CAT

Certified Accounting Technicians Examination

Stage: Level L2.3

Subject Title: Management Accounting

Study Manual

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LEVEL 2

L2.3 MANAGEMENT ACCOUNTING

First Edition 2012

This study manual has been fully revised and updated in accordance with the current syllabus. It has been developed in consultation with experienced lecturers.

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Contents

Contents

Contents

Contents

Contents

BLANK

INTRODUCTION TO THE COURSE

Stage: Level 2
Subject Title: L2.3 Management Accounting

Aim

The aim of this subject is to ensure that students develop a knowledge and understanding of the various cost accounting principles, concepts and techniques appropriate for planning, decision-making and control and the ability to apply these techniques in the generation of management accounting reports.

Learning Outcomes

On successful completion of this subject, students should be able to:

- Explain the relative strengths and weaknesses of alternative cost accumulation methods and discuss the value of management accounting information.
- Calculate unit costs applying overhead using both absorption costing and activity based costing principles.
- Apportion and allocate costs to units of production in job, batch and process costing systems, for the purpose of stock valuation and profit measurement.
- Identify and explain cost behaviour patterns and apply cost-volume profit analysis.
- Define and use relevant costs in a range of decision-making situations.
- Prepare and present budgets for planning, control and decision-making.
- Compute, interpret and investigate variances.
- Demonstrate communication skills including the ability to present quantitative and qualitative information, together with analysis, argument and commentary, in a form appropriate to the intended audience.

Syllabus:

1. The Role of the Management Accountant

- The nature and scope of management accounting.
- The relationship between management accounting and financial accounting.
- Cost classifications.
- The role of the Management Accountant in a modern business environment including the recognition of possible ethical issues that may arise.

2. Cost Accumulation Systems

- Accounting for materials: stock valuation approaches (FIFO; LIFO and AVCO); EOQ; JIT concepts.
- Accounting for labour: remuneration methods; incentive schemes; productivity, labour turnover and labour performance reports.
- Accounting for Overheads: absorption costing and activity based costing (ABC) approaches to overheads.

3. Costing Methods

- Job and batch costing.
- Process costing for single products and the use of equivalent units calculations under both FIFO and Weighted Average accounting systems.
- Process costing ledger accounts including normal and abnormal loss/gain.
- The role of costing in non-manufacturing sectors.
- Marginal costing and the importance of contribution for decision-making.
- Comparison of marginal costing and absorption costing approaches.

4. Information for Decision Making

- Cost behaviour patterns and identification of fixed/variable elements in a cost using High/Low method.
- Break-even analysis and the importance of contribution.
- Break-even chart preparation and interpretation.
- Calculation of break-even point, margin of safety and target profit.
- Limitations of Cost Volume Profit Analysis.
- Relevant costing principles including committed, sunk and opportunity costs.
- Relevant costs in decision-making.
- Decision making with a single limiting factor/constraint.
- Qualitative factors relevant to specific decisions.

5. Information for Planning and Control

- The role of budgeting including alternative budgeting systems (Fixed, flexible, incremental and Zero Based Budgeting (ZBB)).
- Behavioural and motivational issues in the budgetary process.
- Functional and subsidiary budgets.
- Standard costing: role and procedures for standard setting including different types of standards.
- Variance analysis: the calculation and interpretation of basic sales/cost variances. Reconciliation reports. The inter-relationship and possible causes of variances. (Fixed overhead capacity and efficiency variances are not examinable.)

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Study Unit 1

Introduction to Cost Accounting

Contents

A. NATURE AND FUNCTIONS OF COST ACCOUNTING

What Is "Cost Accounting"?

The Chartered Institute of Management Accountants, in its publication, "Terminology of Management and Financial Accountancy", defines cost accounting as:

> ".... that **part** of management accounting which establishes budgets and standard costs, and the actual costs of operations, processes, departments or products and the analysis of variances, profitability or social use of funds."

This involves participation in and with management to ensure that there is effective:

- Formulation of plans to meet objectives (long-term planning)
- Formulation of short-term operation plans (budgeting/profit planning)
- Corrective action to bring future actual transactions into line (financial control)
- Recording of actual transactions.

What Cost Accounting Provides for the Organisation

(a) **Additional Financial Information**

When cost accounting was first used, its main purpose was to provide additional information concerning the financial operations of an organisation. For the majority of firms, this is still considered as its main purpose. It usually implies historical costing and the production of regular detailed statements and statistics.

(b) **Control Information**

A more modern concept of cost accounting is that its purpose is to assist management by providing them with control information.

This usually demands more from the cost accountant. He or she will still produce statistical statements, but will be required to analyse and interpret these statements. Comparisons will be made with "budgets" and "standards", and the cost accountant will probably use the exception system of reporting, advising management only where action is required.

(c) **Management Tool**

Cost accounting has often been likened to a tool in the hands of management. Consider what this means:

(i) It must be the right tool. The cost accountant, in consultation with management, must agree what information is required and when; the cost of providing it will also have to be taken into consideration. The question must also be asked, is complete accuracy necessary? Will an approximation within given limits be of more value, if it can be provided swiftly?

Any system of costing **must** be tailored to suit the organisation which it serves. In many cases simple historical cost accounting will be sufficient; in others a more sophisticated system may be necessary.

(ii) The tool must be capable of doing the job. The cost accountant must ensure that the facts and figures produced provide management with the information they require, in an easily assimilated form.

Do not forget that manufacturing conditions and markets will change over the years, and the cost accounting system may need to be adapted to suit changing needs. A new system may need to be designed and introduced.

(iii) It is management who use the tool, and the extent of its success will depend upon the degree of efficiency with which it is used.

Objects of a Cost Accounting System

Different firms will use cost accounting for different purposes. Nevertheless, every system will involve some of the objectives listed below.

(a) **Cost Control**

This will be assisted by:

(i) Finding out the cost of each product (or service), process and department - costs must be ascertained in phase with manufacturing activity, enabling remedial action to be taken quickly when it is required.

(ii) Comparing the costs with budget, standard or past performance figures to indicate the degree of efficiency attained.

(iii) Analysing the variances from budget and identifying the person or department responsible so that prompt, remedial action may be taken.

(iv) Disclosing to what extent production facilities are used and indicating the amount and cost of idle and waiting time.

(v) Presenting the information suitably to management, in such a form as to guide them in taking any necessary action.

(b) **Advice to Management in the Formulation of Policy**

This will include:

(i) Provision of information to assist in the regulation of production and the systematic control of the organisation.

(ii) Provision of special investigations and reports. These might deal with such matters as:

- Whether to manufacture a part or to sub-contract another firm.
- The advisability of installing new machinery.
- The effect of increased or reduced production volumes on profitability.

(c) **Advice on the Effects of Management Policy**

This will be disclosed through reports (both regular reports and those following special investigations).

(d) **Estimating and Price Fixing**

Figures will be provided from standards or past results as the basis for future estimates.

Cost is an important factor in price fixing, but it is not the only one. Demand and competitive activity are also crucial. Therefore a firm's profitability may depend largely on its ability to control costs in ways described in (a) above.

B. COST ACCOUNTING COMPARED WITH FINANCIAL ACCOUNTING

You will be familiar already with the end-products of financial accounting, namely the balance sheet and the profit and loss account. These are valuable documents for management, the first giving the position of a company or firm at a specific time, the second showing the results of the company's operations over a specific period of time. The books of account from which the profit and loss account and balance sheet are derived are also of value, since they provide a record of every transaction.

Despite the value of the financial accounts, it was their inadequacy which gave rise to the introduction of costing and the development of costing techniques. The financial accounts show primarily external transactions (sales, purchases, borrowing, etc.) and the profit for the organisation as a whole. Management requires detailed knowledge of the cost of each product or unit, of each department or process to show how the profit was built up and the relative profitability of each section of the business. Cost accounting has now become an essential factor of every business.

It is of interest that in recent years "integrated accounts" (see later in this study unit) have grown in popularity. Integrated accounts are merely the combining of the financial and cost accounts into one set of books. We seem to have come full circle, from the separation of the financial and cost accounts, through the development of costing, to the joining together of the two systems into one integral system. Of course, in many businesses increasing computerisation has assisted this development.

C. THE ROLE OF COST ACCOUNTING IN A MANAGEMENT INFORMATION SYSTEM

Product Analysis

Only the very simplest form of organisation does not need a cost accounting system, and even in this case some "cost accounting" would be done, but the simplicity of the business renders a special system unnecessary.

In a more complex organisation, results can be analysed in depth. The cost of each process or operation which goes to make up the final product can be ascertained, as can the cost of the various "service" departments (stores, tool room, power house, etc.).

Investigating Costs

The cost accountant would not be satisfied merely to ascertain the figures, however. Perhaps costs can be reduced, and/or revenues, and/or production increased.

The cost accountant will consult the sales manager. It may be that increases in price will result in a decrease in sales. Moreover, financial considerations are not the only ones to be borne in mind.

By pursuing such enquiries, the cost accountant is achieving the second function of costing, that is, cost control. It should be stated here that it is not the cost accountant's job to make executive decisions, but merely to express the management's policy in terms of money, and to indicate where efficiency may be increased.

Guiding Management Policy

A most important side to the cost accountant's work is providing information to management at all levels. His or her job is to advise management of the financial effects of alternative policies. He or she is an adviser only; it is for the manager to make policy decisions. Thus the cost accounting system will justify itself only when the information it produces is used by management. (**Management** accountants are part of "Management" and make use of **both** cost accounting information **and** financial accounting information for their **involvement** in management decisions.)

Non-Financial Considerations

Clearly therefore, before management can make decisions, they require information on which to arrive at the decisions and cost accounting information is **one** part of the required information. Other matters need to be considered which are frequently of a non-financial nature, however. These might include:

(a) position in the market;

(b) environmental considerations;

(c) legal constraints;

(d) staff qualifications and training needs

Study Unit 2

Principles of Costing

Contents

A. THE ELEMENTS OF COST

The expenditure we are considering in our cost accounting is, of course, the same expenditure (subject to certain considerations which will be mentioned) as that which is dealt with in the financial accounts. It is merely that we are looking at it in a different way. Whereas the financial accounts are normally concerned only with the nature of the expense, e.g. whether it is wages, lighting and heating, etc., the cost accounts are concerned with the **purpose** of the expense, e.g. whether the wages are in respect of, say, manufacturing or distribution, and if manufacturing, whether they are in respect of labour directly or indirectly concerned with the product, and so on.

Make sure that you clearly UNDERSTAND, and then REMEMBER, the following classifications.

Labour, Materials and Expenses

All expenditure can be classified into three main groups - labour, materials and expenses.

Each of the expenses may be subdivided into one of two categories:

(a) Items directly applicable to the product, i.e. **direct**.
(b) Items which cannot be directly applied to the product, i.e. **indirect**.

The total of indirect materials, indirect labour and indirect expenses is called **overhead**.

Fixed and Variable Costs

There is a further subdivision of costs which we may briefly note here (and about which I will say more later), and that is between fixed costs and variable costs. **Fixed costs** are those which remain constant (in total) over a wide range of output levels, while variable costs are those which vary (in total) more or less according to the level of output. This division is of great significance, and we shall be dealing with it later. Observe, now, that by its very nature "prime cost" consists of variable items only, while the various overhead categories may contain some of each kind.

(a) **Examples of fixed costs**: rent, rates, insurance, depreciation of buildings, management salaries.
(b) **Examples of variable costs**: raw materials, commission on sales, piece-work earnings.

Definitions

Here are some definitions in this connection, which you must understand clearly:

(a) Direct Labour Cost

This is the cost of remuneration for employees' efforts applied directly to a product or saleable service which can be identified separately in product costs.

Examples of direct labour, as defined above, would include the costs of employing bricklayers, machine operators, bakers, miners, bus drivers. There is no doubt as to where you would charge these labour costs. Doubt would arise, however, with a truck driver's wage in a factory. His wage cannot be charged direct to any product, as he is helping many departments and operators. Therefore, his wage would have to be classified as indirect. In a few exceptional circumstances it may be established that the truck driver is employed only to transport materials for the manufacture of one product. If this were the case, his wage could be charged direct to the product, and he would be as much a direct worker as the operator who is using the materials.

(b) Direct Materials Cost

This is the cost of materials entering into and becoming constituent elements of a product or saleable service and which can be identified separately in product cost. The following materials fall within this definition:

(i) All materials specially purchased for a particular job, order or process.

(ii) All materials requisitioned from the stores for particular production orders.

(iii) Components or parts produced or purchased and requisitioned from the finished goods store.

(iv) Material passed from one operation to another.

We must consider here the term "raw material". In many cases the raw material of one industry or process is the finished product of another. Thus leather in the form of hides constitutes the finished product of a tannery but the raw material of a footwear factory; while carded wool, the product of the carding process, becomes the raw material of the hardening section.

(c) Direct Expenses

These are costs, other than materials or labour, which are incurred for a specific product or saleable service.

Direct expenses are not encountered as often as direct materials or labour costs. An example would be electric power to a machine, provided that the power is metered and the exact consumption by the machine is known. We can then charge the cost of power direct to the job. More often, however, we will know only the electricity bill for the whole factory, so this will be an indirect expense.

Another example of a direct expense is a royalty payment to the inventor of a product.

(d) Prime Cost

This is the total cost of direct wages, direct material and direct expenses.

(e) Overhead

Overhead is the total cost of indirect labour, indirect materials and indirect expenses.

Examples of indirect materials include oils, cotton waste and grease. **Examples of indirect labour** include the costs of employing maintenance workers, oilers, cleaners and supervisors. **Examples of indirect expenses** include lighting, rent and depreciation.

Overheads may be divided into four main groups:

(i) works or factory expense;

(ii) administration expense;

(iii) selling expense;

(iv) distribution expense.

An Example from the Confectionery Industry

The cost of production of most commodities is made up mainly of the cost of the raw materials of which they are manufactured and the cost of labour which is employed making them, i.e. wages.

	RWF	RWF	RWF
To Direct Materials Consumed:			
(1) **Flour**			
Opening Stock		2,080	
Purchases		5,720	
		7,800	
Less:			
Closing Stock	990		
Part-Finished Goods	300	1,290	6,510
(2) **Gelatine**			
Opening Stock		1,720	
Purchases		3,180	
		4,900	
Less:			
Closing Stock	55		
Part-Finished Goods	60	115	4,785
(3) **Sugar and Other Materials**			
Opening Stock		5,040	
Purchases		10,920	
		15,960	
Less:			
Closing Stock	4,985		
Part-Finished Goods	360	5,345	10,615
COST OF RAW MATERIALS USED			21,910
To Direct Labour			3,720
To Direct Expense			-
PRIME COST			25,630
To Factory Overhead			6,650
FACTORY COST (COST OF PRODUCTION)			RWF32,280

To this total of factory cost will be added administration, selling and distribution expenses, to arrive at a figure of total cost, to which will be added profit to give the selling price. (This method of costing is known as Absorption Costing - see later.)

The example given above is of a “process” industry in which the product passes from one process to the next. Unless production is shut down completely at the end of each accounting period, which would be most uneconomical, there will at all times be some product “in the pipeline” at various stages of completion which will be credited against the charges for the period in question and become the opening charge for the subsequent period. These opening and closing adjustments are always necessary.

An Example from the Photographic Industry

Let us now consider a business which manufactures cameras, where the amount of labour involved in manufacture is small compared with the amount of precision machinery which is necessary for the manufacture of efficient apparatus. In such an industry, costs arising from the depreciation and obsolescence of machinery may be of much greater importance compared with the cost of materials and labour than they were in the case of the confectionery manufacturing company. These charges which are related only indirectly to output are said to constitute **indirect** expenditure, as against materials and labour and other similar items which constitute **direct** expenditure.

In addition to depreciation, all the charges incurred in the general offices (such as salaries of managers, rent and rates) together with the expenses involved in marketing the product (such as advertising and carriage) must be included in the indirect expenses. You will appreciate, therefore, that in order to give a reflection of the cost of production for each unit of output, accounts must be prepared to show the allocation of these indirect expenses as well as the direct expenses (provided it is intended to follow Absorption Costing methods rather than Marginal Costing - see later).

B. BASIC COSTING METHODS

The basic costing method employed by an organisation must be devised to suit the methods by which goods are manufactured or services are provided. The choice is between specific order costing, service/function costing and continuous operation/ process costing.

Specific Order Costing

This costing method is applicable where the work consists of separate contracts, jobs or batches, each of which is authorised by a special order or contract.

The subdivisions of specific order costing are:

(a) Job Costing

This applies where work is undertaken to a customer's special requirements. Each "job" is of comparatively short duration. Throughout the manufacturing process, each job is distinct from all other jobs. Examples of industries using job costing are: building maintenance, certain types of engineering (e.g. manufacture of special purpose machines) and printing.

(b) Batch Costing

This is a form of specific order costing which applies where similar articles are manufactured in batches, either for sale, or for use within the undertaking. In most cases the costing is similar to job costing.

(c) Contract Costing

This applies when work of long duration is undertaken to customers' special requirements, e.g. builders, civil engineers, etc.

In job costing, costs of each job (or batch) can be separately identified.

Continuous Operation/Process Costing

This is the basic costing method applicable where goods or services are produced by a sequence of continuous or repetitive operations or processes to which costs are charged before being averaged over the units produced during the period. This procedure is widely used, for example, in the chemicals industry.

Service/Function Costing

This is the method used for specific services or functions, e.g. canteens, maintenance and personnel. These may be referred to as service centres, departments or functions.

C. COST CENTRES AND COST UNITS

Cost Centre

A cost centre is a location, function or item of equipment in respect of which costs may be ascertained and related to cost units for control purposes. A cost centre may be a productive department, an individual machine, a service department such as stores serving the productive departments, etc.

Cost Unit

This is a quantitative unit of product or service in relation to which costs are ascertained. For instance, in paint manufacture, costs would be ascertained "per litre of paint". The litre of paint is therefore the cost unit.

Examples of cost units in other activities are:

Accounting	Account maintained
Brewing	Barrel of beer racked
Brickmaking	1,000 bricks
Building industry	Complete job or contract
Cable manufacture	1,000 yards (or m) of cable
Canteen	Employee or meal served
Chemicals industry	Per gram, kg, etc. depending on relative quantity produced
Power station	Kilowatt/hours
Gravel or sand pits	Cubic yard/metre extracted
Hospitals	Per patient-day, or per bed-week
Invoicing	Per 100 or 1,000 invoices
Liquids	Gallon, litre
Maintenance	Operating hour or value of asset
Metal plating	Square foot/metre
Police service	Per 1,000 population or per constable-day
Printing	Ream or 1,000 copies
Public transport	Miles run, passenger-mile, 100-seat mile or fare-stage
Purchasing	Per order placed, or value of materials
Sales order department	Per enquiry, or value of sales made
Sales representative	Per call or value of sales made
School	Per pupil-day or per examination passed
Steam	1,000 lbs steam raised
Storage	Tonne of material, gallon or litre of liquid, value of materials
Street cleaning	1,000 population, or mile of road
Street lighting	Lamp or mile of road
Timber	1,000 cu. ft, board-foot, etc.

Typing	Space, line typed or standard document typed
Water supply	1,000 population or 1,000 gallons produced
Window cleaning	per window or 100 sq. yds

Profit Centre

A profit centre is a location or function in respect of which both expenditure and income may be attributable. A profit centre may be a division of the business or a specific function within the organisation. In order that true profitability may be assessed, it is necessary to install procedures to transfer-charge all relevant costs and revenue to the profit centre. Ideally, the net costs of all central operating areas should be allocated, on an agreed basis, to profit centres.

The development of the profit centre concept means that profit centres have come to act as a focal point for the collation of cost centres and the provision of useful high-level management information.

Examples of profit centres in the financial services industry are:

- UK clearing banking
- Merchant banking
- Credit card operations
- Corporate banking
- International banking.

D. SUPERIMPOSED PRINCIPLES AND TECHNIQUES

Whichever costing method is in use (a choice which will be largely dictated by the production method), there is a choice of principles and techniques which may be adopted in presenting information to management. These are introduced briefly here, and we will study some of them in detail later.

Absorption Costing

This principle involves **all** costs, including the costs of selling and administration, being allotted to cost units. Total overheads are "absorbed", via the method thought most appropriate.

