

KENYATTA UNIVERSITY
INSTITUTE OF OPEN LEARNING

CAC 202
COST ACCOUNTING I

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DEPARTMENT OF ACCOUNTING AND FINANCE

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LESSON ONE

1.0 INTRODUCTION TO COST ACCOUNTING

Learning objectives

After studying this lesson, you should be able to:

- Understand the various cost concepts.
- Know how costs are classified.
- Know the behaviour of fixed, step, and variable costs.
- Identify costs that are useful for decision making.
- Understand the difference between cost control and cost reduction.

Definition of Cost Accounting

Cost accounting is the process of determining the cost of producing some product, providing some service or undertaking some activity. In abroad sense, it that part of management accounting which establishes budgets and standard costs and actual costs of operations, processes, departments or products and the analysis of variances, profitability or social use of funds.

Purpose of Cost Accounting in Planning and Control

1. It indicates where losses and wastes are accruing before the work is finished. Immediate action can be taken to minimize the losses.
2. It enables management to consider alternative methods and procedures in management in order to decide whether to manufacture a product or buy it from outside or to continue production at a loss or adjust the prices.
3. Enables management to arrive at the cost of production of every unit, job, operation, process, department or service, thus, develop a cost standard.
4. Provides for periodic profits or loss account and balance sheets at such intervals e.g. weekly, monthly, or quarterly as management may recognize during he financial year either for the business as a whole, departments or products.
5. Reveals sources of economies in production having regard to methods, types of equipments, design, output or layout.
6. Presents comparative cost data for different periods and various volumes of production. Management can therefore monitor the development of the business and use the information for budgetary control.

Cost Accounting Versus Financial Accounting

Financial accounting is that part of accounting that covers the classification and recording of actual transactions of an entity in monetary terms in accordance with established concepts, principles, accounting standards and legal requirements. It also presents as

accurate as possible the effects of those transactions over a period of time and at the end of financial year. The emphasis of financial accounting is upon classification by type of transaction and type of expenditure rather than functional analysis of cost accounting.

Cost Accounting Versus Management Accounting

Management accounting is the provision of information required by management for:

1. policy formulation
2. planning and controlling the activities of the enterprise
3. decision making
4. disclosure to employees
5. disclosure to share holders and other interested parties
6. safeguarding assets

In general, management accounting is wider in scope and uses. More advanced techniques than those used in cost accounting are applied in management accounting. However, a fundamental requirement of management accounting is the existence of a sound costing system to provide basic data.

Both management accounting and cost accounting are concerned with the provision of information for internal planning, control, and decision making purposes with considerable emphasis on the costs, functions, activities, processes and products.

Installation and Operation of Cost Accounting

Before installing a cost accounting system, the organization needs should be studied and investigated in order to establish the following:

1. The nature of the organization
2. the size of the organization
3. the purpose for which cost information is required
4. the benefits of cost information that will accrue
5. the availability of workforce who have the necessary skills of cost accounting

Characteristics of an Effective Cost Accounting System

Any accounting system should meet the following minimum requirements:

- a. There should be a separate cost accounting department. The duties of cost accounting should be clearly laid out. This is for the purpose of avoiding conflict and duplication of duties with those of financial accounting.
- b. There should be standard pre-printed forms. These will be used for recording labor hours, issue of materials, and the cost involved.
- c. There should be coordination and cooperation among staff members of the entire organization particularly those involved in recording and analyzing costs.
- d. There should be a system of recording overheads accurately and charging the same to jobs.

- e. The cost accounts and financial accounts should be maintained in such a way that they can be reconciled easily.
- f. The cost accounting system should be simple and meet the requirement of cost versus benefit.

1.1 Cost Concepts

Cost

Cost is defined as the amount of expenditure incurred on or attributable to a specified activity or product. It relates to past costs which are the basis of cost ascertainment. At the simplest level, costs include components, quantity used and price.

Cost Units

A cost unit is a unit of quantity of product or service or time in relation to which costs are ascertained or expressed. The cost unit will be different in different organizations. For example it may be unit of production like a passenger seat, a hair cut, a patient bed, etc. it may also be a unit of time like one labor hour or one consulting hour.

Cost Centre

A cost centre is a production or service location, function, activity or item of equipment whose costs may be attributed to cost units. Examples of cost centers are: the works office, sales representations, invoicing section, and inspection. Any particular part of the enterprise in general (such as the accounts department, the store department, and administration department) is regarded as cost centers.

1.2 Cost Classification

Cost classification is the arrangement of items of cost in a logical sequence having regard to the nature and purpose of those costs. These classes of costs can be categorized as:

Functional classification

Costs are arranged according to functions of the organization. The following are common functional costs in most organizations:

a. Production costs

These are costs incurred in the production activities of the organization. Production costs include the raw materials and labor costs and direct overheads. These costs are collectively known as elements of manufacturing costs.

Material costs- material costs can be direct or indirect. Direct material costs are those that can be physically identified with a specific product e.g. the cost of wood in the manufacture of a table. Indirect material costs are

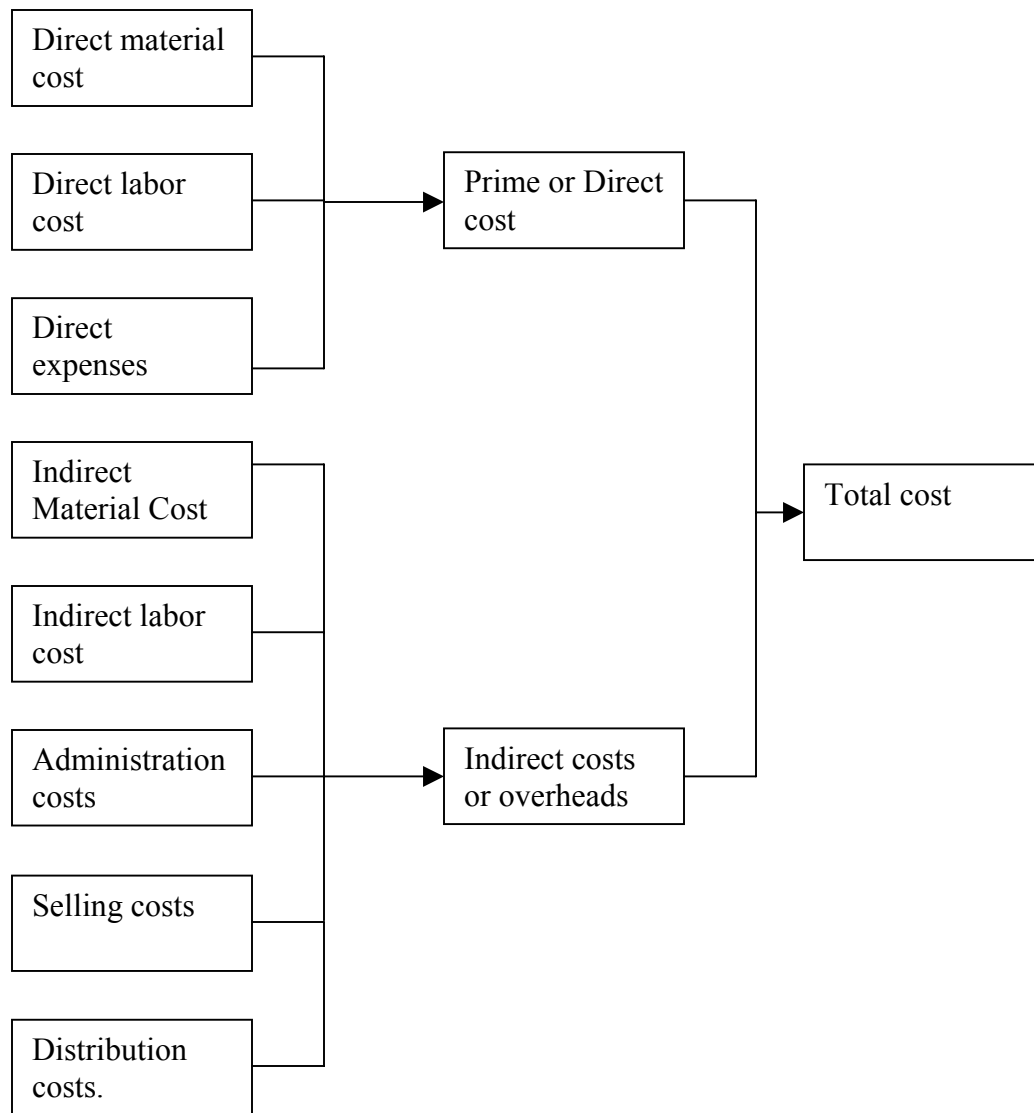
those that can not be directly identified with the product e.g. the cost of nails or glue in the manufacture of a table.

Labor costs- labor costs can also be direct or indirect. Direct labor costs are those that can be specifically traced to a particular product e.g. wages of machine operators engaged in the production process. Indirect labor costs consist of all wages of employees who are not directly involved in the production of the product but assist in production of the product e.g. the salaries of factory supervisors.

Direct overheads/ expenses- these consists of all manufacturing costs other than direct labor and direct material costs. These overheads include: indirect wages, indirect materials, rent and rates, and depreciation

- b. **Administration costs**- these are costs associated with the overall management of the business. They can not be identified with a specific function e.g. salaries of office staff, office rent, postage and telephone, etc.
- c. **Selling costs**- these are costs consumed in the generation of revenues or securing orders from customers e.g. sales commission and advertisement expenses
- d. **Distribution costs**- these are costs incurred in handling the product from the time the product is completed until it reaches the final destination. Such costs include: warehouse expenses and packaging costs.

The composition of product costs can be illustrated by use of a diagram shown below.



1.3 Cost Behavior

Cost behavior is how costs change with an increase in the level of activity or production level of the firm. Costs in general can be classified into:

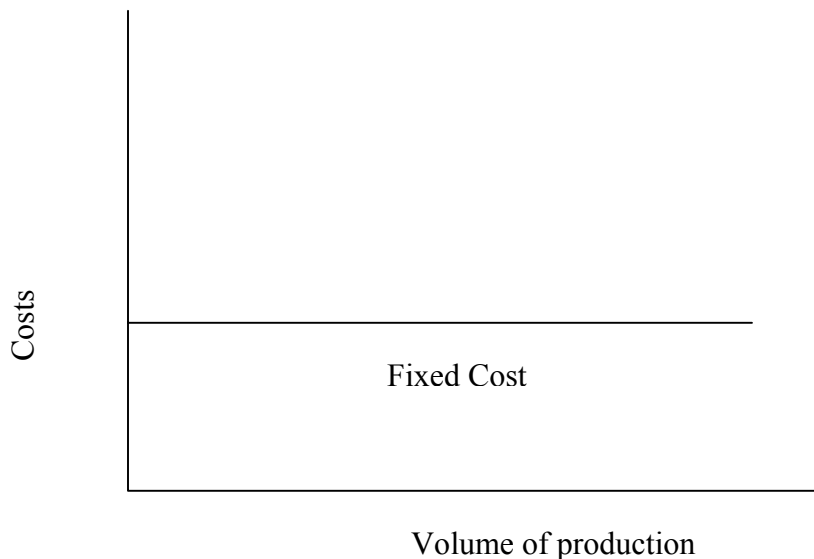
- Fixed costs.
- Variable costs.
- Mixed costs.

Fixed Costs

A fixed cost is said to be fixed if that cost tends to remain unchanged in total despite even relatively wide fluctuations in levels of output or activity. Rental costs, property taxes, supervising salaries, and depreciation are often given as a good example of a cost that is fixed in that the amount paid or incurred does not vary no matter how many units are produced or provided.

However, it does not mean that fixed costs never change. The assumption is the operations of the firm are maintained at the same capacity over a longer period of time. Should the firm decide to expand and invest in new assets, the fixed costs will definitely change.

Graphically, fixed costs are represented by a horizontal line as shown below.



Classification of Fixed Costs

Fixed costs can be classified further into the following classes:

- i. Committed costs- these are costs incurred to maintain company's facilities and physical existence, and over which management has little or no discretion. Plant and equipment depreciation, taxes, insurance premium rate and rent charges are examples of committed costs.
- ii. Managed costs- these are related to current operations which must continue to be paid to ensure the continued operation of the company. For example, management and staff salaries.
- iii. Discretionary costs- they are also known as programmed costs. They result from special policy decisions, management programs, new researches, etc. for

example research and development costs, marketing programs, and new system development costs.

- iv. Step costs- a step cost is constant for some level of output beyond which it starts to change. If production is increased again, the costs will shift upwards in stair-case behaviour. An example of such costs is the cost of supervision. These costs can be shown diagrammatically as below:

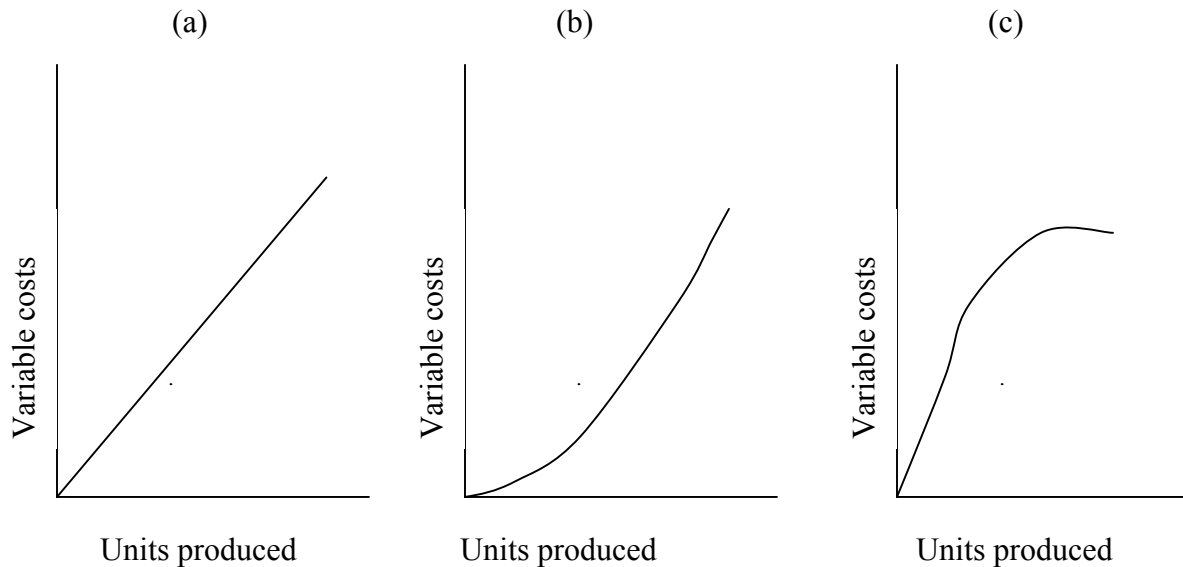


Variable Costs

A variable cost is said to be variable if the total cost changes in proportion to changes in the levels of output or activity. The rate of change in a variable cost need not be 1: 1. That is, a cost may vary in direct proportion where for every unit change in output there is a unit change in total cost. Alternatively, the total cost may vary in the ratio of 5: 1, or 10: 3. The important point is that there is a significant relationship between changes in output and changes in total cost. Direct materials cost and direct labour cost is generally variable costs.

Variable overheads like factory supplies, indirect materials, sales commission, and office supplies are some other examples of variable costs. If the factory is shut down, variable costs are eliminated. Variable cost is always expressed in terms of units or percentage of volume; it can not be stated in terms of time. The behaviour of variable cost could be linear or non-linear depending on the activity involved.

Illustration of variable cost behaviour.



- (a) Variable cost exhibiting a linear relationship between cost and units produced.
- (b) Variable cost exhibiting a non-linear relationship between cost and units produced (variable costs increasing at an increasing rate).
- (c) Variable cost exhibiting a non-linear relationship between cost and units produced (variable costs increasing at a decreasing rate).

Mixed Costs

Mixed costs are made of fixed and variable elements. They are a combination of semi-variable costs and semi fixed costs. Because of the variable component, they fluctuate with volume; because of the fixed component they do not change in direct proportion to output.

1.4 Costs for Decision Making and Planning

Product and Period Cost

Accountants classify costs as product costs and period costs. Product costs are those that are identified with goods purchased or produced for resale. In a manufacturing organization they are costs that the accountant attaches to the product and that are included in the inventory valuation for finished goods.

Period costs are those costs that are not included in the inventory valuation and as a result are treated as an expense in the period in which they are incurred. Hence no attempt is made to attach period costs to products for inventory valuation purposes. In manufacturing organizations, all manufacturing costs are regarded as product costs and non-manufacturing costs are regarded as period costs. Companies operating in the merchandising sector will record the purchase price of goods traded as product costs; while other costs like administration and selling expenses will be considered as period costs.

Opportunity Cost

This is the cost of the best foregone alternative. It is the benefit lost by rejecting the best competing alternative to the one chosen. The benefit lost is usually the net earnings or profits that might have been earned from rejected alternative. For example, assume that a manufacturer can sell a semi finished product for Sh 100,000. However, the manufacturer decides to finish the product before selling it. The opportunity cost of that product is therefore Sh 100,000. (Revenue foregone in order to finish the product before selling). Opportunity costs are important in decision-making and evaluating alternatives. However, these costs are not recorded in the accounting system.

Sunk Cost

A sunk is the cost that has already been incurred and its amount will be affected by the choice between various alternative. They are generally known as unavoidable cost, it refers to all past costs since these amounts can not be change once the cost is incurred. They are costs which have been created by a decision in the past and can not be changed or avoided by any decision that is made in the future. Examples of sunk costs are the book values of existing assets (plant and equipment, inventory, investment in irredeemable securities). Except for the possible gain or loss on disposal of such assets, the book value is not relevant for decisions to be made.

