. Direct material price arises due to fluctuations in market price, purchasing non-standard lots and the consequent reduction in quantity discount, increase in or additional transport cost for a quick delivery making advantage of cash discount, etc.

If actual raw material price is greater than the standard raw material price, it is indicative of incurring high cost in raw materials and therefore the variance is adverse (A) and otherwise variance is favorable (F)

Direct material price variance

=ACTUAL QUANTITY PURCHASED X (STANDARD PRICE – ACTUAL PRICE)

$$\text{MPV} = \text{AQ} (\text{S.P} - \text{A.P})$$

Direct material usage Variance

Direct material usage variance represents the difference between the actual quantities of raw materials used in production and the standard quantities that should have been used in actual production multiplied by standard price. Standard quantity for actual production should be calculated because it helps to know whether the material is properly used in production in the production or not

The actual quantities of raw materials used in production is greater than the standard quantities, the variance is adverse (A); otherwise the variance is favorable (F)

A direct material usage variance is caused on account of subsequent or defective materials, carelessness in

The use or handling of materials, pilferage of raw materials, wastage due to inefficient production methods or unskilled employees

Direct material variance=Standard Price = (Standard Quantity – Actual Quantity)

$$\text{MUV} = \text{SP} (\text{SQ} - \text{AQ})$$

NOTE

Material Cost Variance

This is the difference between the standard material cost allowed for the production level achieved and the actual material cost incurred

Material Cost Variance = Standard Cost – Actual Cost.

Material Price Variance + Material Usage Variance = Material Cost Variance

$$\text{I.E } (\text{S.Q} \times \text{S.P}) - (\text{A.Q} \times \text{A.P})$$

Causes

- i) Fluctuations on prices
- ii) Efficiency or inefficiency in the usage of the materials caused by:
 - a) Mixing the materials in different proportion
 - b) Difference in the field of the materials
- iii) Use of substitute materials

- iv) Use of wrong standards or estimates

Material mix variance

This is that portion of material usage variance arising from mixing the materials in different proportions from the standard mix ratios.

$$= \text{STANDARD PRICE (ACTUAL MIX IN STANDARD PROPORTIONS - ACTUAL MIX)}$$

Material yield variance

This is that portion of the material wage variance arising from the difference between the actual output and the standard or expected output.

$$= \text{standard cost} \times (\text{standard yield /output} - \text{actual yield})$$

NB: Material Mix variance + Material Yield Variance = Material Usage Variance.

Illustration

BCH Ltd. Produces a type of liquid fertilizer .The production of this liquid fertilizer requires three different types of chemicals namely: Exe , Wye and Zed .The chemicals are mixed in the proportion of 0.4,0.3 and 0.3 respectively and their standard costs are sh.12,sh.7 and sh.5 respectively

Additional information

- In recent past the standard yield has been 80% on 100 litres of the chemical mix.
- The company maintains a policy of not carrying any raw materials, as storage space is limited.
- Annual production of liquid fertilizer has been set at 8,320,000 litres.
- In the month of April 2006, the company produced 150,000 litres of the fertilizer at a total cost of sh.1,708,000 .Actual number of litres used and cost per litre for the three chemicals were as follows:

Chemicals	Litres	Cost per litre Sh.
Exe	90,000	11.00
Wye	70,000	8.40
Zed	40,000	5.50

The company had expected the usage of Exe ,Wye and Zed chemicals to be 75,000,56250 and 56,250 respectively.

Required;-

- Material price variance
- Material yield variance
- Material mix variance

Solution

(A) Material price variance. = actual quantity (standard price – actual price)

Exe: 90000 (12-11) = 90,000 (F)

Wye: 70000 (7-8.40) = 98,000 (A)

Zed: 40000 (3-5.50) = 20,000 (A)
28000 (A)

(B) Material yield variance = Standard Cost per unit (Standard Output – Actual Output)

Standard Cost per Unit

Exe: 12 x 0.4 = 4.8

Wye: 7 x 0.3 = 2.1

Zed: 5 x 0.3 = 1.5
8.4

Standard Output = 80% of Material. Mix

1 Litre of 0.8 of Outputs = 8.4

$$= \frac{8.4}{0.8} \times 1 = Sh\ 10.5$$

Standard Output (80%)

Total

Standard Output = Inputs x 80%

$$\begin{aligned} & 200000 \times 80\% \\ & = 160000 \end{aligned}$$

Therefore Material Yield Variance = 10.5 (160,000 – 150000) = 105,000 A.

(C) Material Mix Variance = Selling price (Actual mix in standard Proportion – Actual Mix)

Actual Mix

Actual Mix in Standard Proportion

Exe: 90000 0.4 × 200,000 : 80000

Wye: 70000 0.3 × 200,000 : 60000

Zed: 40000 0.3 × 200,000 : 60000

20000

Material Mix Variance =

Exe 12(80000 – 90000) = 120,000 (A)

Wye 7(60000 – 70000) = 70,000 (A)

Zed 5(60000 – 40000) = 100,000 (F)
90,000 (A)

(D) Material Usage Variance = S.P. (SQ – A.Q)

Standard Quantity

Input:

Exe: $0.4 \times 187500 = 7,500L$

Wye: $0.3 \times 187500 = 56,250L$

Zed: $0.3 \times 187500 = 56,250L$

Material Usage Variance =

Exe $12(75,000 - 90,000) = 180,000 (A)$

Wye $7(56,250 - 70,000) = 96,250 (A)$

Zed $5(50,250 - 40,000) = 81,250 (F)$
 $195,000 (A)$

Reconciliation

Material Mix Variance = $90,000 (A)$

Material Yield Variance = $105,000 (A)$
 $195,000 (A)$

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.

LABOUR COST VARIANCE

This is the difference between the standard labour cost allowed for the production level achieved and the actual labour cost incurred.

Total direct labour Cost Variance

The total labour cost variance is the difference between the standard direct wages for actual production and the actual direct wages paid.

If the standard wages for actual production are greater than the actual direct wages paid this indicates that the labour cost incurred was lower than estimated and therefore the variance is favorable (F); otherwise the variance is Adverse (A)

Direct labour cost variance = Standard direct wages for production – Actual direct wages paid
= (Standard labour hours for actual production × Standard wages rate Hour)-(Actual labour hours
× Actual wages rate per hour

The total direct labour cost variance is made up of two elements

The direct labour rate variance; which gives the difference between the actual rate of labour and the standard rate per hour for the actual hours worked

The labour efficiency variance; which is the difference between what was actually used and what should have been used under standard terms at the standard labour rate.

Direct labour rate variance

The direct labour rate represents the difference between the standard wages rate per hour and the actual wage rate per hour of the actual hours worked

If the actual direct labour is greater than the standard rate, this indicates that higher costs for direct labour have been incurred compared to the estimated costs and therefore the variance is adverse (A) ; Otherwise the variance is favorable (F)

The causes of labour rate variances usually are changes in basic wage rates, new workers being paid different rates from standard rates, different rates being paid to workers employed to meet seasonal demands or to do urgent work etc.

Direct labour rate variance= (Standard wage rate per hour – Actual wage rate per hour) ×Actual labour hours

LRV = AH (S.R – A.R)

Causes rate variance

- a) Higher rates being paid than planned due to wage (increase) awards.
- b) Higher or lower grade of workers being used than planned.
- c) Payment of unplanned overtime or bonus.

Labour efficiency variance

This is that portion of labour cost variants arising as a result working for more or less hours in production than expected.

Labour Efficiency variance = Standard rate (Standard Labour hours – Actual labour hours worked)

LEV = SR (S.H – A.H)

Causes of labour efficiency variance

- a) Use of incorrect grade of labour e.g. poorly trained personnel.
- b) Poor workshop organization or supervision.
- c) Incorrect materials or machine problems.
- d) Use of better quality labour
- e) Increase labour or decrease labour efficiency.

NOTE;

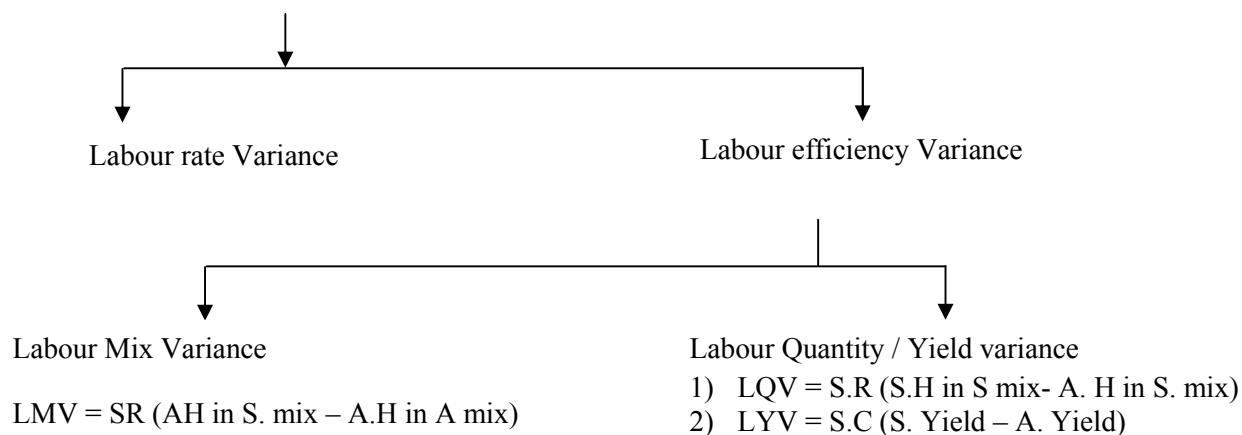
In some cases, there may be some hours paid which was non-productive i.e. idle time. Idle time is the difference between the hours paid and hours worked.