Marginal Costing

This is a principle whereby **variable** costs only are charged to cost units, and the fixed cost attributable to the relevant period is written off in full against the "contribution" for that period, contribution being the difference between total sales value and total variable costs. At this stage therefore, remember when using marginal costing, **do NOT attempt to apportion fixed costs to individual cost units**.

Actual Cost Ascertainment

This is the ascertainment of costs in retrospect, after they have been incurred. It is also known as historical costing.

Variance Accounting

This is a technique whereby the planned activities of an undertaking are quantified in budgets, standard costs, standard selling prices and standard profit margins. These are then compared with the actual results, and note is taken of the differences, i.e. the "variances", for subsequent examination.

Differential Costing

This is a technique used in the preparation of "ad hoc" information, in which only cost and income **differences** between alternative courses of action are taken into consideration. In other words, any costs which would be incurred whatever decision were taken, are ignored.

Incremental Costing

This is another technique used in the preparation of "ad hoc" information. Here consideration is given to a range of graduated or stepped changes in the level or nature of activity, and the additional costs and revenues likely to result from each degree of change are presented.

Uniform Costing

This is the use by several undertakings of the same costing system (i.e. the same basic method, specific order costing or operation costing, and the same superimposed principles and techniques, e.g. absorption costing rather than marginal costing). Uniform costing enables the results of the various organisations concerned to be compared. In many industries, a trade association advises member firms on costing methods, and collects data from them, which is then circulated to member firms so that they can see how they compare with other firms in the industry. Strict anonymity is, of course, maintained.

To recapitulate at this stage, a reminder of the total cost structure, within the context of Absorption Costing, can be represented as follows:

Direct Labour
Direct Materials
Direct Expenses
Prime Cost

Prime Cost
Factory Overheads
Works, Factory or Production Cost

Works, Factory or Production Cost
Admin. Overheads
Selling Overheads
Distribution Overheads
Total Cost

Total Cost
Profit
Selling Price

Figure 3

E. SOME MORE TERMINOLOGY

Controllable and Uncontrollable Costs

Sometimes reference is made to costs being either “controllable” or “uncontrollable”. As we have seen already, costs are charged or allocated to cost centres. Each cost centre has an officer in control. Costs are said to be “controllable” when the costs charged can be influenced by the actions of this person in charge. Where they cannot, they are of course “uncontrollable” costs. Sometimes controllable costs are referred to as “managed costs”.

Avoidable and Unavoidable Costs

“Avoidable costs” are the specific costs of part of an organisation which would be avoided if that part or sector/activity did not exist. Another term for this is “relevant costs”. It follows, therefore, that “unavoidable costs” are those that are unaffected by a particular decision. As they are in fact irrelevant to the decision, they are also known as “irrelevant costs”.

F. DIFFERENCE BETWEEN ABSORPTION AND MARGINAL COSTING SYSTEMS

We have already looked at the broad divisions between Absorption and Marginal Costing systems but we have not yet considered them in detail. This we will do later in the course. In the meantime, let us consider a case which may indicate more clearly the difference.

A company manufactures three products, A, B and C, and in the year makes a profit of RWF70,000, as follows:

	RWF
Total Sales	600,000
Variable Labour	160,000
Variable Material	240,000
Variable Overhead	30,000
Fixed Overhead	100,000
Net Profit	70,000

It is decided to analyse these figures between Products A, B and C. The company uses absorption costing and apportions (or spreads) fixed overhead in proportion to the sales value of Products A, B and C. (We have not yet covered the methods of getting a proportion of overhead costs into costs; this follows later in the course.)

The figures now become:

	Total	**A**	**B**	**C**
	RWF	RWF	RWF	RWF
Sales	600,000	250,000	200,000	150,000
Variable Labour	160,000	70,000	45,000	45,000
Variable Material	240,000	100,000	60,000	80,000
Variable Overhead	30,000	15,000	10,000	5,000
Fixed Overhead	100,000	41,666	33,334	25,000
Net Profit	70,000	23,334	51,666	(5,000)

Management considers the situation. It decides to stop manufacturing C, since it is producing a net loss of RWF5,000. Sales of A and B cannot be increased because of market conditions. However, as a result of dropping C, fixed overheads will reduce to RWF90,000. The staff formerly employed on the production of C were temporary and have been sacked. Management congratulates itself and looks forward to an improved net profit situation.

To their dismay the following results arise:

	Total	A	B
	RWF	RWF	RWF
Sales	450,000	250,000	200,000
Variable Labour	115,000	70,000	45,000
Variable Material	160,000	100,000	60,000
Variable Overhead	25,000	15,000	10,000
Fixed Overhead	90,000	50,000	40,000
Net Profit	60,000	15,000	45,000

Despite their efforts, profits are actually reduced by RWF10,000!

The reason for this should be fairly obvious. If we consider the situation in terms of financial accounting, we have lost RWF20,000 gross profit which C produced (RWF150,000 sales less RWF130,000 cost of sales) which in turn could have been available to cover, in part, the expenses of the company. This is basically the approach followed by marginal costing. Instead of referring to "gross profit", the term "contribution" is used, that is, the contribution made towards covering overheads or fixed costs.

If a marginal costing approach had been taken to the initial figures for Products A, B and C, these would have read as follows:

	Total	A	B	C
	RWF	RWF	RWF	RWF
Sales	600,000	250,000	200,000	150,000
Variable Labour	160,000	70,000	45,000	45,000
Variable Material	240,000	100,000	60,000	80,000
Variable Overhead	30,000	15,000	10,000	5,000
	430,000	185,000	115,000	130,000
Sales less Variable Costs (CONTRIBUTION)	170,000	65,000	85,000	20,000
Fixed Overhead	100,000			
Net Profit	70,000			

Note, **no** attempt has been made to spread the fixed overhead cost of RWF100,000 between Products A, B and C. Provided the total contribution is greater than fixed overhead, a net profit will result. Obviously, if the contribution in total can be increased (by increased sales prices or variable costs reductions) a higher net profit will result.

In this case we have studied, it is in fact the very spreading of fixed overhead costs between Products A, B and C which lead management to think that C was making an overall loss. For some particular reason, it was decided to allocate fixed overheads to Products A, B and C in direct proportion to their sales value. Suppose instead it had been decided to allocate them in direct proportion to the variable overheads incurred by A, B and C. This would have resulted in fixed overhead of RWF50,000 being allocated to A, RWF33,334 to B and RWF16,666 to C, with the result that the overall net profit of RWF70,000 would have been split between A RWF15,000, B RWF51,666 and C RWF3,334. In **this** case, the management might not have been tempted to cancel C!

Clearly, the basis on which fixed overheads are allocated is most important in the decision areas of sales levels, production levels, etc. Advocates of marginal costing consider that, at best, such allocation of fixed overheads is fairly arbitrary and can only confuse, so it is better not to attempt it.

We will return to this later in the course but at this point it must be stated that absorption costing is still widely practised and indeed in some areas is ideal for the needs which exist. In monopolistic situations, in local and in central government, it can be, and is, used extensively. In such circumstances cost management often centres on comparisons of total cost in one period of time with another period of time. Provided the same method of allocating fixed overheads is used in the periods being compared, then such cost comparisons are still valid, particularly as the information is required for comparison purposes only and **not** for changes in levels of production/services decisions.

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Study Unit 3

Cost Behaviour Patterns

Contents

A. INTRODUCTION

As we saw earlier in this study unit, costs can be divided either into direct and indirect costs, or variable and fixed costs.

Direct costs are **variable**, that is the total cost varies in direct proportion to output. If, for instance, it requires RWF10 worth of material to make one item it will require RWF20 worth to make two items and RWF100 worth to make ten items and so on.

Overhead costs, however, may be either fixed, variable or semi-variable.

B. FIXED COST

A fixed cost is one which **can** vary with the passage of time but, **within limits**, tends to remain fixed irrespective of the variations in the level of output. All fixed costs are overhead. **Examples of fixed overhead are: executive salaries, rent, rates and depreciation.**

A graph showing the relationship of total fixed cost to output appears in Figure 4.

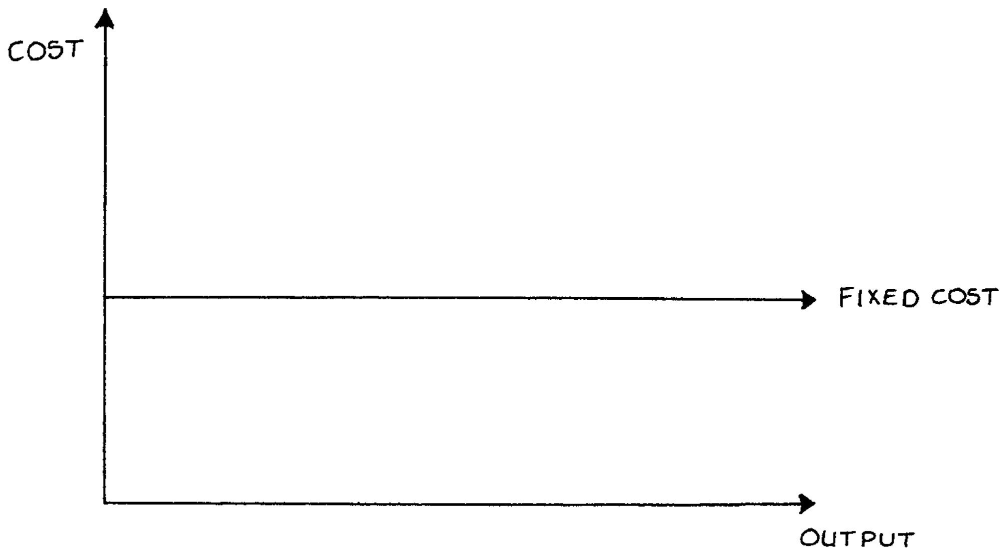


Figure 4

Please note the words "within limits" in the above description of fixed costs. Sometimes this is referred to as the "relevant range", that is the range of activity level within which fixed costs (and variable costs) behave in a linear fashion.

Suppose an organisation rents a factory. The yearly rent is the same no matter what the output of the factory is. If business expands sufficiently, however, it may be that a second factory is required and a large increase in rent will follow. Fixed costs would then be as in Figure 5.

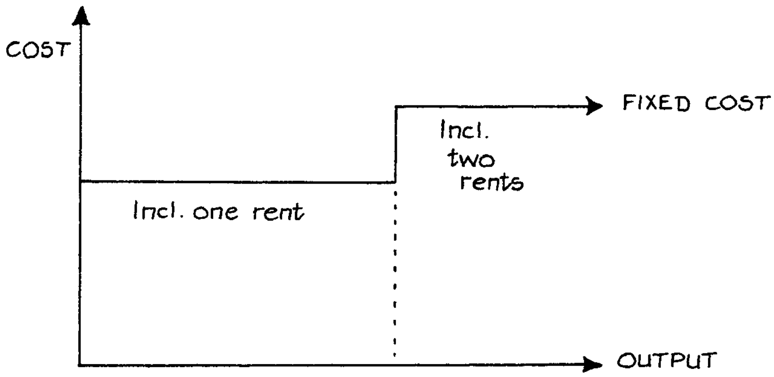


Figure 5

A cost with this type of graph is known as a step function cost for obvious reasons.

C. VARIABLE COST

This is a cost which tends to follow (in the short term) the level of activity in a business.

As already stated, direct costs are by their nature variable. **Examples of variable overhead are: repairs and maintenance of machinery; electric power used in the factory; consumable stores used in the factory.**

The graph of a variable cost is shown in Figure 6.

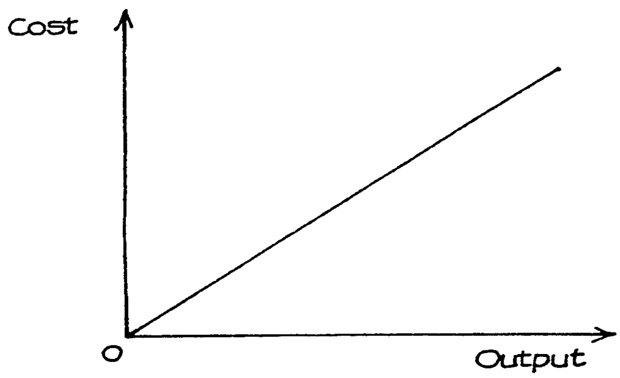


Figure 6

D. SEMI-VARIABLE (OR SEMI-FIXED) COST

This is a cost containing both fixed and variable elements, and which is thus partly affected by fluctuations in the level of activity.

For examination purposes, semi-variable costs usually have to be separated into their fixed and variable components. This can be done if data is given for two different levels of output.

Example

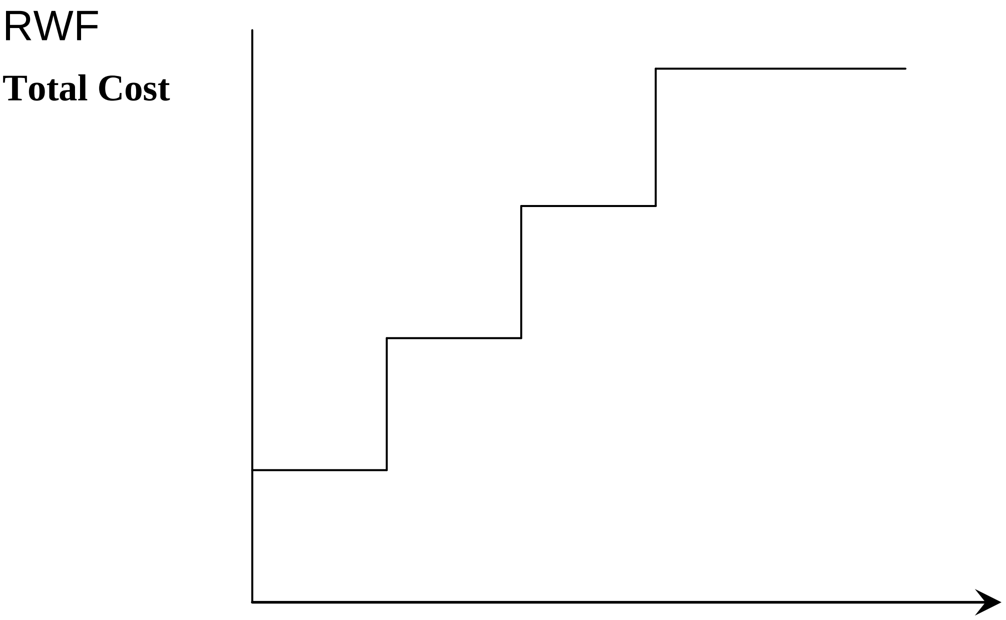
<u>At output 2,000 units, costs are RWF12,000.</u>

<u>At output 3,000 units, costs are RWF17,000.</u>

Therefore for an extra 1,000 units of output, an extra RWF5,000 costs have been incurred. This is entirely a variable cost, so the variable component of cost is RWF5 per unit.

Therefore at the 2,000 units level, the total variable cost will be RWF10,000. Since the total cost at this level is RWF12,000, the fixed component must be RWF2,000. You can check that a fixed component of RWF2,000 and a variable component of RWF5 per unit gives the right total cost for 3,000 units.

E. STEP COST



Level of Activity

<u>Example</u>: Rent can be a step cost in certain situations where accommodation requirements increase as output levels get higher.

A Step Cost

Many items of cost are a fixed cost in nature within certain levels of activity.

Semi-Variable Costs

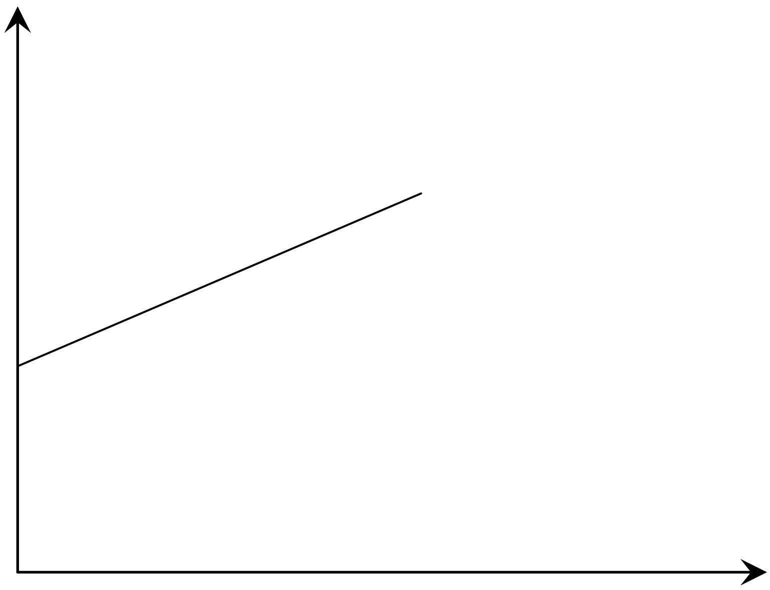
This is a cost containing both fixed and variable components and which is thus partly affected by fluctuations in the level of activity (CIMA official DFN).

<u>Example:</u> Running a Car

- Fixed Cost is Road Tax and insurance.
- Variable cost is petrol, repairs, oil, tyres-all of these depend on the number of miles travelled throughout the year.

RWF

Total Cost



Level of Activity

A method of splitting semi-variable costs is the High – Low method.

High – Low method

Firstly, examine records of cost from previous period. Then pick a period with the highest activity level and the period with the lowest level of activity.

- Total Cost of high activity level minus total cost of low activity level will equal variable cost of difference in activity levels.
- Fixed Costs are determined by substitution

Example of High - Low Method

Highest level 10,000 units, cost of RWF4,000
Lowest Level activity level 2,000 units cost of RWF1,600

Variable Cost Element:

$$\frac{(RWF4{,}000 - RWF1{,}600)}{10{,}000 \text{ units} - 2{,}000 \text{ units}}$$

$$= \frac{2{,}400}{8{,}000}$$

$\therefore$ = RWF 0.30 per unit

Fixed Cost (under high level figure)

RWF4,000 – (10,000 x RWF 0.30)

= RWF1,000

Scattergraphs

Information about two variables that are considered to be related in some way can be plotted on a scattergraph. This is simply a graph on which historical data can be plotted. For cost behaviour analysis, the scattergraph would be used to record cost against output level for a large number of recorded "pairs" of data.

Then by plotting cost level against activity level on a scattergraph, the shape of the resulting figure might indicate whether or not a relationship exists.

In such a scattergraph, the y axis represents cost and the x axis represents the output or activity level.

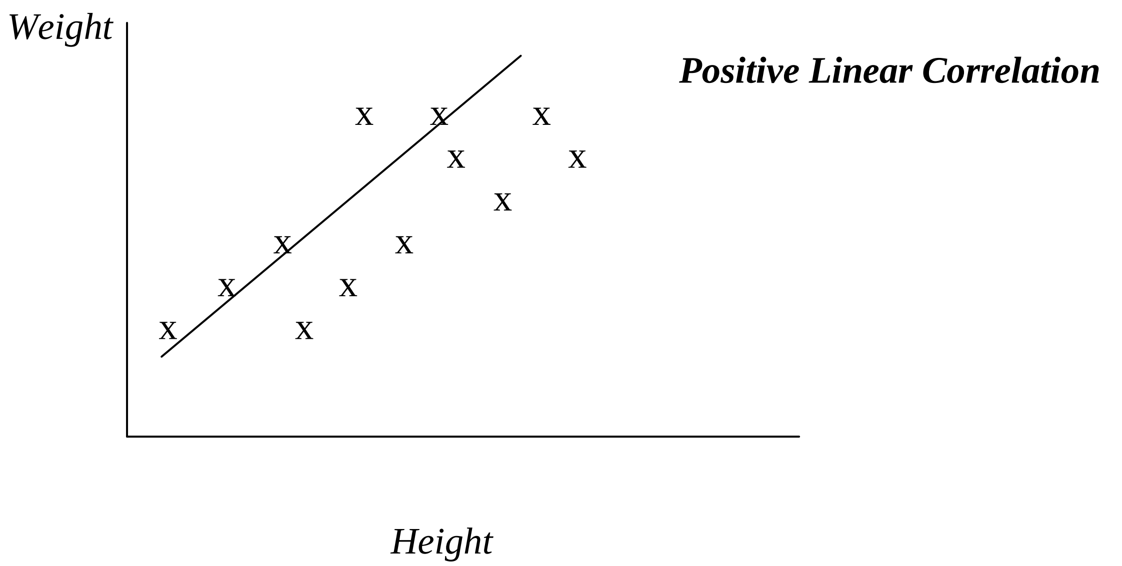
One advantage of the scattergraph is that it is possible to see quite easily if the points indicate that a relationship exists between the variables, i.e. to see if any correlation exists between them.