Relevant and Irrelevant Cost

For decision-making, costs and revenues can be classified according to whether they are relevant to a particular decision. Relevant costs are those costs that will be change by a decision, whereas irrelevant costs can not be changed by a decision. For example, if you are faced with a choice of making a journey using your own car or by public transport,

the car tax and insurance costs are irrelevant, since they will remain the same whatever alternative chosen. However, petrol costs for the car will differ depending on which alternative is chosen, and this cost will be relevant for decision making. All sunk costs are irrelevant costs but not all irrelevant costs are sunk costs because some irrelevant costs can be irrelevant now but could be incurred in future.

Incremental and Marginal Costs

Incremental (differential) costs are the difference between costs for the corresponding items under each alternative being considered. For example, the incremental costs of increasing output from 500 to 600 units per day are the additional costs of producing extra 100 units per day. Incremental costs may or may not include fixed costs. If fixed costs change because of a decision, the increase in costs represents an incremental cost.

Incremental costs are similar in principle to the economist's concept of marginal cost. The main difference is that marginal cost represents the additional cost resulting from an additional unit of output. Economists normally represent the theoretical relationship between cost and output in terms of an additional unit of production.

Imputed Costs

These are costs not incurred in some transaction but which are relevant to the decision making as they pertain to a particular situation. These costs do not enter the traditional accounting system. Interests on internally generated funds, rental value of company owned property, and salaries of owners of a single proprietorship are some examples of imputed costs.

Shut Down Costs

These are costs which have to be incurred under all situations in the case of stopping manufacture of a product or closing down a department or division. Shutdown costs are always fixed costs. If the manufacture of a product is stopped, variable costs will not be incurred. However, a part of fixed costs will be incurred (such as rent, security, property taxes, etc.)

1.5 Cost Control and Cost Reduction

Cost control is the comparative analysis of actual costs with standard costs or budgeted costs to facilitate performance evaluation and formulation of corrective measures. It aims at accomplishing conformity between actual result and standards or budgets.

Cost reduction on the other hand is an attempt to bring down costs. Costs reduction implies real and permanent reduction in unit cost of goods manufactured without impairing their suitability for the intended use. The costs can be reduced by increasing productivity, search for cheaper materials, use of cheaper labor, etc. cost control measures should result in cost reduction

The difference between cost control and cost reduction is that cost control is conservative, preventive and procedural while cost reduction continuous, dynamic and innovative in nature. Reduction of costs is a corrective measure and is applicable to all kinds of businesses.

Tools used for cost reduction

- i. value analysis or value engineering
- ii. work study
- iii. Job evaluation and merit rating.
- iv. Production planning and control
- v. Rationalization
- vi. Quality control
- vii. Economic order quantity
- viii. Use of better technology
- ix. Simplification of processes
- x. Variety reduction
- xi. Market research
- xii. Inventory management and control
- xiii. Wastage management

LESSON TWO

2.0 COST ESTIMATION

Learning objectives

After studying this lesson, you should be able to:

- Identify and describe the different methods of estimating costs.
- Calculate regression equations using high-low, scattergraph and least-squares techniques.
- Describe multiple regression analysis and indicate the circumstances when it should be used.
- Identify and explain the requirements which should be observed when using statistical regression analysis.
- Identify and explain the six steps required to estimate cost functions from past data.

Determining how cost will change with output or other measurable factors of activity is of vital importance for decision making, planning and control. The preparation of budgets, the production of production reports, the calculation of standard costs and the provision of relevant costs for pricing and other decisions all depend on reliable estimates of costs and distinguishing between fixed costs and variable costs at different activity levels.

The basic idea in cost estimation is to estimate the relation between costs and the variables affecting costs. The basic formula of estimating costs is:

$$TC = F + VX$$

Where TC is the total cost

F is the fixed cost

V is the variable cost per unit of output

X is one unit of output.

The difficult task in cost estimation is separating costs into fixed and variable costs. This is because some categories of costs have no clear cut behaviour and neither fall on Fixed nor variable cost. Consequently, not all variable costs have a linear relationship with production levels. For example, labor costs can be classified as variable when the company uses casual labor hired on a daily basis so that the employment of labor can be exactly matched to meet the production requirements. In contrast, direct labor may be classified as step fixed costs for activities where a fixed number of people are employed and this number is maintained even when there is a temporary reduction in the quantity of activity. This brings complications in modeling costs into an equation. However, this

does not mean that the exercise of cost estimation should be shelved on these grounds. In practice, several methods outlined below of cost estimation have been developed:

- i. account analysis
- ii. Engineering estimates.
- iii. Scatter graph and high-low estimates.
- iv. Statistical methods (usually employing regression analysis)

Results will obviously differ from method to method and usually more than one method is applied in order to compare results. Because line managers bare ultimate responsibility for all cost estimates, they frequently apply their own judgment as a final step in the estimation process. These methods therefore should be seen as ways of helping management to arrive at the best estimate possible.

2.1 Account Analysis

The account analysis approach calls for a review of each cost account used to record costs that are of interest. Each cost is then identified as either fixed or variable, depending on the relationship between the cost and some activity.

The table below illustrates how costs can be classified into fixed and variable cost.

Cost at 4,600 units of output (115 direct labor-hours)			
Account	Total	Variable Cost	Fixed Cost
Indirect labor	Sh 321	Sh 103	Sh 218
Indirect materials	422	307	115
Building occupancy	615	-	615
Property taxes	51	40	11
Power	589	535	54
Repairs	218	119	99
Data processing	113	88	25
Quality inspections	187	187	-
Personnel services	115	47	68
Totals	<u>2,631</u>	<u>1,426</u>	<u>1,205</u>

The total costs for the coming period are the sum of the estimated total variable and total fixed costs. Since the total variable costs are directly related to quantity of expected production, the variable production overhead per unit may be stated as Sh. 0.31 (Sh. 1426/4600 units). The general cost equation may be expressed as:

$$\begin{aligned}
 TC &= F + VX \\
 &= 1,205 + 0.31 \times 4600 \text{ (for 4600 units)} \\
 &= 1205 + 1426
 \end{aligned}$$

$$= \text{Sh } 2631.$$

If management wanted to estimate the costs at a production level of 4,800 units, it would substitute the figure of 4,600 with 4,800.

Therefore,

$$\begin{aligned} \text{TC} &= 1205 + 0.31 \times 4800 \\ &= 1205 + 1488 \\ &= \text{Sh } 2693. \end{aligned}$$

Account analysis is a useful way of estimating costs. It makes use of the experience and judgment of managers and accountants who are familiar with company operations and the way costs react to changes in activity levels. Account analysis relies heavily on personal judgment. This may be an advantage or a disadvantage depending on the bias of the person making the estimate. Decisions based on cost estimates have major economic consequences for the people making the estimates. Thus, the individual may not be entirely objective. More objective methods are often used in conjunction with account analysis so that the advantage of multiple methods is obtained.

2.2 Engineering Estimates

Engineering estimates of costs are usually made by measuring work involved in a task. A detailed step-by-step analysis of each phase of each manufacturing process, together with the kind of work performed and costs involved, is prepared. (This is sometimes part of a time-and-motion study). The time it should take to perform each step is then estimated. These times are often available from widely published manuals and trade association documents.

The times required for each step in the process are summed to obtain an estimate of the total time involved, including allowance for unproductive time. This serves as a basis for estimating direct labor costs. Engineering estimates of materials required for each unit of production are usually obtainable from drawing and specification sheets.

Other costs are estimated in a similar manner. For example, the size and cost of a building needed to house the manufacturing operation can be estimated based on area construction costs and space requirements. An estimate of the needed number of supervisors and support personnel can be based on an estimate of direct labor time.

One advantage of the engineering approach is that it can detail each step required to perform an operation. This permits comparison with other settings where similar operations are performed. It enables a company to review its manufacturing productivity and identify specific strengths and weaknesses. Also, it does not require data from prior activities in the organization and it can be used to estimate costs for totally new activities.

A company that uses Engineering estimates can often identify where “slack” exists in its operations. For example, if an engineering estimate indicates that 80,000 square feet of floor area are required for assembly process but the company has been using 125,000

square feet, the company may find it beneficial to rearrange the plant to make floor space available for other uses.

A difficulty with engineering process is that it can be quite expensive to use. Another consideration is that engineering estimates are often based on optimal conditions. Therefore, when evaluating performance, bidding on a contract, planning for expected costs, or estimating costs for any purpose, it is wise to consider that the actual work conditions will be less optimal.

2.3 The Scattergraph Method

The Scattergraph method involves plotting past costs against past activity levels. It is often a useful way of visually depicting cost-activity relationships. The plot (scattergraph) will also indicate any significant change in the relationship between costs and activity at different levels of production.

To prepare a scattergraph, first obtain the relevant data of cost incurred and the level of activity involved. The number of observations to include depends on the availability of data and the cost-benefit of obtaining reliable data. A rule of thumb is to use three years of data extracted monthly. If costs and activity are relatively stable, then a relatively short period (12 months or so) may be adequate.

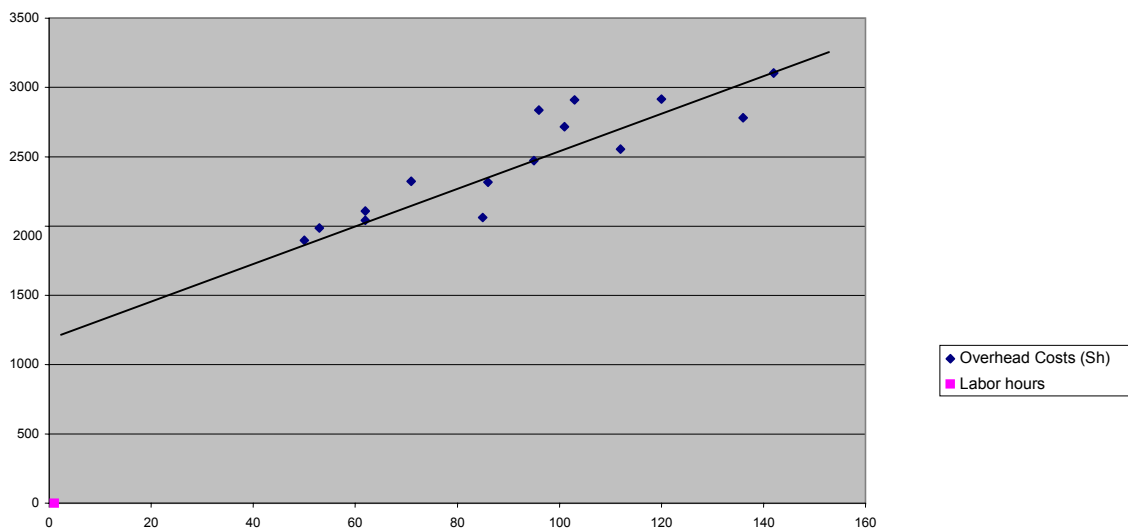
The slope of the line represents the estimated variable costs, and the intercept with the vertical axis represents an estimate of fixed costs. Determination of the best fit is often a matter of “eyeball judgment”. Consequently, scattergraphs are usually not used as the sole basis for cost estimates. Rather they are used to illustrate the relationships between costs and activity levels and to point out any past data that might be significantly out of line.

Illustration:

Data for the past 15 months were collected for Greenhorn Co. to estimate variable and fixed manufacturing overheads. These data are presented and plotted on the scattergraph. Once the data points were plotted, a line was drawn to fit the points as closely as possible. The line was extended to the vertical axis on the scattergraph in order to identify the intercept.

Time Period	Direct Labor- hours	Overhead Costs (Sh)
1	62	2107
2	62	2040
3	120	2916
4	71	2322
5	50	1896

6	95	2471
7	142	3105
8	86	2316
9	112	2555
10	136	2780
11	85	2061
12	103	2910
13	96	2835
14	101	2715
15	53	1986



Y axis- Represent Costs.
X axis- Represent Labor hours.

2.4 High-Low Method

From the actual observations, the period with the highest level of activity and that with the lowest level of activity are identified. The observations of the two points are then used to formulate a straight line equation. This might be applied where there is insufficient data and where a straight line relationship can be assumed. This method has the weakness of using only two values while ignoring the rest of the data. The two values used are extreme and might distort the results obtained.

Illustration:

The following observations were recorded over the past five months.

Month	Units (Labor Hrs)	Overheads (Sh)
January	150	400
December	250	600
November	100	300
October	160	425
September	50	200

Required:

Use High-Low method to find a cost equation and estimate overhead costs for the month of February if total units expected for the period are 300 units.

Solution:

High activity	250
Related Costs	Sh 600

Low activity	50
Related Costs	Sh 200

Unit variable cost	$= (600-200) / (250-50)$
	Sh 2.0 per unit of labor hour.

$$\begin{aligned}
 TC &= F + VX \\
 600 &= F + 2(250) \\
 600 &= F + 500 \\
 F &= 600 - 500 \\
 F &= 100
 \end{aligned}$$

$$\begin{aligned}
 \text{For February, estimated costs} &= 100 + 2(500) \\
 &= 100 + 1000 \\
 &= \text{Sh } 1100.00
 \end{aligned}$$

2.5 Statistical Cost Estimation (Regression Analysis)

Regression technique (also called the least squares method) is designed to generate a line that best fits a set of data points. Because regression procedures use all data points, the resulting estimates have a broader base than estimates based only on high-low points. In addition, regression techniques generate a number of statistics that under certain assumptions enable a manager to determine how well the estimated regression process also permits inclusion of more than one predictor. This may be useful when more than one activity affects costs. For example, variable manufacturing overheads may be a function of both direct labor-hours and the quantities of direct materials processed.

Regression equations can be illustrated below:

$$Y = a + bX \dots\dots\dots \text{Simple regression equation}$$

$$Y = a_0 + b_1X_1 + b_2X_2 \dots\dots\dots \text{Multiple regression equation}$$

$$Y = a_0 + b_1X + b_2X^2 \dots\dots\dots \text{Non-Linear regression equation.}$$

Where Y is the total cost estimated.

a is the fixed cost.

b is the coefficient

X is the units of activity

Regressing the equation enables one to get the line of best fit by employing statistical techniques. This technique is based on the principle that the sum of squared residuals (SSR) from the regression line can be minimized using the following formula:

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

$$\text{Intercept } a = \frac{\sum y - b \sum x}{n}$$

where n is the number of observations

Illustration:

The data below relates to activity (x) and the respective costs incurred in past months. You are required to find the simple regression equation of (y)

Month	Units (x)	Cost (y)
January	2	60
February	5	100
March	4	70
April	6	90
May	3	80

Solution:

Units (x)	Cost (y)	xy	x ²
2	60	120	4
5	100	500	25
4	70	280	16

$$\begin{array}{cccc} 6 & 90 & 540 & 36 \\ 3 & 80 & 240 & 9 \\ \Sigma x = 20 & \Sigma y = 400 & \Sigma xy = 1680 & \Sigma x^2 = 90 \end{array}$$

$$\begin{aligned} \text{Coefficient } b &= \frac{n \Sigma xy - (\Sigma x)(\Sigma y)}{n \Sigma x^2 - (\Sigma x)^2} \\ &= \frac{5 (1680) - 20 (400)}{5 (90) - (20)^2} \\ &= 400/50 = 8 \end{aligned}$$

$$\begin{aligned} \text{Intercept } a &= \frac{\Sigma y - b \Sigma x}{n} \\ &= [400 - 8 (20)]/5 \\ &= 48. \end{aligned}$$

Therefore, the regression equation will be:

$$y = 48 + 8x$$

Correlation Coefficients

The disadvantage with regression equation is that the calculations involved are complex. However, computer software programs are now available and can be applied with ease. The major advantage of the regression programs is that in addition to estimating the cost equation, it also provides other statistics. Such statistics include the correlation coefficient (R), which is a measure of the proximity of the data points to the regression line. The closer R is to 1.0, the closer the data points are to the regression line. Conversely, the closer R is to Zero, the poorer the fit of the regression line.

The adjusted R-square is the correlation coefficient squared and adjusted for the number of independent variables used to estimate. This adjustment to R-square recognizes that as the number of independent variables increases, R-square (unadjusted) increases. For example, if there are as many independent variables as there are observations; R-square (unadjusted) would be 1.0. The adjusted R-square is interpreted as the proportion of the variation in Y explained by the right-hand side of the equation; that is, by X predictors.

Steps Followed in Estimating Cost Functions

- i. Select the dependent variable (y) to be predicted.

The choice of the cost(s) to be predicted will depend upon the purpose of the cost function. If the purpose is to estimate the indirect costs of a cost centre then all the indirect costs associated with the production centre that are considered to have the same cause and effect relationship with the potential cost drivers should be grouped together. A separate cost function would be established for each cost pool.

ii. Select the potential cost drivers.

Examples of potential cost drivers include direct labor hours, machine hours, direct labor cost, number of units of output, number of production run set-ups, number of orders processed and weight of materials.

iii. Collect data on the dependent variable and cost drivers.

A sufficient number of past observations must be obtained to derive realistic cost functions. The data should be adjusted to reflect any changes of circumstances, such as price changes, inflation, changes in the production process etc. the time period used to measure the dependent variable should correspond to the time used to measure the independent variable.

iv. Plot the observations on a graph.

A general indication of the relationship between the dependent variable and the cost driver can be observed from the graph. The graph will provide visual indication on the cost behaviour.

v. Estimate the cost function

Statistical techniques are normally applied in estimating the cost function.

vi. Test the reliability of the cost function.

The reliability of the cost function determines the confidence that can be placed on the cost functions. With the aid of software programs, this task can be performed with much ease.

Self Review Questions

1. Explain what is meant by a cost function.
2. under what circumstances can the engineering method be used to estimate costs
3. Describe the high-low method.
4. What is the major limitation of high-low method?
5. Describe how the scattergraph method is used to analyze costs into their fixed and variable elements.
6. Describe the regression method and explain how this method is better than the high-low method.
7. What factors need to be considered when using past costs to estimate cost functions?
8. Describe the steps that should be followed when estimating cost functions.