This gives rise to idle time variance

Idle time V = Standard rate (Hrs. paid – Hrs. worked) or Standard rate (idle time)

Labour cost variance

$$LCV = (S.H \times S.R) - A.H \times A.R$$

**OVERHEADS VARIANCES****Variable production overhead variances**

The variable production overhead total variance can be subdivided into the variable production overhead expenditure variance and the variable production overhead efficiency variance (based on actual hours)

Fixed production overhead variances

The fixed production overhead total variance can be subdivided into an expenditure variance and a volume variance. The fixed production overhead volume variance can be further subdivided into an efficiency and capacity variance.

The fixed overhead expenditure variance

The fixed overhead expenditure variance occurs if the numerator is incorrect. It measures the under- or over-absorbed overhead caused by the actual total overhead being different from the budgeted total overhead.

Therefore, fixed overhead expenditure variance = budgeted (planned) expenditure – Actual Expenditure.

The fixed overhead volume variance

As we have already stated, the fixed overhead volume variance is made up of the following sub-variances.

- Fixed overhead efficiency variance
- Fixed overhead capacity variance

These variances arise if the denominator (i.e. the budgeted activity level) is incorrect.

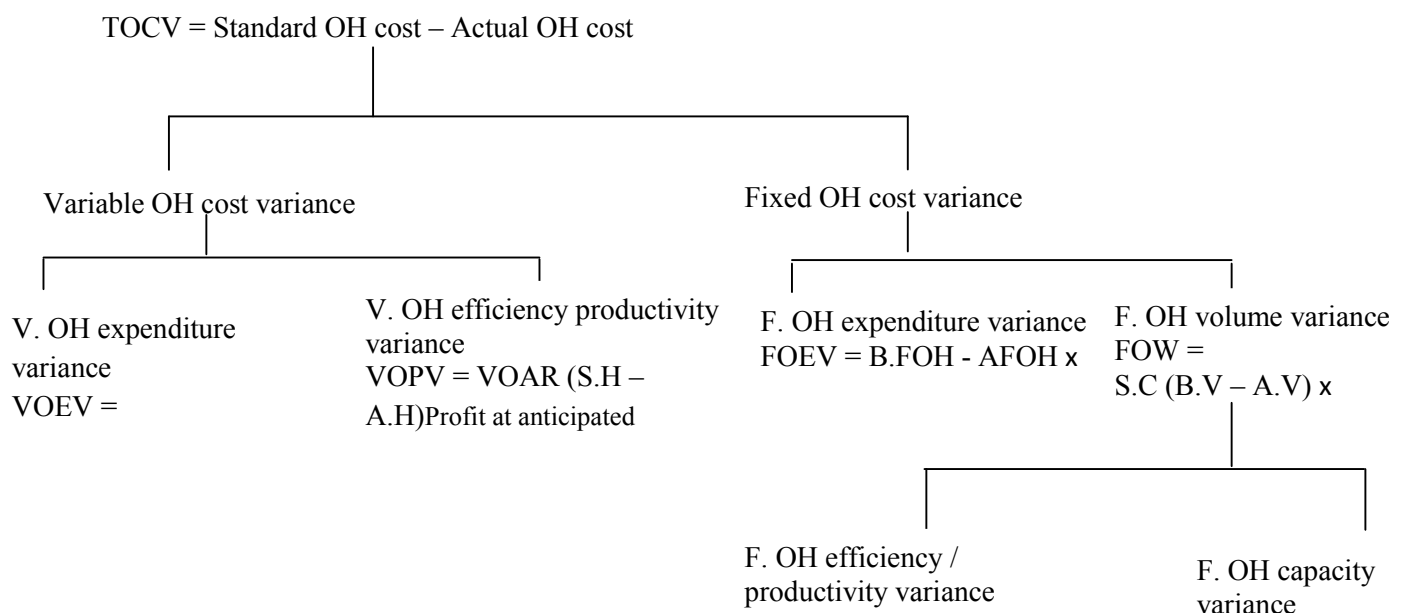
The fixed overhead efficiency and capacity variances measure the under- or over-absorbed overhead caused by the actual activity level being different from the budgeted activity level used in calculating the absorption rate.

How to calculate the variances

The following definitions express how each overhead variance should be calculated.

- **Fixed overhead total variance** is the difference between fixed overhead incurred and fixed overhead absorbed. In other words, it is the under- or over-absorbed fixed overhead.
- **Fixed overhead expenditure variance** is the difference between the budgeted fixed overhead expenditure and actual fixed overhead expenditure.
- **Fixed overhead volume variance** is the difference between actual and budgeted (planned) volume multiplied by the standard absorption rate per unit.
- **Fixed overhead volume efficiency variance** is the difference between the number of hours that actual production should have taken, and the number of hours actually taken (that is, worked) multiplied by- the standard absorption rate per hour.
- **Fixed overhead volume capacity variance** is the difference between budgeted (planned) hours of work and the actual hours worked, multiplied by the standard absorption rate per hour.

Total overhead cost variance



Where;

TOCV	is Total overhead cost variance
OH	is overhead
VOH	is variable overhead
VOCV	is variable overhead cost variance
FOCV	is fixed overhead cost variance
VOEV	is variable overhead expenditure variance
AH	is actual hours
SH	is standard hour
VOAR	is variable overhead absorption rate
VOPV	is variable overheads productivity variance
FOEV	is fixed overheads efficiency variance
BFOH	is the budgeted fixed overheads
AFOH	is the actual fixed overheads
BV	is the budgeted volume
AV	is the actual volume

Illustration

A company uses absorption costing for both internal and external reporting purposes as it has a considerable level of fixed production costs. The following information has been recorded for the past year.

Budgeted fixed production overheads	Sh. 2,500,000
Budgeted (Normal) activity levels:	
Units	62,500 units
Labour hours	500,000 hours
Actual fixed production overheads	Sh. 2,890,350
Actual levels of activity:	
Units produced	70,000 units
Labour hours	525,000 hours

Required:

- Calculate the fixed production overhead expenditure and volume variances and briefly explain what each variance shows.
- Calculate the fixed production overhead efficiency and capacity variance and briefly explain what each variance shows:

Solution**a) Fixed production overhead Expenditure variance**

Fixed overhead expenditure variance = (Actual expenditure on fixed overhead – Budgeted fixed Overhead)

$$\begin{aligned} &= \text{sh. } (2,890,350 - 2,500,000) \\ &= \text{sh. } 390,350 \text{ (A)} \end{aligned}$$

This variance indicates that the company has spent more than originally budgeted.
Fixed production indicates that the company has spent more than originally budgeted.

Fixed production overhead volume variance

$$\begin{aligned} \text{Fixed overhead volume variance} &= \text{Fixed overhead absorption rate per hour} \times (\text{Budgeted hours} - \\ &\text{Standard hours required for actual production}) \\ &= (560,000 \text{ (W1)} - 500,000) \text{ hours} \times \text{sh. } 5 \text{ per hour (W2)} \\ &= \text{sh. } 300,000 \text{ (F)} \end{aligned}$$

Workings

Standard hours required for actual activity

For that first we shall calculate

$$\text{Budgeted hours per unit} = 500,000 \text{ hours} / 62,500 \text{ units} = 8 \text{ hours per unit}$$

$$\begin{aligned} \text{Standard hours required for actual activity} &= \text{Actual units} \times \text{Budgeted hours per unit} \\ &= 70,000 \text{ units} \times 8 \text{ hours per unit} \\ &= 560,000 \text{ hours.} \end{aligned}$$

W2

$$\text{Fixed overhead Absorption Rate (FOAR)} = \frac{\text{Budgeted Fixed overhead}}{\text{Budgeted Activity (standard hours)}}$$

$$= \text{sh. } 2,500,000 / 500,000 \text{ hours} = \text{sh. } 5 \text{ per hour.}$$

This variance indicates that the company has used more labor than originally budgeted.

b)Fixed production overhead Efficiency variance.

Fixed overhead Efficiency variance = Fixed overheads absorption rate x (Actual hours worked or paid – standard hours required for actual production).

$$\begin{aligned} &= \text{sh. } 5 \times (525,000 - 560,000) \text{ hours} \\ &= \text{sh. } 175,000 \text{ (F)} \end{aligned}$$

This variance shows that labour worked for more hours than was originally budgeted thereby exceeding the budgeted capacity.

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's the risk of ignoring the impact of the sales effort on profit. When we say profit margins, we assume absorption costing and contribution margin when we are marginal costing.