Positive correlation exists where the values of the variables increase together (for example, when the volume of output increases, total costs increase).

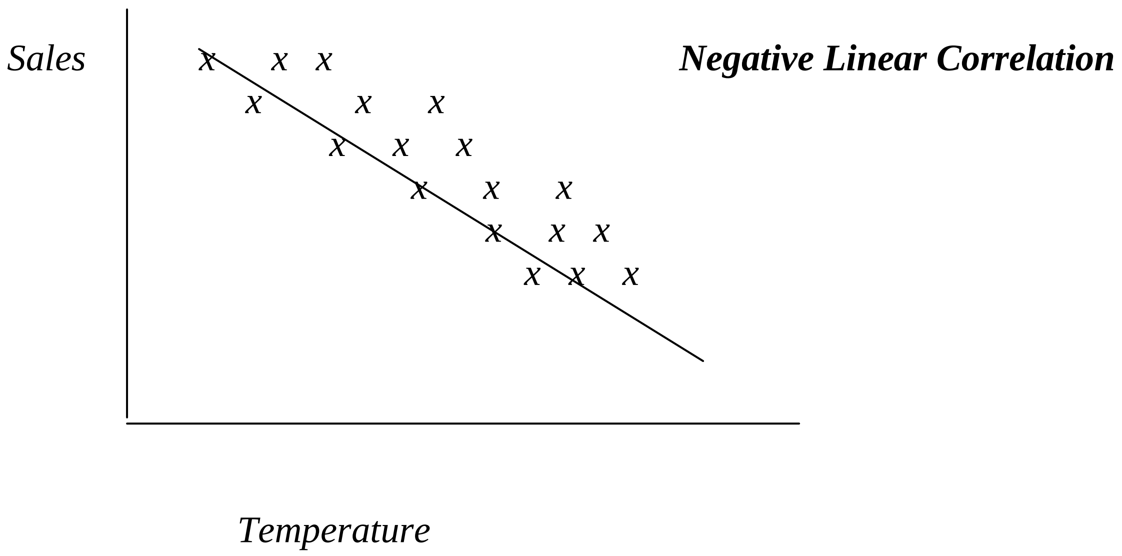
Negative correlation exists where one variable increases and the other decreases in value

Some illustrations:

1. Weight and height in humans

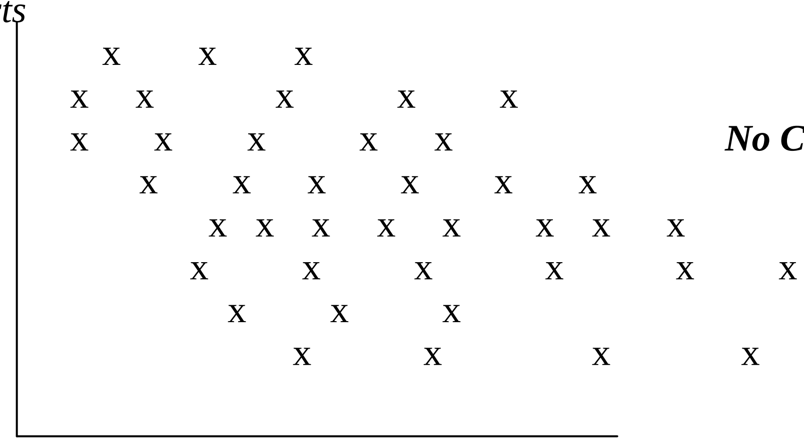


2. Sales of Scarves and temperature



3. Sugar Imports and Mining Production

Imports



No Correlation

Mining Production

A scattergraph can be used to make an estimate of fixed and variable costs, by drawing a "*line of best fit*" through the band of points on the scattergraph, which best represents all the plotted points.

The above diagrams contain the line of best fit. These lines have been drawn using judgement. This is a major disadvantage, as drawing the line "by eye". If there is a large amount of scatter, different people may draw different lines.

Thus, as a technique, it is only suitable where the amount of scatter is small or where the degree of accuracy of the prediction is not critical.

However, it does have an advantage over the high-low method in that all points on the graph are considered, not just the high and low point.

Regression Analysis

This is a technically superior way to identify the "slope" of the line. It is also known as "Least Squares Regression". This statistical method is used to predict a linear relationship between two variables. It uses all past data (not just the high and low points) to calculate the line of best fit.

The equation of the regression line of y on x is of the form:

$$y = a + bx$$

In other words, if we are trying to predict the cost (y) from an activity (x), it is necessary to calculate the values of a and b from given pairs of data for x and y. The following formulae are used:

$$a = \frac{\Sigma y}{n} - \frac{b\Sigma x}{n}$$

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

where "n" is the number of pairs of x and y values. (The symbol "Σ" means 'the sum of')

Thus, in order to calculate "a", it is necessary to calculate "b" first.

Example

The following is the output of a factory and the cost of production over the last 5 months:

	Output ('000 units)	Cost (RWF'000)
January	20	82
February	16	70
March	24	90
April	22	85
May	18	73

(i) Determine a formula to show the expected level of costs for any given volume of output

(ii) Prepare a budget for total costs if output is 27,000 units

Solution:

Let x = output
Let y = costs

n = 5 (5 pairs of x & y values)

Construct a table as follows: (in '000)

x	y	xy	x^2	y^2
20	82	1,640	400	6,724
16	70	1,120	256	4,900
24	90	2,160	576	8,100
22	85	1,870	484	7,225
18	73	1,314	324	5,329
Σx = 100	**Σy = 400**	**Σxy = 8,104**	**Σx^2 = 2,040**	**Σy^2 = 32,278**

$$b = \frac{n\Sigma xy - \Sigma x\Sigma y}{n\Sigma x^2 - (\Sigma x)^2} = \frac{5(8,104) - (100)(400)}{5(2,040) - (100)^2}$$

$$b = 2.60$$

$$a = \frac{\Sigma y}{n} - \frac{b\Sigma x}{n} = \frac{400}{5} - \frac{2.6(100)}{5}$$

$$a = 28 \text{ (or 28,000)}$$

Thus, the formula for any given level of output is:

y = RWF28,000 + RWF2.60x

where

y = total cost (in RWF'000)

x = output (in '000 units)

If output is 27,000 units, then total cost (y) will be:

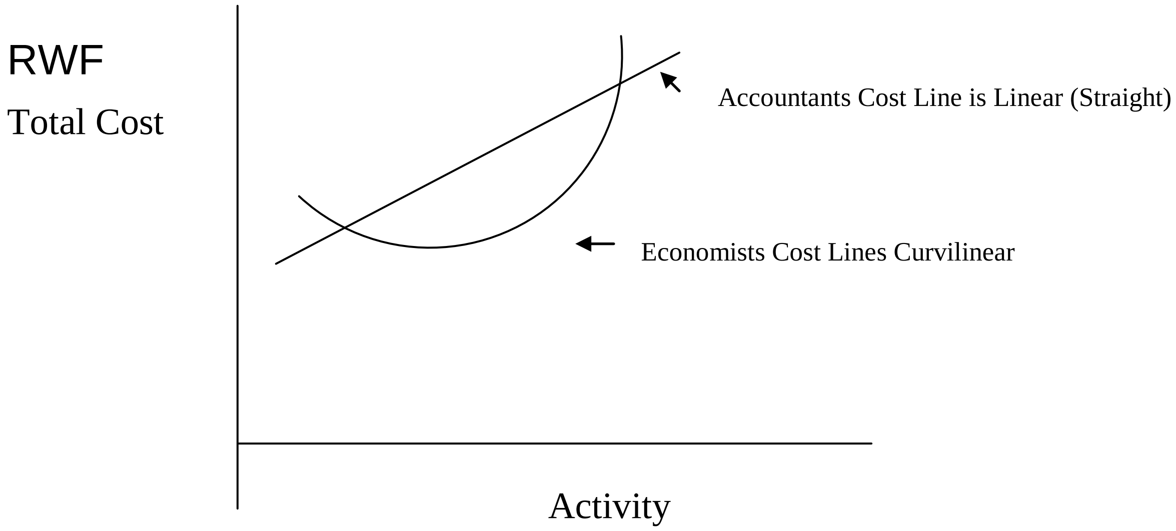
y = RWF28,000 + RWF2.60(27,000)

y = RWF98,200

F. THE LINEAR ASSUMPTION OF COST BEHAVIOUR

1. Cost are assumed to be either fixed, variable or semi-variable within a normal range of output.
2. Fixed and variable costs can be estimated with degrees of probable accuracy. Certain methods maybe used to access this (High-Low method).
3. Costs will rise in a straight line/linear fashion as the activity increases.

G. ACCOUNTANTS - V'S – ECONOMIST MODEL



Assumptions of Above Diagram

The accountants state that the linear assumption of cost behaviour is linear because:

1. The linear cost (straight line) is only used in practice within normal ranges of output ⇨ 'Relevant Range of Activity'.

   The term 'Relevant Range' is used to refer to the output range at which the firm expects to be operating in the future.
2. It is easier to understand than Economists' cost line.
3. The fixed and variable costs are easier to use.
4. The relevant range and the costs estimated by the economists and the accountants will not be very different.

H. FACTORS AFFECTING THE ACTIVITY LEVEL

1. The economic environment.
2. The individual firm – its staff, their motivation and industrial relations.
3. The ability and talent of management.
4. The workforce (unskilled, semi-skilled and highly skilled).
5. The capacity of machines.
6. The availability of raw material.

I. COST BEHAVIOUR AND DECISION MAKING

Factors to Consider:

1. Future plans for the company.
2. Current competition to the company.
3. Should the selling price of a single unit be reduced in order to attract more customers.
4. Should sale staff be on a fixed salary or on a basic wage with bonus/commission.
5. Is a new machine required for current year.
6. Will the company make the product internally or buy it.

For all of the above factors, management must estimate costs at all levels and evaluate different courses of action. Management must take all eventualities into account when making decisions for the company.

Example of things management would need to know is fixed costs do not generally change as a result of a decision unless the company have to rent an additional building for a new job etc.

J. COST VARIABILITY AND INFLATION

Care must be taken in interpreting cost data over a period of time if there is inflation. It may appear that costs have risen relative to output, but this may be purely because of inflation rather than because the amount of resources used has increased.

If a cost index, such as the Retail Price Index, is available the effects of inflation can be eliminated and the true cost behaviour pattern revealed.

It is essential for the index selected to be relevant to the company; if one of the many Central Statistical Office indices is not appropriate, it may be possible for the company to construct one from its own data.

Consider the following example, which deals with the relationship between production output and the total costs of a single-product company, taken over a period of four years:

Year	**Output**	**Total Costs**
	(tonnes)	RWF
1	2,700	10,400
2	3,100	11,760
3	3,700	14,880
4	4,400	20,700

Suppose that we have the above information, together with the cost indices as follows:

Year	**Cost Index**
1	100
2	105
3	120
4	150
5	175 (estimated)

If our estimated output for Year 5 is 5,000 tonnes, how may we calculate the estimated total costs?

First, we have to convert the costs of the four years' production to Year 1 cost levels, by applying the indices as follows:

Year	**Actual Cost**	**Conversion Factor**	**Cost at Year 1 Level**
	RWF		RWF
1	10,400	1	10,400
2	11,760	100/105	11,200
3	14,880	100/120	12,400
4	20,700	100/150	13,800

Secondly, we must split the adjusted costs into their fixed and variable elements. This is done by examining the difference or movement between any two years, for example:

	Production	**Adjusted Cost**
Year 1	2,700 tonnes	RWF10,400
Year 4	4,400 tonnes	RWF13,800

We observe that an increase of 1,700 tonnes gives a rise in costs of RWF3,400. The variable cost is therefore RWF2 per tonne.

Now by deducting the variable cost from the adjusted cost in **any** year, we can ascertain the level of fixed cost. For example, in Year 4, the variable cost @ RWF2 per tonne would be 4,400 × RWF2 = RWF8,800. If we deduct this figure from the total adjusted cost RWF13,800, we are left with the fixed cost total of RWF13,800 – RWF8,800 = RWF5,000. This fixed cost is, of course, expressed in terms of Year 1 cost level. In real terms, the fixed costs (those costs which do not vary with changes in volume) will increase over the four years in proportion to the cost index.

We now see that the yearly total costs, adjusted to Year 1 cost levels, may be split into the fixed and variable elements as follows:

Year	**Production** **(tonnes)**	**Fixed** RWF	**Variable** **@** RWF**2 tonne**	**Total** RWF
1	2,700	5,000	5,400	10,400
2	3,100	5,000	6,200	11,200
3	3,700	5,000	7,400	12,400
4	4,400	5,000	8,800	13,800
5 (est'd)	5,000	5,000	10,000	15,000

Finally, by applying the cost index for each year to the total costs at Year 1 cost levels, we may complete our forecast:

Total Cost at Year	Year 1 Levels	Cost Index	Actual Cost
RWF	RWF		
1	10,400	100	10,400
2	11,200	105	11,760
3	12,400	120	14,880
4	13,800	150	20,700
5 (est'd)	15,000	175	26,250

Limitations

This forecast of RWF26,250 for the total costs in Year 5 is, of course, subject to many limitations. The method of calculation assumes that all costs are either absolutely fixed or are variable in direct proportion to the volume of production. In practice, as we have seen, it is usually found that "fixed" costs will tend to rise slightly in steps, while the variable costs will usually rise less steeply at the higher levels of output, because of the economies of scale.

Also, our forecast will only be as accurate as our forecast of the cost index for Year 5. This is as difficult to predict as the Retail Price Index, which is influenced by changes in the price of each item in the "shopping basket".

The analysis of cost behaviour in this way is thus useful as a guide to management, provided we remember that:

(a) It assumes a linear (or "straight line") relationship between volume and cost.

(b) Costs will be influenced by many other factors, such as new production methods or new plant.

(c) Inflation will have a varying effect on different items of cost.

This subject of cost behaviour is fundamental to many aspects of cost accounting.

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Study Unit 4

Materials and Stock Control

Contents

Contents (continued)

A. INTRODUCTION AND DEFINITIONS

You have so far in your studies learned how cost accounting differs from financial accounting, how we can set up double entry cost accounts, how expenditure can be categorised into cost elements, and the nature of these cost elements, and we have touched on the two accounting techniques of absorption costing and marginal costing.

We are now going to examine the first element of cost - material. Before we do so, however, you should study carefully the following definitions of the various kinds of materials stock:

(a) Raw Materials
This is unprocessed stock awaiting conversion into saleable products. Remember that the finished product of one process or industry is often the raw material of the next process or another industry.

(b) Bulk Materials
These are materials not in unit form, i.e. they cannot be counted but must be measured by weight, volume, bars, tubes or sheets. Such materials are not suitable for the work in hand without any change in form.

(c) Part-Finished Stock
This is work-in-progress which has not reached the stage of completion as a part or component.

(d) Finished Goods
These are manufactured goods, ready for sale or despatch, e.g. to a customer or agent. They may also be known as manufactured stock or completed stock, and represent work-in-progress which has been completed and transferred physically, and by entry in the accounts, from the manufacturing department to the warehouse.

(e) Finished Parts
These are items or component parts which are in store and are awaiting either final assembly or sale as spares.

(f) Scrap Material
This is discarded material which has some recovery value and which is usually either disposed of without further treatment (other than reclamation and handling), or reintroduced into the production process in place of raw material.

(g) Indirect Materials
These are materials which cannot be identified as part of the product, e.g. material for the machine which makes the product.

(h) Consumable Stores
This term refers to certain direct materials, such as lubricants, waste, cleaning materials, etc.

B. ACCOUNTING FOR MATERIALS

Accounting for materials is every bit as important as accounting for cash.

Waste

Adequate control is necessary to guard against the many forms of waste which occur, such as carelessness, pilfering, breakages, breaking bulk materials into small lots, overstocking, etc.

Overstocking

This causes loss by wasting space and congesting the stores; physical deterioration through evaporation, shrinkage, damp or rust; obsolescence, so that space is wasted by out-of-date material; and loss of interest on capital needlessly locked up.

Inefficient purchasing may result in direct financial loss by buying in the wrong markets or at the wrong time, and in indirect loss by holding up the work on account of the failure to secure deliveries at the required time.

Advantages of Accounting for Materials

The advantages of stores (material) accounting may be summarised briefly as follows:

(a) A check on the honesty of staff is provided.

(b) Differences are detected, investigated and prevented in the future.

(c) Production is not held up for lack of materials.

(d) Overstocking is avoided.

(e) Systematic buying is facilitated.

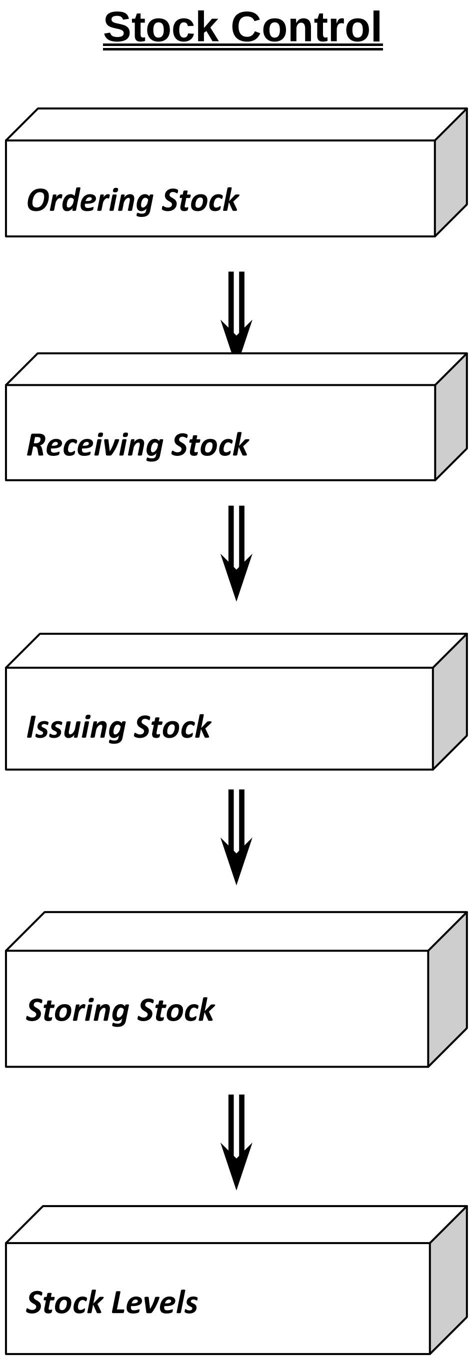
(f) Obsolete stocks are detected and dealt with.

(g) Wastage due to various causes can be measured.

(h) In the event of a fire which damages materials in stores but not the relative records, or of a burglary, there is evidence available to produce to the insurance company in connection with the amount of the claim.

C. OUTLINE OF PROCEDURES

We shall now briefly outline the procedures necessary in the purchase, receipt, storage, issue and transfer of materials.



Buying

(a) Requests for the purchase of materials should always be made to the purchasing officer, who can co-ordinate the requirements of several departments.

(b) The purchasing officer should maintain records so that the best possible terms can be obtained for the goods required. (This will usually mean best possible price, but occasionally it may be necessary to accept a higher price, for instance to obtain speedier delivery.)

(c) Official order forms should be issued by the purchasing department and copies should be raised as follows:

(i) To supplier.

(ii) To goods inward area to facilitate checking on arrival of goods.

(iii) Copy retained to check supplier's invoice when it arrives.

(iv) Additional copies may be raised according to the requirements of the business, but the number should be kept to a minimum.

Receipt

All goods should be introduced into the organisation through a designated and controlled area. The material should be inspected by a competent official, who should prepare, in duplicate, a goods received note. One of these forms should be passed to the purchasing department for comparison with the copy of the order form and the invoice when it comes to hand. The second copy will be passed to the storeman, who will enter details on the bin card when receiving the goods. (Bin cards are more fully described in the next study unit.)

It is common for a firm supplying goods to require a signature of an authorised official of the recipient organisation. Such procedures obviously improve the internal controls within the supplier but often the recipient is acknowledging that he has received the goods, in full, in good condition. In many cases the necessary testing and checking will take some time so it is usual to sign the delivery note and add the word "unexamined". This provides satisfactory evidence to the supplier that a delivery was made, without preventing the recipient from taking action should some of the goods be missing or defective.