9. A hospital's records show that the cost of carrying out health checks in the last five accounting periods have been as follows:

Period	No. of patients seen	Total cost
1	650	17,125
2	940	17,800
3	1260	18,650
4	990	17,980
5	1150	18,360

Required:

Using the high low method and ignoring inflation, determine the estimated cost of carrying out health checks on 850 patients in period six.

10. Moland Inc. uses time series analysis and regression techniques to estimate future sales demand. Using these techniques, it has derived the following trend equation:

$$Y = 10,000 + 4,200x$$

Where y is the total sales units; and

X is the time period.

Required:

The total sales units forecast for time period 29.

11. Chesco Ltd is preparing its budget for the year to 30 June 2005. There has been uncertainty in the Kenya oil industry following the disagreements between the Kenya Revenue Authority and the major oil dealers and there is need to control expenditure in all areas and stick to the budget. In respect of fuel oil consumption, it is desired 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 data relates to the year ending June 30 2004:

	Hours (Sh '000s)	Expense (Sh '000s)		Hours (Sh '000s)	Expense (Sh '000s)
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 ending June 30 2004 were as follows:

	Machine hours ‘000s	Fuel oil expense Sh
Annual total	420	6,840
Monthly average	35	570

Required:

- a) estimate fixed and variable elements of fuel oil expense from the above data by both the following methods:
 - i. High and low points
 - ii Regression analysis
- b) If the correlation coefficient(R) arising from the above data is 0.25, interpret the significance of this fact.

LESSON THREE

3.0 MATERIAL COSTING

Objectives

After studying this lesson you should:

- Know the objectives of material pricing
- Understand the problems and general features of pricing systems
- Describe the characteristics of the main issue pricing systems: First in First out (FIFO), Last in First out (LIFO), Average Price, and Standard Price.
- Know to calculate issue prices and stock values using all the pricing systems.
- Understand the objectives and principles of stock recording
- Have been introduced to stock control
- Know how to calculate economic order quantity (EOQ)

The Essentials of Material Control

From the costing perspective, the essentials of material control prior to actual use in production can be summarized as follows:

- i. Materials of appropriate quality and specification should be purchased only when required and appropriately authorized.
- ii. The suppliers chosen should represent an appropriate balance between quality, price and delivery.
- iii. Materials should be properly received and inspected.
- iv. Appropriate storage facilities should be provided and stock levels physically checked on a regular basis.
- v. Direct material used in production should be charged to production on an appropriate and consistent pricing basis.
- vi. Indirect material used in production and non production departments should be appropriately charged to correct cost centre and included in the overheads of the cost centre.
- vii. The documentation, accounting system and controls at each stage should be well designed and effective
- viii. Stock taking must be well organized to ensure that stock quantities on hand are available when required.

3.1 The Material Control Process

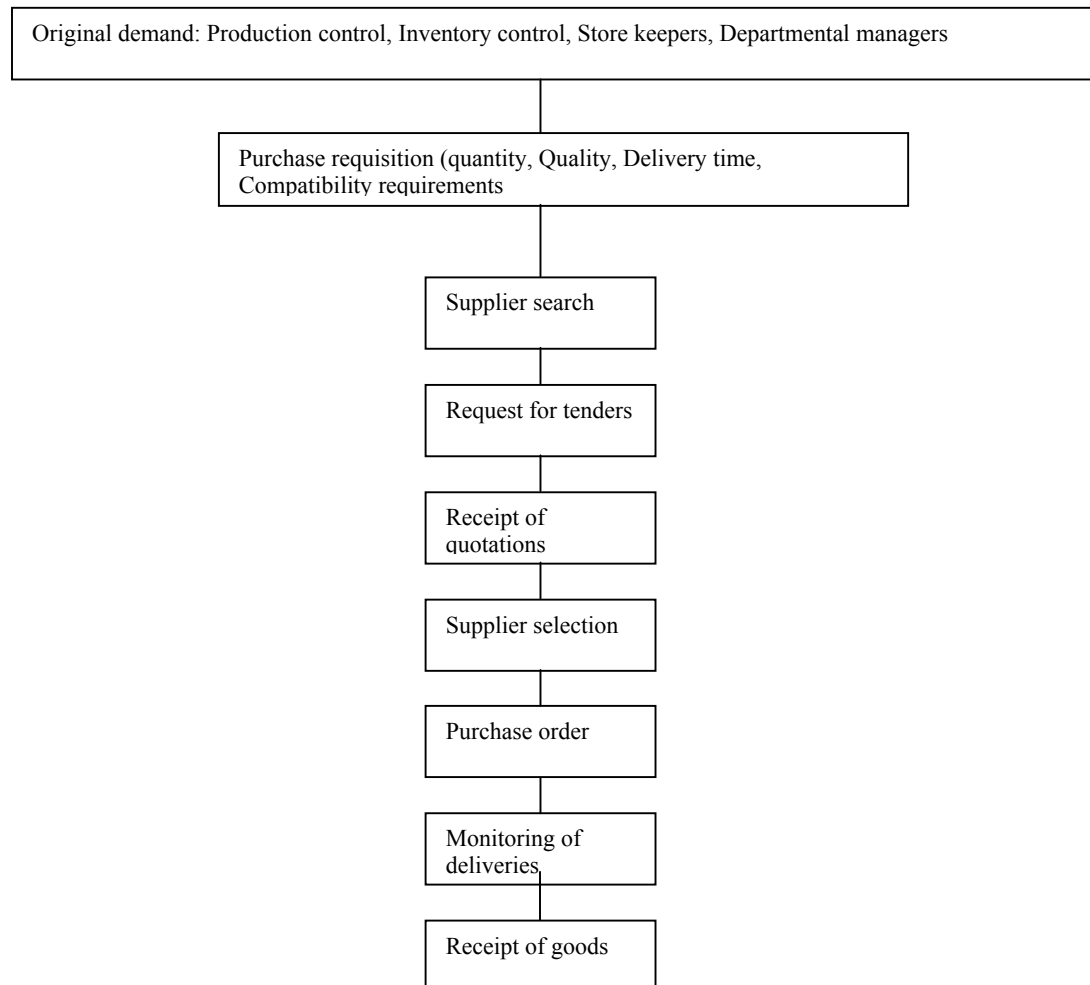
The important features material control processes are: purchasing, receipt, storage, and issue.

Purchasing

Because such a large proportion of a firm's costs are represented by bought in materials and services, the purchasing function is of great importance and has become highly specialized. The responsibility of purchasing function includes price, quality, and delivery all of which are crucial factors. Late delivery, poor materials, incorrect specification and other mistakes associated with poor purchasing procedures are likely to have adverse effect on the profitability of the firm. The avoidance of production delays, excessive scrap caused by incorrect materials and avoidance of excessive stocks are among the aims of an efficient purchasing function.

Purchasing Procedures

Although the exact system varies from firm to firm, the following procedures are common as illustrated by figure 3.1

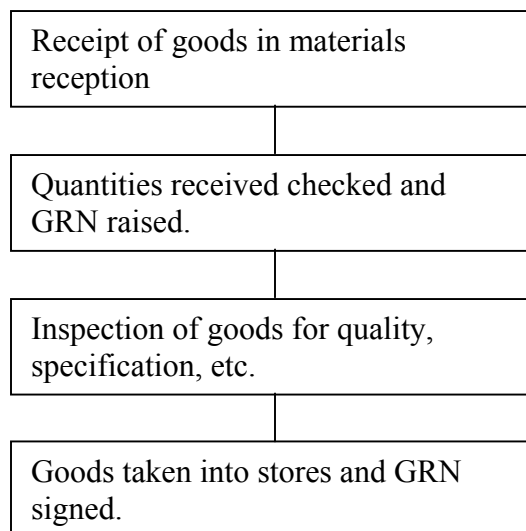


Notes to figure 3.1

- Although the diagram shows various originating sources producing a purchase requisition, frequently production and inventory control may produce a schedule of requirements specifying delivery dates and call off rates.
- The purchase order is the basis of legal contract between the firm and the supplier and should clearly define the required goods or services. Virtually all organizations refuse to recognize an invoice from a supplier which is not covered by a purchase order. The issue of purchase orders must be closely controlled and signing restricted to few senior people.
- The monitoring of deliveries (progress chasing) is a purchasing procedure. However, it is sometimes the responsibility of production control and works administration.

Reception and Inspection Procedures

Reception procedures can be shown diagrammatically (figure 3.2)



Notes to figure 3.2

- The goods received note (GRN) is a document necessary so that the supplier's invoice can be verified and passed for payment usually by the purchase department.
- The usual procedure of passing the supplier's invoice includes: checks that items invoiced were as ordered (from the purchase order) and as received (from GRN), verification of price, discounts and credit terms (from purchase order), coding of invoice both for type of expenditure and place to be charged

Storekeeping

It is normal to compare the controls and checks on petty cash float of a few hundred shillings with the frequently haphazard procedures used in many stores containing hundreds of thousands of shillings worth of stock. Storekeeping is an important function and can make a substantial contribution to efficient operations. Storekeeping includes the following activities:

- i. Efficient and speedy issue of required materials, tools etc.
- ii. receipt of part of materials from goods reception (i.e. external items) and from production (i.e. internal items)
- iii. Organizing storage in logical sequence, thus ensuring items to be found speedily when required, and that all items can be precisely identified and storage space is used effectively.
- iv. Organizing stock checks either on a continuous basis or a periodic basis as to be able to provide accurate stock figures when required.
- v. Protecting items in store from damage and deterioration.
- vi. Securing the stores from pilfering, theft and fire.

Storage Issues and Returns

The issue of materials must be appropriately authorized and amount issued recorded so that the appropriate charges can be made to production or to receiving cost centre. The usual way this is done is by material requisition (MR)

An MR would contain:

Quality, part No., Description, Job or Cost Centre, Authorization.

On presenting an MR to the store man, it would be checked for correctness and authorization and if satisfactory, the issue would be made. The MR would be retained by stores who would insert date of issue and forward the MR to stores records (for updating the stock records) and to the cost department for pricing and charging. The store man must ensure that the MR is amended when the issue can not be made exactly as the original request, e.g. where only a part of the issue is made or an alternative material is acceptable when an original request is unavailable.

The procedure for goods returned to store is similar to those outlined above except that the document involved is termed as material return note and, of course, the goods are taken into stores rather than issued.

3.2 Stocktaking

There are two approaches to the task of stocktaking: Periodic (usually annual) and perpetual (continuous).

Periodic Stocktaking

The objective of periodic stocktaking is to find out the physical quantities of materials of all types (raw materials, finished goods, W-I-P etc) at a given date. This is a substantial task even in a modest organization and becomes a difficult task in a large firm. The following factors need to be considered:

- Adequate number of staff should be available who should receive clear and precise instructions on the procedures.
- The stock take should be done on a weekend or overnight so as not to interfere with production.
- The stock take should be organized into clearly defined physical areas and the checkers should count or estimate all materials in the area.
- Adequate technical assistance should be available to identify materials, part no's etc.
- Great care should be taken to ensure that only valid stock items are included and that all valid items are checked.
- The completed stock sheets should have random, independent checks to verify their correctness.
- The quantities of each type of material should be checked against the stock record to expose any gross errors which may be due to stocktaking errors or errors in the recording system.
- The pricing and extension of the stock sheets, which are done manually, should be closely controlled. If the pricing and value calculations are done by computer, the input quantities and stock part numbers should be correctly entered.

Continuous Stocktaking

To avoid some of the disruptions caused by the periodic stocktaking, many organizations operate systems whereby a proportion of stock is checked daily so that over the year all stocks are checked at least once and many items particularly the high valued or fast moving items would be checked several times. Where continuous stocktaking is adopted, it is invariably carried out by staff independent from the storekeepers.

Centralized vs. Decentralized Storage System

The type of storage system will depend on the nature of the organization. The type of storage system to be adopted will depend on the management decision of that organization. In making the decision on what type of storage system is appropriate, the management will weigh the advantages and disadvantages of each system in line with the company's operations.

Advantages of Centralization.

- i. lower stock is maintained
- ii. there is less risk of duplication
- iii. there is optimum utilization of store staff
- iv. Closer control of inventory.
- v. There is more security from pilferage.
- vi. Paperwork is reduced
- vii. Stocktaking is easier than when the system is a decentralized one
- viii. More advanced equipment for handling and monitoring stocks will be viable.
E.g. the use of computers and mechanized equipments.

Disadvantages of Centralization

- i. It is less convenient when the company has numerous branches or departments that are far apart.
- ii. It may not be possible to know what is going on in a local area.
- iii. There are longer delays in obtaining materials.
- iv. Greater internal or external transport costs in carrying materials.
- v. Bureaucracy and slow decision making.

The disadvantages of decentralization are the advantages of decentralization and vice versa.

3.3 Changes in Production and Purchasing Systems

There are a number of changes taking place in industry which are altering dramatically the way that products are made and production is organized. These changes naturally influence supporting activities such as purchasing and storage. Several of the more important developments are outlined below. These are Just-In-Time purchasing, Just-In-Time production and Materials requirements planning.

Just-In-Time (JIT) Systems

JIT systems aim at producing the required items at the time when they are required. It involves the pursuit of excellence at all stages with a climate of continuous improvement. A JIT system is characterized by:

- A move towards zero inventory
- Elimination of non-value added activities

- An emphasis on perfect quality i.e. Zero defects
- Short set-ups
- A move towards a batch size of one
- 100% on time deliveries
- a constant drive for improvement
- demand-pull manufacture

It is this latter characteristic which gives rise to the name of Just-In-Time. Production only takes place when there is actual customer demand for the product. JIT works on a pull-through basis which means that products are not made to go into stock.

JIT Purchasing

This seeks to match the usage of materials with the delivery of materials from external suppliers. This means that materials stock can be kept at near zero levels. For JIT purchasing to work it requires:

- i. Confidence that suppliers will deliver exactly on time.
- ii. That suppliers will deliver materials of 100% quality so that there will be no rejects, returns and consequence production delays.

The strategy employed in order to guarantee timely supplies is the maintenance of fewer suppliers and placing long term orders in order that the supplier has assured sales and can plan to meet the demand.

JIT Production

JIT production works on a demand-pull basis and seeks to eliminate all waste and activities which does not add value to the product. The lead time associated with making and selling a product includes:

- Inspection time
- Transport time
- Queuing time
- Storage time
- Processing time

Of these, only processing time adds value to the product whereas all the other add cost, but not value. The ideal for JIT systems is to convert materials to finished products with a lead time equal to processing time so as to eliminate all the activities that do not add value.

JIT ideally involves the following:

- The production processes must be shortened and simplified. This requires workers that are more flexible and adaptable.
- Defects should be avoided to save time that would be lost in reworking

- Factory layouts must be changed to reduce movements. Similar Jobs should be grouped together.
- There must be a full employee involvement in searching for improvements and the successful implementations of those improvements.

The application of JIT comes with benefits such as lower investment requirement on inventory, less storage space needed, greater customer satisfaction, and elimination of wastes hidden in inventories, flexibility in adapting to changed market requirements.

Materials Requirement Planning (MRP)

MRP is a computerized information, planning and control system which has the objective of maintaining a smooth production flow.

MRP involves:

- Maximizing efficiency in timing of orders of raw materials or parts that are placed with external suppliers
- Efficient scheduling of the manufacture and assembly of the final product.

Successful operation of MRP requires the following:

- A master production schedule showing the quantities and timings required for the finished product
- A bill of materials (BOM) which shows the breakdown of each finished product into sub-assemblies components and raw materials
- An inventory file containing the balance on hand, scheduled receipts and numbers already allocated for each sub-assembly, component and type of raw material.
- A parts manufacturing and purchasing file containing lead times and production sequence of all sub-assemblies and components produced internally.

MRP has evolved into MRPII which integrates material resource planning, factory capacity planning labor scheduling into a single manufacturing control system.

3.4 Stock Recording and Inventory Control

Stock Recording

However sophisticated the inventory control system is in the firm, a basic prerequisite is that stock movements are accurately recorded. In addition the stock record typically shows the various control levels which relate to the inventory control system and which are explained later in this lesson. In some firms several stock records may be kept regarding a particular materials, but in practice can introduce errors and discrepancies and has little to commend it.

The most frequently encountered records of stocks in manual systems are bin cards and stock record cards.

Bin Cards

These are cards (usually hard paper) attached to or adjacent to actual materials and the entries made at the time of issue either by the store man or a store clerk. They show only basic information relating to physical movements. A typical layout of a bin card is shown below. Figure 3.3

Bin Card				
Part No.....		Location.....		
Date	Reference	Receipts	Issues	Balance

Figure 3.3 Bin Card

- The reference column would be used for inserting the GRN or MR number
- The use of bin cards is currently on the decline partly because of the difficulty of keeping them up to date and partly because of the increasing integration of stock recording and inventory control procedures, frequently using computers.

Stock Record Cards

To obtain the full picture of the stock position of an item it is necessary to know not only the physical stock balance, but also free stock balance. This is defined as

$\text{Free stock balance} = \text{Physical stock} + \text{outstanding replenishment orders} \\ - \text{unfulfilled requirements or allocations}$

The free stock balance is a notational, not physical and is the key figure in inventory control. It is necessary to know physical stock for issue purposes, for stock taking, and for controlling maximum and minimum stock levels and it is necessary to know the free stock position for replenishment ordering. An example of a stock record card is shown as figure 3.4

[illegible]

Figure 3.4 Stock record cards

- The entries in the Ref (reference) columns would be receipts (GRN No), issues (Material requisition No), allocations (Job No or Customers order No) and orders (purchase order No.)
- The above illustration shows a card for a manual or mechanized system, but even when the stock records are computerized, the same type of information is normally included in the computer file.