Total sales variance

Total sales variances signifies the variance in profit (in absorption costing) or in contribution in marginal costing as a result of the combined impact of change in price and sales volume. Similarly total sales value variance signifies the difference between the actual and budgeted sales

If actual sales / actual margins is greater than the budgeted sales / budgeted margin the variance is favorable (F) and otherwise it is adverse (A)

Under absorption costing environment

Total Sales value variance=Actual sales – Budgeted sales
Total sales profit variance=Actual profit-Budgeted profit

Under marginal costing environment

Total sales margin (contribution) variance= Actual margin – Budgeted margin

Sales price and volume variance

The actual price variance signifies the variance between the actual selling price per unit and the standard selling price per unit multiplied by the actual quantity of units sold

The variance identifies that the units are sold for more or less than their standard selling price and the overall impact on revenue due to the customers and therefore the variance is favorable (F) and otherwise is adverse (A). Sales price is calculated both under marginal costing environment and absorption costing environment.

Under the absorption costing method sales price variance is calculated as follows

Sale price variance= (Actual selling price per unit-Standard selling price per unit) × Actual quantity sold

OR

Sales (profit margin) variance = (Actual profit margin – Standard profit margin) × Actual sales volume

$$= [\text{Actual sales price} - \text{Standard cost per unit}] - (\text{Standard sales price} - \text{Standard cost per unit}) \times \text{Actual sales volume}$$

In a marginal costing environment, sales price variance is calculated as

$$\begin{aligned} &\text{Sales price margin variance} \\ &= (\text{Actual contribution margin} - \text{Standard contribution margin}) \times \text{Actual sales volume} \\ &= (\text{Actual sales price} - \text{Standard variable cost per unit}) - \text{Standard sales price} - \text{Standard cost per unit} \times \text{Actual sales volume} \end{aligned}$$

If the margin is greater than the standard the standard margin the variance is favorable (F); otherwise is adverse (A)

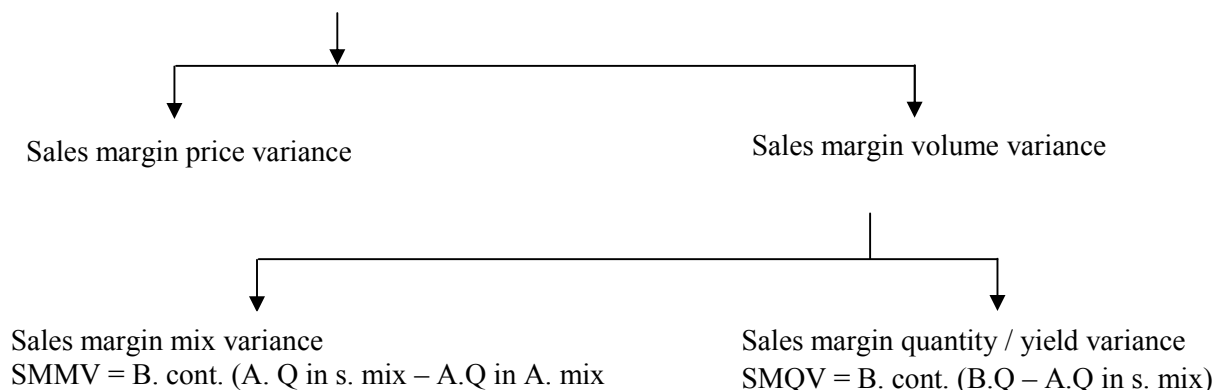
The sales variance signifies the difference between the actual quantities sold and the budgeted quantity, multiplied by either the standard profit per unit or standard contribution per unit. It should be noted that, in absorption costing, the standard profit per unit is used, whereas in marginal costing environment Standard contribution per unit is used.

The variance identifies whether the standard quantity or sales exceeded the budgeted quantity measures the overall impact of change in sales volume on profit or contribution. If the case may be If actual sale volume is greater than the standard sales volume the variance is favorable (F); otherwise the variance is adverse (A)

Sales volume variance = (Actual sales quantity - Budgeted sales quantity) - Standard profit per unit or Standard contribution per unit)

Sales margin variance (SMV)

$$\text{SMV} = (\text{B.Q} \times \text{B. Cont}) - (\text{A.Q} \times \text{A. Con})$$



Where;

B. cont. is the budgeted contribution

BQ is budgeted quantity

AQ is the actual quantity

A cont. is the actual contribution

SMMV is Sales margin mix variance

SMQV is Sales margin quantity yield variance

ILLUSTRATION

From the information provided below, calculate the following variances:

	standard				Actual			
	Qty.(units)	Unit sales price (sh.)	Cost/unit	Total sales	Qty. (units)	Unit sales price(sh.)	Cost/unit (sh.)	Total sales
A	2,000	4	3.5	8,000	2,200	4.10	3.70	9,020
B	2,500	5	4	12,500	2,000	5.25	4.30	10,500
C	1,750	6	5.25	10,500	2,000	5.75	5	11,500
	6,250			31,000	6,200			3,020

- i) sales price variance
- ii) sales margin price variance
- iii) sales volume variance
- iv) sales margin volume variance
- v) total sales value variance
- vi) total sales margin variance

Solution

Sales price variance = (actual selling price per unit – standard selling price per unit) x actual quantity

Product A = sh. $(10 - 4) \times 2,200$ == sh. 220(F)

Product B = sh. $(5.25 - 5) \times 2,000$ = shs.500 (F)

Product C = sh. $(5.75 - 6) \times 2,000$ = sh.500 (A)

Sales price margin variance = Actual contribution margin (W1) – standard contribution margin (W2) x actual sales volume.

Product A = sh. $(0.60 - 0.50) \times 2,200$ = sh.220 (F)

Product B = sh. $(1.25 - 1) \times 2,000$ = sh. 500(F)

Product C = $(0.50 - 0.75) \times \text{sh.}2,000$ = sh. 500 (A)

Workings**W1 actual margin**

A = sh4.10 - sh3.50 = sh0.60

B = sh. 5.25 – sh. 4 = sh. 1.25

C = sh. 5.75 – sh. 5.25 = sh. 0.50

W2 budget margin

$$A = \text{sh. } 4 - \text{sh. } 3.50 = \text{sh. } 0.50$$

$$B = \text{sh. } 5 - \text{sh. } 4 = \$ 1$$

$$C = \text{sh. } 6 - \text{sh. } 5.25 = \text{sh. } 0.75$$

Sales volume variance =

(Actual sales quantity – Budgeted sales quantity) × Standard price per unit

$$\text{Product A} = \text{sh. } (2,200 - 2,000) \times \text{sh. } 4 = 800 \text{ (F)}$$

$$\text{Product B} = (2,000 - 2,500) \times \text{sh. } 5 = \text{sh. } 2,500 \text{ (A)}$$

$$\text{Product C} = (2,000 - 1,750) \times \text{sh. } 6 = \text{sh. } 1,500 \text{ (F)}$$

Sales margin volume variance

(Actual sales quantity – Budgeted sales quantity) × standard profit per unit

$$\text{Product A} = (2,200 - 2,000) \times \text{sh. } 0.50 = \text{sh. } 100 \text{ (F)}$$

$$\text{Product B} = (2,000 - 2,500) \times \text{sh. } 1 = 500 \text{ (A)}$$

$$\text{Product C} = (2,000 - 1,750) \times \text{sh. } 0.75 = \text{sh. } 187.5 \text{ (F)}$$

Total sales value variance = Actual sales – Budgeted sales

$$\text{Product A} = \text{sh. } 9,020 - \text{sh. } 8,000 = \text{sh. } 1,020 \text{ (F)}$$

$$\text{Product B} = \text{sh. } 10,500 - \text{sh. } 12,500 = \text{sh. } 2,000 \text{ (A)}$$

$$\text{Product C} = (11,500 - \text{sh. } 10,500) = \text{sh. } 1,000 \text{ (F)}$$

Total sales margin variance = Actual margin – budgeted margin

$$\text{Product A} = (2,200 \times \text{sh. } 0.60) - (2,000 \times \text{sh. } 0.50) = \text{sh. } 320 \text{ (F)}$$

$$\text{Product B} = (2,000 \times \text{sh. } 1.25) - (2,500 \times \text{sh. } 1) = \text{sh. nil}$$

$$\text{Product C} = (2,000 \times \text{sh. } 0.50) - (1,750 \times \text{sh. } 0.75) = \text{sh. } 312.5 \text{ (A)}$$

Illustration

Cole Dale Ltd. Manufactures and sells product CC. The company operates a standard marginal costing system. The standard cost card for CC includes the following:

	Sh. Per unit
Direct materials	20
Direct labour (6 hours @ sh. 7.50 per hour)	45
Variable production overheads	27
Total	92

The budgeted and actual activity levels for the last quarter were as follows:

	Units	
	Budget	Actual
Sales	20,000	19,000
Production	20,000	21,000

The actual cost incurred last quarter were:-

	Sh.
Direct materials	417,900
Direct labour (124,950 hours)	949,620
Variable production overheads	565, 740

Required:

- Calculate the total variances for the direct material , direct labour and variable production overheads.
- Provide an appropriate breakdown of the total variance for direct labour calculated in part (a) above.
- Suggest two possible causes of each variance calculated in (b)

Solution

a) Material variance

Direct material variance

= standard quantity for actual production at standard price – Actual quantity at actual price

= sh.20 x 21,000 units) – sh.417,900

= sh.420,00 – sh.417,900=

= sh.2,100 (F)

Direct labour variance

= standard hours for actual production at standard rate – actual hours at actual rate

= (21,000 units x sh. 45) – sh.949,620

= sh.945,000 – sh.949, 620

= sh.4, 620 (F)

Variable production overhead variance

= standard cost of actual production – Actual cost of production

= 21,000 units x sh.27) – sh.565,740

= sh.567,000 – sh.565,740

= sh.1,260

b) Labour variance**Direct labour rate variance**

= Actual hours at actual rate – Actual hours at standard rate.