It is essential that the goods are thoroughly checked as soon as possible after receipt and that the supplier is advised of any problems at the earliest opportunity. Normally all contact on such matters will be made by the buyer, who will make use of other technical expertise within the organisation as necessary.

Depending upon the nature of the product, it is sometimes possible to undertake sample checking of quantity or quality. In some circumstances it may be necessary to undertake a full testing procedure, on a strictly limited basis, often to the point of actually destroying the component. Again, depending upon the nature of the product, the purchaser may have made it a condition of his order that, if the specified sample fails his acceptance test, he will be entitled to reject the whole batch. Such procedures are often used by multiple retailers, especially in the clothing industry.

If the materials are not in good condition, the purchasing department must be informed immediately, so that the supplier can be contacted. Often, a goods rejected note is prepared to maintain a formal record and to prevent inadvertent payment of the invoice.

Storage

The point at which goods are stored should be functionally designed and have adequate security. Each storage area should allow easy handling of, and access to, each commodity stored. The sites of stores in an organisation should be carefully planned in relation to cost reduction. Having one centralised store will reduce accommodation costs and wages but will result in more internal transportation and longer lead-times for production departments to get hold of materials.

Issue

The main transactions affecting a system of material control arise from the issue of materials from storage. All materials are issued on an authorisation known as a "stores requisition". This form, usually issued by the production planning department, is the authority for the storeman to pass out goods from his care into the production flow. The storeman receives a departmental signature for the goods, and enters details on the appropriate bin card.

The requisitions, bearing the number of the cost unit or department for which the goods are to be used, are passed to the cost department, where they will be priced. Following normal double entry principles, we must credit the material accounts and debit the job or process accounts with the value of materials used.

Flowchart

The following flowchart (Figure 11) illustrates the movement of goods and paperwork as described above.

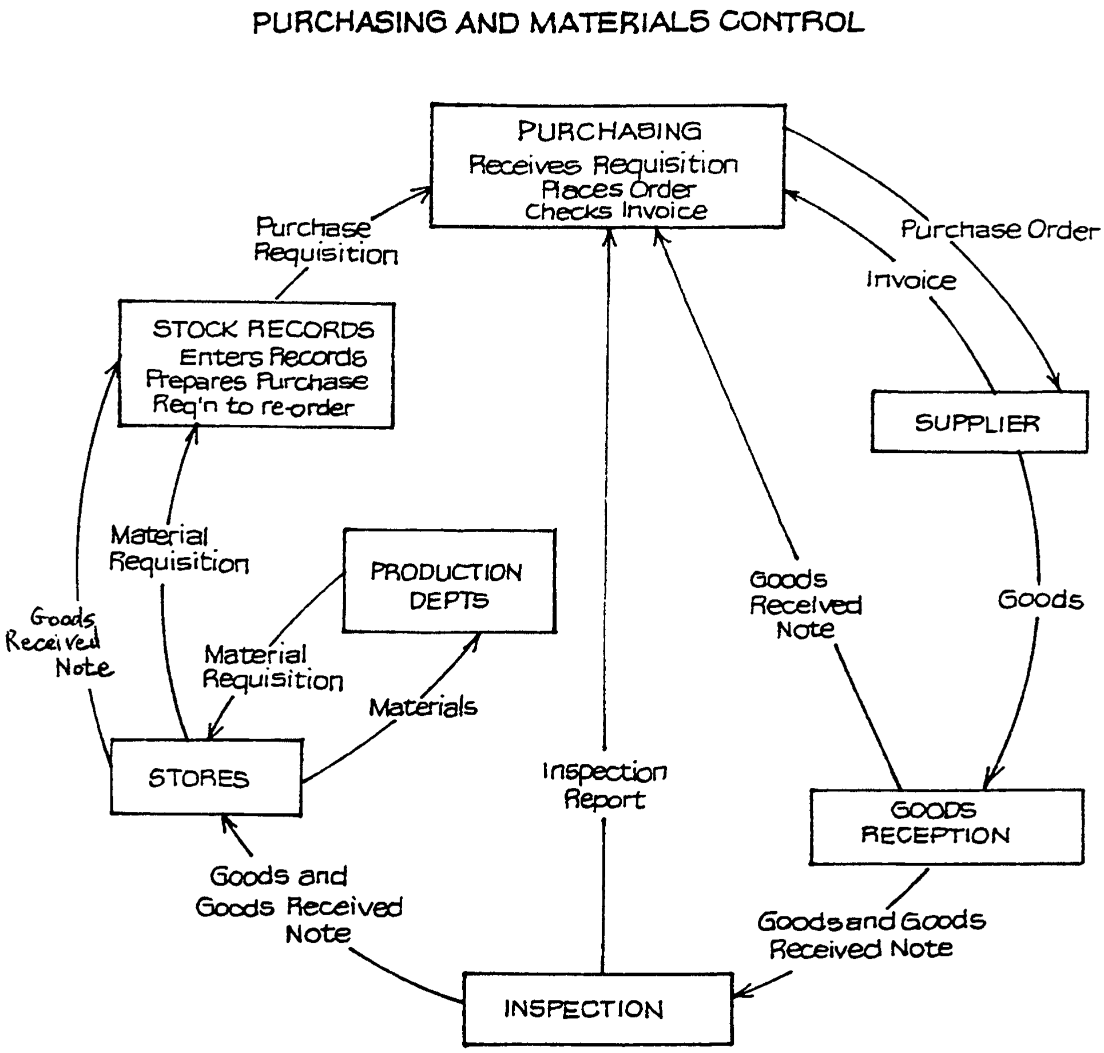

PURCHASING AND MATERIALS CONTROL
PURCHASING
Receives Requisition
Places Order
Checks Invoice
Purchase Requisition
Purchase Order
Invoice
STOCK RECORDS
Enters Records
Prepares Purchase
Req'n to re-order
SUPPLIER
Material Requisition
PRODUCTION DEPTS
Goods Received Note
Material Requisition
Materials
Goods Received Note
Goods
STORES
Inspection Report
GOODS RECEPTION
Goods and Goods Received Note
Goods and Goods Received Note
INSPECTION

Figure 11

D. ORGANISATION AND DOCUMENTATION OF PURCHASING

The Objects of a Purchasing System

(a) To obtain the right quality of materials.

(b) To obtain the right quantity of materials.

(c) To obtain delivery in such a manner as to co-ordinate the receipt of stocks with the production programme or sales requirements.

(d) To pay the minimum price for the materials purchased, consistent with (a) to (c).

(e) To carry the minimum stocks without causing loss of production through shortage of materials.

Main Documents

- Purchase Requisition Form
- Purchase Order Form
- Specification of Materials
- Goods Received Note
- Goods Rejected Note

The Purchase Requisition

The form used to advise the purchasing department of the factory requirements and also to authorise the purchasing department to make the necessary purchase is the purchase requisition (illustrated in Figure 12).

<table>
<tr><td colspan="8" align="center">ABC CO. LTD

PURCHASE REQUISITION

To Purchasing Department Serial No. 1

FROM DEPT. .... CHARGE A/C NO. .... Date .... 20 ..</td></tr>
<tr><td colspan="2">Material Symbol
or Code No.
E</td><td colspan="2">Quantity
Required
F</td><td colspan="2">Description
of Material
G</td><td colspan="2">Delivery
Requirements
H</td></tr>
<tr><td>Purchase
Order No.
A</td><td colspan="3">Date Ordered

B</td><td colspan="2">Supplier

C</td><td colspan="2">Authorised by:

D</td></tr>
</table>

Figure 12

The purchase requisition is completed as follows:

(a) Spaces A, B and C are filled in by the purchasing department.

(b) The signature in space D is that of one of the officials who are authorised to sign the requisition.

(c) Spaces E, F, G are filled in by the storekeeper.

(d) A space may also be provided for the insertion by the purchasing department of the price per unit of the material and the total value of the order, to enable a control to be maintained of purchase commitments.

(e) A copy of the purchase requisition will be retained by the person or department originating it.

(f) In space E the stock code number is entered.

(g) The "Quantity Required" (space F) is regulated by the maximum and minimum stocks, which are fixed by the management. The maximum stock is the amount above which the storekeeper may not allow the stock in hand to rise, and the minimum stock is the amount below which the stock in hand should not fall.

    In space F the unit of quantity (i.e. lbs, tons, etc.) must be stated clearly, to avoid any possible under- or over-ordering. It may be of advantage to have a separate space for "Unit of Quantity". To save re-handling on delivery, it is essential to indicate the form in which the goods are to be delivered, e.g. in cartons of 100 units or pallets holding 1 gross of packets, etc.

(h) In space H the delivery instructions should include the unloading bay or direct to place or usage, etc. Date required by may also be inserted.

Normally, three copies of the purchase requisition will be prepared and routed, as follows:

(1) To the purchasing department.

(2) To the planning department for information purposes, or this copy may be held by the authorising executive.

(3) Retained by the issuing department.

A list of officials with power to authorise requisitions should be compiled and properly authorised requisitions only should be accepted by the purchasing department. Most requisitions will come from the storekeeper, when stocks of standard materials need replenishing. Requisitions may also be initiated by:

- Production control department, for materials to be issued direct to jobs.
- Plant engineer, for materials required for capital projects or maintenance.
- Heads of administrative departments, for indirect materials not kept as standard stock.

The Purchase Order

An official form, known as a purchase order, must be sent out for every order, to show the supplier that the order is an official one on behalf of the firm, and so that the receiving system can function efficiently. In the case of new or non-standard materials, issue of the order will be preceded by a tendering procedure so that the best supplier can be selected.

The purchase order normally incorporates the purchaser's terms and conditions of purchase; acceptance of the order is deemed to imply acceptance under the purchaser's terms. This is an important consideration regarding the ultimate acceptance of the goods and any subsequent claims made for defective goods. A significant amount of a purchasing officer's time can often be taken up in agreeing whose terms are applicable to a particular order.

PURCHASE ORDER

ABC CO. LTD & ADDRESS	Order No. ....
To:	Please quote this No. on your Invoice
	Date ....
Please supply in accordance with the instructions given on the back of this order.	

Our Code	Quantity	Particulars	Rate	Amount
		Your quotation No. .... Terms: Signed for ABC Co. Ltd		

Figure 13

Copies of the purchase order will generally be distributed as follows:

(1) To the supplier.

(2) To the receiving department.

(3) To the accounting department.

(4) To the department which issued the purchase requisition.

(5) Retained by the purchasing department.

Specification of Materials

<table>
<tr><td colspan="6" align="center">ABC CO. LTD

SPECIFICATION OF MATERIALS</td></tr>
<tr><td colspan="4">Inward Order No.
Details
Delivery Note</td><td colspan="2">No.
Date
Date</td></tr>
<tr><td rowspan="2">Item No.</td><td rowspan="2">Details</td><td rowspan="2">Quantity</td><td rowspan="2">Code (if stock Material)</td><td colspan="2">For use of Storekeeper</td></tr>
<tr><td>Remarks</td><td>Purchase Req. No.</td></tr>
<tr><td>1
2
3
4
5
6
7
8
9
10</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Compiled by
Checked by</td><td colspan="3">Drawing Office Ref.:
Planning Office Ref.:</td></tr>
</table>

Figure 14

A specification of materials (also known as a bill of materials) is a form which shows all the materials and items which will be required for a particular order; this is prepared by the drawing office.

On receipt of such specification, the storekeeper will be able to foresee the requirements of the particular job concerned, and will make sure that he has the necessary materials in stock. If he is short of any of them, he will prepare a stock purchase requisition, and will inform the planning department so that any readjustment of plans necessitated by a shortage of material may be made.

E. RECEIVING DEPARTMENT

Duties

(a) Receiving and signing for goods from suppliers.

(b) Unloading the goods. (The department will have a copy of the purchase order, so that arrangements can be made in advance for any special apparatus required.)

(c) Checking the contents as to quantity and condition and conformity with the purchase order.

(d) Taking the necessary steps to have the goods tested or inspected.

(e) Notifying the stores department or the requisitioning department of the receipt of goods.

(f) Delivering the goods to the appropriate point of storage or usage.

Goods Inwards Book and Goods Received Note

A goods inwards book may be kept to record all receipts from suppliers. Often goods cannot be checked immediately on unloading, and recording the receipt of the goods in the goods inwards book will ensure adequate control of the goods. The particulars usually recorded in the goods inwards book are:

- Date received
- Supplier and carrier
- Very brief description of the goods
- Reference to the goods received note when compiled.

The next step is the preparation of the goods received note (see below).

Spaces A to G on the form shown (Figure 15) will be filled in at the goods receiving department. It will then be sent with the goods to the stores department, where the goods will be unpacked and their quality and condition inspected. If he is satisfied, the inspector will then sign in the space H and the document will be forwarded to the purchasing department.

If the inspector is dissatisfied with the goods, he will issue a goods rejected slip and send this to the purchasing department.

<table>
<tr><td colspan="8">ABC CO. LTD

GOODS RECEIVED NOTE

Supplier: No. 1

..........................G..............................
....
.... Date Received .... 19 ....</td></tr>
<tr><td colspan="2">Code No.</td><td colspan="2">Quantity Received</td><td colspan="2">Description of Material</td><td colspan="2">Remarks</td></tr>
<tr><td colspan="2">A</td><td colspan="2">B</td><td colspan="2">C</td><td colspan="2"></td></tr>
<tr><td colspan="2">Purchase Order No.</td><td colspan="2">Carrier</td><td colspan="2">Received by:</td><td colspan="2">Inspected by:</td></tr>
<tr><td colspan="2">D</td><td colspan="2">E</td><td colspan="2">F</td><td colspan="2">H</td></tr>
</table>

Figure 15

Space may be provided on the goods received note for the insertion of a goods rejected slip number and the bin or location number where the goods are finally placed by the storekeeper. Space may also be provided for the number and type of containers and for reference to a separate report, e.g. inspection, shortage, damage report.

Rejected Goods

When goods are found to be defective or otherwise not in accordance with the order, they will be rejected. When goods are rejected, a routine similar to the following should be adopted:

(a) A goods rejected note, similar to that shown in Figure 16 should be prepared in triplicate.

(b) One copy of this note should be sent to the purchasing department, which will then arrange with the supplier to obtain credit and arrange for the replacement of the rejected goods.

(c) The second copy should be sent to the planning department, which may have to modify its plans regarding work with the material concerned.

(d) The third copy is filed in the stores.

<table>
<tr><td colspan="5" align="center">GOODS REJECTED NOTE

No.: ....

Supplier: .... Examined by: ....

Order No.: .... Date ....</td></tr>
<tr><td>Code</td><td>Specification No.</td><td>Remarks</td><td>Steps Taken</td><td>Signature (Purch. Dept)</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Figure 16

F. PROCEDURE IN THE ACCOUNTS DEPARTMENT

Now let us look at what is happening on the financial accounting side of the business.

Checking the Invoices

The supplier's invoice will arrive some time after the goods.

It will be necessary to devise carefully a system to check against errors on invoices. A suitable system is where each invoice is, on receipt, entered into an invoice register and numbered. It is then impressed with a rubber stamp, designed as shown in Figure 17.

Spaces (b) and (c) will be filled in by the purchasing department; the requisite numbers are obtained by reference to the copy order book, in which the number of goods received note will have been entered. If each invoice is entered and registered under a serial number, this number being entered in the copy order book, there should be no possibility of passing a duplicate invoice. The register of invoices may be compiled in the purchasing department, the serial number being entered into space (a). The person who is responsible for checking calculations will initial in space (d).

INVOICE STAMP

Register No.	(a)
Order No.	(b)
G.R. Note No.	(c)
Calculations Checked	(d)
Checked with Order	(e)
Prices Checked	(f)
Allocation	(g)
Bought Journal Forward	(h)
Stores Ledger / Job Ledger } Forward	(j)
Passed for Payment	(k)

Figure 17

In large businesses, where hundreds or thousands of invoices are handled daily, the calculations may be checked by a special department.

Spaces (e) and (f) will be initialled by a member of the purchasing department, reference being made to the signature on the goods received note for confirmation that the goods are of the required quality and quantity.

The account to which the purchase is to be charged, e.g. whether it is ordinary stock material or whether it is material purchased for a specific job which has to be charged to the cost account for that job, will be entered in space (g). The folio of the entry in either the stores ledger (for standard materials) or the job ledger (for orders in connection with special jobs) will be entered in space (j).

The invoices will then be passed to the accounts office, where they will be entered in the purchase journal for posting to the bought ledger and the bought ledger control account. The purchase journal folio will be entered in space (h).

Finally, the invoice will be passed for payment by the authorised official, who signs in space (k).

G. THE STOREKEEPER AND STORES ISSUES

Duties of the Storekeeper

The storekeeper has considerable responsibility.

The following is a list of his duties:

(a) To receive materials into the store.

(b) To keep all items in store neatly packed in their own containers and in the position allotted to them.

(c) To issue materials against a duly signed stores requisition.

(d) To see that no unauthorised person is allowed to enter the store. Normally, the only persons allowed access to the stores, apart from the storekeeper himself, are his assistants, stock-takers and auditors.

(e) In some cases the responsibility for checking the quantity of goods in each container or bin will rest with the storekeeper.

(f) To issue a stock requisition whenever the reorder level is reached (see later).

(g) To maintain records of receipts and issues.

(h) To report on any slow-moving and obsolete stocks.

The General Routine for Stores Issues

In no circumstances should materials be issued from store without the presentation of a **materials or stores requisition signed by an authorised person** (see Figure 18). Only by strict enforcement of this rule is it possible to guard against the misuse of materials and the pilfering of stores.

			ABC CO. LTD		Serial No.	
			STORES REQUISITION			
Please supply to			Dept	Date	20	
				Job No.		
Code No.	Description of Material	Quantity		Price	Amount	Stores Ledger
		Required	Issued			
Signed: .... Foreman	Issued by:		Received by:		Cost Office Ref.:	

Figure 18

The price and amount will be entered by the cost office after the document has been recorded by the stores.

The routine in connection with the above requisition is as follows:

(a) When any material is required for a job in a department, the foreman makes out a stores (or materials) requisition. He signs this and it is taken to the storekeeper. Note that frequently the requisitions for a particular job are made out by the planning or progress department from the bill of materials and passed to the foreman only when he is ready to start the job. It is also sometimes required that the requisition number should be entered on the bill of materials.

(b) The storekeeper then issues the materials and signs the requisition, which is also signed by the person receiving the goods.

(c) The requisitions are forwarded regularly to the cost office, where the issues are priced (see later).

Materials Returned to Stores

Any unused materials normally should be returned to stores together with a stores return note, sometimes referred to as a stores credit note. This document gives similar details to the stores requisition but is usually printed in a distinguishing colour, e.g. red. The routine in connection with the returns note is similar to that with the requisition.

Sundry Transfers of Materials

If goods are transferred from one cost unit to another after leaving the stores, it is necessary to charge the receiving cost unit with the value of materials concerned and to credit the cost unit originally charged. This is achieved by raising a materials transfer slip, which bears a description of the goods transferred, the references of both cost units and the signatures of both supervisors concerned.

Transfers should be made only if the goods are immediately required by another department and if it is clearly more efficient (because of location) to make a direct transfer. Otherwise all unused materials should be returned to the stores, as described above, for reissue.

H. STOCK LEVELS

In order to ensure that the flow of production is not impaired by the lack of materials and also that excessive capital is not tied up in stocks, it is necessary to ensure that the level of stock held always lies between certain limits.

Maximum Quantity

This represents the greatest amount of an item of stock which should be carried if the best use is to be made of working capital.

In determining the maximum stock level, the following are among the factors considered:

(a) Capital tied up in stocks.
(b) Capital available.
(c) Cost of storage (including rent, insurance, labour costs).
(d) Storage space available.
(e) Consumption rate.
(f) Economic purchasing quantities (see later).
(g) Market conditions and prices, seasonal considerations.
(h) Nature of material - possible deterioration or obsolescence.

Minimum Quantity

This represents the level below which the stock should not normally be allowed to fall if the requirements of production are to be met.

The minimum level is determined by the rate of consumption of materials and the time taken between placing an order and receiving the material.