Inventory Control

This can be defined as a system in a firm to control the firm's investment in stock. This includes the recording and monitoring of stock levels, forecasting future demands and deciding how many and when to order. The overall objective of inventory control is to minimize the total costs associated with stock. These costs can be categorized into three groups:

Carrying Costs

- Interest on capital invested in stock
- Storage charges (rent, lighting, heating, refrigerating, air conditioning, etc.)
- Stores staffing, equipment, maintenance and running costs.
- Material handling costs
- Audit, stocktaking, stock recording costs
- Insurance and security
- Deteriorating and obsolescence
- Pilferage evaporation, and vermin damage

Ordering Costs

- Clerical and administrative costs of purchasing, accounting and goods reception.
- Transport costs
- Set up and tooling costs associated with each production run
- Planning, production control costs associated with interior order

Stock out Costs

- Lost contribution through lost sale
- Loss of future sales from customers who decide to switch to other suppliers
- Cost of production stoppages caused by stock outs of W-I-P and raw materials
- Extra costs associated with urgent and small quantity replenishment

Stock out costs is normally difficult to quantify but their consideration is important.

Inventory Control Terminology

- i. Lead or procurement time- this is the period of time between ordering and replenishment. Note that ordering can be from external or internal sources.
- ii. Economic order quantity (EOQ) or economic batch quantity (EBQ) - this is the optimal reorder quantity which minimizes the balance of cost between carrying costs and ordering costs.
- iii. Buffer stocks or minimum stock or safety stock- a stock allowance to cover errors in forecasting the lead time or the demand during the lead time. The availability of buffer stocks minimizes the possibility of incurring stock out costs.
- iv. Maximum level- a stock level calculated as the maximum desirable which is used as an indicator to management to show when stocks have risen too high.
- v. Re-order level- the level of stock at which a further replenishment order should be placed. The reorder level is dependent on the lead time and the rate of demand during the lead time.
- vi. Reorder quantity- the quantity of replenishment order, frequently but not always, the EOQ.

The Economic Order Quantity (EOQ)

Before one attempts to calculate the EOQ, it is necessary to find out the major control levels: reorder level, minimum level, and maximum level.

Illustration:

Assume you are given the data below of stock requirement for a certain firm

Average usage	100 units per day
Minimum usage	60 units per day
Maximum usage	130 units per day
Lead time	20-26 days
Previous EOQ	4000 units

From these figures, the following calculations can be carried out

$$\begin{aligned}\text{Reorder level} &= \text{maximum usage} \times \text{maximum lead time} \\ &= 130 \times 26 \\ &= 3380 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{Minimum level} &= \text{Reorder level} - \text{average usage in average lead time} \\ &= 3380 - (100 \times 23) \\ &= 3380 - 2300 \\ &= 1080 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{Maximum level} &= \text{Reorder level} + \text{previous EOQ} - \text{minimum anticipated usage in minimum lead time} \\ &= 3380 + 4000 - (60 \times 20) \\ &= 6180 \text{ units}\end{aligned}$$

Recall that EOQ is a calculated order quantity that minimizes the balance of cost between ordering and carrying costs. To be able to calculate a basic EOQ certain assumptions are necessary.

- i. that there is a known constant stock holding cost
- ii. that there is a known constant ordering cost
- iii. that rates of demand are known

- iv. that the price per unit is constant and known
- v. that replenishment is made instantly (that is the whole batch is delivered at once)

The above assumptions are heroic and it is unlikely that all could be made in practice. Nevertheless the EOQ calculation is a useful starting point in establishing an appropriate reorder quantity.

The EOQ formula is given below (you may refer quantitative techniques books to know how it is derived)

$$EOQ = \sqrt{2C_oD/C_c}$$

Where: C_o = ordering cost per order
 D = Demand per annum
 C_c = Carrying cost per annum

Illustration:

Find the EOQ where the forecasted demand is 1,000 units per month, the ordering cost is Sh 350 per order, the unit cost Sh 8 each and its estimated carrying costs are 15% per annum.

From this example: C_o = Sh 350
 D = 1,000 x 12 = 12,000 units per year
 C_c = Sh 8 x 15% = Sh 1.2 per year

$$\begin{aligned} \text{Therefore: } EOQ &= \sqrt{2 \times 350 \times 12,000 / 1.2} \\ &= 2646 \text{ units.} \end{aligned}$$

3.5 Pricing Issues and Stocks

Objectives of Material Pricing

There are two main objectives of material pricing:

- i. To charge to production on a consistent and realistic basis the cost of materials used.
- ii. To provide satisfactory basis of valuation of inventory at hand.

These objectives should be achieved by a material pricing system which is the simplest effective one and which is administratively realistic.

Problems of Material Pricing

In practice the problem of pricing material issues, which thus determine product costs, is complicated by several factors:

- i. rapidly changing prices for bought in materials and components
- ii. The stock of any material is usually made up of several deliveries which may have been made at different prices.
- iii. The frequent impossibility of identifying items with their delivery consignment.
- iv. The sensitivity of profit calculations to the pricing method adopted particularly where materials form a large part of total cost.

No one pricing method has all the advantages and it is necessary to use the most appropriate system to fulfill the requirements of a particular situation. The features of the various pricing systems are described below.

General Features of Pricing Systems

When an issue is made from stores, the material requisition would be passed to the cost department to be priced and extended to appropriate ledger entries to be made. At the simplest these entries would be:

Dr. Work in progress control a/c (for direct material issue)
 Or Overhead control a/c (for indirect material issue)
 Cr. Stores ledger control a/c

To be able to use some of the pricing systems, the stock recording systems has to be comprehensive enough not only to record overall quantities and prices, but also the number or quantity received in any one batch. This is so that issues can be nominally identified against batches which are necessary to establish the appropriate price to be charged.

Stock Recording Systems

First in First out (FIFO)

Using this method issues are priced at the price of the oldest batch in stock until all units of the batch have been issued when the price of the next oldest is used and so on.

Characteristics

- i. it is an actual cost system
- ii. It is a good representation of sound storekeeping practice where the oldest items are issued first.
- iii. Unrealized profits or losses do not arise

- iv. The stock valuation is based on the more recently acquired items and thus more nearly approaches current market values
- v. Product costs, being based on oldest material prices, lag behind current conditions.(in periods of rising prices, product costs are understated and profits overstated; in periods of falling prices, product costs are overstated and profits understated)
- vi. The system is administratively clumsy. It necessitates that each batch is tracked.
- vii. Cost comparison between jobs is difficult because the material issue price may vary from batch to batch even with issues on the same day.

Last in First Out (LIFO)

In this method, issues are charged out at a price of the most recent batch received and continue to be charged thus until a new batch is received.

Characteristics

- i. it is an actual cost system
- ii. LIFO will frequently result in many batches being only partly charged to production where a subsequent batch is received.
- iii. Product costs will tend to be based fairly closely on current prices and will therefore be more realistic.
- iv. Stocks are valued at the oldest prices
- v. It is administratively clumsy
- vi. It renders cost comparison between jobs difficult
- vii. In periods of rising prices, LIFO, provides a hedge against inflation

Average Price Method

The average price method is a perpetual weighted average system where the issue price is recalculated after each receipt taking into accounts both quantities and money value.

Characteristics

- i. although realistic, it is not an actual buying price except by coincidence
- ii. it is less complicated and can be administered easily than the LIFO or FIFO methods
- iii. It has an effect on product costs and stock valuation approximating the average effects of LIFO and FIFO.
- iv. Cost comparison between jobs using similar materials becomes easier
- v. With constantly fluctuating market prices of materials, it gives better results than either FIFO or LIFO.
- vi. Because it is based on actual costs, no unrealized stock profits and losses occur.

Other Stock Recording Systems

Specific or Unit Price

Where the item issued can be identified with the relevant invoice, the actual cost can be charged. This is only possible with special purpose items bought for a particular job.

Standard Price

This is a predetermined price fixed on the basis of a specification of a product or a service and of all factors affecting that price.

In effect a standard or planned price is an average price for a future period and all issues or returns would be made at the standard price for the period concerned.

Characteristics

- i. not an actual cost, therefore stock profits and losses may arise
- ii. Administratively simple. Only quantities issued and received need be recorded not the money values as they are predetermined.
- iii. There is a practical difficulty in determining an acceptable standard price especially in volatile conditions.
- iv. If a realistic standard price can be established, some guidance to purchasing efficiency may be obtained.
- v. Because material price variations are eliminated, manufacturing cost comparisons can be made more easily.

Replacement price

This method is sometimes known as the market price method. It charges out issues at the buying price on the day of issue. There are many variants to this system. For example, buying in prices may be established by means of a price index or actual prices updated on a monthly basis.

Characteristics

- i. It is not an actual cost price, therefore stock profits or losses may occur.
- ii. Issues would be priced at up to date values
- iii. Major administrative problems in keeping replacement prices up to date.
- iv. Replacement pricing is more frequently used in estimating rather than in normal stock issues
- v. Cost comparison between jobs is difficult

Base Stock Method

This method assumes that initial purchases were meant to provide a buffer stock and that this base stock would appear in all subsequent stock valuations at its original value. This method results in totally unrealistic values and therefore not recommended. It exists in books but not in practice.

Comparison of Pricing Methods

Because of the effect of product costs and stock valuations, there is a need for an organization to be consistent in its issue price methods. Accounting policies demand that the stock valuation adopted by the firm should be consistent over the years. Where there is need for a switch from one system to another, the firm should disclose the reasons for the changes and the possible effects on the accounts of the firm. In practice, the use of FIFO or the average price systems are common.

Illustration:

The data below represents the stock quantities and values of Sambasa Company. You are required to value the stocks using FIFO, LIFO, Average price, and Standard price methods. *Assume that the standard price is Sh 4.50 per unit.*

Date	Receipts	Purchase Price	Issues
1/10	150 units	4.00	
5/10	100 units	4.50	
6/10			80 units
12/10			100 units
20/10	90 units	4.80	
24/10			80 units

Solution

The FIFO method

Receipt date	Qty	Price	Total	Issue date	Issue details			Balance		
					<u>Qty</u>	<u>Price</u>	<u>Value</u>	<u>Qty</u>	<u>price</u>	<u>Value</u>
1/10	150	4.00	600					150	4.00	600
5/10	100	4.50	450					250		1050
				6/10	80	4.00	320	170	70*4.00 100*4.5	730
				12/10	100	70*4.00 60*4.50	415	70	4.50	315
20/10	90	4.80	432					160	70*4.5 90*4.8	747
				24/10	80	70*4.50 10*4.80	363	80	4.80	384
	340		1482		340		1482			
BAL C/F								80 @ 4.80		384.00

The LIFO Method

Receipt date	Qty	Price	Total	Issue date	Issue details			Balance		
					<u>Qty</u>	<u>Price</u>	<u>Value</u>	<u>Qty</u>	<u>price</u>	<u>Value</u>
1/10	150	4.00	600					150	4.00	600
5/10	100	4.50	450					250	150*4.00 100*4.50	1050
				6/10	80	4.50	360	170	150*4.00 20*4.50	690
				12/10	100	20*4.50 80*4.00	410	70	4.00	280
20/10	90	4.80	432					160	70*4.00 90*4.80	712
				24/10	80	80*4.80	384	80	70*4.00 10*4.80	328
	340		1482		340		1482			
BAL C/F								80 units		328.00

The Weighted Average Method

Receipt date	Qty	Price	Total	Issue date	Issue details			Balance		
					<u>Qty</u>	<u>Price</u>	<u>Value</u>	<u>Qty</u>	<u>price</u>	<u>Value</u>
1/10	150	4.00	600					150	4.00	600
5/10	100	4.50	450					250	4.20*	1050
				6/10	80	4.20	336	170	4.20	714
				12/10	100	4.20	420	70	4.20	294
20/10	90	4.80	432					160	4.54**	726
				24/10	80	4.54	363	80	4.54	363
	340		1482		340		1482			
BAL C/F								80 @ 4.54		363.00

Average price calculations

- * 150 units at Sh 4.00 = 600
Plus 100 units at Sh 4.50 = 450

Total 250 units valued at Sh 1050
Average price = $1050/250 = \text{Sh } 4.20$
- ** 70 units at Sh 4.20 = 294
Plus 90 units at Sh 4.80 = 432

Total 160 units valued at Sh 726
Average price = $726/160 = \text{Sh } 4.54$

The Standard Price Method

Receipt date	Qty	Price	Total	Issue date	Issue details			Balance		
					<u>Qty</u>	<u>Price</u>	<u>Value</u>	<u>Qty</u>	<u>price</u>	<u>Value</u>
1/10	150	4.50	675					150	4.50	675
5/10	100	4.50	450					250	4.50	1125
				6/10	80	4.50	360	170	4.50	765
				12/10	100	4.50	450	70	4.50	315
20/10	90	4.50	405					160	4.50	720
				24/10	80	4.50	360	80	4.50	360
	340		1482		340		1482			

Bal C/F 80 @ 4.50 363.00

Purchase Price Applicable

In practice there is no clear cut purchase price to be applied in stock valuation. Other factors such as taxes and discounts complicate the determination of purchase price. The following are commonly encountered complications:

- i. Value added tax (VAT) - most of the goods and services supplied in Kenya have an additional VAT charge of 16% (subject to revisions at every fiscal year). This tax charge is part of an organizations input tax which can be reclaimed so that the VAT charge should not be included in the cost accounts. If the person is not registered for VAT the VAT charged will be part of the cost price.
- ii. Transport, storage and delivery charges- where the purchaser has to bear these charges they form part of the cost of the goods and so should be included in the cost accounts. Where these charges are invoiced per unit or by weight then they would be included in the direct material cost. Often this is not practicable, or the amounts involved are small, in which case the additional charges would be allotted to production overheads.
- iii. Quantity or trade discount- these are discounts given against a list price for ordering in large quantities. The net price of the items is used (gross amount less quantity or trade discount).
- iv. Cash discount- the cash discount is generally considered to be a financial accounting item and is normally not included in cost accounts.

- v. Packaging and container charges- where packaging or containers are charged separately the cost accounting treatment varies according to whether the containers are returnable or not.
- Non returnable packaging container charges- the cost of packaging is part of the purchase price of materials and would be included in direct or indirect costs as appropriate.
 - Returnable packaging container charges where full credit is given- the normal assumption would be that containers are returned and full credit received so that the container cost would not be included in the cost accounts. In certain circumstances however, containers normally get damaged and the organization do not get a full refund for containers. If this amount is normally large, the charges could be included in direct material cost otherwise it will be charged to production overheads.
 - Returnable packaging container charges where partial credit is given- the net cost of containers (amount charged less credit given) is an addition to the material cost and would be included in the cost amounts.

Pareto or ABC Analysis

Detailed stock control sometimes takes time and resources and can cost a considerable amount of money. Pareto analysis is a system of aggregating stock into classes of value so that they can be managed accordingly. Close monitoring is given to high valued items and less monitoring is given to low valued stocks.

A typical analysis of stock items has shown that:

20% of stock items carry 80% of total value. This is classified as *Class A* and is given a close day to day control

30% of stock items carry 15% of total value. This is classified as *Class B* and is given a regular review.

50% of stock items carry 5% of total value. This is classified as *Class C* and is given an ad hoc review.

ABC analysis should be used with care. There are some low value items that are critical to the firm. If they are out of stock, it may cost the firm dearly, thus, low value might not mean low importance. Unavailability of greasing oil for example might force the whole production plant to stop running.

Self Review Questions

1. What is a bin card?
2. What is free stock balance? Why is this figure of importance?
3. What are the key elements in inventory control?
4. What are the three categories of costs associated with stock
5. Define: Lead time, EOQ, Buffer stock, Reorder level.
6. What are the assumptions necessary to use the basic EOQ formula?
7. An investigation into stores procedures and record keeping shows that for part No. Z45 the physical stock differed from the Bin Card and also from the record card kept in the works office which did not agree with the bin card. Give reasons for the differences.
8. What is the EOQ when demand is 25 per working day, ordering costs are Sh 150 per order, the items cost Sh 3 each and carrying costs are 12% per year? Assume a 250 working days in a year.
9. what are the essentials of material control
10. Outline the main steps in the purchasing procedure.
11. Where does goods received note (GRN) originate and what is its purpose?
12. What are the major activities involved in storekeeping?
13. What is periodic and continuous stocktaking?
14. In what circumstances is it essential to use continuous stock taking?
15. What are the advantages and disadvantages of a decentralized storage?
16. What are the features of JIT system of inventory?
17. What benefits are claimed for JIT?
18. What is material requirement planning?
19. Design the layout of a purchase order.
20. give reasons why stocktaking errors occur
21. What are the differences between JIT purchasing and conventional purchasing?
22. What are the objectives of issue price systems?
23. What are the basic ledger entries for material issues: to production? Indirect materials?
24. What is the FIFO system?
25. What is the effect of FIFO system in times of inflation or rising prices?
26. What are the characteristics of the LIFO system?
27. Describe the average price method
28. Define a standard issue price
29. The following information is available about a component.

Opening stock	1 st Jan	500 at Sh 2 each
Receipts	6 th Jan	160 at Sh 2.20 each
	20 th Jan	180 at Sh 2.25 each
Issues	2 nd Jan	300
	16 th Jan	210

Complete three separate stores ledger accounts assuming that issues are priced using:

- i. Average price
- ii. FIFO
- iii. LIFO
- iv. Standard price (assume the standard price per unit is Sh 2.2)

30. Which of the following items would be taken as part of the cost of materials taken in stores?

- i. Cash discount
- ii. Trade discount
- iii. VAT
- iv. Freight and carriage charges
- v. Cost of non-returnable containers
- vi. Cost of returnable containers

31. At what price per unit should the following stock item be entered in the stores ledger if the following invoice was received from a supplier?

Invoice			
150 units part no ACAE	750		
Less 20% discount	150		
			600
Plus Vat at 16%	96		
			696
Plus packing charges 5 non refundable pallets	34		
			730
<i>2.5% discount will be given for payment made in 30 days.</i>			

LESSON FOUR

4.0 LABOR COSTING

Objectives

After studying this lesson you should:

- Know the main categories of remuneration
- Understand the features of time based systems
- Know the features of incentive schemes
- Distinguish between straight and differential piecework
- Know how labor costs decline in proportion to total costs
- Be able to describe time sheets, Job and operation cards
- Know the main steps in wage procedures
- Understand the factors which determine wages
- Be able to describe job evaluation and merit rating
- Understand the key functions of human resource department
- Be able to calculate labor turnover

4.1 Remuneration Methods

Trends in Employment and Remuneration

At present Manual workers are paid by some form of incentive scheme. This overall percentage masks extremely wide variation from industry to industry. For example in general engineering around 80% of the workers are paid wholly or partly by some form of incentive scheme, whereas in process industries the figure is as low as 15%.