= sh.949,620 – (124,950 hrs. x sh.7.50)

= sh. 949,620 – sh. 937, 125

= sh. 12,495

Direct labour efficiency variance

= standard hours for actual production at standard rate – Actual hours at standard rate

= (6 hrs. x 21,000 units x sh. 7.5) – (124,950 hrs. x sh. 7.5)

= sh. 945,000 – sh. 937,125

= sh. 7,875 (F)

Breakdown of the total direct labour variance is as follows

Total direct labour variance = direct labour rate variance + direct labour efficiency variance

= sh.12,945 (A) + sh. 7,875 (F)

= sh. 4,620 (A)

c) Causes of direct labour rate and efficiency variance**i) Direct labour rate variance**

- High graded workers paid at a higher rate.
- New workers being paid at rates different from the standard rates
- Higher than expected wage settlement for the company

ii) Direct labour efficiency variance

- Highly motivated workers
- Insufficient training
- Incomplete supervision
- Workers dissatisfaction
- Bad working conditions
- Use of defective machinery and equipment etc.

Illustration

From the following information of lucky Plc calculate.

	Budgeted		Actual	
	Product A	Product B	Product A	Product B
Units	400	800	480	790
Sales price	Shs.5	Shs.4	Shs.4.75	Shs.3.9
Cost	Shs.4.5	Shs. 3	Shs.4.6	Shs.2.9

- a) Sales price variance
- b) Sales margin price variance
- c) Sales volume variance
- d) Total sales value variance
- e) Total sales margin variance.

Solution

- a) **Sales price variance** = (Actual selling price per unit – standard selling price per unit) x actual quantity sold.

Product A = sh. (4.74 – 5) x 480 units = sh. 120

Product B = sh. (3.9 – 4) x 790 units = sh. 79 (A)

- b) **Sales margin price variance** = (actual contribution margin – standard contribution margin) × actual sales volume.

Product A = sh. (0.25 – 0.25) × 480 units = sh. 120 (A)

Product B = sh. (0.90 – 1) × 790 units = sh. 79 (A)

Workings**W1 standard contribution margin**

A = sh.(5 – 4.50) = sh. 0.50

B = sh. (4 – 3) = sh.1

W2 Actual contribution margin

A = sh. (4.75 – 4.5) = sh. 0.25

B = sh. (3.9 – 3) = sh. 0.90

- c) **Sales margin volume variance** = (Actual quantity – Budgeted quantity) x standard margin

Product A = (480 – 400) units × sh. 0.50 = sh. 40(F)

Product B = (790 – 800) units ×sh.1 = sh. 10(A)

- d) **Total sales value variance** = Actual sales – budgeted sales

Product A = sh. 2,280 –shs. 2,000 = sh. 280 (F)

Product B = sh. 3,081 –shs. 3,200 = sh. 119(A)

- e) **Total sales margin variance** = actual margin – budgeted margin

Product A = (480 units ×sh. 0.25) – (400 units × sh. 0.50) = sh. 80 (A)

Product B = (790 units × sh. 0.9) – (800 units × sh. 1) = sh. 89(A)

REVISION EXERCISE

QUESTION ONE

A company has budgeted to produce 2,750 articles in 22,000 hours, with fixed overheads of Sh 88,000 and variable overheads of Sh 55,000. The company's production during the period of the budget was 2,700 articles in 21,500 working hours with fixed overheads costing Sh 90,000 and variable overheads Sh 58,000.

Required:

Calculate the following variances:

- Overhead variance.
- Fixed production overhead variance.
- Variable production overhead variance.
- Fixed production overhead expenditure variance.
- Fixed production overhead volume variance.
- Fixed cost productivity variance.
- Capacity variance.

Solution:

$$\begin{aligned}
 \text{a) Overhead Variance} &= \text{Total Budgeted overheads} - \text{Total Actual Overheads} \\
 &= (88,000 + 55,000) - (90,000 + 58,000) \\
 &= \text{Shs } 143,000 - \text{Shs } 148,000 \\
 &= \text{Shs } 5,000\text{A}
 \end{aligned}$$

$$\begin{aligned}
 \text{b) Fixed Production Overhead Variance} &= \text{Actual Fixed Overheads} - \text{Standard Fixed Overheads} \\
 &= \text{Shs } 90,000 - (2,700 \times [88,000/2,750]) \\
 &= \text{Shs } 90,000 - 86,400 \\
 &= \text{Shs } 3,600\text{(A)}
 \end{aligned}$$

$$\begin{aligned}
 \text{c) Variable Production Overhead Variance} &= \text{Actual Variable Overheads} - \text{Standard Variable Overheads} \\
 &= 58,000 - [2,700 \times (55,000/2,750)] \\
 &= 58,000 - 54,000 \\
 &= \text{Shs } 4,000\text{(A)}
 \end{aligned}$$

$$\begin{aligned}
 \text{d) Fixed Production Overhead Expenditure Variance} &= 90,000 - 88,000 \\
 &= \text{Shs } 2,000\text{(A)}
 \end{aligned}$$

e) Fixed Production Overhead Volume Variance

$$\begin{aligned}
 &= (\text{Budgeted} - \text{Actual Units}) \times \text{Fixed Overhead Absorption Rate per unit} \\
 &= (2,750 - 2,700) 32 \\
 &= \text{Shs } 1,600(\text{A})
 \end{aligned}$$

f) fixed Production Overhead Efficiency or Productivity Variance

$$\begin{aligned}
 &= (\text{Actual Hours} - \text{Standard Hours}) \times \text{F.O.A.R per hour} \\
 &= (21,500 - 21,600) \times 88,000/22,000 \\
 &= 100(4) \\
 &= \text{Shs } 400\text{F}
 \end{aligned}$$

g) Capacity Variance Also called Fixed Overhead Capacity Variance

$$\begin{aligned}
 &= (\text{Budgeted Hours} - \text{Actual Hours}) \text{ F.O.A.R Per hour} \\
 &= (22,000 - 21,500) 4 \\
 &= \text{Sh. } 2,000(\text{A})
 \end{aligned}$$

QUESTION TWO

Tonga Ltd manufactures a single product whose cost structure is given below:

	Sh	Sh
Direct materials:		
Material A (2 kg @ Sh 25 per kg)	50	
Material B (3 litres @ Sh 75 per litre)	225	275
Direct labour (4 hours @ Sh 30 per hour)		120
Variable overheads		80
Fixed overheads		25
		500

The variable and fixed overheads are absorbed on the basis of the direct labour hours.

During the year ended 31 October 2000, the company produced and sold 40,000 units and incurred the following costs:

	Sh.	Sh.
Direct materials:		
Material A (78,000 Kg)	205,000	
Material B (121,000 Kg)	6,800,000	7,005,000
Direct labour (156,000 hours)		4,900,000
Variable overheads		3,000,000
Fixed overheads		900,000
Total cost		15,805,000

Required:

- Material mix and yield variances.
- Variable overhead expenditure and efficiency variances.
- Standard cost card for 40,000 units.

Solution:

i) Material Mix Variance = (Standard Price of Standard Mix – Standard Price of Actual Mix)

But Standard Price of Standard Mix = Quantity Mixed × Standard Cost of Mix
Quantity per Mix

$$= \frac{199,000 \times 275}{5} = \text{Shs } 10,945,000$$

Standard Price of Actual Mix: A: $78,000 \times 25 = 1,950,000$

B: $121,000 \times 75 = 9,075,000$ Shs 11,025,000

Material Mix Variance = SH 10,945,000 – Sh.11, 025,000 = Sh. 80,000 (A)

Material Yield Variance = Standard Cost of Mix (Standard Yield – Actual Yield)

$$= \frac{275 (199,000 - 40,000)}{5} = \text{Sh.}55,000 \text{ F}$$

Therefore Material Usage Variance = Material Mix Variance + Material Yield Variance

$$= 80,000 \text{ (A)} + 55,000 \text{ (F)} = \text{Sh.}25,000 \text{ A}$$

ii) Variable Overhead Absorption Rate = Sh.80 = Sh. 20/hr = V.O.A.R
4 hrs

Fixed Overhead Absorption Rate = Sh.25 = 6.25/hr
4 hrs

Variable Overhead Expenditure Variance

= Actual Variable Overheads Incurred – Actual Hours x V.O.A.R

= Shs 3,000,000 – (156,000 x 20)

= Shs 3,000,000 – 3,120,000

= 120,000 Favourable

Variable Overhead Efficiency Variance

= (Actual Hours x V.O.A.R) – (Standard Hours x V.O.A.R)

$$\begin{aligned}
 &= 3,120,000 - (40,000 \times 4 \times 20) \\
 &= 3,120,000 - 3,200,000 \\
 &= 80,000 \text{ Favourable}
 \end{aligned}$$

NB: Variable Overhead Cost Variance = Standard Variable Overhead – Actual Variable Overhead

$$\begin{aligned}
 &= 3,200,000 - 3,000,000 \\
 &= \text{Shs}200,000
 \end{aligned}$$

$$\begin{aligned}
 &= \text{Variable Overhead Expenditure Variance} + \text{Variable Overhead Efficiency Variance}
 \end{aligned}$$

iii)

Tonga Ltd
Standard Cost Card

Output Level:	40,000 Units
Cost Item:	Sh.
Direct Material: A: $40,000 \times 2 \times 25$:	2,000,000
B: $40,000 \times 3 \times 75$	9,000,000
Total Material Cost	11,000,000
Direct Labour: $(4 \times 30 \times 40,000)$	4,800,000
Prime cost	15,800,000
Variable Overheads: $(20 \times 4 \times 40,000)$	3,200,000
	19,000,000
Fixed Overheads: $(4 \times 6.25 \times 40,000)$	1,000,000
Total Production Cost	20,000,000

QUESTION THREE

Nyundo Ltd manufactures a product whose standard variable cost is given below:

Direct materials (2 kg @ Sh 3)	6
Direct labour (0.75 hours @ Sh 4)	3
Variable overheads	1

The company treats fixed costs as period costs and therefore they are not charged to products.