Reorder Level

It is necessary to set a point at which an order must be placed. This point is known as the reorder level. It will be higher than the minimum level, to cover use during the period before the order is received.

Reorder Quantity

The reorder quantity is the quantity which should be ordered at the time the reorder level is reached. It will depend on the discounts available from suppliers for bulk ordering, the cost of placing an order and the cost of storage (see later).

Formulae

- Reorder level = Maximum consumption × Maximum reorder period.
- Minimum stock = Reorder level – (Normal consumption × Normal reorder period).
- Maximum stock = Reorder level + Reorder quantity – (Minimum consumption × Minimum reorder period).
- Average stock = Minimum stock + ½ Reorder quantity.

These levels should be reviewed periodically to ensure that they reflect current conditions.

Example

Component A is used as follows:

Normal usage	50 per week
Minimum usage	25 per week
Maximum usage	75 per week
Reorder quantity	300
Reorder period	4-6 weeks

Calculate the reorder level, the minimum and maximum levels, and the average stock level.

Solution

Reorder level = Maximum consumption $\times$ Maximum reorder period

= 75×6

= 450

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

= $450 - 50 \times 5$

= 200

Maximum level = Reorder level + Reorder quantity $-$ (Minimum consumption $\times$ Minimum reorder period)

= $450 + 300 - (25 \times 4)$

= 650

Average level = Minimum stock + one half Reorder quantity

= $200 + (300 \div 2)$

= 350.

I. ECONOMIC ORDER QUANTITY

Formula

There is a formula which tells a company the optimum batch size in which to purchase goods.

The formula is:

$$Q = \sqrt{\frac{2C_2D}{C_1}}$$

Where:

Q is the economic order quantity;

D is the annual demand for the product;

C_2 is the fixed cost of placing an order, i.e. delivery charges, clerical time in placing order, checking invoice, etc., which do not vary with the size of the order; if the goods are produced internally it will include fixed production costs incurred specifically in producing the batch, e.g. tool setting;

C_1 is the annual cost of holding one unit of stock.

You should notice that the model is rather limited: the unit cost is assumed to be constant. There is no provision for quantity discounts which might make it more attractive to purchase larger quantities.

Or

Formula:	$\sqrt{\dfrac{2\ D\,C^{o}}{C^{H}}}$

Where:

D_o = Demand

C = Cost of Ordering

C_H = Cost of holding

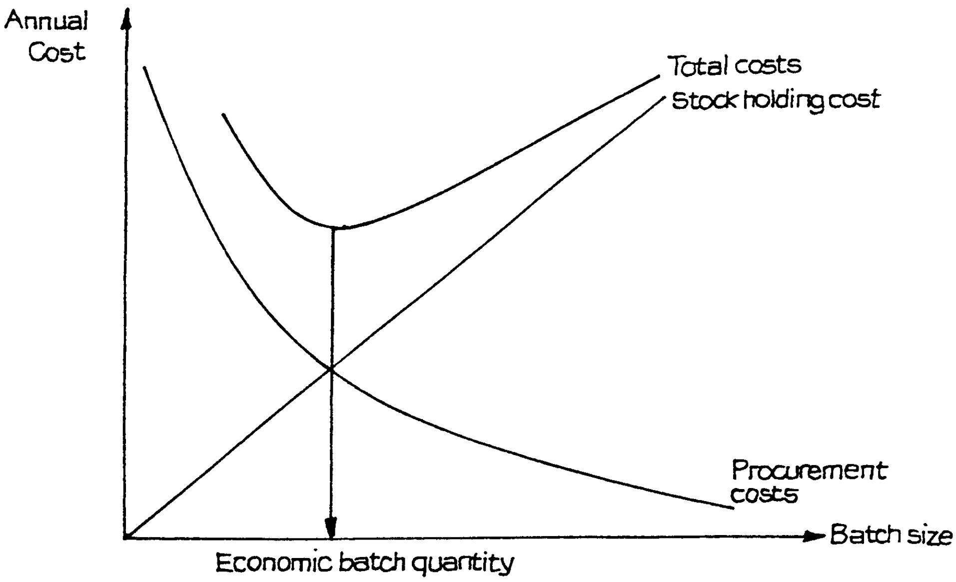


Figure 19

The position of the economic batch quantity can be illustrated graphically (see Figure 19). Obviously, the larger the batches which are bought, the fewer batches there need to be to cover the annual demand. Therefore, the total fixed cost (S × number of batches) decreases as the batch size increases. Conversely, buying larger batches will increase the average stock held, and therefore increase the total stockholding cost. The economic batch quantity is at the point where total costs are minimised.

Example

A company uses 4,000 components, type "A", in a year. The cost of placing an order is RWF20. The stockholding cost is RWF4 per item per year. Stocks are replenished when the stock level falls to 50 units; orders placed are received the same day. Calculate the economic order quantity.

Solution

Using the formula $Q = \sqrt{\dfrac{2DS}{H}}$

Then, $Q = \sqrt{\dfrac{2 \times 4{,}000 \times 20}{4}}$

$= \sqrt{40{,}000}$

$= 200$

∴ orders should be placed for batches of 200 units at a time.

Explanation

The correctness of the formula can be demonstrated by using the data of the above example and "testing" different order sizes.

A	Order size	100	160	200	250
B	Number of orders p.a.	40	25	20	16
C	Total ordering cost B × RWF20	RWF800	RWF500	RWF400	RWF320
D	Average stock 50 + (½ × A)	100	130	150	175
E	Stock holding cost D × RWF4	RWF400	RWF520	RWF600	RWF700
F	Total cost C + E	RWF1,200	RWF1,020	RWF1,000	RWF1,020

∴ 200 is the economic order quantity.

J. STOCK TURNOVER

This term expresses the number of times stock is sold or used within a given period. Usually it is expressed as a ratio:

$$\frac{\text{Cost of sales for a specific period}}{\text{Average value of stock held}}$$

(Average value of stock held is (Opening value + Closing value) ÷ 2.)

Example:

Cost of stock sold in Year 1	RWF600,000
Opening stock	RWF30,000
Closing stock	RWF20,000

$$\text{Stock turnover} = \frac{RWF\,600{,}000}{RWF\,25{,}000} = 24 \text{ times per year.}$$

K. ACCOUNTING RECORDS REQUIRED FOR MATERIALS

Bin Cards

Bin cards are prime entry records of the quantities of stock, kept on an in/out/balance basis, held in designated storage areas.

These records are maintained at the physical point of storage and usually show only quantities, not costs, of items held. The storekeeper is responsible for keeping the bin cards up-to-date.

The bin card records receipts, issues and the balance remaining in stock. The receipts side will show entries from goods received notes and returned to stores notes and the issues portion shows the goods passed to production as per stores requisition slips. The balance on hand shown on the card should equal the physical number of items in stock.

The bin card may also show the materials allocated, i.e. reserved for a particular cost unit but not yet issued; and free stock, which is the balance on order and on hand less the allocated stock. This is because the reorder level is sometimes set in terms of the free stock level.

Stores Ledger Accounts

These accounts are maintained in a stores ledger held in the cost office, an account being opened for each item held in stock. The entries mirror the transactions shown on the bin cards, but show the values as well as quantities. The physical separation of the bin cards and stores ledger accounts and the fact that different staff are involved helps prevent fraud or pilfering of materials. Having a dual record also helps to detect clerical error.

L. STOCKTAKING

This is a process whereby stocks (which may comprise direct and indirect materials, work-in-progress and finished goods) are physically counted and are then valued item by item.

Perpetual Inventory and Continuous Stocktaking

When the stores balances are recorded after every issue or receipt of materials, a perpetual inventory is in operation. This can be combined with a continuous stocktaking system whereby a few items are actually counted every day. The physical quantity in stock is then compared with the balance shown in the records.

The advantages of this system are as follows:

(a) The temporary dislocation of work caused by end-of-period stocktaking is avoided.

(b) The daily checking of items can be so arranged that all items are checked at least twice a year, and fast-moving or valuable lines can be checked more frequently. Checking should be carried out by non-stores staff, and advance notice should not be given of which items are to be checked each day.

(c) Explanations of differences between physical stock and records can be made more easily and perhaps measures can be taken to prevent a recurrence.

Such differences might be due to:

(i) Evaporation;

(ii) Absorption of moisture;

(iii) Losses in breaking bulk;

unavoidable differences.

(iv) Unavoidable approximation in measuring issues;

(v) Pilferage;

(vi) Poor storage conditions or handling, causing damage;

avoidable differences.

(vii) Careless measurement.

(d) There is a reinforcement of the need for honesty on the part of the staff.

(e) The annual accounts can be prepared earlier, as the book value of the stores is acceptable for balance sheet purposes. The stock value can also be used to prepare monthly accounts.

(f) The opportunity can be taken to check that maximum stock levels are not being exceeded so that the disadvantages of excessive stocks are more easily avoided.

The perpetual inventory routine needs to be thoroughly documented within the organisation, and active measures taken to ensure that laid-down procedures are followed. This is necessary not only to gain the greatest internal advantage of this approach, but also in order that the auditors may be convinced of the validity of the stock figures. To this end the auditors will generally spend a lot of time satisfying themselves that the system is working correctly, especially in the early years after its implementation.

Methods of Stocktaking

(a) Individual Count

Where items are individual and of the same generic group, it is necessary to count the number of each type held in stock.

As a general rule this is only carried out when items are of reasonable size; where nuts, bolts or nails are concerned, it is usual to weigh the items or estimate the amount by experience. The individual count method is very slow and laborious if there are a large number of items involved. This method can be greatly speeded up if stock is stored in standard quantities or bundles, so that it merely becomes a question of counting the number of bundles.

(b) Measurement of Liquids

The method by which the liquid is stored and used will very largely determine the way in which the physical stocktaking should be carried out. If liquid is delivered in bulk and drawn off for use automatically, it is usual for meters to be installed which give the usage for a period and the volume remaining in storage. The tolerance of accuracy is normally very small and, subject to practical experience, it is usual to accept the reading on the meters for purposes of stocktaking. Electronic measuring devices are extremely accurate and can be relied on to provide a high degree of accuracy.

In certain cases usage may be measured by a type of meter which does not record deliveries or stock remaining, e.g. a petrol pump of the older type. A theoretical stock value will be continuously maintained, but the contents of the tank will be compared with this at regular intervals. A dip-stick will normally be used for this purpose. This method of measurement relies on the fact that one dip-stick is maintained for each size of tank, and the degree of accuracy will depend on the calibration of the stick.

(c) Measurement by Calculation

There are many materials which are solids but cannot be counted individually, e.g. coal, flour or sugar. The amount of such items can be calculated by ascertaining the cubic space taken up measured, for example, in cubic feet; so that by using the known weight of the commodity per cubic foot, the total weight can be obtained for pricing.

(d) Measurement by Technical Estimate

Where goods are incapable of being counted or measured by scientific means, it may be necessary to resort to technical estimates.

Organisation of Annual Stocktaking

Many large organisations, which are not working on a perpetual inventory system, will arrange for the physical stocks to be counted before the year end. This is a satisfactory arrangement provided suitable systems are in place to monitor stock movements between the date of the physical check and the financial year end. The auditors must be advised in advance if this route is to be followed and it must be emphasised how important it is to have in place procedures to monitor stock movement and to ensure that they are being correctly followed.

With an annual stocktake (rather than a continuous system) the greatest problem is that of getting the full procedure carried out in the time allowed. The deadline allowed for the completion of stock figures is some time before the completion of the annual accounts. As the physical count cannot take place before the close of the last day's business, the time available is short and the work to be done considerable.

(a) Preparatory Work

Time will be saved at the stocktaking if preparatory work can be carried out prior to commencement of stocktaking. Jobs which can be done are: the typing of forms, the entering of static information such as description and in certain cases price, the grouping of forms by departments and the issue of stocktaking forms at least one week in advance of the date of action.

One week before stocktaking, therefore, a responsible official can check that the correct forms have been issued to the various sections and departments and have been completed in respect of date, heading and all static information. This will eliminate one of the common bottle-necks caused by people complaining that they did not receive the correct forms or did not receive any forms at all.

Careful design of forms can also save time at the actual stocktaking. They should be on stout card so that they are not damaged in the stores, logically laid out so that the person completing them can work from left to right, and should ask only for relevant information.

(b) Physical Counting and Measurement

This should be carried out by non-stores staff (but the stores staff should be on hand to assist by showing the stocktakers the location of each item). The stocktakers should only be required physically to measure the stock and enter this on forms on which the description of each item has already been entered: all other entries to be made can be done in the cost office. The auditors should normally be invited to attend the physical count, although their appearance will depend upon the materiality of the stock figure.

(c) Valuation

Having ascertained the quantity of stock, this has to be converted to a value in RWF. We will consider this later.

(d) Checking

On completion of the calculation and the checking, it should be the specific responsibility of the official in charge of stocktaking to ensure that all stock sheets issued have been returned fully completed.

Any additional sheets relating to new types of stock should be specially studied, so that at the following stocktaking the appropriate preparatory work can be carried out.

All sections should then be merged into a stock summary, taking care to ensure a full audit trail back from the final stock value to the individual items of stock.

(e) Conclusion

If the suggestions on form design and organisation of staff are carried out, accurate physical stock figures can be obtained. Nevertheless, an annual stocktaking is a major undertaking needing a lot of work.

M. THE PRICING OF MATERIAL ISSUES

Problem of Pricing

In times of changing prices, firms have to decide on how they will price the materials issued to production, when they are trying to arrive at overall production costs. Should it be the price they actually paid for the material, or the current price of the same type of material (which could well be higher)?

There are several different methods of pricing material issues, which we shall now discuss.

At Market Price Ruling at the Date of Issue

When quoting for business, it may be necessary to include materials on the basis of their market price at the time, even though they may have been bought some time earlier at a higher price; for, if a firm gives a high quotation in an attempt to recover the full cost of the materials, it may lose the business altogether to a competitor whose quotation is based on the current market price.

Conversely, if a manufacturer has, through good fortune or foresight, acquired considerable stocks of a material at a price below that currently ruling and he acquires business which will use those materials, he will want to take advantage of this good buying by placing a quote which includes the current market value of the materials. (The manufacturer will not always get away with this! In particular, if he is a contractor for a government department he will be obliged to charge for the materials at cost.)

The use of market prices therefore gives credit for good buying and the reverse for bad buying. The difficulty is to establish the current market price and, as this does not line up with the actual cost of the materials, it is necessary to operate an adjustment account to take care of the differences.

At Inflated Cost

This method is used to cover the unavoidable wastage which may occur in certain circumstances. The changes which often take place in this wastage render the method inaccurate and an adjustment account will have to be opened.

At Cost Price

Issue of materials is usually carried out on this basis, and clearly it is not necessary to use an adjustment account. There are several conventions by which materials can be issued at cost price; the most usual are described below.

(a) FIFO - First In, First Out

This is a method pricing material issues using the oldest purchase price first, i.e. the oldest items in stock shown by the stock records are issued first.

If the transactions involved are numerous, this method involves a great deal of clerical effort, and it is therefore best used for slow-moving stock where the value is high and the price does not fluctuate a great deal. In times of rising prices, the valuation of issues tends to be low. On the other hand, the value placed on the closing stock will reflect current prices, since if the first stock to come in is deemed to be the first issued, it is the latest stock which remains.

Advantages of FIFO

1. Probably represents what is really happening within the stores.
2. Easy to use.
3. Easy to explain to managers.
4. The closing stock value should be near market value.

Disadvantages of FIFO

1. Can be difficult to operate.
2. Issues of stock can be at a lower cost than market price, especially in a period of inflation.

Example

Date	Receipts			Issues			Balance	
	Units	Rate	Amount	Units	Rate	Amount	Units	Amount
		RWF	RWF		RWF	RWF		RWF
Jan. 1	12	1.00	12.00				12	12.00
" 10	10	1.05	10.50				22	22.50
" 11				5	1.00	5.00	17	17.50
" 26				8 (7	1.00	7.00		
				(1	1.05	1.05	9	9.45
" 30	10	1.10	11.00				19	20.45
Feb. 4				5	1.05	5.25	14	15.20
" 10				6 (4	1.05	4.20		
				(2	1.10	2.20	8	8.80
" 11	10	1.05	10.50				18	19.30
" 15				9 (8	1.10	8.80		
				(1	1.05	1.05	9	9.45

Stock balance made up of 9 units @ RWF1.05 = RWF9.45.

FIFO may be inequitable in that two jobs on the same day may be charged different rates for the same material.

(b) LIFO - Last In, First Out

This is a method of pricing material issues using the last purchase price first.

When this method is in operation, stores issued are charged at the prices of the latest items in the stock from which the materials are drawn. In times of inflation, therefore, the cost of the present high-priced material is charged to production as it is incurred. On the other hand, closing stocks will be conservatively valued. Like FIFO, the method can be cumbersome to operate and possibly inequitable.

Advantages of LIFO

1. Fairly accurate method of accounting for inflation.
2. Helps decision making.
3. Stock that is issued is close to market value of stock.

Disadvantages of LIFO

1. Can be difficult to operate.
2. Difficult to explain to managers.
3. Variations in prices.
4. Closing stocks become undervalued when compared to market value.

Example

Date	Receipts			Issues			Balance	
	Units	Rate	Amount	Units	Rate	Amount	Units	Amount
		RWF	RWF		RWF	RWF		RWF
Jan. 1	12	1.00	12.00				12	12.00
" 10	10	1.05	10.50				22	22.50
" 11				5	1.05	5.25	17	17.25
" 26				8 (5	1.05	5.25		
				(3	1.00	3.00	9	9.00
" 30	10	1.10	11.00				19	20.00
Feb. 4				5	1.05	5.50	14	14.50
" 10				6 (5	1.10	5.50		
				(1	1.00	1.00	8	8.00
" 11	10	1.05	10.50				18	18.50
" 15				9	1.05	9.45	9	9.05

Balance of stock 1 @ RWF1.05 = RWF1.05
8 @ RWF1.00 = RWF8.00 } = RWF9.05

Both FIFO and LIFO can produce anomalies - two jobs which receive materials on the same day may be charged differently because one batch of purchases has been exhausted

(c) Weighted Average Price

Under this method, the price at which stores are issued is calculated by dividing the total cost of the materials in stock from which the material to be priced could have been drawn, by the total quantity of material in that stock.

This method has the advantage of spreading the cost more evenly. It can be used to advantage where the price of materials fluctuates rapidly and is a useful method for computerised accounting.

However, like the LIFO and FIFO methods, it may involve a lot of clerical work. Should there be an extremely high or low price, it is reflected in the costs for a long time afterwards.

A simplification is to use a **periodic** weighted average, calculating the average net after each receipt but retrospectively once a month (say). If this method were used in the previous example, the average for January would be RWF1.0469 (32 units received at RWF33.50) and this would be used for both issues in January. The balance on hand at the beginning of February would then be valued at RWF19.89 (19 units at RWF1.0469), so the retrospective weighted average for February would be RWF1.0479 ((RWF19.89 plus RWF10.50) divided by 29).

A further simplification is to use a simple average, i.e. adding up the prices without weighting for quantity and dividing by the number of prices. Again this may be calculated on the continuous or periodic system.

Using the continuous system, the simple average for the 1 January to 10 January consignments would be RWF1.025 ((RWF1 plus RWF1.05) divided by 2). This method should only be used when there is little fluctuation in prices, but it can be a useful time-saving short-cut.

Advantages of Weighted Average Price

1. Any fluctuations in price are smoothed out.
2. Decision making is made easier using this method.
3. Easier to operate.

Disadvantages of Weighted Average Price

1. Prices and closing stock values can be lower than the market value.
2. When using this system, actual price can run into several decimal places.

(d) Standard Price

This is the method adopted when a standard costing system is in operation. Purchases are posted to the stock account at the predetermined standard price and issues are priced at standard price. The difference between the actual cost of purchases and their value at standard price, called the "price variance", is posted to a separate account.

(e) Replacement Price

Under this method, stores are issued at the current replacement price. Using standard manual record cards it is not possible to maintain details of the value of goods in stock, although the physical balance is maintained and may be multiplied by the current replacement price to arrive at a replacement cost stock figure. This stock figure would need to be adjusted subsequently, before it could be used in the financial accounts of the company.

Good records are essential, as the replacement price at the time of each issue must be known and this is only likely to be realistic in a fully computerised environment. The system has the advantage that all issues are made at current economic value, but this in itself will lead to the generation of sundry profits and losses on stock holdings.