There has been a general tendency for larger firms to move away from direct incentive schemes to schemes such as measured day work. There is also a tendency for workers to become salaried employees which has clear costing implications as direct labor costs become more fixed in nature rather than varying with output.

The trend evident in most parts of the world is that patterns of employment are changing from full time employment to part time employment. There is less job security and more self employment. In Kenya, the government is starting to move away from permanent employment schemes to renewable contractual schemes. The ultimate goal is to have a flexible employment system where demand for labor is matched with availability of work. However, this does not mean that full time employees will be eliminated. Companies will want to maintain a small core of full time employees with a large pool of part-timers or contractors. In effect firms will be operating Just in Time system for labor. The new developments are not without disadvantages as it may result into social oppressions, low and irregular earnings, and biased dismissals in the pretext of no work or poor performance.

Remuneration Methods

The two main categories of remuneration are:

- i. Time based
- ii. Remuneration related to output or performance.

Within these two categories there are innumerable variations some of which have general applicability whilst others are of a local and specialized nature. Remuneration systems are frequently complex and administratively cumbersome, but because the system is the result of negotiations, disputes and disagreements over the years, attempts to rationalize and simplify are frequently met with hostility and suspicion.

The newer forms of production organization, such as Just In Time systems mean more and more workers will be paid time rates and will not have their pay dependent on individual output levels. There are two reasons for this: first, parts are only produced as and when required. This means that the repetitive production of components that move into stock is avoided as one of the key objectives of JIT. Secondly, what counts in JIT is the output of the group (known as a *production cell*) as a whole. As a consequence workers have to be flexible and adaptable so that they can move from task to task according the demand. In such circumstances individual incentive schemes are of little or no value.

In addition more and more wages and salaries, traditionally classified as overheads, are now being traced to product lines and classed as direct. Support functions are also grouped around specific product lines so that identification of costs is more direct. This has led to the development and use of activity based cost system (ABC System)

Time Based Systems

Basic System

At the simplest level workers would be paid for the number of hours worked at a basic rate per hour up to, say, 40 hours per week. Time worked in addition to 40 hours would be classed as overtime and is usually paid at a higher rate.

Although workers pay is not related to output, this does not mean that the output and performance is unimportant. Supervision and managerial control systems are employed so that workers are paid for actually working and not merely attending.

Advantages

- i. simple to understand and administer
- ii. It simplifies wages negotiations because only the rate needs to be determined unlike incentive schemes where negotiations are complicated.

Disadvantages

- i. it has no real incentive to increase output
- ii. all employees in the same grade are paid the same rate regardless of performance
- iii. constant supervision may be necessary

The time based systems are most appropriate for:

- i. Work where quality, safety, health care are all important e.g. tool making, nurses, signal operators etc.
- ii. Work where incentive schemes would be difficult or impossible to install e.g. direct labor, stores assistants, clerical work etc.
- iii. Work where output is not under the employees control e.g. power station workers, teachers, etc.

High Day Rate Pay System

This is a time system which is designed to provide a strong incentive by paying rates well above normal basic time rates in exchange for above average output and performance. For its successful application it is necessary to ensure that the output levels are the result of detailed work studies and that there is agreement from the labor force and the unions involved on the required production level. A typical application of this system is on assembly line production in the car industry and in the domestic appliance manufacture.

Advantages

- ii. It is claimed to attract higher grade workers.
- iii. Provides a direct incentive without the complications of individual piecework rates
- iv. Simple to understand and administer

Disadvantages

- i. May cause other employers to raise their rates to attract better workers thus nullifying the original effect.
- ii. Problems occur when the original target production figures are not met

Common Bonuses Found in Time Based Systems

In addition to time rates explained above, bonuses or extra payments are frequently made. Some common examples are:

- i. Shift bonus- where a worker agrees to work shifts, particularly where rotating shifts are used, he receives an extra amount.
- ii. Time keeping bonus- where a person's timekeeping has been good over the week a bonus may be paid.
- iii. Continuous working bonus- where the plant has achieved continuous production without strikes, go slows or stoppages a weekly bonus is paid. This system appears to have had some successes in one of the large car manufacturers.

Note: many variations exist, for example, many firms which operate a time based systems pay, in addition, some form of output bonus and conversely some of the above bonuses are found in firms where the main method of remuneration is by an incentive scheme.

4.2 General Features of Incentive Schemes

All incentive schemes relate payment to output in some way or another. There are innumerable variations; some schemes apply to individuals whilst others apply to groups of workers, some have a direct and immediate relationship to output whilst others are more indirect.

From a properly organized and well planned systems both the firm and the employees can benefit. The employee from the extra income arising from increased productions, and the firm from the reduced overheads per unit of the increased production. Unfortunately not all schemes achieve this ideal, but careful attention to the following factors will help to achieve this objective.

- i. Remuneration should reflect workers effort and performance. Payment should be made without delay, preferably soon after the completion of the task.
- ii. The scheme should be reasonably simple to assist administration and to enable employees to calculate their own bonuses.
- iii. Performance levels should be demonstrably fair i.e., they should be in reach of the average worker.
- iv. There should be no artificial limit and earnings should be safeguarded when problems arise outside the employee's control.
- v. The scheme should not be introduced until there has been full consultation and agreement with the employees and the union.
- vi. The full application of the scheme, performance levels, rates, etc. must be considered so that it will have a reasonable length of life.

Advantages of Incentive Schemes

- i. It increases production thereby increasing wages but also reducing overheads per unit.
- ii. May enable the firm to remain competitive in inflationary conditions
- iii. May improve morale by ensuring that extra effort is rewarded
- iv. More efficient workers may be attracted by the opportunity to earn higher wages.

Disadvantages of Incentive Schemes

- i. There are problems in establishing performance levels and rates.
- ii. Some incentive schemes are complex and expensive to administer.
- iii. Some groups of workers, although relatively unskilled, may earn high wages through incentive schemes whilst others engaged on skilled work may become resentful when differentials are eroded.

Individual Incentive Schemes

These schemes relate to an individual worker and has immediate and direct impact on the wages received by an individual employee. There are several individual incentive schemes some of which are explained below:

Straight Piecework

At its most basic the worker would be paid an agreed rate per unit for the number of units produced. On occasions the number of operations would be the basis of payment or, where various types of articles are produced, a piecework time allowance per article would be sent to and the worker paid for the piecework hours produce. For example, assume that the data in the following figure 4.1

Week No.	37
Employee No.	5872
Clock hours.	40
Output:	300 units of A, piecework time allowance 1.8 mins/ unit 150 units of B, piecework time allowance 1.5 mins/ unit 100 units of C, piecework time allowance 2.2 mins/ unit
Piecework rate.	20 Cts. Per minute produced
Total production	$= (300 \times 1.8) + (150 \times 1.5) + (100 \times 2.2)$ piecework minutes $= 985$ piecework minutes
Gross wages	$= 985 \times 20$ Cts. $= \text{Sh. } 197.00$

Figure 4.1 wage determination

Note:

- i. Piecework time produced is not equivalent to actual clock hours. Piecework time allowance is merely a device for measuring the work content of dissimilar items.
- ii. Piecework with guaranteed day rates is instituted to safeguard earnings from falling below normal day rates. The worker will therefore be paid the higher of piecework rate or day rate. The reason for the guarantee is because of unforeseen interruptions that may occur such as delays, shortages, tool breakages etc. that can not be blamed on the worker.
- iii. Workers transferred to areas where they will no longer enjoy the incentive schemes like the other workers should be paid extra amounts in lieu of the bonuses forfeited.

Differential Piecework

One objection to straight piecework systems is that, because a flat rate per unit is paid, the incentive effect at higher production levels declines. Differential piecework seeks to overcome this by increasing the rate progressively at various production levels, e.g.

Up to 100 units per day	10 Cts / unit
101-150 units per day	15 Cts / unit
151-200 units per day	20 Cts / unit

On occasions in differential schemes the whole of the output is paid at the higher rate when the next production threshold is reached.

Group Incentive Schemes

Although individually based incentive schemes are common, on occasions they are inappropriate and some form of group scheme is used. These schemes are more appropriate in:

- i. Where production is based in group e.g. road surfacing, Van selling.
- ii. Where production is integrated and all efforts are directed towards the same end, e.g. in line production.
- iii. Where the production methods or product makes it infeasible to measure individual performance.

The sharing of bonus amongst the group should be decided by management in full agreement with the group members and possibly the union.

Advantages of Group Schemes

- i. It engenders closer cooperation in the group leading to team spirit.
- ii. Administratively simpler with far less recording of labor times, production rates etc.
- iii. Support workers not directly associated with production can easily be included in the scheme.
- iv. It greatly reduces the number of rates to be negotiated.
- v. It leads to more flexible working arrangements within the group.

Disadvantages of Group Schemes

- i. It is less direct than individual schemes and so may not provide the same incentive.
- ii. Less hardworking members of the group receive the same bonus with those working hard and this may create friction.
- iii. It is not always easy to obtain agreement on proportions of bonus which group members will receive.

4.3 Incentive Schemes in Practice

A significant portion of production workers are paid under some form of incentive or bonus scheme and there is no doubt that some schemes are extremely effective. Many others are not and recognition of some of the following problems will help to ensure a workable and efficient scheme.

- i. An incentive scheme will not solve the problems of badly managed, poorly organized, ill-equipped firms.
- ii. To ensure only good production is paid for, sound quality control and inspection procedures are vital.
- iii. All incentive schemes should be based on efficient working methods following comprehensive work studies
- iv. Care should be taken not to enter into sham productivity schemes where pay increases does not result into improved productivity.

Profit Sharing

Profit sharing is part of the benefits package that employees could receive. The amounts received by individuals are usually related to their salary or wages and the profit share may be given in cash or shares of the company. In the latter case the system becomes a form of co-ownership. Profit shares are sometimes huge and larger than the employees' normal salaries.

4.4 Trends in Labor Costing

In the past costs was a major proportion of total cost. This meant that it was worthwhile carrying out a thorough analysis of labor costs and making necessary detailed accounting entries.

The position today is very different, factories are highly automated and labor is a small (and reducing) proportion of total cost. In this circumstance simpler systems are being used for labor with some companies eliminating direct labor accounting completely and showing labor costs together with direct overheads.

4.5 Labor Recording, Costing and Allied Procedures

Labor Records

In most manufacturing companies and for many in the service sector, records of attendance time for each worker are required whatever the system of remuneration. In addition, if an incentive scheme is used, records may be required for operations, processes, parts, time, quantities, sales made, enquiries handled or whatever is used as the basis for the incentive scheme.

These records for the basis of wage calculations and for such costing data as: direct and indirect labor costs, overhead build-up, labor cost control. In many cases now days the recording is done electronically and not by using traditional forms and paperwork. The recording may be done by entries on terminals, automatic counting or weighing or by various forms of scanning using bar codes. Whatever the recording methods used the principles and objectives remain the same.

The two types of records; those for attendance and those for output are described below:

Attendance Records

In all but very small concerns this is done by use of clock cards, one for each worker, and a time recording clock usually based at the entrance to the premises. The clock card is the basis of time recording and whatever additional time records are kept, they must be reconciled with the total attendance and time recorded on the clock card by the time recording clock.

With the increased use of technology more recording systems are now electronic instead of mechanical but, of course, have similar objectives. Electronic systems are based on the use of plastic cards with magnetic strips which are issued to employees. These cards are suitable for firms which adopt flexible- time working. This is where employees are required to attend for a minimum number of hours each day- often within specified hours- but outside of this they may work at times to suit themselves provided they accumulate the agreed number of hours per period. Obviously, flexible-time working is more suited to clerical and administrative staff rather than production workers.

Output Records

The records necessary must be tailored to the requirements of incentives and labor cost control systems in operation. Unnecessary recording incurs extra clerical costs and may slow down production and should be avoided. The following are typical records found in many manufacturing companies:

- Daily and weekly time sheets
- Job cards
- Operation cards

Daily and Weekly Time Sheets

These are records, filled in by the worker and countersigned, which show how he spent his time during the day or week. The general objective is to reconcile all the time in attendance with time bookings either to jobs or operations.

Weekly time sheets tend to be less accurate but require less clerical effort. It really depends on whether the worker deals with numbers of small jobs, when daily time sheets would be preferred, or is employed on jobs which last a considerable time when weekly sheets may be adequate.

Job Cards

Unlike time sheets which relate to individual employees and may contain bookings relating to numerous jobs, a job card relates to a single job or batch and is likely to contain entries relating to numerous employees.

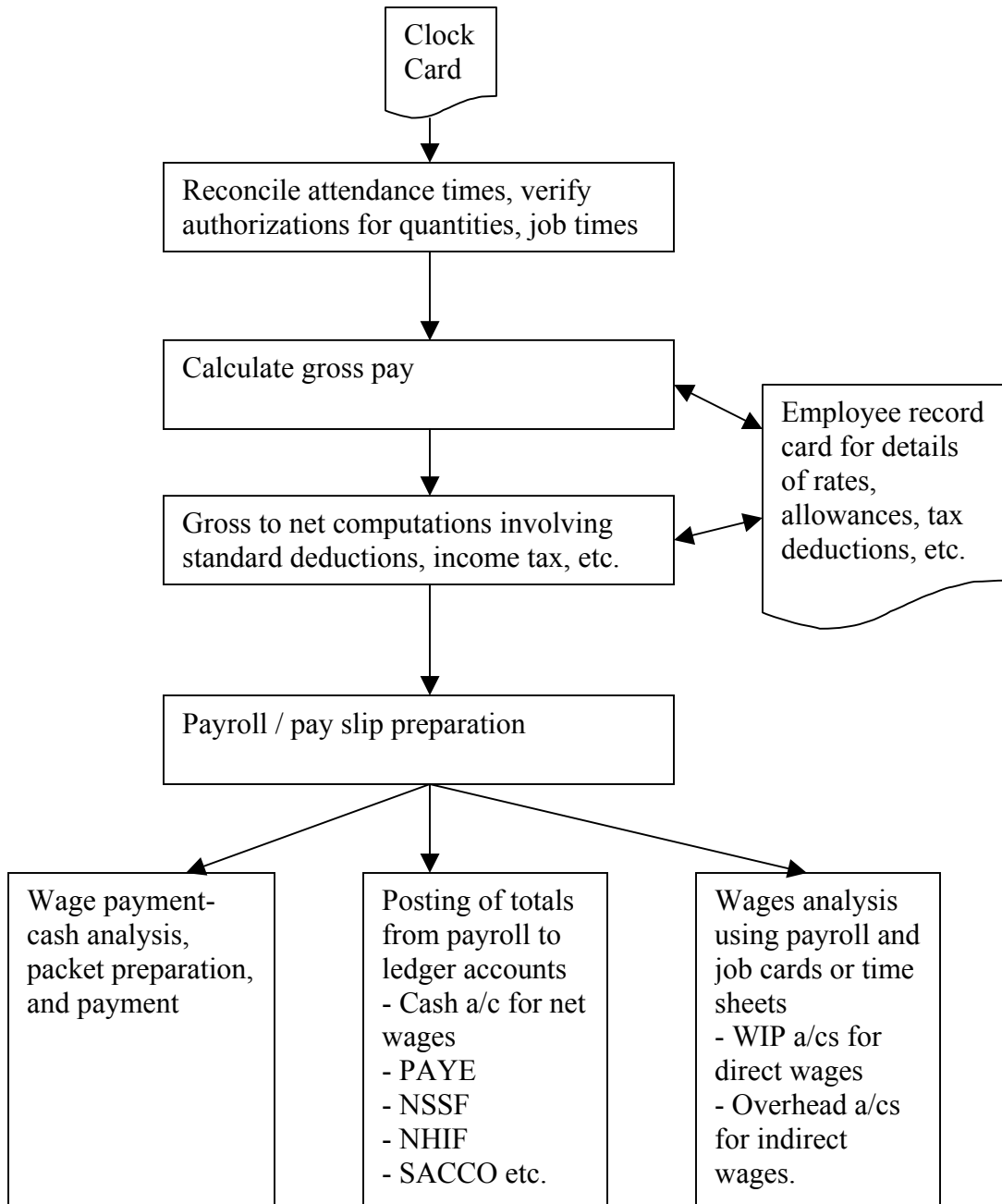
On completion of the job it will contain a full record of the times and quantities involved in the job or batch. The use of job cards, particularly for jobs which over several weeks, makes reconciliation of work time and attendance time a difficult task. These cards are difficult to incorporate directly into wages calculation procedures.

Operation Cards

These cards, sometimes known as piecework tickets, are provided for each operation or stage of manufacture so that each operation will have at least one card. In this way a job will have a number of operation cards and although this increases the paperwork, it does enable the operation cards to be used directly in the wage calculation procedures.

Wages Procedures

The flowchart below shows an outline of wages procedures from the original clock card to basic cost accounting entries.



Costing of Labor

Using job cards and / time sheets or output records and the payroll, the cost department carries out a detailed analysis of all wages paid to enable the labor costs for products,

operations, jobs, cost centers and departments to be established. This is done for cost ascertainment and cost control purposes.

Direct wages- that proportion of wages of production employees directly attributable to production is charged to the job or operation in which engaged and the total of direct wages for the period is charged to a departmental W-I-P control A / C.

Direct wages would normally exclude overtime and shift premiums. The reason for this is that such premiums, if classed as direct, would be charged only against the job done during the overtime period which is unjust because it is fortuitous which jobs are done during ordinary or overtime.