The following information relates to the month of March 2001.

	1/3/2001	31/3/2001
	Sh.	Sh.
Stocks (all at standard cost)		
Raw materials	12,000	6,000
Finished goods	36,000	42,500

The following information is available for the month of March 2001:

	Sh.
Sales @ Sh. 20 per unit	200,000
Material purchases @ Sh. 3.50 per kg	42,000
Direct labour cost (8000 hours)	30,000
Variable overheads	12,000
Material price variance (adverse)	21,000

The management is wondering whether they could have performed better.

Required:

Calculate the following variances in each case stating two possible causes:

- Material usage variance
- Labour rate variance.
- Labour efficiency variance.
- Variable overhead expenditure variance:
- Variable overhead efficiency variance.
- Briefly comment on two possible causes of each variance in (i) above

Solution:

Nyundo Limited

- Material usage Variance = Standard Price (Standard Quantity – Actual Quantity)

Actual Quantity of Raw Material used is computed as follows:

	Cost (Shs)	Unit cost	Units
Opening Stock:	12,000	1.50 ⁽ⁱ⁾	8,000
Purchases	42,000	3.50	12,000
	54,000		20,000
Less closing stock	(6,000)	2.50 ⁽ⁱⁱ⁾	(2,400)
Raw material used	48,000		17,600

Opening stocks assumed valued at standard price of Shs 3/2 kg = Shs 1.5

Closing stocks assumed an average of both opening stock and purchases $\frac{(1.50 + 3.50)}{2} = \text{Shs } 2.50$

Standard Quantity = Quantity expected to be used for the actual output.

Quantity produced is computed as follows:

	Value (Shs)	Unit cost	Units
Opening Stock:	36,000	10	3,600
Sales	100,000	10	10,000
	136,000		136,000
Less closing stock	(42,500)	10	(4,250)
Production	93,500		9,350

NB: Units Cost at Standard = Sh 6 + Sh 3 + Sh 1 = Sh 10

9,350 units of production are expected to use: 2 kg x 9,350 = 18,700 kgs of raw material

$$\therefore \text{Material usage Variance} = 1.50 (18,700 - 17,600) \\ = \text{Sh } 1,650 \text{ (F)}$$

$$\begin{aligned} \text{(b) Labour rate variance} &= \text{Actual Hours (Standard Rate - Actual Rate)} \\ &= 8,000 (4 - 3.75) \\ &= \text{Sh } 2,000 \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{(c) Labour efficiency variance} &= \text{Standard Rate (Standard Hours - Actual Hours)} \\ &= 4 ((9,350 \times 0.75) - 8,000) \\ &= \text{Sh } 3,950 \text{ (F)} \end{aligned}$$

$$\text{(d) Variable Overhead Expenditure Variance} = \text{Actual Variable Overheads} - (\text{Actual hours} \times \text{V.O.A.R.})$$

Where V.O.A.R = Variable Overhead Absorption Rate

$$= 12,000 - (8,000 \times 1/0.75) = \text{Sh } 1,333 \text{ (A)}$$

(e) Variable Overheads Efficiency Variance

$$= \text{V.O.A.R (Actual labour hours - Standard labour hours)}$$

$$= 1 (8,000 - 9,350) = \text{Shs } 4,467 \text{ (F)}$$

0.75

(f) Possible causes of:

Favourable Material Usage Variance:

- Good quality of labour
- High quality of material
- Optimum utilization of materials with little or no wastage

Favourable labour rate variance:

- Employment of lower cost labour
- Overestimated labour rate
- Reducing prices of labour in the market

Favourable labour efficiency variance

- High quality of labour
- Motivated labour force
- Underestimated standard output

Adverse variable overhead expenditure variance:

- Underestimated overheads absorption rate
- Lower output level than expected
- Increase in overheads during the period

Favourable variable overhead efficiency variance

- Less hours taken to produce units
- Increased efficiency in the output process

TOPIC 10

COST MANAGEMENT

VALUE CHAIN RESEARCH AND DEVELOPMENT-DESIGN-PRODUCTION-MARKETING DISTRIBUTION AND CUSTOMER CARE

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.

Michael Porter introduced the value chain analysis concept in his 1985 book 'The Competitive Advantage'. Porter suggested that activities within an organisation add value to the service and products that the organisation produces, and all these activities should be run at optimum level if the organisation is to gain any real competitive advantage. If they are run efficiently the value obtained should exceed the costs of running them i.e. customers should return to the organisation and transact freely and willingly. Michael Porter suggested that the organisation is split into 'primary activities' and 'support activities'.

Primary Activities

Inbound logistics : Refers to goods being obtained from the organisation's suppliers and to be used for producing the end product.

Operations : Raw materials and goods are manufactured into the final product. Value is added to the product at this stage as it moves through the production line.

Outbound logistics : Once the products have been manufactured they are ready to be distributed to distribution centres, wholesalers, retailers or customers. Distribution of finished goods is known as outbound logistics.

Marketing and Sales: Marketing must make sure that the product is targeted towards the correct customer group. The marketing mix is used to establish an effective strategy, any competitive advantage is clearly communicated to the target group through the promotional mix.

Services: After the product/service has been sold what support services does the organisation offer customers?. This may come in the form of after sales training, guarantees and warranties.

With the above activities, any or a combination of them are essential if the firm are to develop the "competitive advantage" which Porter talks about in his book.

Support Activities

Support activities assist the primary activities in helping the organisation achieve its competitive advantage. They include:

Procurement: This department must source raw materials for the business and obtain the best price for doing so. The challenge for procurement is to obtain the best possible quality available (on the market) for their budget.

Technology development: The use of technology to obtain a competitive advantage is very important in today's technological driven environment. Technology can be used in many ways including production to reduce cost thus add value, research and development to develop new products and the internet so customers have 24/7 access to the firm.

Human resource management: The organisation will have to recruit, train and develop the correct people for the organisation to be successful. Staff will have to be motivated and paid the 'market rate' if they are to stay with the organisation and add value. Within the service sector such as the airline industry, employees are the competitive advantage as customers are purchasing a service, which is provided by employees; there isn't a product for the customer to take away with them.

Firm infrastructure: Every organisations needs to ensure that their finances, legal structure and management structure work efficiently and helps drive the organisation forward. Inefficient infrastructures waste resources, could affect the firm's reputation and even leave it open to fines and sanctions.

Types of value chain

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 multilinked 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.

JUST IN TIME (JIT)

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 buildup. 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.

Objectives of JIT /Advantage

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 is 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.

Disadvantages of JIT

- 1) High ordering cost due to high orders
- 2) There are chances of stock outs in case of failure on the side as the supplier

USE OF COMPUTERS IN COSTING

A computer is a set of electronic device that can systematically and sequentially follow a set of instructions called a program to perform high-speed arithmetic and logical operations on data. Because of the rapid changes in finances and its related fields, accurate record keeping is critical. Computerizing a business' tasks of accounting procedures, increases efficiency. With a computer and its appropriate software, one can request and receive an in house balance sheet, an income statement, cash flow and statements of affairs and other accounting reports within a short time: hence an increase in productivity.

Let's take time to briefly see the role computers are playing in the field of accounting, changing some of the things that were manually done and facilitating accounting data processing.

General Ledger

Electronic General Ledgers are labor saving device for the preparation of financial statements and for establishing multiple income and cost entries. It takes charge of secondary postings.

Inventory Control

Electronic Inventory Control module has multiple functions, which includes tracking inventory for both costing and tax purposes, aid managers in controlling purchasing (and the overall level of expenditure) and minimizing the investment in inventory (and subsequent loss of cash flow). It is integrated with the general ledger so it can automatically set aside the correct amount for processing further.

Many shops now use **stock control** systems. The term "stock control system" can be used to include various aspects of controlling the amount of stock on the shelves and in the stockroom and how reordering happens.

Typical features include:

- Ensuring that products are on the shelf in shops in just the right quantity.
- Recognizing when a customer has bought a product.
- Automatically signaling when more products need to be put on the shelf from the stockroom.
- Automatically reordering stock at the appropriate time from the main warehouse.
- Automatically producing management information reports that could be used both by local managers and at Head office.