N. OBSOLETE, DORMANT AND SLOW-MOVING STOCK

Obsolete Stock

Obsolete stock can be a serious matter. All stock represents cash and should be turned into products and sold to bring the money back in again.

Obsolete stock is dead cash. All possible steps must be taken to prevent stock from becoming obsolete by the co-ordination of the efforts of all concerned. For example, the design department may agree to a modification being held back until existing stocks have been used; or the sales department may have a big "push" on an item which is shortly to be dropped, so as to clear out stocks.

Yet some obsolescence is unavoidable. It is a good thing to keep a separate section of the stores, to which any stocks declared obsolete should be transferred immediately.

Thought must be given as to whether there will be a demand for spares for old models still in existence and, if so, some parts must be set aside for this purpose.

The remaining problem then is the one of finding the best possible market for the remainder. The buying department is usually in the best position to do this.

Remember, it is not only the cost of the materials which is tied up, but storage space, labour, etc.

Dormant and Slow-Moving Stock

In addition to obsolete stock there is the problem of dormant stock, and of slow-moving stock. Dormant stock means an item which has not moved for a considerable period. It is not obsolete because it has not been replaced by a new item, and in the future it is expected to move again.

Slow-moving stock may consist of items which are only issued at long intervals. Obviously an item like this will not be featured as a stock receipt until, after a long interval, it drops to reorder level. At that time, either the storekeeper will mark the reorder requisition "SM" so that the matter will be investigated, or, in the case of an automatic system, the item will be printed out by the computer as an exception for special study.

O. JUST-IN-TIME (JIT)

Traditionally organisations in the West have used a "push" production flow system. This system has the following stages:

1. Buy raw materials and place them in stock
2. Produce goods based on sales forecasts
3. Requisition goods from stock and make products according to the production schedule
4. Place finished goods into finished goods store
5. Sell to customers from finished goods when customers request products

However, Japanese companies, most notably Toyota, developed a different system, known as Just-In-Time or Stockless Production. This system is not a "push" system but a "pull" system.

A product is not made until the customer requests it and components are not made until they are required by the next production stage. In a full JIT system, virtually no stock is held; that is no raw material stock and no finished goods stock, but there will usually be a small amount of work-in-progress.

JIT stock management methods seek to eliminate any waste that arises in the manufacturing process as a result of using stock. JIT purchasing methods apply the JIT principle to deliveries of material from suppliers. With JIT production methods, stock levels of raw materials, work-in-progress and finished goods are reduced to a minimum or eliminated altogether by improved work-flow planning and closer relationships with suppliers.

Advantages of JIT

JIT stock management methods seek to eliminate waste at all stages of the manufacturing process by minimising or eliminating stock, defects, breakdowns and production delays. This is achieved by improved workflow planning, emphasising quality control and firm contracts between buyer and supplier.

One advantage of JIT stock management methods is a stronger relationship between buyer and supplier. This offers security to the supplier, who benefits from regular orders, continuing future business and more certain production planning. The buyer benefits from lower stock holding costs, lower investment in stock and work-in-progress and the transfer of stock management problems to the supplier. The buyer may also benefit from bulk purchase discounts or lower purchase costs.

The emphasis on quality control in the production process reduces scrap, re-working and set-up costs, while improved production design can reduce or even eliminate unnecessary material movements. The result is a smooth flow of material and work through the production system, with no queues or idle time.

Disadvantages of JIT

A JIT stock management system may not run as smoothly in practice as theory may suggest, since there may be little room for manoeuvre in the event of unforeseen delays. For example, there is little room for error on delivery times.

The buyer is also dependent on the supplier for maintaining the quality of delivered materials and components. If delivered quality is not up to the required standard, expensive downtime or a production standstill may arise, although the buyer can protect against this by including guarantees and penalties in the suppliers contract. If the supplier increases prices, the buyer may find that it is not easy to find an alternative supplier who can meet his needs at short notice.

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Study Unit 5

Labour

Contents

Contents (Continued) **Page**

A. METHODS OF REMUNERATION

Fixing Wage Rates

Wage rates may be fixed by individual agreement between employer and employee, or more commonly by collective bargaining between trade unions and employers' associations.

An employer may pay wages on an hourly basis, per piece, or may adopt one of the various bonus methods of payment, but the general principle of a wages policy is to obtain the maximum production per RWF of wages paid while maintaining an acceptable quality of production, within the limits of "social justice" (i.e. employees should receive a "fair day's wages").

In deciding on the method of remuneration to use, attention must be paid to the following factors:

(a) The relative importance of quantity and quality, and the cost of spoilage.

(b) The degree of specialisation and standardisation of the product.

(c) The degree to which automatic or semi-automatic machines are used.

Main Methods

Workers may be paid by time of attendance or by results. The latter method provides an incentive to increase production. "Payment by results" covers:

(a) Piece Rates:

These may be:

- Straight piece rates
- Piece rates with guaranteed minimum
- Differential piece rates.

(b) Bonus Schemes:

These can be any of the following:

- Bonus schemes for direct workers individually
- Bonus schemes for direct workers in groups
- Bonus schemes for indirect workers
- Bonus schemes for staff.

(c) Performance-Related Pay

(d) Indirect Monetary Incentives:

These may take the form of:

- Co-partnership schemes
- Profit-sharing schemes
- Allowances and expenses of various kinds.

(e) Non-Monetary Incentives:

These are further inducements to increase output. They include security of employment, prospects of promotion and the satisfaction that a job gives to an employee (i.e. craft work as opposed to repetitive production).

B. TIME RATES

At Ordinary Levels

This system is the most common method of wage payment in Britain. It is a system of paying workers for the time worked rather than for work produced. It may be in the form of an hourly rate, or shift or weekly rate for an agreed number of hours. We must examine the circumstances in which it is most favoured, and its advantages and disadvantages.

(a) Where the System Can be Favoured

(i) Where the work done is very difficult to measure, e.g. when a service is rendered - *nurses*, *policemen*, *probation officers*, *lift attendants*, *teachers* - or when the work cannot be standardised, e.g. the majority of clerical operators or administrative work.

(ii) When workers are learning, e.g. *apprentices*.

(iii) Where the speed of the machine, operation, or process governs the speed at which the operator can work, e.g. assembly lines, chemical plants, and process industries such as bottle or paper making.

(iv) When quality of production is of prime importance and would be endangered by encouraging an operator to work faster.

(v) When safety is likely to be *endangered if the operation is speeded up*, e.g. lorry driver.

(vi) When it is found that *good employer/employee relations exist and a satisfactory output is being achieved*. The introduction of an incentive scheme may disrupt the good employer/employee relations, causing discontent and possibly lower production.

(vii) When work is so unstandardised that the expense and difficulty involved in measuring the work done, etc. would be so great as to outweigh any advantages accruing from an incentive scheme.

(b) Advantages

(i) The system is simple to understand and simple to operate, saving on clerical labour in number and quality of staff.

(ii) Wages are stable, an advantage rated very highly by many workers.

(c) Disadvantages

(i) The system provides no direct incentive to the worker to increase output or to produce better quality work.

(ii) It tends towards higher production costs because the workers tend to work at an accepted minimum rate.

(iii) It requires close supervision, and in times of full employment the worker's output is greatly dependent on his goodwill and conscientious attitude, since there is no fear of dismissal.

(d) Effect of Variations in Output

Any gain or loss arising from variations in the operators' efficiency will be borne by the employer. Thus, if the daily wage of each of four operators is RWF40:

If A produces 20 units his labour cost per unit is RWF2, i.e. RWF40 divided by 20 units.

If B produces 40 units his labour cost per unit is RWF1, i.e. RWF40 divided by 40 units.

If C produces 80 units his labour cost per unit is RWF0.50, i.e. RWF40 divided by 80 units.

If D produces 100 units his labour cost per unit is RWF0.40, i.e. RWF40 divided by 100 units.

Clearly, labour cost per unit falls with increased production. This is illustrated in Figure 20.

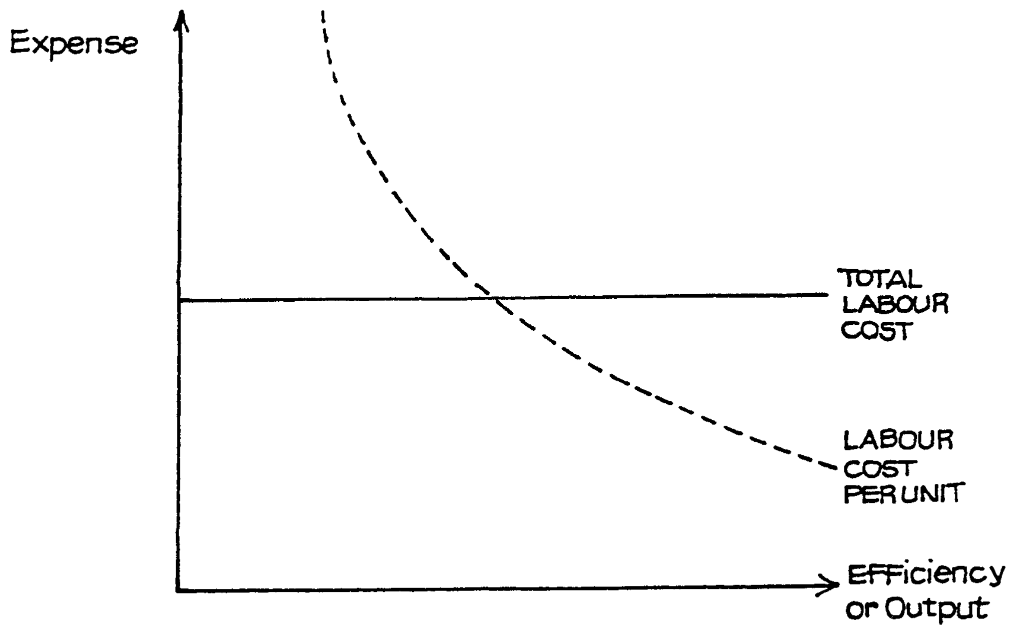

Figure 20

High Wage Plan

(a) Significant Points

(i) An appreciably higher than average wage is paid compared with other factories in the area.

(ii) A higher standard of output, both in quality and quantity, is set.

(iii) As a vacancy attracts a larger number of applicants, the employer can secure the services of better workers, who will be willing to maintain the higher standard in order to retain their jobs and the higher wages.

(b) Advantages

(i) It is simple to understand and operate.

(ii) Wages are stable.

(iii) It overcomes the lack of incentive of ordinary time rates.

(iv) Output increases, and as a result, the cost per unit falls, compensating the employer for the increase in wages.

(c) Disadvantages

(i) As with ordinary time rates, this system still does not provide incentive for exceptional effort and ability.

(ii) It requires close supervision.

Graduated Time Rates

These are time rates adjusted for particular reasons, e.g. changes in the cost of living, additional rates for merit, loyalty, etc.

C. INCENTIVE SCHEMES

General Principles

There are some general principles which should apply to all incentive schemes:

(a) The reward should be as nearly related to effort as possible, both in amount and in time of payment.

(b) The scheme should be fair to both employer and employee.

(c) There should be mutual agreement to ensure that the basis of the scheme is fully understood, covers all reasonable points, and is not capable of being misinterpreted.

(d) The scheme should be strong and positive; it should have clearly defined, worthwhile and attainable objectives.

(e) There should be no limits placed upon the amount of additional earnings.

(f) The incentives should not be affected by matters outside the employees' control.

(g) The incentive should be reasonably permanent, not merely a device to be used by the employer when business is good and dropped when it is not.

(h) The rates for payment by results should be fixed only after the job has been properly assessed.

(j) Piece rates or time allowances, once fixed, should remain, unless conditions or methods change.

(k) The standard of performance set must be reasonably attainable by the average employee and it should be possible to demonstrate that this is so.

(l) The scheme should be simple, capable of being understood by the workers so that they can make their own calculations, and easy to operate with the minimum of clerical work.

(m) A properly prepared incentive scheme should assist supervision and help to reduce the cost of it.

(n) The scheme should be in conformity with any national, local or trade agreement.

Reasons for Having an Incentive Scheme

Before we discuss various incentive schemes, it would be useful if we considered the difference such a scheme of remuneration might make to certain firms.

Firms with high fixed overheads will want to increase output as much as possible, because by increasing output they can spread the fixed overheads over a larger number of units, thus reducing the fixed cost per unit - assuming, as we have already seen, that absorption costing is in operation.

Under some incentive schemes the labour cost per unit will rise, but by increasing the output, the total cost per unit will fall (again employing absorption costing).

Example

		Under a Guaranteed Fixed Wage		Under an Incentive Scheme	Under an Increased Incentive
		A	B	C	D
(a)	No. of units produced	150,000	200,000	250,000	300,000
(b)	Total fixed cost	RWF500,000	RWF500,000	RWF500,000	RWF500,000
(c)	Fixed cost per unit $\frac{(b)}{(a)}$	RWF3.33	RWF2.50	RWF2.00	RWF1.67
(d)	Total wages cost	RWF100,000	RWF100,000	RWF120,000	RWF160,000
(e)	Wages cost per unit $\frac{(d)}{(a)}$	RWF0.67	RWF0.50	RWF0.48	RWF0.53
(f)	Material cost per unit	RWF1.00	RWF1.00	RWF1.00	RWF1.00
(g)	Total cost per unit (c) + (e) + (f)	RWF5.00	RWF4.00	RWF3.48	RWF3.20

You will note that the increased production in B has caused the fixed cost per unit and labour cost per unit to fall considerably. In C the fixed cost per unit has again fallen, but because the incentive scheme is in operation the labour cost per unit has hardly fallen at all. Because an increased incentive is operating in D, the wages cost per unit has risen, but this is more than compensated for by the reduction in fixed cost per unit.

D. PIECE-RATES

Advantages of Piece Rates

(a) Time wasted by employees is not paid for, although much depends on the cause of the idle time and on the agreement in force in the particular industry.

(b) Each worker is paid on his merits, and thus individual effort is encouraged.

(c) The increase in production through the workers being induced to work faster causes a decrease in the fixed expenses chargeable to each unit (in an absorption costing context).

(d) The employer knows in advance the exact direct labour cost of each job; this information is invaluable when tendering for work.

(e) The workers tend to be more careful with tools and equipment when they know that any mishap to these will reduce their own earning powers.

Disadvantages

(a) Difficulty may be encountered in fixing an equitable rate

(b) Slow workers may feel discontented as they will receive a lower wage than the faster worker. Trade unions are often opposed to piece work on this ground and also on the ground that the greater speed of production due to piece work may reduce employment opportunities in the long run.

(c) Excessive waste of material may be caused through the workers attempting to work quickly. Scrapped work will not be paid for, but the employer will lose to the extent of the overheads involved and the cost of the material spoilt, particularly if any of the unsatisfactory work has been allowed to continue in production and has passed through subsequent operations. It would be advantageous to introduce a penalty for spoiled work but this would be very difficult.

(d) Unless some differential or bonus system is introduced, there is no extra reward for exceptional effort, e.g. a worker is paid the same per unit for producing one unit or 50 units. Conversely, no fine is levied for slow production and although only a small wage is earned, the overhead expenses per unit will increase.

(e) Payment may be irregular, because of numerous factors, e.g. sickness, breakdown of machinery, shortage of raw materials, and bad weather.

In many industries, however, there are now agreements providing for the payment of a guaranteed minimum week when causes outside the control of the workers operate to disturb or prevent normal production.

(f) If the proportion of overhead to labour cost is very low, then there is little advantage to be gained.

(g) It is stated that over-production may result from speedy work, although it should be possible, with an efficient planning and production control (or progress) department, to ensure that only the required amounts of any commodity are produced.

(h) The risk of accidents may be increased.

(j) Piece rates may encourage individuals to work purely for themselves and there may be a lack of co-operation in the department.

(k) There may be a tendency towards absenteeism and bad time-keeping, especially when workers feel they have earned “enough”.

E. DIFFERENTIAL PIECE-RATE SYSTEMS

The principle behind differential piece-rate systems is to introduce an additional incentive, at the point when most workers feel it is not worthwhile putting any more extra effort into their work - in other words, to encourage them to put in that extra effort.

For example, let us consider lifting potatoes. If there are 12 potato plants in each row, it will not be difficult to dig up one row in one day, but if we are only being paid RWF2 per row it will not give us much of a day’s wage. If we dig up 20 rows this will give us a wage of RWF40, 21 rows a wage of RWF42 and so on. You will probably agree that to dig another row after the twenty-first is going to involve considerable effort - much more effort than the first row. Under a straight piece-work system, we are still paid RWF2 for the first or the twenty-first row.

MR. Taylor realised that the straight piece-work system gave no additional incentive to workers for outstanding effort. He introduced the differential piece-work system, under which a worker receives an additional bonus after he reaches a certain level of output. Thus, in our example of potato lifting, Taylor might have introduced a rate of RWF3 per row once the work has reached 25 rows. Once the figure of 25 has been reached, the RWF3 per row will be paid for all the rows dug (not just for those after 25), thus giving a very strong incentive to the worker to reach and pass the 25 figure.

Differential piece-rate systems are suitable when there are relatively high fixed costs in comparison with direct wages; the aim is continuous maximum production.

F. PREMIUM BONUS SCHEMES

The main systems using the premium bonus principle are Halsey or Halsey-Weir and Rowan systems. These are important and most examination questions on incentive schemes will he based on them

In premium bonus systems a time allowance and not a piece rate is made for a job. The bonus arising from greater production is shared between employer and employee. Compare this with straight piece work where all the gains or losses arising from labour efficiency or inefficiency are borne by the employee, while the reverse is true with guaranteed time rates, when all gains or losses arising from labour efficiency are borne by the employer

Basic Features

The following points apply to premium bonus schemes:

(a) Basic time rate is guaranteed.

(b) The hourly rate of employees increases, but at a lower rate than production.

(c) A low task is set, e.g. 70% of standard. The result is that employees begin earning bonus at a relatively low level of output, encouraging them to increase efforts.

Advantages and Disadvantages

(a) Advantages

(i) (c) above is probably the most important - it encourages workers and even learners to increase efforts.

(ii) There is a guaranteed basic wage.

(iii) The system is reasonably simple to understand.

(iv) The employer benefits by sharing in the saving of time, which may encourage him to install time-saving machinery and improve methods.

(v) The system is suitable where it is impossible to measure production standards with a high degree of accuracy.

(vi) The system can be operated after very little time study and investigation. Obviously, the more elaborate the preparation the more accurate will be the rate setting, but this will increase the overhead costs. Being able to operate the system almost at once can be a very important advantage.

(b) Disadvantages

(i) Employees often object to sharing the savings in time and it is difficult to explain or to justify the principle to the workers.

(ii) Incentive is not nearly as strong as for straight piece work.

(iii) Direct labour costs increase at low levels of output when compared with a straight piece-work system and even when compared with a guaranteed day-wage system.

Halsey System, or Halsey-Weir System

This is a premium bonus scheme with a time-rate guarantee. Standard time is allowed for the job, and if this time or longer is taken, time rate is paid. If less time is taken the worker is paid a fixed percentage of the saving in time. In practice the bonus percentage varies between 30% and 70% of time saved; the usual proportion is 50%.

To apply this on a 50% basis, look at the following example.

Earnings are: Time rate × (Time taken + 1/2 Time saved).

Assume: Time rate RWF4 per hour

Time allowed 50 hours

Time taken 40 hours

Earnings will be: RWF4 × (40 hours + 1/2 × 10 hours)

= 45 × RWF4 = RWF180

or 45 hours' pay for 40 hours' work.

To find the effective hourly rate, divide the amount earned by the time (number of hours) taken to earn it.

Rowan System

This is also a premium bonus scheme. A standard time is allowed for a job and a bonus paid for the time saved. The bonus is paid as a percentage addition to the time rate, equal to the percentage of time saved to standard time.

There are two methods of calculation:

(a) Time wages + (% Hours saved × Time wages).

$$\text{(b)} \quad \left(\text{Time taken} + \frac{\text{Time taken} \times \text{Time saved}}{\text{Time allowed}}\right) \times \text{Time rate per hour}$$

Assume:	Time rate	RWF4 per hour
	Time allowed	50 hours
	Time taken	40 hours

Earnings would be RWF160 + (20% × RWF160) = RWF192.