Indirect wages- the wages of such people as inspectors, stores assistants, clerks and laborers would be coded to the appropriate department to form part of overheads of that department. In addition, the proportion of production workers wages which can not be classed as direct, e.g. idle time, overtime and shift premium would also be classified as indirect included in overheads and subsequently absorbed into production costs via the appropriate overhead absorption rates.

Labor cost control- the cost department activities described above provide the raw data for cost ascertainment and also for cost control purposes. Cost control at its simplest will show various comparisons, for example, direct and indirect wages, compared with the same classifications in previous periods. The simplest way to analyze is to use ratios. In this way, the trends of labor costs will be shown and may give some guidance to management on cost control.

Other Factors Related to Labor Costing

Wages Determination

In determining the appropriate wages, numerous factors are involved. The weight of these factors varies from Firm to Firm and includes:

- i. general economic conditions in industry
- ii. government policy, e.g. the minimum wages acceptable
- iii. profitability of the firm
- iv. the union strength
- v. Employment condition of the country.
- vi. Cost structure of the firm and industry. If labor costs constitute a high proportion of the total cost, the firm may not be willing to pay higher wages.
- vii. Strategic importance of the firm or industry.
- viii. Availability of workers with required skills.
- ix. The nature of the job environment. Hazardous or dangerous working conditions might force the Firm to pay higher wages. In Japan, for example, Jobs labeled as 3K (i.e. Dangerous, Dirty, and Difficult) cost more wages on average.

- x. Wages prevailing locally and nationally.

Job Evaluation

This is a technique which seeks to show in a reasonably objective manner the relative worth of jobs. It attempts to do this by analyzing the content of each job under various categories, e.g. training required, degree of responsibility, working conditions, and types of decisions involved and so on. Scores or points are given for each factor. The total of the points for each job is then used to establish the ranking of one job to another and, by reference to pay scales.

Advantages

- i. It makes an attempt to be objective in ranking jobs.
- ii. It is reasonably effective within an organization at ranking jobs.

Disadvantages

- i. It is not suitable for ranking widely different jobs.
- ii. The job evaluation process is subjective.

Note:

- Job evaluation studies the job and not the person doing the job.
- Job evaluation is only one factor amongst many in determining the actual pay for the job.

Merit Rating

Unlike job evaluation, merit rating is concerned with the individual employee. It seeks to rate the employee's performance to assist in determining whether a person should receive a merit award, promotion, or demotion. It does this by considering performance and attributes of an employee under various categories, for example, initiative, attendance, accuracy, willingness, etc. and giving the number of points for each factor. Merit rating under various guises is frequently encountered in staff appraisal schemes, particularly in large firms, and is considered to be of value in providing a reasonably standard basis to difficult task of individual appraisal.

The Human Resource Function

Most firms have human resource departments. These departments normally perform the following functions:

- i. Advertising, recruiting, and engaging labor.
- ii. Discharge, transfer, administration of appraisal schemes.
- iii. Industrial relations and union negotiations.
- iv. Maintenance of personnel records and provision of statistical information to government departments, trade associations, etc.
- v. Provision of information to management on such matters as absenteeism, lateness, labor turnover, normal and overtime worked, etc.
- vi. Staff development, training, educational schemes, and apprenticeships.
- vii. Welfare, sports and social facilities.
- viii. Safety and medical facilities.
- ix. Manpower planning and forecasting

In general, the personnel function has the responsibility of providing an efficient labor force which is cost effective and keeping labor turnover to a minimum.

Labor Turnover and its Implication

Labor turnover (LT) is usually expressed as a ratio:

$$LT = \frac{\text{Number of employees replaced per period}}{\text{Average total number of employees in the period}}$$

Although some labor movements are of value, high LT rates destroy morale, increases costs and reduce productivity. People leave jobs for a variety of reasons, some of which are avoidable, and it is imperative to analyze the reasons for labor turnover. The causes may be one or a combination of the following factors:

- Redundancy
- Dissatisfaction over prospects, pay, hours, conditions.
- Lack of career structure.
- Lack of training or day release.
- Personal advancement.
- Marriage, pregnancy.
- Retirement.
- Discharge.
- Move from locality.
- Changes in domestic circumstances.

The implication of high labor turnover higher costs in terms of:

- Leaving costs- the costs of conducting fresh interviews, and disruption of output.
- Replacement costs- the costs of advertising selection, personnel department procedures.
- Training costs- the costs of required internal and external courses.

- Learning costs- slower initial production, increased wastages of material, tool breakages, increased accident rates, and poor service.

Self Review Questions

1. What are the two major categories of remuneration methods?
2. In what circumstances is the use of the high day rate system appropriate?
3. What bonuses are commonly encountered in conjunction with time based remuneration schemes?
4. What factors should be considered when designing incentive schemes?
5. What are the objectives of differential piecework systems?
6. In what circumstances are group incentives most appropriate and what are their shortcomings?
7. What is profit sharing?
8. What is a clock card?
9. Why are job cards difficult to incorporate into wages procedures?
10. Describe the steps of wage procedure.
11. Are overtime and shift premiums normally included in direct wages? Explain.
12. Give some examples of reports that might assist labor cost control.
13. What are some of the factors in wage determination?
14. What is the objective of job evaluation?
15. What is merit rating?
16. What are the functions of the personnel department?
17. What is labor turnover? How is it calculated?
18. A new incentive scheme has recently been introduced and the first period's results have been analyzed. After studying the results the chief executive has said that although he was pleased to see increase in production he was disturbed to see that the average labor cost per unit has increased. In view of this it was his opinion that the scheme should be discontinued. You are required to reply to the chief executive's comments.
19. A worker is paid by differential piecework. The scheme is as follows:

Up to 50 units per day	50 Cts per unit
51 to 70 units per day	60 Cts per unit
71 to 80 units per day	65 Cts per unit
81 to 100 units per day	70 Cts per unit
101 and over units per day	80 Cts per unit

His daily outputs for a five day week were as follows:

Monday	68 units
Tuesday	83 units
Wednesday	59 units
Thursday	103 units
Friday	47 units

Required: Calculate his gross pay for the week.

20. A firm's basic rate is Sh. 8 per hour and overtime rates are time and half for evenings and double time for weekends. The following details have been recorded on three jobs.

	Job 1	Job 2	Job 3
	Hours	Hours	Hours
Normal time	480	220	150
Evening time	102	60	80
Weekend	10	30	16

You are required to calculate the labor cost chargeable to each of the jobs in the following circumstances:

- i. Where overtime is worked occasionally to meet production requirements.
- ii. Where overtime is worked at the customer's request to bring forward the delivery time.
- iii. In order to avoid criticism for spending too long on a job some production workers have been incorrectly classifying part of the time spent actually working on the job as waiting time. What are the implications of this practice?

LESSON FIVE

5.0 OVERHEAD COSTING

Objectives

After studying this lesson you should:

- Understand the principles of overhead absorption and common bases used
- Be able to calculate under/over absorption
- Understand the principles of overhead apportionment
- Know how to deal with the overheads of service departments
- Understand depreciation and the main methods used
- Be able to describe how overheads are dealt with in activity-based costing
- Know how to calculate and use cost driver rates

5.1 Overhead Absorption

Overhead absorption is the process by which overheads are included in the total cost of a product. It is a means of attributing overheads to a product or service based on direct labor hours, direct labor cost or machine hours.

The terminology definition given above relates to the traditional production volume based approach to overhead absorption not to activity-based approach. The traditional approach is described first and afterwards activity-based costing will be discussed.

Overhead absorption becomes of great importance when dissimilar products are made which require different production processes or for jobs which, although using identical facilities, occupy the facilities for varying length of time. It is of importance in these circumstances because the overheads absorbed into the product or job places upon the production facilities.

To determine the overhead to be absorbed by a cost unit, it is necessary to establish an overhead absorption rate (OAR) which is calculated by using two factors: the overheads attributable to a given cost centre and the number of absorption base (labor hours, machine hours, etc.) that is deemed most suitable; thus

$$\text{OAR for cost centre} = \frac{\text{Total overheads of cost centre}}{\text{Total number of units of absorption base applicable to cost centre}}$$

The total overhead of a cost centre are established by the processes of a cost allocation and cost apportionment. The various absorption bases are described below:

5.2 Bases of Absorption

The objective of overhead absorption process is to include in the total cost of a product an appropriate share of the firm's total overheads. An appropriate share is generally taken to mean an amount which reflects the efforts and time taken to produce a unit or complete a job. In the unlikely event of identical products being produced by identical processes for the whole of a period, the total overheads could be shared equally amongst the products. To cope with the practical situations various absorption bases have been developed.

Illustration:

Assume the following information relate to the production cost centre of a certain product:

Total overheads for the period	Sh. 12,000
Total direct labor hours for the period	1,600
Total direct wages	3,200
Total direct materials used	6,000
Total machine hours	2,400
Total units produced	90

Using these data the following absorption rates could be calculated using the OAR formula.

$$\begin{aligned}\text{Direct labor hour OAR} &= \frac{\text{Sh. 12,000}}{1,600 \text{ hrs}} \\ &= \text{Sh. 7.50 overheads per labor hour}\end{aligned}$$

$$\begin{aligned}\text{Direct wages OAR} &= \frac{\text{Sh. 12,000}}{\text{Sh. 3,200}} \\ &= \text{Sh. 3.75 overheads per Sh. of wages.}\end{aligned}$$

$$\begin{aligned}\text{Direct material OAR} &= \frac{\text{Sh. 12,000}}{\text{Sh. 6,000}} \\ &= \text{Sh. 2.00 overheads per Sh. of materials.}\end{aligned}$$

$$\begin{aligned}\text{Prime cost OAR} &= \frac{\text{Sh. 12,000}}{\text{Sh. 9,200}} \\ &= \text{Sh. 1.30 overheads per Sh. of prime cost.}\end{aligned}$$

$$\begin{aligned}\text{Machine hour OAR} &= \frac{\text{Sh. } 12,000}{2,400 \text{ hrs}} \\ &= \text{Sh. } 5.00 \text{ overheads per machine hour.}\end{aligned}$$

$$\begin{aligned}\text{Cost unit OAR} &= \frac{\text{Sh. } 12,000}{90 \text{ units}} \\ &= \text{Sh. } 133.00 \text{ overheads per unit produced.}\end{aligned}$$

Using the Calculated OAR

When it has been decided what is the most appropriate rate to use for a given cost centre, the OAR is used to calculate the cost of a cost unit as in the following example.

A cost unit X has been produced in a cost centre and the following details recorded.

Cost unit X	
Direct materials used	Sh. 23.00
Direct wages	27.50
Direct labor hours	12.00
Machine hours	17.00

Assuming that it has been decided that the direct labor rates is the most appropriate method to use, calculate the cost unit using the data given.

Solution:

Direct materials used	Sh. 23.00
Direct wages	<u>27.50</u>
Prime cost	50.50
Overheads (12 hrs @ Direct labor hours	
Labor hour OAR of Sh. 7.50 per hour	<u>90.00</u>
	<u>140.50</u>

In practice, the most appropriate OAR for a given cost centre is decided upon and used for all the cost calculations of units passing through that cost centre. Different cost centers may well have different absorption bases and the factors influencing the choice will depend on circumstances surrounding each case.

Note:

- In practice only one base of overhead absorption is used. (one that is viewed to be the most appropriate)
- The various absorption bases produce substantially different amounts of overheads to be absorbed into cost unit.

- The wide range of overheads possible shows that there is no single, accurate cost. All costs are based on conventions and judgment.

For product X, the following different overheads can be obtained using the various OARs based on direct labor, direct wages, direct material, prime cost, machine hour, and cost unit.

Absorption base	OAR	units	calculation	overhead absorbed
Direct labor hour	7.50 per hr	12	12×7.5	Sh. 90
Direct wages	3.75 per Sh.	27.5	27.5×3.75	Sh. 103.125
Direct material	2.00 per Sh.	23	23×2	Sh. 46
Prime cost	1.30 per Sh.	50.50	50.5×1.3	Sh. 65.65
Machine hour	5.00 per hr	17	17×5	Sh. 85
Cost unit	133 per unit	1	1×133	Sh. 133

Direct Labor Basis

Overhead absorption rate based on direct labor is most appropriate in a labor intensive cost centre and, providing the time booking system is good, easy to use. However, most production now days involve substantial use of machinery so the labor hour method may become increasingly inappropriate.

Machine Hour Basis

This method is most appropriate in merchandised cost centers. In such cost centers many of the overheads are related to machinery (power, repairs, depreciation, etc.), so a machine hour basis rate should reflect fairly accurately the incidence of the overheads.

Direct Wages Basis

This is a frequently used rate in practice and is easy to apply. Direct wages paid are related to time, but because of varying rates paid to different personnel, piecework, and bonus systems, there is no exact correlation between wages paid and time elapsed. If there was only one rate per hour paid throughout a cost center and no form of incentive scheme, and then directs wages system would give identical results to the labor hour basis. This is rarely the case.

Direct Material Basis

This method if used could lead to absurd anomalies. Different quality of material has different prices yet they undergo virtually the same processing procedures. If overheads are absorbed based on the direct material cost, more overheads will be allocated to high quality material even if they undergo the same processes as the low quality material.

Prime Cost Basis

Although part of the prime cost is time related (direct wages), the inclusion of the direct material element would lead to possible anomalies prevalent in the direct material method.

Cost Unit Basis

Provided all the units produced are identical, with identical production processes and time, this absorption method would give accurate results. However, such circumstances are unlikely; therefore, the use of this method is limited.

Choosing the Appropriate Base

The factors to be considered in the choice of an appropriate base are given below, but it should be noted that the final choice is a matter of judgment and common-sense. There is no rule of the thumb regarding what OAR should be applied in a given situation. What is required is an absorption rate which realistically reflects the characteristics of a given cost centre and which avoids undue anomalies.

There is general acceptance that the time based method (labor hours, machine hours, and to a lesser extent direct wages) are more likely to reflect the load on a cost centre and hence the incidence of overheads.

Predetermined Absorption Rate

Absorption rates of overheads are always predetermined. This means that the overhead absorption rate (OAR) is calculated prior to the accounting period, using estimated or budgeted figures for overheads and units of absorption base chosen. Thus the formula for predetermined OAR will be:

$$\text{Predetermined OAR for cost centre} = \frac{\text{Budgeted total overheads for cost centre}}{\text{Budgeted total number of units of absorption base}}$$

The major reason for this procedure is that the actual overheads and actual number of base units are not known in total until the end of the period and the actual OAR could not be calculated until then. This would mean that the product costs could not be calculated until the end of the period. This would in turn create delays into procedures such as

invoicing and estimating. Because of this disadvantage, absorption rates are based on predetermined rates.

Under or Over Absorption

Using predetermined rates, overheads are absorbed into actual production throughout the accounting period. Because predetermined rates are based on estimated production and estimated overheads, the overheads absorbed by this process do not agree with the actual overheads incurred for the period. If the overheads absorbed are greater than actual overheads, this is known as *over absorption*. Conversely, if absorbed overheads are less than actual overheads, this is known as *under absorption*. The following example shows how to calculate the amount of overheads under or over absorbed.

Following data relate to production at a cost centre Q12:

	Budgeted	Actual
Overheads	Sh. 12,000	Sh. 12,624
Direct labor hours	1,600	1,584
Direct wages	Sh. 3,200	Sh. 3,410
Direct materials	Sh 6,000	Sh. 5,984
Machine hours	2,400	2,344
Units produced	90	92

The predetermined overhead absorption rate for direct labor hours is Sh. 7.5 per hour (refer previous example on calculation of overheads absorption rates). The total overheads absorbed by actual activity of 1,584 labor hours = $1,584 \times 7.5 = \text{Sh. } 11,880$ of overheads absorbed into production, but actual overheads were Sh. 12,624 thus in this example, overheads were *under absorbed*.

$$\begin{aligned}\text{Under absorbed overheads} &= 12,624 - 11,880 \\ &= \text{Sh. } 744\end{aligned}$$

note:

It will be observed that under (or over) absorption can arise from either actual overheads differing from budget or a difference between the actual and budgeted amount of the absorption base or a combination of these two factors.

Dealing with Under and Over Absorption

The budgeted figures used for calculating the predetermined OAR's are based on the expected levels of production and overhead. There are many factors which cause actual results to differ from those expected and it must be realized that it is the actual costs and overheads which determine the final profit. This means that the total of actual costs must appear in the final profit and loss account and not merely those calculated product costs which include prime cost plus overheads based on predetermined OAR. Accordingly, the amount of under absorbed overheads should be added to total costs before the profit is

calculated and conversely the amount of over absorbed overheads should be subtracted from total cost.

Total Production Cost = Actual direct Material + actual direct labor + absorbed overheads + under absorption or - over absorption

Using the example of production center Q12, the total production cost will be:

$$5,894 + 3,410 + 11,880 + 744 = \mathbf{21,928 \text{ (to be posted to the P\&L a/c)}}$$

note:

- The actual direct costs for each cost unit would be immediately available from the labor and material booking system for the job card.
- The under or over absorption of overheads can only be established when the actual overheads will be known.
- Although eventually appearing in a profit and loss account or operating statement, the under or over absorption is sometimes put to a monthly suspense account as an intermediate stage and the net balance taken to P&L at the year end.

Absorbing Non-Production Overheads

The example of absorption bases discussed so far relates to production overheads. However, a significant proportion of overheads of a typical company are non production overheads, e.g. selling and marketing overheads, research and development overheads, distribution overheads, administrative overheads, etc. these overheads also form part of total cost of a cost unit and have to be absorbed or charged into the profit and loss account. Although the absorption bases for production overheads appear to have some rationale, the methods in common use for non-production overheads unfortunately are somewhat arbitrary. The different methods used are given below, but it must be emphasized that provided a given method is used consistently by an organization, the choice of the method is probably not important except where costs are used as the basis of pricing. In such cases the choice of method may be important. The common bases of absorbing non production overheads are shown below:

Type of overhead	Absorption base(s) used
Selling and marketing	sales value or production cost
Research and development	production cost or conversion cost or added value
Distribution	production cost or sales value
Administration	production cost or conversion cost or added value

Conversion cost- production cost less the cost of direct materials.