These might detail what has sold, how quickly and at what price, for example. Reports could be used to predict when to stock up on extra products, for example, at Christmas or to make decisions about special offers, discontinuing products and so on. Sending reordering information not only to the warehouse but also directly to the factory producing the products to enable them to optimize production.

Computer Aided Manufacturing (CAM)

Today, increasing competition level in the markets require using CAM systems that enable firms to manufacture quality products for customer demands in a short time. Using CAM systems in manufacturing processes has brought about important changes in firms' performance measurement systems.

Spreadsheets

Electronic Spreadsheets allow you to do anything that you would normally do with a calculator, pencil and columnar scratch pad. A typical integrated double entry accounting spreadsheet system will contain some of the following components: general ledger, inventory levels, order entry, payroll, time, and billing etc...

Job Order Costing System

A job order costing system is utilized by businesses that manufacture products for specific orders. It is employed in circumstances where a business wants to know the expenses associated with manufacturing different jobs, products, or services for a given period. By using this system to determine the costs of expenses, the expenses are tracked to the activity (job) and then the expenses of performing the activity are split-up by the unit numbers of the activity to succeed in determining the cost per-unit average of the product. The costs of producing each job in a job order costing system must be captured and tracked in order to determine the accurate cost of producing the specific product. Some costs for a business that would be associated with this may include materials, labor, and overhead related to producing a product. However, materials labor and overhead will differ from specific product and specific customer order to the next. Personalized production that is specific to a customer want or job order need which may involve greater encouragement from our

resources than that of the common productivity movement within the business would be an example of a particular customer or job order.

INVENTORY MANAGEMENT

Inventory management software is a computer-based system for tracking inventory levels, orders, sales and deliveries. It can also be used in the manufacturing industry to create a work order, bill of materials and other production-related documents. Companies use inventory management software to avoid product overstock and outages. It is a tool for organizing inventory data that before was generally stored in hard-copy form or in spreadsheets. It is often associated with and is similar to distribution software.

The Uses of Computers in Inventory Control

Computerization has revolutionized inventory management, as technologies ranging from automatic scanners to radio frequency identification chips now allow businesses to track their inventory from the moment a company buys it wholesale to the moment the products leave the building in the hands of a customer.

Receipt of Goods

A retail store or a central warehouse uses bar code or radio-frequency identification scanning at the point of receipt of goods. Scanning individual items or shipment pallets allows a company to itemize all shipments from the supplier, which can be compared against the purchase order for errors or losses in transit. When your business ships these goods out of the warehouse to their point of sale, a second scan can automatically tally the remaining stock in the warehouse, and send messages to the purchasing managers indicating that it is time to reorder.

Retail Turnover

Many businesses use similar scanning techniques at the point of checkout. As of 2010, bar code scanners are more popular than RFID for this purpose. Both will automatically enter the correct price at the register and prevent data entry errors. They also can create a perfect real-time record of how much stock remains on the shelves, how much is available in on-site storage, and whether a new shipment is necessary from the warehouse. Combine this information with warehousing data, and your business can create additional alerts to key management when a bottleneck occurs. For example, if a dozen retail stores anticipate needing restocking, but the warehouse does not have sufficient goods on hand, your business can place a rush order to fill the need.

Stock Management and Cost Reduction

The process of moving goods through a company pipeline is always economically inefficient. The purchase of the goods represents an investment of company capital, which your business cannot recoup until you sell your inventory. Warehousing of goods before sale introduces the possibility of inventory shrinkage in value from theft, damage, deterioration or changes in customer taste. Moving goods from warehouses to the point of sale involves shipping costs, especially if the shipment is incorrect, or if the internal shipping process is inefficient. Computerization provides a real-time

picture of this entire work flow process, and allows managers to reduce purchasing costs through minimizing inventory, increase the efficiency of internal shipping systems, and reduce the possibility of theft or damage by being able to track each item down to the individual staffer who takes responsibility for it.

Cost centre analysis

Conducting cost and revenue analyses involves using a spreadsheet-based software tool to help develop a baseline of programmatic and financial data for your facility. The tool's completed spreadsheets provide a picture of current situation and help identify needed changes to increase a program's cost efficiency and revenue generation. The tool is also useful for exploring the possible impact of making changes, such as:

- Changing standard practices;
- Adding new services or facilities;
- Using some services or facilities to subsidize others.

BUDGETING AND DECISION MAKING

DECISION SUPPORT SYSTEMS (DSS)

DSS are alternatively termed end-user computing systems. Their objective is to support managers in their work, especially decision making.

DSS tend to be used in planning, modeling, analyzing alternatives and decision making. They generally operate through terminals operated by the user who interacts with the computer system. Using a variety of tools and procedures the "manager (i.e. the user) can develop his own systems to help perform his functions more effectively. It is this active involvement and the focus on decision making which distinguishes a DSS from a data processing system. The emphasis is on *support for decision making* not on automated decision making which is a feature of transaction processing.

DSS are especially useful for semi-structured problems where problem solving is improved by interaction between the manager and the computer system emphasis is on small, simple models which can easily be understood and used by the manager rather than complex integrated systems which need informal specialists to operate them.

The main characteristics of DSS are:

- a) The computer provides support but does not replace the manager's judgement nor does it provide predetermined solutions.
- b) DSS are best suited to semi-structured problems where parts of the analysis can be computerized but the decision maker's judgement and insight is needed to control the process.
- c) Where effective problem solving is enhanced by interaction between the computer and the manager.

TOPIC 11

OVERVIEW OF PERFORMANCE MEASUREMENT

Introduction

Performance measurement and target-setting are important to the growth process. While many small businesses can run themselves quite comfortably without much formal measurement or target-setting, for growing businesses the control these processes offer can be indispensable.

The benefits of performance measurement

Knowing how the different areas of your business are performing is valuable information in its own right, but a good measurement system will also let you examine the triggers for any changes in performance. This puts you in a better position to manage your performance proactively.

One of the key challenges with performance management is selecting what to measure. The priority here is to focus on quantifiable factors that are clearly linked to the drivers of success in your business and your sector. These are known as key performance indicators (KPIs). See the page in this guide on deciding what to measure.

Bear in mind that quantifiable isn't the same as financial. While financial measures of performance are among the most widely used by businesses, nonfinancial measures can be just as important.

For example, if your business succeeds or fails on the quality of its customer service, then that's what you need to measure - through, for example, the number of complaints received. For more information about financial measurement, see the page in this guide on measurement of your financial performance.

The benefits of target-setting

If you've identified the key areas that drive your business performance and found a way to measure them, then a natural next step is to start setting performance targets to give everyone in your business a clear sense of what they should be aiming for.

Strategic visions can be difficult to communicate, but by breaking your top level objectives down into smaller concrete targets you'll make it easier to manage the process of delivering them. In this way, targets form a crucial link between strategy and day-to-day operations.

FINANCIAL PERFORMANCE MEASURES

Financial performance exists at different levels of the organisation. This page is mostly concerned with measuring the financial performance of the organisation as a whole, and of measuring the performance of key projects. Further measures are used as part of the particular problem of divisional performance appraisal.

Traditionally, financial performance measures are split into the following categories:

- Profitability
- Liquidity / working capital
- Gearing
- Investor ratios

Profitability measures

Return on capital employed (ROCE)

ROCE is a key measure of profitability. It shows the net profit that is generated from every \$1 of assets employed.

$$\text{ROCE} = \frac{\text{Net profit}}{\text{Capital employed}} \times 100$$

- ROCE is sometimes calculated using PBIT instead of net profit. Use whichever figure is given in the exam.
- Capital employed = total assets less current liabilities or total equity plus long-term debt.
- Capital employed may be based on net book value (NBV), gross book value or replacement cost. (note to students: Use whichever figure is given in the exam.)

Advantages	Disadvantages
<ul style="list-style-type: none"> • Easy to calculate. • Figures are readily available. • Measures how well a business is utilising the funds invested in it. • Often used by external analysts/investors. 	<ul style="list-style-type: none"> • Research shows a poor correlation between ROCE and shareholder value. • Care must be taken to ensure that like is compared with like, when comparing with different companies – e.g. inclusion of intangibles in capital employed. • Can be distorted by accounting policies. • ROCE can be improved by cutting back investment – this may not be in the company's long-term best interest.

An increase in ROCE could be achieved by:

- Increasing net profit, e.g. through an increase in sales price or through better control of costs.

- Reducing capital employed, e.g. through the repayment of long term debt.

The ROCE can be understood further by calculating the net profit margin and the asset turnover:

$\text{ROCE} = \text{net profit margin} \times \text{asset turnover}$

Gross profit margin

This is the gross profit as a percentage of turnover.

$$\text{Gross profit margin} = \frac{\text{Gross profit}}{\text{Turnover}} \times 100$$

A high gross profit margin is desirable. It indicates that either sales prices are high or that production costs are being kept well under control.

Net profit margin

This is the net profit (turnover less all expenses) as a percentage of turnover.

$$\text{Net profit margin} = \frac{\text{Net profit}}{\text{Turnover}} \times 100$$

A high net profit margin is desirable. It indicates that either sales prices are high or that all costs are being kept well under control.