You will notice that, under the Rowan system, the worker is paid more than under the Halsey system at levels of production just over standard; but the Halsey system gives the worker a much higher incentive at high levels of efficiency.

G. GROUP BONUS SCHEMES

General Principles

Incentive bonus schemes can be applied to the group as well as to individuals. The bonus is calculated for the group and shared among them on an agreed basis.

(a) Use

Group bonus schemes are usually introduced where particular circumstances apply:

(i) Where there is a desire to encourage an "esprit de corps" in the factory.

(ii) Where it is impossible to measure an individual's output, as in many automated processes. The output is dependent on the group.

(iii) Where individual bonus schemes are causing jealousy among workers and possibly a reduction in co-operative effort.

(b) Advantages

(i) The great advantage is that the group bonus scheme promotes team work. The bonus is paid to all workers, i.e. not only direct workers but foremen, inspectors, internal transport workers, tool-men, etc.

(ii) It may encourage poorer workers to work harder, following the lead of better workers. Poorer workers may feel that they cannot let their team-mates down and may therefore put extra effort into their work

(iii) Group bonus schemes are usually simple and fairly cheap to operate compared with individual schemes.

(iv) Mutual supervision is often exercised by the group members.

(c) Disadvantages

(i) Many employers contend that total output tends to fall because good workers have not the same incentive to work as efficiently.

(ii) The incentive may be lessened as wages tend to be more constant than in individual schemes.

Bonus Schemes for Indirect Workers

These usually take the form of, say, a proportion of the average bonus of a related group of direct workmen, or of a shop.

Staff Incentive Schemes

These are not common but may take many forms.

A bonus for a foreman may be related to the output of his department, or the total hours saved in his department.

The grading of clerical staff may persuade people to work to attain a higher grade and thus increase earnings. In some cases work measurement may be made the basis (see later). This applies particularly to machine operators such as typists and data processing input operators.

H. PERFORMANCE-RELATED PAY

In recent years many organisations have introduced remuneration systems in which the wage and salary levels are based upon the performance of individual employees. These systems are aimed at rewarding employees according to their performance, ensuring that those employees who perform the best receive the highest rewards. Incentives are also built into the remuneration system that motivate employees to improve their performance at work. Examples of performance-related pay are:

(a) Sales personnel who are paid a commission on sales.

(b) Branch managers whose pay is based upon the profits earned by each branch.

I. PROFIT SHARING AND CO-PARTNERSHIP

Profit sharing and co-partnership are not synonymous; you should be able to define each one.

Definitions

(a) Profit Sharing

The definition of profit sharing, as agreed at an international congress in 1889, is that "an employer agrees with his employees that they shall receive in partial remuneration of their labour, and in addition to their wages, a share, fixed beforehand, in the profits realised by the undertaking".

Be careful to note that the share in the profits is fixed beforehand and is not a bonus granted at the discretion of the employer, although the agreed formula will usually define the limits which will permit a profit share.

(b) Co-Partnership

Co-partnership gives the workers an opportunity to share in the profits, capital and control of the undertaking.

Thus, the worker will participate in the profits of the firm in addition to standard wages. He should be able to accumulate his share of profits in the capital of the company and, if these are in the form of shares with voting rights, he will automatically share in the control of the undertaking. A share in the control of the undertaking may also be secured by forming a co-partnership committee of workers, which will have some influence in the management of the firm.

Methods

There is a great variety of methods used in schemes for profit sharing and co-partnership. Circumstances differ among firms and consideration will be given to the following points:

(a) Capital employed and the division of profit between capital and labour.

(b) Labour employed and to what extent labour influences output and cost of production

Once the amount of profit to be divided among the workers has been decided upon we have a problem, namely how is this money to be divided among the workers? A straight percentage of wages would not compensate for loyalty, long service, etc. On the other hand, a person employed for a few months has not contributed fully to the profits.

This brings us to the question of qualification for participation in the scheme, e.g. at age 21 or after one or two years' service are possible qualifications. It is important that the qualifications are decided **before** the scheme begins - and agreed with those who hope to participate in it.

Advantages and Disadvantages

(a) Advantages

(i) The most important advantage is that the scheme can be designed to reduce labour turnover, e.g. double bonus may be paid after five years' service or there may be a system of increasing bonuses after every four years' service.

(ii) It does help to build up a team spirit. The status of the worker is raised, particularly with co-partnership, when workers may have a little influence in management decisions through their share voting rights.

(iii) It is said to stimulate interest in the work and increase efficiency; for instance, the employee may feel it is worthwhile making more suggestions.

(iv) It is said to increase productivity.

(b) Disadvantages

(i) There is considerable difficulty in deciding on a basis for apportioning the profits as indicated above.

(ii) Profits fluctuate; therefore bonuses will fluctuate and may sometimes be zero.

(iii) Workers in fact have little say in management policy. Although policy decisions may be best for the firm in the long term, they may not be for immediate profits.

(iv) Trade unions have been against such schemes, arguing that they weaken the trade unions, and that share ownership is "an extension of the capitalist society".

(v) The poor workers share equally with good workers.

(vi) The scheme provides no direct incentive because rewards are too long deferred, i.e. paid once, or possibly twice, per annum.

(vii) Employees may not trust the figures given by management.

(viii) The amount of profit is not controlled solely by the workers, efforts, and this makes them suspicious of the scheme. For example, suppose the workers work at the same level of efficiency in two successive years, but because the buying department makes a highly profitable purchase, the first-year profits and bonuses are high. In the second year there could be a trade depression and profits and bonuses will probably be non-existent.

(ix) Workers share in the profits of good years but do not suffer the losses of bad years.

J. NON-MONETARY INCENTIVES

Purpose

Financial incentives aim mainly at immediate results, while the object of non-monetary incentives is, in general, to build up output over a long-term period, by the following methods:

(a) **Encouraging loyalty** in the firm and reducing labour turnover.

(b) **Improving the employees' health,** thus reducing absences through illness and increasing efficiency because the workforce is physically fitter.

(c) **Building up a happy and contented staff,** thus reducing absenteeism and increasing output through more willing co-operation.

(d) **Making prospects with the firm attractive** so that it can select the best workers when a vacancy arises.

(e) **Building up good industrial relations,** thereby reducing strikes.

(f) **Giving the worker a sense of purpose** and a feeling of security through the interest shown by management in providing the various amenities.

Various Aspects

It is impossible to list all non-monetary incentives but you should consider the following:

(a) Health:

- Medical unit in the factory staffed by trained nursing and first-aid staff and possibly a doctor.
- Safety officer.
- Provision for private medical treatment.

(b) Canteen:

- Subsidised meals, ensuring that workers have at least one substantial meal per day.

(c) Social:

- Sport as well as dancing and social gatherings.

(d) Education:

- Day-release facilities or provision for full-time sandwich courses.
- Prizes and/or increments in salary for examination successes.
- Training in all branches of the firm so that employees have the experience when there is a possibility of internal promotion.

K. MEASUREMENT OF THE EFFICIENCY OF LABOUR

Efficiency Ratio

The efficiency (productivity) ratio is defined as:

$$\frac{\text{Standard hours of output}}{\text{Actual hours to produce output}} \times 100\%$$

Example

The standard time which should be taken to produce one unit is two hours. In a 40-hour week, one employee produces 19 units and another 22 units.

Their efficiency ratios are respectively:

$$\frac{19 \times 2}{40} \times 100 = \frac{38}{40} \times 100 = 95\%$$

and

$$\frac{22 \times 2}{40} \times 100 = \frac{44}{40} \times 100 = 110\%$$

This ratio could be employed for the whole factory rather than for individual workers. Trends could then be observed and any decrease in efficiency investigated.

Output per Man/Hour

This is an alternative method of measuring overall efficiency, where total output is divided by the number of hours taken to produce it.

The method of calculating “man-hours” may or may not include both direct and indirect workers. It is probably better, from the point of view of controlling labour costs, to include both.

Trends in this statistic need careful interpretation. For instance, if further mechanisation is introduced, output per man/hour should increase. (The efficiency ratio would automatically take account of such changes because the standard hours allowance would be adjusted on any change in methods.)

An alternative to “output per man/hour” would be “output per RWF100 of labour cost”. This takes account of wages increases: if a pay rise is awarded, output must increase if the “output per RWF100” statistic is not to decrease.

Ratio of Direct to Indirect Labour

Provided the degree of mechanisation does not change, management should control the proportion of indirect labour. If the ratio shows that indirect labour forms an increasing proportion, this points to administrative inefficiency. On the other hand, too low a proportion of indirect labour may mean that direct workers are not receiving the back-up services they need.

Care needs to be taken in interpreting this measure, however, as clearly the proportion of direct workers will fall with increasing mechanisation. There is thus no “ideal” ratio which can be quoted.

L. LABOUR TURNOVER

We mentioned in the previous study unit that the various incentive schemes can help to reduce labour turnover. Now we will study this topic in more detail.

Measuring Labour Turnover

The most common measure of labour turnover is:

$$\frac{\text{Number of leavers replaced}}{\text{Average workforce}} \times 100\%$$

Thus, if a reduction in the workforce were planned, e.g. by offering early retirement, the people retiring early would not enter into the turnover statistics. In measuring labour turnover, management is concerned to control the cost of having to replace those employees who **leave**.

Cost of Labour Turnover

The cost of labour turnover can be high. It includes the following:

(a) Personnel Department

Under this heading come all the costs associated with recruitment: advertising, interviewing, interviewees' expenses, etc.

(b) Training New Recruits and Losses Resulting

Every new recruit must have some training. Training costs money, i.e. the time of another operator who has to show the new beginners how to do the job; or the time of a supervisor or training school.

Even after training, the beginner will be unable for some time to do a full day's work equivalent to that of a skilled operator with years of experience. The result is that the machines used by the new recruit are underemployed, causing further loss.

The new recruit is also likely to cause more scrap and possibly break tools and equipment more readily than a skilled operator. He or she is also more liable to accidents, causing further loss.

Reasons for Turnover

A certain amount of labour turnover is inevitable - employees retire or die, thus giving younger staff opportunities for promotion. However, as has been pointed out, labour turnover is costly and so should be controlled. Every effort should be made to find out why workers leave and, where defects are found, to put them right.

Where labour turnover is high and workers are being regularly lost to other firms in the same locality, the following factors require careful consideration:

(a) Methods of wage remuneration, e.g. is skill being adequately rewarded? Does average remuneration compare well with other local firms? Can workers reach an adequate rate of earnings without a high proportion of overtime working?

(b) Have the employees confidence in the future long-term prospects of employment within the organisation?

(c) Is there any antagonism on the part of the employees, owing to inefficient management?

(d) Are there sufficient general incentives to encourage employees to stay within the organisation, e.g. long service awards, pensions, canteen facilities, joint consultation, sports and recreational facilities, etc?

Suggested Remedies

(a) Personnel Department

If recruitment procedures are good, labour turnover will be reduced because the right people will be given the right jobs.

The personnel department can also help reduce labour turnover by developing and maintaining good employee/employer relations. Joint consultation may be developed. Clearly wage rates will be an important issue, as will opportunities for training and promotion.

(b) General Welfare

Good employee/employer relations may be developed by the personnel department but certain services will also go a long way towards maintaining such relationships and improving morale. The most important of these include the provision of sports facilities, e.g. sports field, tennis court, , etc; canteen facilities with, possibly, subsidised meals; adequate first-aid facilities with possibly a medical centre run by a doctor (depending on the size of the firm); pension scheme - a very powerful factor in reducing labour turnover among employees.. Part of the expense of providing these facilities must be set against the cost of labour turnover, although some of these services will also tend to reduce absenteeism and sickness.

M. RECORDING LABOUR COSTS

The calculation of wages and payroll normally requires two sets of documentation in respect of each employee, i.e. a time record and a work summary record. By evaluating each record separately and then comparing the respective payable hours, we can be sure that a full analysis has been made for cost purposes.

Time Recording

The recording of gate times, i.e. the arrival of each employee at the works in the morning and his or her departure in the evening, is very important. A number of methods are in use, depending on the number of employees involved, and you must know the outline of these methods. If you work in a large factory with the latest machinery you may feel that some of these methods are old fashioned, but in cost accounting it is important to bear in mind that circumstances in different concerns vary considerably and what may be old fashioned and cumbersome in a large works may be the most convenient way of dealing with a small factory of 20 or 30 employees. You must remember that the costing methods to be used in any business must be the most suitable for that business, and not necessarily those which have proved successful elsewhere.

More attention is being paid nowadays to effective clocking systems. The sellers of the many types of clock claim, quite justifiably, that an installation which includes a time clock, other clocks and a "hooter", all synchronised, more than pays for itself in a short time by reason of the extra production resulting from more prompt starts, precisely-timed tea breaks, etc. These systems are usually obtainable on a rental basis, which includes full maintenance, at a reasonable cost.

Try to inspect some different types of machine and system; make sure that you are fully aware of the method adopted by your own employer.

Time Recording Methods

Time Book

Here, employees on arrival write their names in a book which is ruled off at the time for starting, late arrivals signing below the line, or alternatively the names are placed in alphabetical order and each employee enters his or her time of arrival.

Check or Disc Method

Here, numbered metal discs are hung up outside the office. On arrival, each employee removes a disc bearing his or her own number and places it, either in a receptacle, or on another board, also numbered.

Note that the time book and disc methods record only the fact of early arrival or lateness and not the extent of this, but they both have the advantage of being simple to operate.

N. INDIRECT LABOUR

In all works, some staff will be employed on servicing work, e.g. plant maintenance. Where an employee is continuously engaged on the same type of service or indirect labour, a record of his or her work may not be required since the total wages may be charged to the one expense account. Where an employee undertakes various kinds of indirect work, however, it may be necessary to keep some record of the manner in which he or she spends his or her time, so that the labour costs may be allocated to the correct accounts in the cost ledger. A time-sheet similar to that shown in Figure 27 may be used.

(From Study Unit 2 you will recall that direct labour is where the employee's efforts are applied **directly** to a product or saleable service which can be identified separately in a product cost.)

Name:									
Clock No.:					Rate per Hour				
Nature of Work	Hours							RWF	
	Th.	Fri.	Sat.	Mon.	Tues.	Wed.	Total		
Machinery Repairs									
Dept A									
" B									
" C									
Machine Cleaning									
" Oiling									
					Sig.				

Figure 27: Indirect Labour Record

Examples of Direct and Indirect Labour

	Direct	Indirect
Wages of Support Staff		✓
Bonuses		✓
Basic Pay of Indirect Workers		✓
Basic Pay of Direct Workers	✓	
Cost of Idle Time		✓
Overtime at Request of Customer Order	✓	

O. TREATMENT OF OVERTIME

It is not within the scope of a cost accountant's duties to decide whether or not overtime working should be authorised, but he or she must record the cost of such working, analyse the cause and report the facts to management. Clearly, when a department has had idle time during normal working hours and has worked overtime, this situation should be referred to higher management.

There should be a separate column on the pay sheets for overtime so that it is possible to obtain the total overtime cost quickly.

For employees who are required to work "unsocial hours" it is now common practice to make shift premium payments as an additional incentive. These are a particular feature of operations that have to be run on a 24-hour, 365 days of the year basis and, eventually, they tend to lose their free incentive advantage, once the employee has become used to receiving them on a regular basis.

The underlying principle for charging overtime is: charge the cost to the cost unit causing the expense. This may be illustrated as follows:

(a) Job Cost

Charge to individual jobs if customer wishes delivery date to be brought forward and overtime has to be worked to do so.

(b) General Overhead

This category of overhead account is charged with overtime if general pressure of business has caused occasional overtime working. It would be unfair to make an extra charge to those jobs which just happened to be done in the evening.

(c) Direct Labour Cost

On the other hand, if overtime is worked regularly and consistently because of a shortage of direct workers, it is really part of the normal direct labour cost and should be treated accordingly. An average hourly rate would be calculated based on the number of hours at standard rate and the number of hours at premium rates, and all jobs would be charged with labour at this average rate.

(d) Departmental Overhead

(i) If inefficiency within a particular department has caused overtime then that departmental overhead account should be charged with the cost.

(ii) If overtime has been worked in Department B because Department A was inefficient, the cost of overtime in Department B should be charged to the departmental overhead of Department A.

P. SUMMARY

The information given in this study unit covers a broad spectrum of the recording systems used. It must be emphasised that each industry has its own problems in recording both attendance times and work-on-the-job times and that the solutions adopted are likely to be unique. Great care needs to be taken to ensure that enough data is collected to meet central requirements without making the procedure so onerous that it becomes inefficient.

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Study Unit 6

Overheads and Activity Based Costing

Contents

A. EXAMPLES OF EXPENSES

So far we have examined two of the components of cost, namely labour and material costs. The third cost element is expenses, which comprises all items not falling within the other two categories. Examples therefore include rent, rates, telephone charges, power, royalties payable to an inventor, depreciation of equipment, etc.

Direct and Indirect Expenses

We saw with both material and labour that such costs could be direct or indirect. For instance, the wages of a skilled carpenter in a furniture factory are a direct cost, but the wages of a foreman or of a clerk in the cost office are normally indirect. The distinction is that the carpenter's wages can be identified with particular products, whereas the others cannot.

The same distinction applies in the case of expenses, although there are in fact very few examples of direct expenses. Royalties payable to the inventor of a product are clearly a direct expense. Another example would be the running cost of a machine used entirely for one particular product; in practice, however, most machines are used for a variety of products so their associated costs are indirect expenses.

B. NOTIONAL EXPENSES

Rent

If a business rents its factory, the rent payable is, of course, an expense. Often, even if the premises are owned and no rent is paid, a notional charge in lieu of rent is included in the cost accounts. This allows for the fact that the real cost of premises is not only the depreciation of those premises but also the interest on the capital which is tied up (which a landlord would allow for in fixing the rent). This permits direct comparison of costs of production between different sites.

Interest on Capital

It may similarly be argued that the expenses in the cost accounts should include a notional charge for interest on capital in respect of all manufacturing equipment (regardless of whether money was in fact borrowed to purchase that equipment). Arguments for and against this approach are as follows:

(a) In Favour of Including Interest on Capital

(i) Just as wages are the reward for labour, interest is the reward for capital. Therefore an economist would argue that interest, as well as wages and other costs, ought to be taken into account in calculating profit.

(ii) False conclusions may be drawn from comparisons if interest is not taken into account. If one manufacturer makes his own sub-assemblies while another buys them ready-made, interest on the additional capital which the first manufacturer has tied up must be taken into account in deciding which of them has taken the more economical option.

(iii) Interest takes account of the time factor, which is of prime importance in production.

(b) Against Including Interest on Capital

(i) Interest payments depend on the manner in which the business is financed. One manufacturer may provide his own capital, while another may decide to raise loans. The manner of financing does not affect the manufacturing cost but only the way in which the ultimate profit is distributed (whether used to pay interest on loans or available for the owner).

(ii) How should interest be calculated? Should the cost of fixed assets alone be used, or should capital tied up in stocks also be taken into account? What rate of interest should be used? Problems arise when comparisons are required between firms in the same industry and in many cases production costs may be widely different.

(iii) Inclusion will complicate the cost accounts and, if interest is included in stock valuations in the cost accounts, an adjustment would be required in order to arrive at stock valuations for the financial accounts.

The arguments against often outweigh the arguments in favour of inclusion of this interest as an expense. However, when pricing a large order which the manufacturer will have to finance for a long period before receiving payment, it is reasonable to include an amount to cover interest on capital.

C. CAPITAL EQUIPMENT

Depreciation

Depreciation is charged in order to apportion the capital cost of a fixed asset over its working life. Depreciation is often a major part of the total overhead expense, so it is worth looking in some detail at the methods which are used to calculate it.

There are at least two methods of calculating an annual depreciation charge in common use: i.e. the **straight line method**, whereby the capital cost of the machine, less any estimated residual value at the end of its life, is spread equally over the estimated number of years of life; and the **reducing balance method**, in which a percentage of the remaining book value of the machine is written off each year, so that the charge declines as the asset gets older.

In costing, we want to arrive at a level of annual charge for depreciation and find a means of apportioning it (along with other costs) to the individual products or jobs. This is done by:

(a) Estimating the number of hours to be worked by the machine per year and dividing the annual depreciation by this estimated number of hours, to arrive at a machine-hour rate.

(b) Estimating the number of hours to be worked by the machine throughout its life, and dividing the capital cost, less any estimated residual value, by this number of hours, to arrive at a machine-hour rate.