Added value- sales value of a product less cost of bought materials and services.

The calculation procedure for non production overhead rates is the same as those of production overhead

Illustration

The following estimated figures have been established for product X.

Estimated selling and marketing overheads	Sh. 100,000
Estimated total sales value	Sh. 1,000,000

Selling and marketing predetermined OAR = Estimated overheads / Estimated sales value

$$= \text{Sh. } 100,000 / 1,000,000$$

$$= 10 \text{ cts / Sh. of sales or } 10\% \text{ of sales value.}$$

Recording Overheads to Production

The process where total overheads are absorbed into production is known as absorption costing. The absorption of total overheads into product costs has implications for performance measurement, cost control, and stock valuation. The process of absorption costing has been subjected to criticism by managers and accountants. The criticism arises from the fact that overheads contain fixed costs which do not change when the level of activity changes and which would still have to be paid if there was no activity. To overcome some of the difficulties, an alternative method of costing has been developed, known as marginal costing, which, although using the process of absorption, excludes fixed costs from the absorption process.

The conventional method of establishing overheads and absorbing them into production follow the following stages:

- Stage 1. Cost elements
The raw data relating to labor, materials, and expenses are gathered from invoices, payroll, goods issued notes and requisitions.
- Stage 2. Coding
All the raw cost data needs to be classified and then coded in respect of the type of expense and location. This process is fundamental to all the costing and management accounting procedures.
- Stage 3. Cost Analysis
Where discrete items of cost can be allotted to cost centers this is termed as *allocation*. Where the cost has to be spread or shared over several cost centers, this is known as *apportionment*. The bases of apportionment could

be the floor area, volume or space occupied, number of employees in each cost centre, weights of material, etc.

- Stage 4. **Service Cost Centers**
 These are cost centers which provide a service to production cost centers. Examples are maintenance, stores and boiler house,. Their costs are building up by the usual process of allocation and primary apportionment and then their total costs are apportioned (secondary apportionment) over the production cost centers, thus forming part of the production overheads which are absorbed into the cost units produced.
- Stage 5. **Production Cost Centers**
 These are cost centers involved directly in production processes. For example the assembly shops, drilling machines, spray shop, etc.
- Stage 6. **Overhead Absorption**
 The overheads of each cost centre are absorbed into the costs of the units produced, usually in proportion to the time involved i.e. by the labor hour or the machine hour rate.

Service Cost Centers

Since no production cost units pass through the service cost centers, it is necessary to apportion the service department costs to the production cost centers so that all production costs are absorbed into production. The bases for apportioning service costs to production departments are as follows:

Service department	possible bases of apportionment to production cost centers
Maintenance	Maintenance labor hours Maintenance wages Plant values
Stores	No. of requisitions Weight of materials issued
Inspection	No. of production employees per cost centre No. of inspection tickets No. of jobs
Production control	No. of production employees per cost centre No. of jobs
Power generation	Material usage Notional capacity Technical estimate

Personnel department No. of employees per department

Note:

- The basis chosen should be one that is judged to be the most equitable way of sharing the service department's costs over departments which use the service. This May mean that a particular and unique basis of apportionment may have to be derived. It must reflect the use made of the services provided.
- Wherever possible, service department costs should be charged directly (allocated). For example the costs of maintenance wages and materials. When a maintenance job is done for a department, the wages and materials used would be charged directly to the department concerned. In this way only the unallocated service department costs need to be apportioned.

Illustration

Prepare an overhead analysis using the following data and calculate suitable overhead absorption rates for the milling, assembly, and spraying departments. The data relate to one accounting period.

Basic data:

	Production cost centers			Service cost centers		Totals
	Milling	Assembly	Spraying	Stores	Maintenance	
No. of employees	60	150	50	12	28	300
Labor hours	3,020	6,640	1,900	504	1,190	13,584
Plant & machinery (Sh)	450,000	150,000	90,000	34,000	170,000	894,000
Area (m ²)	15,000	20,000	7,000	1,000	2,000	45,000
Material requisitions	2,800	600	500	-	1,100	5,000
Other maintenance hrs	150	60	90	-	-	300
KWH ('000)	600	140	100	20	340	1,200
Machine hours	16,800	2,200	600	-	-	19,600

During the period the following data were recorded:

	Indirect Materials (Sh)	Indirect labor (Sh)	Major maintenance work (Sh)
Milling	5,000	10,500	37,000
Assembly	2,000	5,000	15,000
Spraying	3,000	4,500	9,000
Stores	6,00	8,500	-
Maintenance	3,400	23,500	-
Total	14,000	52,000	61,000

In addition, the following details were obtained from the accounts department relating to the period:

	Sh
Fire insurance	2,500
Power	9,000
Heating and lighting	4,000
Rates	3,600
Machine depreciation	16,800
Machine insurance	1,700
Canteen deficit	8,500
Balance of maintenance costs exclusive of major works	35,000

Overhead analysis (*amounts in Sh*)

Overhead item	Apportionment basis	Totals	Production cost centers			Service cost centers	
			Milling	Assembly	Spraying	Stores	maintenance
Allocated items							
Indirect material		14000	5000	2000	3000	600	3400
Indirect labor		52000	10500	5000	4500	8500	23500
Major maintenance		61000	37000	15000	9000	-	-
Apportionment items							
Fire & machine insurance	Plant values	4200	2112	706	424	158	800
Power	KWH	9000	4500	1050	750	150	2550
Heating & lighting	Floor area	4000	1334	1778	622	88	178
Rates	Floor area	3600	1200	1600	560	80	160
Machine depreciation	Plant values	16800	8454	2822	1694	632	3198
Canteen deficit	No. of employees	8500	1700	4250	1416	340	794
	Totals	208100	89412	40086	25494	11864	41244
Secondary apportionment							
Stores	Material requisitions		6644	1424	1186	(11864)	2610
Maintenance	Plant values		28600	6212	5720	-	(43854)
Total production overheads	dept.	208100	124656	51044	32400	-	-
Overhead absorption basis			Machine	Labor	Labor		
Overhead absorption rates			124656/16800 = 7.42 per machine hr	51044/6640 = 7.69 per labor hr	32400/1900 = 17.05 per labor hr		

Note:

- All apportionment's follow a similar principle. For example, the total fire and machine insurance of Sh 4,200 is divided by the total plant value of Sh 894,000 which is then multiplied by the value of plant in each cost centre.
- The secondary apportionment is carried out using a net plant value of Sh 690,000 (i.e. less the values in stores and maintenance).

5.3 Service Departmental Costs

There are three categories of service departmental costs:

- Service departments that work for cost centers only.
- Service departments that work for cost centers and other service departments as well.
- Service departments that work for other Service departments only.

Service departments for cost centers only

Total service department costs are easily arrived at by the usual process of allocation and primary apportionment from the raw data.

Service departments that work for cost centers and other service departments as well

A particular problem arises where two or more service departments work for each other as well as for production. For example, assume that Maintenance (M) does work for Stores (S) and stores supply items to Maintenance. The total cost of M cannot be ascertained until the charge for S's service is known, and similarly the total cost of S cannot be found until the charge for M's work is known.

Some way has to be found to break into this circular problem so as to be able to ascertain service department costs. This can be done by three methods: continuous allotment, elimination, and using simultaneous equations.

Illustration:

A small factory has two service departments, Maintenance (M) and Stores (S) and three production departments (P_1 , P_2 , and P_3). The service departments provide services for each other as well as for the production departments and it have been agreed that the most appropriate bases of apportionment for service department costs are: capital equipment values for maintenance and number of requisitions for stores.

The overheads applicable for each department following allocation and primary apportionment are:

Department	Overheads in Sh.
M	13,600
S	5,400
P ₁	24,000
P ₂	39,000
P ₃	52,000
Total	134,000

Data for apportionment of service Department overheads

	M	S	P ₁	P ₂	P ₃
Capital values	30,000	20,000	100,000	152,000	128,000
Proportion	-	5%	25%	38%	32%
No of req.	1,800	-	4,800	3,240	2,160
Proportion	15%	-	40%	27%	18%

req- requisitions

The above data are used for each of the solution methods described below:

The Continuous Allotment Method

The principle involved in this method is that the appropriate proportion of the costs of the first service department are allotted on the second (i.e. 5% of M to S), then the appropriate proportion of the second department is allotted back to the first department (i.e. 15% of S to M) and so on until the amounts allotted to and fro become insignificant.

	Department M Sh	Department S Sh
Original allotment	13,600	5,400
5% of 13,600 to S		<u>680</u>
		6,080
15% of 6,080 to M	912	
5% of 912 to S		46
15% of 46 to M	6	
(5% of 6 to S are insignificant)		
Total	14,518	6,126

The notional service department overheads, i.e. Sh 14,518 and Sh 6,126 are then used in the secondary allotment as shown below:

	Departments				
	M	S	P1	P2	P3
Original allotment	13600	5400	24000	39000	52000
Apportionment of M Overheads	(14518)	726	3630	5516	4646
Apportionment of S Overheads	918	(6126)	2450	1654	1104
Total	Nil	Nil	30080	46170	57750

The Elimination Method

This is a simpler method which apportions in turn service department costs to users. Once a service department's costs have been apportioned the department is eliminated from further apportionments. This means return charges from other service departments do not arise and therefore the effects of reciprocal servicing is ignored. The sequence in which departments are eliminated can be related to either the amounts involved or the number of departments serviced. Using the same data as for illustration 1.0 above, apportionment will be as follows:

	Departments				
	M	S	P1	P2	P3
Original allotment	13600	5400	24000	39000	52000
Apportion total of M And eliminate M	(13600)	680	3400	5168	4352
Apportionment of S And eliminate S		(6080)	2860	1932	1288
Total	Nil	Nil	30260	46100	57640

Note:

- M was eliminated first as the larger amount was involved.
- The apportionment of M is in the original proportions (i.e. 5%, 25%, 38%, and 32%)
- When M is eliminated, the apportionment of S becomes 40:27:18 to P1, P2, and P3 respectively.

Simultaneous Equations

This method is also referred to as algebraic method. It utilizes an equation for each service department and solves these equations by conventional methods. Using the same illustration;

Let M = total overheads for maintenance when the stores charges have been allotted.

S = total overheads for stores when maintenance charges have been allotted.

$$M = 13600 + 0.15S$$

$$S = 5400 + 0.05M$$

Rearranging the equations we obtain

$$M - 0.15S = 13600 \dots\dots\dots (i)$$

$$-0.05M + S = 5400 \dots\dots\dots (ii)$$

multiply equation (ii) by 20

$$M - 0.15S = 13600 \dots\dots\dots (i)$$

$$-M + 20S = 108000 \dots\dots\dots \text{new } (ii)$$

adding equation (i) and (ii) we obtain:

$$19.5S = 121600$$

$$S = 6126$$

$$\begin{aligned} \text{Therefore, } M &= 13600 + 0.15 * 6126 \\ &= 14519 \end{aligned}$$

Having obtained the values for M and S , the secondary apportionment can take place. The values obtained for M and S , are the same as those for continuous allotment method.

Service Department Working for Other Service Departments

Where a service department provides a service to another service department, for example stores to maintenance, it is necessary to apportion the providing departments costs before that of receiving department. In the example given, stores costs would be apportioned to maintenance, then the maintenance department's costs would be apportioned between the various production cost centers. The reason for this is that the total cost of maintenance department must include an appropriate charge for stores issue received.

Depreciation

Most of the items classified as overheads e.g. rent, rates, indirect labor, and materials, office expenses, electricity and heating charges, have their values externally determined (e.g. the landlord fixes the rent, the local authority fixes the rates etc.). However, depreciation is a major item of overhead cost that is determined internally. Depreciation determination involves the measure of the cost of a fixed asset that has been consumed during the period. Consumption includes wearing out, using up or other reduction in the useful economic life of a fixed asset due to usage, effluxion of time, or obsolescence.

The conventions of accounting for depreciation spread the cost of a fixed asset over its life and consequently over the production involved. A further difference between depreciation and overheads such as rates and salaries, is that it is a notional item of expense. (It does not involve actual cash outflow). The usefulness of depreciation is to enable the firm to include the cost of its assets in the products they produce. Since the cost of assets is normally huge and the life of these assets extends over a number of years, it is prudent to apportion a fraction of the total asset value each year to production. This apportionment is in the form of depreciation.

Depreciation methods are numerous and the one to be used depends on the appropriateness of that method to the assets of the firm. Basically, depreciation methods can be classified as *time based or volume based*. It is necessary to establish the total amount that needs to be charged to depreciation. This amount is termed as the *net asset cost* and is calculated as follows:

$$\text{Net asset cost} = \text{purchase price} + \text{installation} + \text{delivery costs} - \text{net scrap value.}$$

Other costs that can be claimed (such as VAT for registered organizations) should be deducted from the purchase price in order to reduce the net asset cost. The scrap value is the amount expected to be realized at the end of the useful life of the asset. Since the asset is to be sold after using it for a number of years, this amount is not known with precision but is a management estimate.

The main depreciation methods used are:

- Straight line method.
- Reducing balance method.
- Units of production method.

Plant Register

To be able to allocate and apportion depreciation charges, an up to date record of all assets must be kept. This is called a *plant register*. It contains the following details:

- Asset description, serial number, supplier details, and original cost.
- Technical data such as speeds, capacities, fuel usage.
- Location.
- Depreciation method applied, estimated life, residual value, and amounts written off, and written down value.
- Details of capital allowances and balancing charges.
- Disposal details.
- Major maintenance expenditure.
- Additions and enhancements.

Overhead Problems

There are some items to which special consideration should be given as to whether they form part of overheads or not.

i. Taxation

Taxation is regarded as an appropriation of profit and is omitted from routine costing systems. However, for many decision and planning purposes the effects of taxation are crucial. Therefore, taxes should be included in special studies and reports where appropriate.

ii. Value added Tax

VAT can be claimed (unless one is not registered) and therefore it should not be included in the case of registered firms. Where the firm is not registered, VAT paid forms part of the cost.

iii. Interest

There are problems in devising a practical scheme on how interest is to be calculated and included. Because of this, interest is normally not included in costing system.

5.4 Overheads and Activity Based Costing (ABC)

ABC has developed to deal with the shortcomings associated with conventional absorption costing. Traditional costing system absorbs overheads to production based on labor or machine hours even though many overheads vary, not with production volume but with the range and complexity of production.

Where overheads form a large proportion of total costs (a trend that is experienced currently), it is therefore important to trace overheads to production in a more realistic manner. This is done by collecting overheads into *cost pools* and using *cost drivers* to charge the product with a suitable amount of overheads in order to reflect its usage in supporting the production.

Under ABC, costs can be classified into:

- Short term variable costs
- Long term variable costs
- Fixed costs

Short Term Variable Costs

These are costs that vary with production volume such as power costs. The variability of these costs is directly related to production volume. These overheads should be traced to products using production volume based cost drivers as appropriate. For example, allocating of such overheads based on direct labor hours, machine hours, direct material cost or weight. There could be several cost drivers whenever labor hours, machine hours, and material cost are used in different proportions.

Long Term Variable Costs

These are overhead costs which do not vary with production volume but do vary with other measures of activity. For example, costs for support activities such as stock handling, production scheduling, set-ups etc, are fixed in the shorter term but vary in the longer term according to the range and complexity of products manufactured. In ABC these costs are traced to products by *transaction based cost drivers*.

Fixed Costs

These are classified as costs which do not vary for a given time period with any activity indicator. For example, the salary of the CEO, rent, security, etc.

Cost Pools and Cost Drivers

ABC focuses on what factors cause or drive costs. Cost drivers are any factors which cause a change in the cost of activity. For example, the quality of parts received by an activity is a determining factor in the work required by that activity and therefore affects the resources. An activity may have multiple cost drivers associated with it. Because of the possibility of multiple cost drivers, there is a difficulty in choosing the appropriate cost driver. No single rules exist pertaining to the selection of cost drivers and the best approach is to identify the resources that constitute a significant portion of the product.

Cost pools are point of focus for the costs relating to a particular activity. They are similar in principle to cost centers in traditional systems. Costs are pooled (collected) on the basis of the activity that drives the costs regardless of the departmental boundaries. For example, if the cost driver is the number of set-ups' then all the costs relating to setting-up will be pooled together. Cost pools are therefore not related to departmental boundaries and do not encompass the activities of one department only. Thus, cost pools are more than the number of departments present in an organization.

Illustration:

Departments	Major activities
Manufacturing	drilling, Forming, Assembly.
Engineering	maintenance, Product design, Tool design.
Quality control	inspection,

The development of ABC and the designation of cost pools and appropriate cost drivers are not merely a cost recording and cost attribution process. The system enables the management answer the following questions:

- What does the department achieve? Does it add value or it simply adds cost? Why is it needed? Can the firm do without the department?
- What causes the activity for which the department is responsible?

The appreciation of the ABC system is the fact that people can not manage costs but they can manage the activities that cause costs.

Selecting Cost Drivers

There should be a direct cause-effect relationship between consumption of overheads and the chosen cost driver. This relationship is not necessarily a short term one. Costs such as salaries make up a significant portion of total overheads but are not easily adjusted in the short run. The number and type of cost drivers chosen will depend on several factors such as:

- i. the required accuracy of product costing
- ii. The extent that a given cost driver captures the actual consumption of an activity by a product.
- iii. The extent to which a cost driver can be related to many activities or cost pools. The cost pool should be homogenous (fairly represented by one cost driver). Where this is not possible the pool may need to be subdivided and numerous cost drivers used. (of course this will complicate the system).
- iv. The extent that one cost can be fairly applied to diverse products. For example if the cost driver, 'number of inspections' were used to trace inspection costs to products, distortions will occur if inspections take varying amounts of time for different products.