Asset turnover

This is the turnover divided by the capital employed. The asset turnover shows the turnover that is generated from each \$1 of assets employed.

$$\text{Asset turnover} = \frac{\text{Turnover}}{\text{Capital employed}}$$

A high asset turnover is desirable. An increase in the asset turnover could be achieved by:

- Increasing turnover, e.g. through the launch of new products or a successful advertising campaign.
- Reducing capital employed, e.g. through the repayment of long term debt.

EBITDA

EBITDA is:

- earnings before interest, tax and depreciation adjustment or
- earnings before interest, tax, depreciation and amortisation.

The two versions are entirely interchangeable.

Advantages	Disadvantages
<ul style="list-style-type: none"> • It is a proxy for cash flow from operations and is therefore a measure of underlying performance. • Tax and interest are externally generated and therefore not relevant to the underlying success of the business. • Depreciation and amortisation represent a write off of expenditure over a number of years and might therefore be excluded when examining the performance of a particular year. • Easy to calculate. • Easy to understand. 	<ul style="list-style-type: none"> • It ignores changes in working capital and their impact on cash flow. • It fails to consider the amount of fixed asset replacement needed by the business. • It can easily be manipulated by aggressive accounting policies related to income recognition and capitalisation of expenses.

Liquidity measures

The main reason why companies fail is poor cash management rather than profitability so it is vital that liquidity is managed.

A company can be profitable but at the same time encounter cash flow problems. Liquidity and working capital ratios give some indication of the company's liquidity.

Current ratio

This is the current assets divided by the current liabilities.

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

The ratio measures the company's ability to meet its short term liabilities as they fall due.

A ratio in excess of 1 is desirable but the expected ratio varies between the type of industry.

A decrease in the ratio year on year or a figure that is below the industry average could indicate that the company has liquidity problems. The company should take steps to improve liquidity, e.g. by paying creditors as they fall due or by better management of receivables in order to reduce the level of bad debts.

Quick ratio (acid test)

This is similar to the current ratio but inventory is removed from the current assets due to its poor liquidity in the short term.

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{inventory}}{\text{Current liabilities}}$$

The comments are the same as for the current ratio.

Inventory holding period

$$\text{Inventory holding period} = \frac{\text{Inventory}}{\text{Cost of sales}} \times 365$$

This indicates the average number of days that inventory items are held for.

An increase in the inventory holding period could indicate that the company is having problems selling its products and could also indicate that there is an increased level of obsolete stock. The company should take steps to increase stock turnover, e.g. by removing any slow moving or unpopular items of stock and by getting rid of any obsolete stock.

A decrease in the inventory holding period could be desirable as the company's ability to turn over inventory has improved and the company does not have excess cash tied up in inventory. However, any reductions should be reviewed further as the company may be struggling to manage its liquidity and may not have the cash available to hold the optimum level of inventory.

Receivables (debtor) collection period

$$\text{Receivables collection period} = \frac{\text{Receivables}}{\text{Turnover}} \times 365$$

This is the average period it takes for a company's credit customers / debtors / receivables to pay what they owe.

An increase in the receivables collection period could indicate that the company is struggling to manage its debts. Possible steps to reduce the ratio include:

- Credit checks on customers to ensure that they will pay on time
- Improved credit control, e.g. invoicing on time, chasing up bad debts.

A decrease in the receivables collection period may indicate that the company's has improved its management of receivables. However, a receivables collection period well below the industry average may make the company uncompetitive and profitability could be impacted as a result.

Payables (creditor) period

$$\text{Payables period} = \frac{\text{Payables}}{\text{Purchases}} \times 365$$

This is the average period it takes for a company to pay for its purchases.

An increase in the company's payables period could indicate that the company is struggling to pay its debts as they fall due. However, it could simply indicate that the company is taking better advantage of any credit period offered to them.

A decrease in the company's payables period could indicate that the company's ability to pay for its purchases on time is improving. However, the company should not pay for its purchases too early since supplier credit is a useful source of finance.

Gearing ratios

In addition to managing profitability and liquidity it is also important for a company to manage its financial risk. The following ratios may be calculated:

Financial gearing

This is the long term debt as a percentage of equity.

$$\begin{aligned} \text{Gearing} &= \frac{\text{debt}}{\text{equity}} \times 100 \\ \text{or} &= \frac{\text{debt}}{\text{debt} + \text{equity}} \times 100 \end{aligned}$$

A high level of gearing indicates that the company relies heavily on debt to finance its long term needs. This increases the level of risk for the business since interest and capital repayments must be made on debt, where as there is no obligation to make payments to equity.

The ratio could be improved by reducing the level of long term debt and raising long term finance using equity.

Interest cover

This is the operating profit (profit before finance charges and tax) divided by the finance cost.

$$\text{Interest cover} = \frac{\text{operating profit}}{\text{finance cost}}$$

A decrease in the interest cover indicates that the company is facing an increased risk of not being able to meet its finance payments as they fall due.

The ratio could be improved by taking steps to increase the operating profit, e.g. through better management of costs, or by reducing finance costs through reducing the level of debt.

Other investor ratios

Investors will be interested in all of the above measures, along with the following:

Earnings Per Share (EPS)

EPS is a measure of the profit attributable to each ordinary share.

$$\text{EPS} = \frac{\text{Profit after tax less preference dividends}}{\text{Weighted average number of ordinary shares in issue}}$$

For EPS to be truly meaningful, it must be set in context.

- Is EPS growing or declining over time?
- Is there likely to be significant dilution of EPS?
- Is it calculated consistently?

Advantages	Disadvantages
<ul style="list-style-type: none"> • Easily understood by shareholders. • Calculation is precisely defined in FRS 22 (IAS 33) avoiding ambiguity. • Figures are readily available. • Often used as a performance measure between companies, sectors, periods within the same organisation. 	<ul style="list-style-type: none"> • Research shows a poor correlation between EPS growth and shareholder value. • Accounting treatment may cause ratios to be distorted.

Dividend cover

This is the net profit divided by the dividend.

$$\text{Dividend cover} = \frac{\text{net profit}}{\text{dividend}}$$

A decrease in the dividend cover indicates that the company is facing an increased risk of not being able to make its dividend payments to shareholders

Dividend yield

- Dividend yield = (Dividend per share/Current share price) × 100%

This is one way of measuring the return to shareholders but ignores any capital growth / loss.

Earnings yield

- Earnings yield = (EPS/Share price) × 100%

This is another one way of measuring the return to shareholders but, as with dividend yield, ignores any capital growth / loss.

Shareholder value

As discussed above, profit based measures have a poor correlation with shareholder value. Measures that have a closer correlation include the following:

- Discounted cash flow based approaches such as NPV, IRR and MIRR
- Economic value added (EVA)

NON-FINANCIAL MEASURES OF PERFORMANCE

Non-Financial Performance Indicators (NFPIs) and business performance

Introduction

There are a number of areas that are particularly important for ensuring the success of a business and where the use of NFPIs plays a key role. These include:

- the management of human resources
- product and service quality
- brand awareness and company profile.

The management of human resources

Traditionally the main performance measure for staff was cost (a FPI). However, businesses have started to view staff as a major asset and recognise that it is important to attract, motivate and retain highly qualified and experienced staff.

As a result, NFPIs are now also used to monitor and control staff. These can include the following:

- staff turnover
- absentee rates / sick days
- % of job offers accepted
- results of job satisfaction surveys
- competence surveys

Product and service quality

Problems with product or service quality can have a long-term impact on the business and they can lead to customer dissatisfaction and loss of future sales.

A product (or service) and its components should be critically and objectively compared both with competition and with customer expectation and needs, for example:

- Is it good value?
- Can it really deliver superior performance?
- How does it compare with competitor offerings?
- How will it compare with competitor offerings in the future given competitive innovations?

Product and service quality are usually based on several critical dimensions that should be identified and measured over time. Performance on all these dimensions needs to be combined to give a complete picture. For example:

- an automobile firm can have measures of defects, ability to perform to specifications, durability and ability to repair
- a bank might be concerned with waiting time, accuracy of transactions, and making the customer experience friendly and positive
- a computer manufacturer can examine relative performance specifications, and product reliability as reflected by repair data.

Brand awareness and company profile

Developing and maintaining a brand and/or a company profile can be expensive. However, it can also enhance performance. The value of a brand/company profile is based on the extent to which it has:

- high loyalty
- name awareness
- perceived quality
- other attributes such as patents or trademarks.

NFPs may focus on areas such as customer awareness and consumer opinions.

Difficulties in using and interpreting qualitative information

Particularly at higher levels of management, non-financial information is often not in numerical terms, but qualitative, or soft, rather than quantitative. Qualitative information often represents opinions of individuals and user groups. However there are issues related to its use.

- Decisions often appear to have been made on the basis of quantitative information; however qualitative considerations often influence the final choice, even if this is not explicit.
- Conventional information systems are usually designed to carry quantitative information and are sometimes less able to convey qualitative issues. However the impact of a decreased output requirement on staff morale is something that may be critical but it is not something that an information system would automatically report.
- In both decision making and control, managers should be aware that an information system may provide a limited or distorted picture of what is actually happening. In many situations, sensitivity has to be used in interpreting the output of an information system.
- Information in the form of opinions is difficult to measure and interpret. It also requires more analysis.
- Qualitative information may be incomplete.
- Qualitative aspects are often interdependent and it can be difficult to separate the impact of different factors.
- Evaluating qualitative information is subjective, as it is not in terms of numbers - there are no objective formulae as there are with financial measures.
- The cost of collecting and improving qualitative information may be very high.
- Difficulties in measurement and interpretation mean that qualitative factors are often ignored.