Cost drivers and cost pools chosen must suit the organization. The choice of drivers and pools will therefore vary from one organization to another. The table below shows the activities and cost drivers that can be identified in an organization.

Activity	Cost driver
Customer order processing	No of orders
	No of customers
	Size of orders
	No of customer visits.
Production control	No of engineering changes
	No of machine layout changes
	No of operational parts
	No of personnel
	No of schedule changes
	Delivery performance
	No of production batches

	No of set-ups No of work orders
Material planning/Inventory control	No of parts No of deliveries No of material movement No of stock discrepancies No of shortages No of on-time movements No of schedule movements No of receipts Material weight/volume
Engineering support	No of set-ups No of engineering changes No of product changes No of production hours No of defects No of tool changes No of change notices No of breakdowns
Inspection and Quality control	No of inspections No of rejects Checking frequency No of parts No of suppliers No of receipts No of product changes Batch sizes No of customers General accounting
Number of suppliers or customers	Frequency of dispatches Frequency of deliveries No of invoices No of purchase/sales orders No on payroll No of accounting changes

Illustration of ABC calculation

Tri-Star Company has introduced an ABC system of costing and has classified its main activities into cost pools. Cost drivers have been selected for each cost pool as shown below:

Cost pool	Cost driver
Material procurement	No of orders
Material handling	No of material movements
Set-ups	No of set-ups
Maintenance	No of maintenance hours
Quality control	No of inspections
Machinery (power, depreciation, etc.)	No of machine hours

The following data is available for the period:

Cost pool	Budgeted Overhead Sh 000's	Budgeted volume
Mat. Procurement	1100	4,500 orders
Mat. Handling	1850	2750 movements
Set-up	900	525 set-ups
Maintenance	2650	21000 maintenance hours.
Quality control	2300	8500 inspections
Machinery	3600	125000 machine hours.

Given that a batch of 4200 part No Y22 with a direct cost (material and labor) of Sh 363500 and usage of activities as follows:

Material orders	84
Material movements	49
Set-ups	22
Maintenance hours	610
Inspections	90
Machinery hours	1060

Required:

Determine the cost of the batch using ABC

Solution:

Budgeted overheads and cost driver volumes are as follows:

Cost pool	Budgeted Overhead 000's	Cost driver	Budgeted volume	Cost driver rate
Mat. Procurement	1100	No. of orders	4,500	1100/4500 =
244/order				
Mat. Handling	1850	No. of movts.	2750	1850/2750 =
673/movt.				
Set-up	900	No. of set-ups	525	900/525 = 1714/set-up
Maintenance	2650	Maint. Hrs.	21000	2650/21000 = 126/hr.

Quality control	2300	No. of insp.	8500	2300/8500 =
271/insp.				
Machinery	3600	No. of Mach hrs	125000	
3600/125000 = 28.8/hr.				

Cost of Batch Y22		Sh	Sh.
Direct costs			363,500
Material order costs	84 @ 244	20,496	
Material movements	49 @ 673	32,977	
Set-ups	22 @ 1714	37,708	
Maintenance hours	610 @ 126	76,860	
Inspections	90 @ 271	24,390	
Machinery hours	1060 @ 28.8	<u>30,528</u>	<u>222,959</u>
Batch cost			<u>586,459</u>

Self Review Questions

1. What is the objective of overhead absorption?
2. Give six examples of overhead absorption bases.
3. What factors govern the choice of absorption base?
4. When is the direct labor hour basis or machine hour basis of overhead allocation most appropriate?
5. Why are absorption rates pre-determined?
6. How does over/under absorption arise?
7. What is a service cost centre?
8. Give six examples of bases of apportionment of service department costs to production cost centers.
9. What are the three methods of establishing service department costs when reciprocal servicing takes place?
10. Why is depreciation a notional charge?
11. What are the details kept in a plant register?
12. How are overheads classified in ABC system?
13. How do cost pools differ from traditional cost centers?
14. What factors need to be considered when selecting cost drivers?
15. (i) calculate five different overhead absorption rates for cost centre KX2 based on the following data:

Labour hours for period	2,600
Total direct wages for period	Sh 7,500
Total direct material for period	Sh 16,000
Total machine hours for period	4,500
Total units produced in period	1500
Total overheads for period	28,000

Round your answers to two decimal places.

(ii) A cost unit has been produced in cost centre KX2 and the following details recorded:

Direct materials used	Sh 33
Direct wages	Sh 36
Direct labor hours	12
Machine hours	18

Calculate the cost of this unit using each of the absorption bases calculated in (i)

16. Calculate the amount of over/under absorption of overheads for cost centre KX3 given the data below.

Cost centre KX3 for period 6		
	Budgeted	Actual
Direct labor hours	12,000	13,000
Direct wages	Sh 38,000	Sh 41,000
Machine hours	7,000	7,400
Direct materials	Sh 53,000	57,000
Units produced	160,000	175,000
Overheads	Sh 115,000	Sh 120,000

It is considered that overhead absorption base on labor hours is the most appropriate basis for the cost centre.

17. Two products M and N are made using similar equipment and methods. The data for the last period is shown below:

	M	N
Units produced	12,000	16,000
Labor hours per unit	2	4
Machine hours per unit	8	4
Set-ups in period	30	90
Orders handled in period	24	120
Overheads for period	Sh	
Production set-ups	358,000	
Order handling	60,000	
Machine activity	55,000	

Required:

Calculate the overheads to be absorbed per unit of each product based on:

- (i) Conventional absorption costing using a labor hour absorption rate.
- (ii) An ABC approach using the suitable cost drivers.

LESSON SIX

6.0 COSTING TECHNIQUES

Costing techniques are methods used to assign costs to products or inventory. There are two major methods of costing:

- i. marginal costing, and;
- ii. Absorption costing.

6.1 Marginal (Variable) Costing

Marginal cost means variable production cost. They are costs that vary directly with the level of production. If an extra unit of output is produced, the costs which could be incurred for producing this extra unit will only be marginal (variable) costs since fixed costs remain constant. Marginal costing is also called *direct costing* or *contribution approach*.

Marginal costing is a costing technique in which only variable manufacturing costs are considered and used while valuing inventories and determining cost of goods sold. That is, only variable manufacturing costs are considered product costs and are allocated to products manufactured. These costs include direct materials, direct labor and variable factory overheads. Fixed factory overheads are not considered product costs and are not used to value inventories and determine the cost of goods sold. Fixed manufacturing overheads are treated as period costs in marginal costing and are written off to the profit and loss account in the period when they are incurred.

6.2 Absorption Costing

Absorption costing (full costing) is a costing technique in which all manufacturing costs, variable and fixed, is considered as costs of production and is used in determining the cost of goods manufactured and inventories. All manufacturing costs are fully absorbed into finished goods.

Difference between marginal costing and Absorption costing

The following differences between marginal costing and Absorption costing exist:

- i. Cost element in product cost- the treatment of fixed factory overheads is different in the two techniques. Absorption costing includes fixed factory overheads while marginal costing does not.
- ii. Inventory values- marginal costing and Absorption costing do influence inventory values differently. The values of inventory under marginal costing are relatively at a lower figure as inventories values exclude the cost of fixed factory overheads.
- iii. Difference in net income- the differences of inventory values between the two methods will also lead to different income reported.

6.3 Income Statement under Marginal Costing and Absorption Costing

Under absorption costing all costs are divided into three categories: manufacturing, selling and administrative costs. In the income statement, all manufacturing cost (variable and fixed) is subtracted from the sales revenue to get a gross margin on sales. Selling and administrative expenses are then deducted to get the net profit.

Under marginal costing, only variable production (direct material, direct labor, and variable manufacturing) are subtracted from the sales revenue to determine the marginal contribution (or marginal profit). All fixed costs and variable selling, distribution and administrative costs are deducted from this balance to arrive at the net income.

The two methods can be illustrated below.

Income Statement

	Absorption Costing		Marginal Costing	
	Sh	Sh	Sh	Sh
Sales		XXX		XXX
Less: manufacturing costs:				
Variable production costs:				
Direct material cost	XX		XX	
Direct labor cost	<u>XX</u>		<u>XX</u>	
Variable factory overheads	XX		XX	
Fixed factory overheads	<u>XX</u>		*	
Cost of goods manufactured	XX		XX	
Add: beginning inventory	<u>XX</u>		<u>XX</u>	
Cost of goods available for sale	XX		XX	
Less: Closing Inventory	XX		<u>XX</u>	
Cost of sales	<u>XX</u>			(<u>XX</u>)
(Over)/Under absorption	<u>XX</u>			*
Actual Cost of Sales		(<u>XX</u>)		* <u> </u>
Contribution Margin/Gross profit		XX		XX
Less: Fixed manufacturing overheads		*		(XX)
Selling and administrative expenses		(<u>XX</u>)		(<u>XX</u>)
Net Income		<u>XX</u>		<u>XX</u>

* Not applicable under the costing method.

Note: marginal costing or absorption costing is designed for management use and not for external reporting.

Advantages of Absorption Costing

- i. Fixed costs are related to production.
- ii. It is more realistic when fixing selling prices.
- iii. Profits can be calculated more accurately.

Advantages of Marginal Costing

- i. Under or over absorption of overheads does not arise.
- ii. It is simpler to apply.
- iii. It helps in appraising different policies.

Note: the advantage of one method is the disadvantage of the other method and vice versa. Management requirement is considered when choosing the method to apply.

Break-Even Point

Break-even point is that level of activity at which sales revenue is equal to total cost. At break-even point, there is no profit or loss. If the production of the company is more than the break-even point, it means the company is operating at a profit. The break-even point can be expressed in terms of production volumes (physical units) or in terms of sales.

Break-even (units) = Total fixed cost/Contribution per unit

Break-even (sales) = [Total fixed cost/Contribution per unit] X Selling price per unit

Contribution to Sales ratio (C/S ratio)

This ratio expresses the relationship between “contribution” and “sales”. As a percentage, it shows the percentage at which contribution changes due to change in sales. C/S ratio is also known as Profit/Volume ratio (P/V ratio). The increase in C/S ratio over time indicates the improvement in the performance of a company and vice versa.

Illustration:

A manufacturing firm produced and sold 10,000 units during the month of April. The following additional information was also provided:

Direct materials	Sh 16 per unit
Direct labor	Sh 8 per unit
Variable overheads	Sh 4 per unit
Fixed overheads	Sh 72,000

Selling price per unit is Sh 40.00

Required:

A statement showing the marginal cost and profit or loss for the month of April.
Calculate the break-even point.

Solution:

	Units	S.P	Value
Sales	10,000	40	400,000
Less: Marginal costs:			
Direct material	10,000	16	(160,000)
Direct labor	10,000	8	(80,000)
Variable overheads	10,000	4	<u>(40,000)</u>
Total marginal costs			<u>(280,000)</u>
Contribution			120,000
Less Fixed costs			<u>(72,000)</u>
Profit			<u>48,000</u>

$$\begin{aligned}\text{Break-even (units)} &= \text{Total fixed cost/Contribution per unit} \\ &= \text{Sh } 72,000 / (120,000/10,000) \\ &= 72,000/12 \\ &= 6,000 \text{ units.}\end{aligned}$$

$$\begin{aligned}\text{Break-even (sales)} &= [\text{Total fixed cost/Contribution per unit}] \times \text{Selling price per unit} \\ &= [72,000/12] \times 40 \\ &= 6,000 \times 40 \\ &= \text{Sh. } 240,000\end{aligned}$$

Illustration:

A manufacturing company produces iron sheets. In the year 2004, 10,000 iron sheets bundles were produced but only 90,000 of them were sold. There were no opening and closing stock of work in progress.

Production costs were as follows:

	Sh 000's
Materials	28,000
Labor	8,000
Production overheads	10,000
Total	46,000

You are also informed that 60% of production overheads are fixed. The iron sheets are normally sold in bundles of 19 Sheets. The average selling price of each bundle was Sh 600. Selling and administrative expenses for the year amounted to Sh 3,000,000 of which 1,200,000 were fixed.

Required:

- a) Profit and loss account on marginal costing basis

- b) Calculate the break-even output in units and shillings
 c) Suppose the company want to make profits of Sh 6,300,000 then find out the level of output in units

Solution:

a)

Marginal costing

Profit and loss account
 For the year ended 2004

	Units	S.P	Value (Sh 000's)
Sales	90,000	600	54,000
Less: marginal costs			
Direct materials			(28,000)
Labor			(8,000)
Production Overhead (40% variable)			<u>(4,000)</u>
Total marginal costs			<u>(40,000)</u>
Less: closing stock of finished goods			* <u>4,000</u> <u>(36,000)</u>
Gross contribution			18,000
Selling and admin. Expenses			<u>(1,800)</u>
Net contribution			16,200
Less fixed costs:			
Production overheads			(6,000)
Selling and admin. Expenses			<u>(1,200)</u> <u>(7,200)</u>
Net Profit			<u><u>9,000</u></u>

* Marginal cost of 100,000 iron bundles = 40,000,000
 Marginal cost per unit = 40,000,000/100,000
 = Sh400.

Units produced = 100,000
 Units sold = 90,000
 Closing stock (units) = 10,000
 Value of closing stock = 10,000 X 400
 = 4,000,000

b) Break-even level of output

Sh.

Fixed cost	
Production overheads	6,000,000
Selling and administration	<u>1,200,000</u>
Total	<u><u>7,200,000</u></u>

Break-even (units) = Total fixed cost/Contribution per unit

$$\begin{aligned}
&= \text{Sh } 7,200,000 / (16,200,000 / 90,000) \\
&= 7,200,000 / 180 \\
&= 40,000 \text{ units.}
\end{aligned}$$

$$\begin{aligned}
\text{Break-even (sales)} &= [\text{Total fixed cost} / \text{Contribution per unit}] \times \text{Selling price per unit} \\
&= [7,200,000 / 180] \times 600 \\
&= 40,000 \times 600 \\
&= \text{Sh } 24,000,000
\end{aligned}$$

c) Level of output for Sh 6,300,000

Total fixed cost	Sh 7,200,000
Profit required	Sh <u>6,300,000</u>
Total contribution required	Sh <u>13,500,000</u>

$$\begin{aligned}
\text{Required level of output} &= \text{Sh } 13,500,000 / 180 \\
&= \underline{\underline{75,000 \text{ units.}}}
\end{aligned}$$

Illustration- Absorption costing

Millan company ltd. Produces tubes for motor vehicles. The following information is available for the year 2004.

Production	20,000 tubes
Sales	15,000 tubes
Production Cost	
Direct materials	2,400,000
Direct labor	600,000
Variable overheads	500,000
Fixed overheads	900,000

Selling and admin. Expenses	
Sales commission	250,000
General expenses	160,000
Overheads (fixed)	240,000

The company sells each tube at a price of Sh 300

Required:

a) Profit and loss account on the basis of absorption costing.

Solution:

Absorption costing profit and loss account for the year ended 31st December 2004

	Units	S.P	Value	Value
Sales	15,000	300		4,500,000

Less: Cost of sales		
Direct Materials	2,400,000	
Direct labor	600,000	
Variable Overheads	500,000	
Fixed Overheads	<u>900,000</u>	
Cost of goods available for sale	4,400,000	
Less Closing stock	<u>1,100,000</u>	<u>3,300,000</u>
Gross profit		1,200,000
Less Selling and admin. Expenses		
Sales commission	250,000	
General expenses	160,000	
Overheads (Fixed)	<u>240,000</u>	<u>650,000</u>
Net profit		<u>550,000</u>

Self Review Questions

1. Distinguish between marginal costing and absorption costing.
2. Define marginal costing and explain the main terms used in marginal costing.
3. write short notes on the following:
 - i. Break-Even point.
 - ii. Contribution.
 - iii. Contribution sales ratio.
4. Describe the advantages of absorption costing and marginal costing.
5. The following information was obtained in the books of Chesonok and Betco. Manufacturing Co. Ltd.

Budget for quarterly period:		Sh
Budgeted sales 30,000 units @ sh 3		90,000
Less: production costs		
Variable cost	60,000	
Fixed cost	18,000	
Selling Costs (Variable)	9,000	<u>87,000</u>
Budgeted profit		<u>3,000</u>

Actual output and sales:

	1 st Quarter	2 nd Quarter
Opening stock (units)	-	5,000
Output (units)	33,000	25,000
Sales (units)	28,000	30,000
Closing stock (units)	5,000	-

Required:

Tabulate the trading profit and loss account under the two methods of absorption costing and marginal costing.

6. The following information relate to records of Sang and McNtany Ltd. (a company that manufactures and sells one standard product.

Sales and Expense Budget for the year ended 31st May2005

	Total Sh	Unit Sh
Sales (120,000 units)	6,000,000	50.00
Variable Costs	3,900,000	32.50
Fixed costs	1,200,000	10.00
Admin. And distribution	<u>600,000</u>	<u>5.00</u>
Net Profit	<u>300,000</u>	<u>2.50</u>

On 31st May the following information were extracted from the records regarding the actual production and sales:

	6 months to Nov. 2004	6 months to May 2005
Production (units)	55,000	40,000
Sales (units)	48,000	42,000
Stocks:		
Opening (units)	-	7,000
Closing (units)	7,000	5,000

Required:

Draft in a columnar form the semi-annual P&L a/c for Sang and McNtany Ltd under absorption costing and marginal costing.

7. Aerospace Engineers manufactures a single product for sale. The current sales for the company stand at Sh 800,000. the cost structure for the manufactured product is as follows:

Direct materials

Material A 6 Kg @ Sh. 7.50 per Kg.

Material B 5 Kg @ Sh. 5 per Kg.

Direct labor 2 Hrs @ Sh. 25 per hour.

Variable overheads Sh. 40 per unit

Fixed overheads Sh. 60 per unit

Fixed overheads per unit have been calculated based on the current sales level of 4,000 units.

Required:

Determine the following:

- i. Sales price per unit
- ii. Current profit or loss
- iii. Break-even point in units and in shillings
- iv. What measures can be done to improve the current profit position.

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