Models for evaluating financial and non-financial performance

As discussed, it is important that a business appraises both financial and non-financial performance. There are four key tools available:

- balanced scorecard
- The performance pyramid
- Fitzgerald and Moon's building block model
- The performance prism

The benefits of these models are as follows:

- financial and non-financial performance measures are included
- they are linked in to corporate strategy
- include external as well as internal measures
- include all important factors regardless of how easy they are to measure
- show clearly the tradeoffs between different dimensions of performance
- show how measures will motivate managers and employees.

BALANCED SCORECARD

A balance Scorecard is an integrated set of performance measures derived from the company's strategies that gives the top management a fast but comprehensive view of the organizational unit. (i.e. a division or a strategic business unit (S.B.U))

The balanced scorecard philosophy assumes that an organizations vision and strategy is best achieved when the organization is viewed from the following four perspectives.

1) Customer perspectives (How customers do see us?)

This gives rise to targets that matter to customer's perspectives.

2) Internal business process (What must we excel in?)

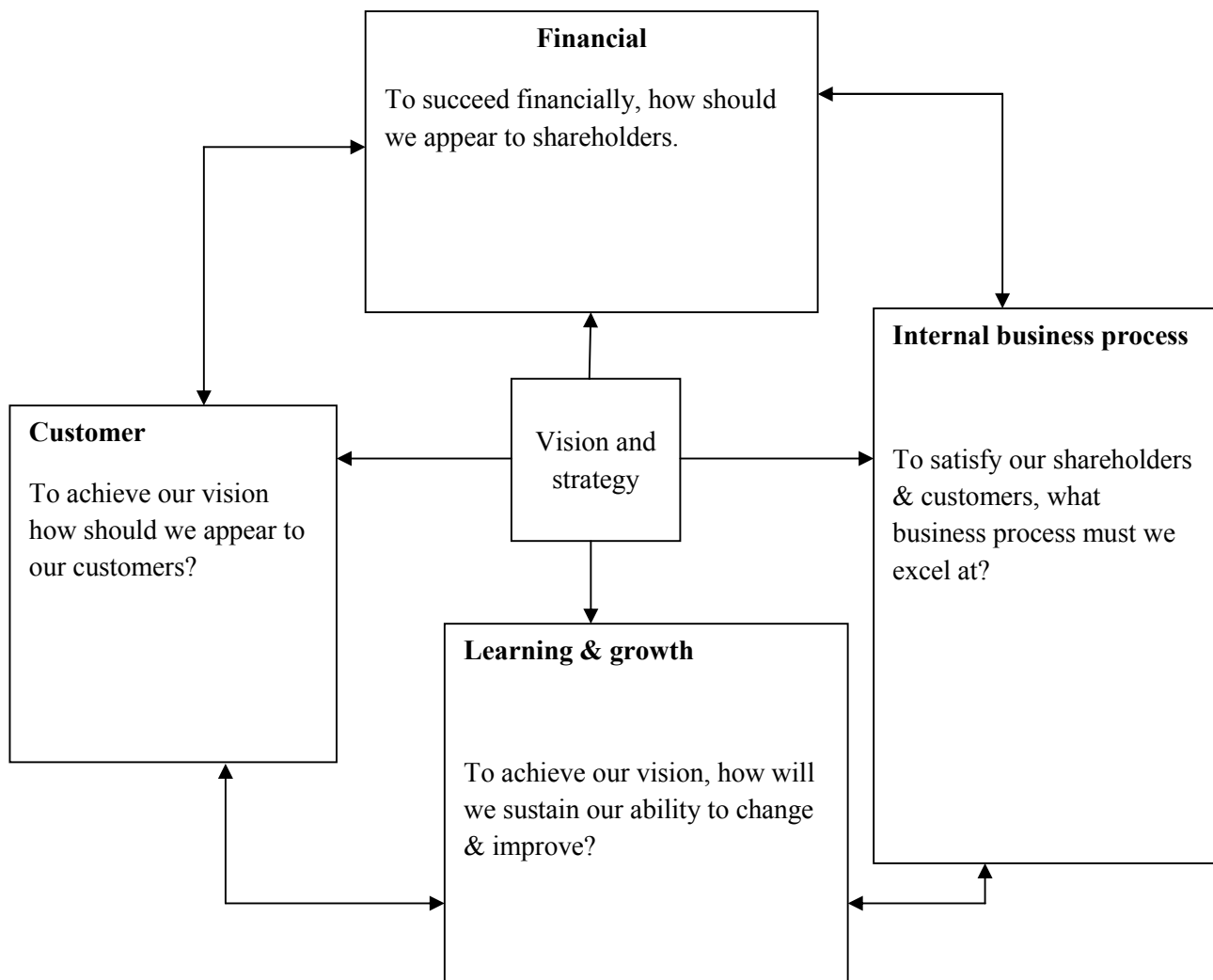
This aims to improve internal processes and decision making quality control.

3) Learning and growth perspective (Can we continue to improve and create value?)

This considers an organization's capacity to maintain its competitive position through acquisition of new skills.

4) Financial perspective (How do we look to shareholders?)

This covers traditional measures such as profitability, R. O. I etc.



By implementing the balanced scorecard, the major objectives for each of the four perspectives should be articulated.

These objectives should be translated into specific performance measures and targets for achievements.

This method integrates traditional financial measures with operations, customer and staff issues vital in long run competitiveness.

Illustration

ABC Ltd has in the past produced just one fairly successful product. Recently, however, a new version of this product has been launched. Development work continues to add a related product to the product list. Given below are some details of the activities during the months of November 2009

Units produced	Existing product - 25,000units New product - 5,000units
Cost of units produced	Existing product = Sh. 375,000 New product = Sh. 70,000
Sales revenue	Existing product - Sh. 550,000 New product = Sh. 125,000
Hours worked	Existing product = 5,000 hrs New product = 1,250 hrs
Development cost	Sh. 47,000

Required:-

Suggest and calculate performance indicators that could be calculated for each of the four perspectives on the balanced scored card.

1) Customer perspective

$$\text{Percentage of sales by new products} = \frac{125,000}{550,000 + 125,000} \times 100 = 18.5\%$$

2) Internal business perspective

i) Productivity:

$$\text{Existing product} = \frac{25,000 \text{ units}}{500 \text{ hrs}} = 5 \text{ hours per unit}$$

$$\text{New product} = \frac{5,000 \text{ mins}}{1250 \text{ hrs}} = 4 \text{ hours per unit}$$

ii) Unit cost:

$$\text{Existing product} = \left(\frac{375,000}{25,000} \right) = \text{sh. 15 per unit}$$

3) Financial perspectives

$$\text{Gross profit; Existing product} = \frac{550,000 - 375,000}{550,000} \times 100 = 32\%$$

$$\text{New product} = \frac{125,000 - 70,000}{125,000} \times 100 = 44\%$$

4) Learning curve and growth perspective

$$\text{Development costs as a percentage of sales} = \frac{47,000}{675,000} \times 100 = 7\%$$

Balanced Scorecard as a Strategic Management System

- 1) Clarifying and translating vision and strategy into specific strategic objectives and identifying the critical drivers of the strategic objectives.
- 2) Communicating & linking strategic objectives & measures.
Once employees understand the high level objectives and measures, they should establish local objectives that support the business unit's global strategy.
- 3) Plan, set targets & align strategic initiatives. Such targets should be over a 3 – 5 year period broken down on a yearly basis so that progression targets can be set for assessing the progress being made towards achieving the long term targets.
- 4) Enhancing strategic feedback and learning so that managers can monitor and adjust the implementation of their strategy and if necessary make fundamental changes to the strategy itself.

Benefits of Balanced Scorecard

- 1) It brings together in a single report four different perspectives on a company's performance that relate to many of the dispersed elements of the company's competitive agenda such as becoming customer oriented, shortening response time, improving quality, emphasizing team work, reducing new product launch times and managing for the long term.
- 2) It provides a comprehensive framework for translating a company's strategic goals into a coherent set of performance measures by developing the major goals for the four perspectives and translating these goals into specific performance measures.
- 3) It helps managers to consider all the important operational measures together i.e. to enable managers see whether improvements in one area may have been at the expense of another.
- 4) It improves communication within the organization and promotes the active formulation and implementation of organizational strategy by making it highly visible through the linkage performance measures to business unit strategy.

Limitations of Balanced Scorecard

- 1) The assumption of the course and effect is too ambitious and lack a theoretical underpinning r empirical support.
The empirical studies undertaken have failed to provide evidence on the underlying linkages between non-financial data and future financial performance.
- 2) There is an omission of important perspective most notable being the environmental impact on society perspective and an employee perspective. There is nothing to prevent companies adding additional perspectives to meet their own requirements but they must avoid the temptation of creating too many perspectives and performance measures as a major benefit of performance measure is the consciousness and clarity of presentation.