(c) Calculating a combined charge for depreciation and repairs, by dividing the capital cost **less** residual value **plus** the total expected repair bill over the asset's life, by the estimated number of hours of use. The advantage of this method is that the cost charged in each year of the asset's life is the same - the rate does not rise with the higher repair bills which will arise in the asset's later years. However, this method may be impractical, since it is difficult to estimate the total repair bill.

A better approach here is to use the reducing balance method. Indeed, some would argue that this is one advantage of using the reducing balance method. Consider the case of a company with only one large machine. It can use either the straight line or the reducing balance method for depreciation. It is known that with each year of usage, repair and maintenance costs will increase.

Machine Cost: RWF200,000

	Straight Line 10%			Reducing Balance 10%		
	Dep.	Rep./Maint.	Total	Dep.	Rep./Maint.	Total
	RWF	RWF	RWF	RWF	RWF	RWF
Yr 1	20,000	0	20,000	20,000	0	20,000
2	20,000	2,100	22,100	18,000	2,100	20,100
3	20,000	3,500	23,500	16,200	3,500	19,700
4	20,000	5,600	25,600	14,580	5,600	20,180
5	20,000	7,080	27,080	13,122	7,080	20,202

You will note that in these circumstances straight line depreciation plus repairs and maintenance will rise each year, whereas reducing balance depreciation plus repairs and maintenance will have a **tendency** towards equality each year. (The figures in the example have been chosen to illustrate this clearly.)

D. INTRODUCTION TO OVERHEAD COSTS

Definition

An overhead cost is defined in the CIMA Terminology as:

"The total cost of indirect materials, indirect labour, and indirect expenses".

This means those items of material, wages or expense which, because of their general nature, cannot be charged direct to a particular job or process but have to be spread in some way over the various jobs or processes.

Identification of Overhead Costs

In considering what is a direct charge and what is an indirect charge, i.e. overhead, regard must be paid to the type of industry, the method of production and the organisation of the firm concerned. For instance, in a general machine shop making a variety of products, the foreman's wages would be an indirect or overhead charge, as there is no obvious method of identifying the cost of the foreman's wages with a particular job; on a building site, the foreman's wages would be a direct expense, as they can only relate to the contract in hand.

The Changing Problem of Overhead Costs

50 years ago most labour was manual, and such overhead expense as existed was a comparatively small proportion of total cost; today the position has changed radically. Direct

labour, as such, becomes an increasingly small proportion of total cost, and overhead expenses very much larger. This tendency will undoubtedly continue as mechanisation and automation develop; and the cost accountant must always move with the times, developing and rearranging information to suit requirements.

We said earlier that a costing system must suit the business; it must suit not only the kind of business but also the stage of development of the business. A costing system which was suitable for a car manufacturer 20 years ago is probably not suitable now - because of the changing relationship between direct labour and overheads and the enhanced information demands to manage the business.

With automation becoming increasingly important, there is a tendency for overheads to increase and for prime costs to decrease. The installation of new machines will increase the depreciation charges and such items as service labour, while fewer workers will be needed to operate them (direct labour).

Classification by Function

There are three main classifications of overhead: production, administration and selling, and distribution overhead. These headings are associated with the three main functions of the business organisation and we should, as a first step, attempt to classify overhead expenditure into the appropriate categories. Clearly, there are certain items of cost which appertain to all three, such as electricity, rent and rates, and it will be necessary to break these individual charges down to the shares appropriate to the main headings.

(a) Production Overhead

Before any business can start producing goods, it must have a building, which has to be heated, lit, ventilated and provided with energy to operate the machines. The building must be kept clean and will need repair and redecoration from time to time, and in addition rent and rates will have to be paid. The products will have to be designed and production must be planned, supervised and checked. Records have to be kept, wages calculated, some form of stores must be operated and materials must be conveyed from point to point within the building.

These functions, and others, are not directly concerned with actual production, but are nonetheless essential and may be looked upon as services to the actual job of production. It is the cost of providing these services which constitutes the production overhead.

Specific examples of this type of overhead are as follows:

(i) Rent and rates of factories and land.

(ii) Insurance and depreciation of plant and machinery, and buildings.

(iii) Salaries of the technical staff.

(iv) Repairs and maintenance of plant and machinery.

(v) Consumable stores used in the factory.

(vi) Holidays, paid sick leave and idle time of factory employees.

(vii) Factory heating and lighting.

(viii) Internal transport expenses.

(The above is not intended to be an exhaustive list.)

(b) Selling and Distribution Overhead

The dividing line between production overhead and selling and distribution overhead comes when the finished goods are delivered to the finished goods store.

Examples of selling and distribution overhead are:

- Salesmen's salaries
- Salesmen's expenses
- Salesmen's commission
- Advertising
- Samples
- Depreciation of delivery vehicles
- Carriage outwards
- Vehicle drivers' wages
- Warehouse charges

(c) Administration Overhead

Examples are:

- Office repairs
- Office salaries
- Depreciation of office machinery
- Office heating and lighting
- Postal charges
- Stationery
- Share of rates.

Collection of Overhead

All expenditure as it is incurred is allocated its appropriate code number and is accumulated against each cost centre. (Remember the definition of "cost centre" given in Study Unit 2.) This will comprise wages and payments which are incurred at irregular intervals. For example, rates may be paid either half-yearly or yearly and it is, therefore, possible that during a shorter period of, for instance, three months, either no expenditure will be incurred, or, alternatively, a whole year's expenditure may be included.

We must, therefore, prepare a periodical "expense summary", which ascertains the total expenditure to be charged to costs of production in respect of each cost centre. It is necessary to improve the simple figures of payments made, by providing for expenditure incurred but not yet paid and for expenditure paid in advance.

Example

Electricity bill of RWF800 per annum paid quarterly in arrears on 28 February (RWF250), 31 May (RWF200), 31 August (RWF100) and 30 November (RWF250).

Rates paid in advance at RWF2,500 (payable 1 April for full year).

As at 30 September the accounts will show:

(a) Electricity payments RWF550

(b) Rates RWF2,500

An apportionment would give:

(a) Electricity $\frac{9}{12} \times$ RWF800 = RWF600 $\therefore$ financial accrual RWF50.

(b) Rates $\frac{6}{12} \times$ RWF2,500 = RWF1,250 $\therefore$ financial prepayment = RWF1,250.

E. OVERHEAD ALLOTMENT

Allocation and Apportionment

You should learn the following CIMA definitions of cost allocation and cost apportionment:

(a) Cost Allocation

"The charging of discrete identifiable items of cost to cost centres or cost units."

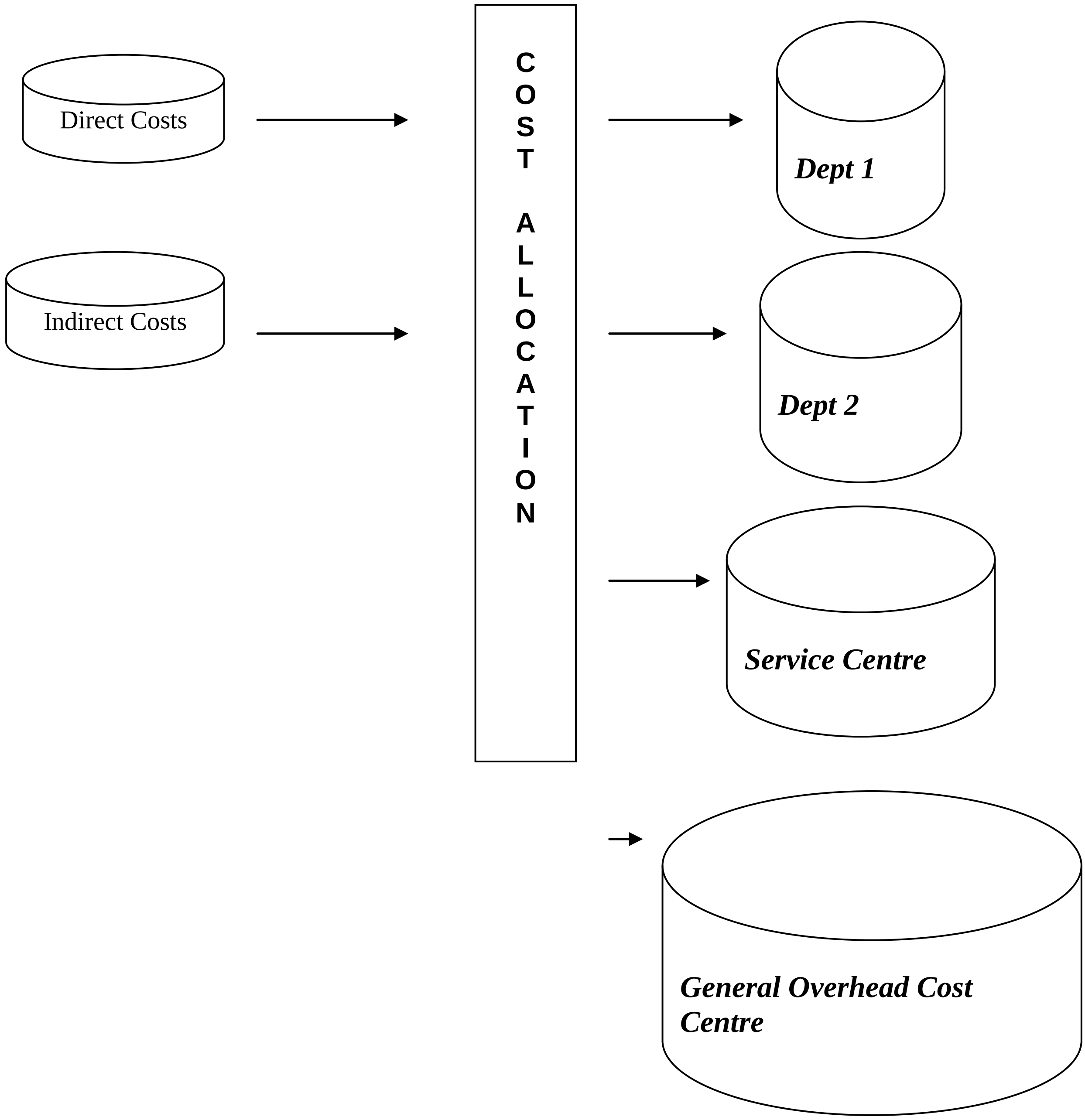
(b) Cost Apportionment

"The division of costs among two or more cost centres in proportion to the estimated benefit received, using a proxy, e.g. square feet."

As an example of cost allocation, repairs to the building housing the raw materials store could be allocated directly to the stores department cost centre.

Those items which cannot be allocated must be apportioned. As the definition implies, there is no single correct way to apportion costs. We have to use the most logical basis possible with the data at our disposal.

Cost Allocation



Cost Apportionment

You will find the following methods of cost apportionment among those used in practice:

(a) Capital Value of Cost Centre

Where cost is increased by reference to the capital value of the cost centre it should be apportioned in the same way, e.g. fire insurance premium charged by reference to capital value.

(b) Cost Centre Labour Cost

Where the cost depends on the extent of labour cost of the centre, such as in the case of employers' liability insurance premiums, this should also form the basis for the apportionment of the premium paid.

(c) Cost Centre Area

Where cost depends on the floor area, it should be apportioned in the same way, e.g. rent and rates.

(d) Cost Centre Cubic Capacity

Where cost is incurred in phase with cubic capacity, it should be spread back on this basis, e.g. lighting.

(e) Number of Employees at Cost Centre

The cost of providing a canteen service is generally proportional to the numbers employed, so it is reasonable to apportion it by reference to the number of employees at each cost centre.

(f) Technical Estimate

The chief engineer of a factory is in a position to estimate how the cost of certain expenses should be apportioned between the various cost centres of the factory. Examples of this type of expense are as follows:

(i) Light

The wattage used in each department can be calculated and the cost of lighting apportioned to each cost centre accordingly.

(ii) Power

The horsepower of machines in each cost centre can be established and the cost of power apportioned on this basis.

(g) Proportionate to Materials Issued

The expenses of operating the stores department, and "normal" stores losses, may be apportioned by this method, measuring materials by value, weight or volume, as appropriate.

(h) Proportionate to Production Hours

There are many items of expenditure which can be apportioned on this basis, although the figures are usually available only where a fairly comprehensive costing system is in operation. Either labour hours or machine hours may be used. Items which may be apportioned on this basis are:

(i) Overtime wages (where not allocated direct).

(ii) Machine maintenance (where not chargeable direct).

Examples

Example 1
Here is an example of overhead allotment.

A company has two production departments, X and Y and three service departments, stores, maintenance and production control.

The data to be used in apportioning costs is:

	Stores	Maintenance	Production Control	X	Y	Total
Area in sq. m.	300	400	100	3000	4200	8000
Number of employees	4	12	30	200	300	546
Value of equipment (RWF**000s)**	-	8	-	20	12	40
Electricity (000 units)	-	20	-	320	210	550
Number of Extraction points	1	2	-	14	23	40

Item	Apportionment Basis	Total Cost	Stores	Maintenance	Production Control	X	Y
		RWF	RWF	RWF	RWF	RWF	RWF
Rent	Area	800	30	40	10	300	420
Indirect material	Allocation	174	11	25	44	31	63
Indirect labour	Allocation	5,463	287	671	1,660	1,040	1,805
Factory administration	Number of employees	2,184	16	48	120	800	1,200
Machine depreciation	Value	440	-	88	-	220	132
Power	Electricity	550	-	20	-	320	210
Heat and light	Area	80	3	4	1	30	42
Machine insurance	Value	40	-	8	-	20	12
Fumes extraction plant	Number of extraction points	120	3	6	-	42	69
		9,851	**350**	**910**	**1,835**	**2,803**	**3,953**

We have now arrived at an estimate of the overhead appropriate to each department or cost centre. However, we really need to express all overhead costs as being appropriate to one or other of the two production departments, for instance, so that we can include in the price of our products an element to cover overhead - for it is only in this way that costs incurred will be recovered. Although costs have been incurred **by** the service departments, they have really in the end been incurred **for** the production departments. The next step is therefore to re-apportion the costs of the service departments. We do this in a similar way to that used in the original apportionment.

Additional data is provided: the total number of material requisitions was 1,750, of which 175 were for maintenance department, 1,000 for Department X and 575 for Department Y. This data will be used to apportion the cost of the stores department to these three departments. Maintenance costs will be directly allocated to production control and Departments X and Y. (In practice, a record may be kept of the number of maintenance hours needed in each department to provide data for cost apportionment.) Production control costs will be apportioned between Departments X and Y according to the number of employees in those departments (already given)

Item	Basis of Apportionment	Stores	Maintenance	Production Control	X	Y
		RWF	**RWF**	**RWF**	**RWF**	**RWF**
Cost b/f from previous table		350	910	1,835	2,803	3,953
Stores Department costs re-apportioned	No. of requisitions	-350	35	-	200	115
Maintenance Department costs allocated	Allocation	-	-945	126	263	556
Production control costs re-apportioned	Number of employees	-	-	-1,961	784	1,177
TOTAL		**Nil**	**Nil**	**Nil**	**4,050**	**5,801**

Note that when a department's costs are re-apportioned, the cost is credited to that department.

Having completed the re-apportionment, you will see that the total of overhead now attributed to Departments X and Y is, of course, equal to the original total of overhead. **This is something you should always check in doing examination questions of this type**.

Examiners have been known to include direct costs in the list of costs, to trap the unwary, e.g. costs such as direct material and production wages. If you are asked to allocate overheads, ignore direct costs.

In the above example, some of the stores department's cost was incurred on behalf of the maintenance department, but not the other way round. When service departments serve each other as well as the production departments (sometimes called reciprocal services), we must use **repeated distribution** to apportion their costs to the production cost centres. An example follows.

Example 2

A manufacturing company has two production departments (machining and assembly) and two service departments (tooling and maintenance).

The expenses of the service departments are dealt with as follows:

Tooling	70% to Machining
	20% to Assembly
	10% to Maintenance
Maintenance	50% to Machining
	30% to Assembly
	20% to Tooling

Overhead incurred during the month was:

	Machining	**Assembly**	**Tooling**	**Maintenance**
	RWF	RWF	RWF	RWF
Indirect Material	4,600	5,200	1,800	600
Indirect Labour	6,100	1,200	2,700	1,600
Miscellaneous	700	900	500	300

We are required to apportion all costs to the production departments.

The first stage is to find the total of all the costs incurred. We can then apportion the costs of each service department in turn until our objective is achieved.

	Machining	**Assembly**	**Tooling**	**Maintenance**
	RWF	RWF	RWF	RWF
Total	11,400	7,300	5,000	2,500
Service department costs redistributed:				
Tooling	3,500	1,000	(5,000)	500
Maintenance	1,500	900	600	(3,000)
Tooling	420	120	(600)	60
Maintenance	30	18	12	(60)
Tooling	9	3	(12)	-
	RWF16,859	RWF9,341	NIL	NIL

(In the above exercise, brackets are used instead of minus signs.)

F. OVERHEAD ABSORPTION

Introduction

Overhead absorption is the allotment of overhead to cost units by means of rates separately calculated for each cost centre.

In other words, when we talk about the amount of overhead absorbed by a product, we mean the proportion of the total overhead which we estimate is appropriate to that product.

If all items produced by a department were identical, there would be no problem. We should simply take the total overhead incurred by each productive department (determined by the methods already described) and divide it by the number of products made, to arrive at an overhead rate for the product. In practice, it is rarely as simple as that, for units are not identical.

The following are methods of overhead absorption found in practice.

Percentage on Prime Cost

This system is still, unfortunately, in widespread use where costing is fragmentary, and it must not be dismissed until you are quite clear why it is inadequate.

Imagine, a manufacturer asked to make a million pairs of army boots. If the boots cost him RWF1 to make they would be sold to the government for RWF1.10, so he would have an income of RWF0.10 per pair to meet general overheads and profits. If, however, he was a very inefficient manufacturer, so that his boots cost him RWF2 per pair to make, they would be sold to the government for RWF2.20 and he would have a sum of RWF0.20 to meet overheads and profits. He had thus a very direct incentive to inefficiency and it is probably true to say that the need to remedy this abuse was one of the powerful factors contributing to the development of the cost accounting profession.

The only thing that can be said in favour of this percentage on prime cost is that it is simple and requires little clerical work, but it would only be approximately true when materials used on every job were equal in price, wages were uniform throughout (both for skilled and unskilled labour) and any equipment used was employed equally on all jobs. As these conditions virtually never apply, the system should virtually never be used.

Formula: $$\frac{\text{Overhead for the period}}{\text{Prime cost for the period}} \times 100$$

$$= \text{Percentage of prime cost}$$

Percentage on Direct Wages

This is a slight improvement on "percentage on prime cost", because fluctuations due to the varying prices of direct materials are eliminated and, furthermore, there are a few items of expenditure which can, in fact, be reasonably absorbed on the basis of direct wages. It is still very unsatisfactory in general, however, and the criticisms against it may be summarised as follows:

(a) The ratio of wages cost to total hours spent on production may vary considerably where on one job skilled men are using expensive machines, and on others a large number of unskilled men are employed without much equipment.

(b) The slower, and therefore usually the more inefficient, worker attracts a larger burden of overheads.

(c) Where piece rates are used, the overhead recovered per piece will be constant, although much of this may have been done quickly by expert workers and the other part slowly by beginners.

Formula: $$\frac{\text{Overhead for the period}}{\text{Wages for the period}} \times 100$$

$$= \text{Wages percentage rate}$$

Points in its favour are:

- It is simple and easy to calculate, especially where the costing system is rough and ready.
- More consideration is given to the time factor.

Percentage on Direct Material

This method has the worst features of the previous two. Only rarely is it found in practice that overhead is proportionate to material used.

Formula: $$\frac{\text{Overhead for the period}}{\text{Direct materials used}} \times 100$$

$$= \text{Material percentage rate}$$

Absorption on Basis of Time

Anyone who has had any experience of costing will have concluded that much overhead expenditure is, above all else, subject to the time factor in its relation to output. If one article takes twice as long to go through the factory as another, it should attract to itself twice the charge for lighting the factory as the other product, and this is only one example which you can probably multiply many times out of your own experience. It is generally true, therefore, that by far the most valuable method of apportioning overhead is on a time basis, and this is usually of one of two kinds, a direct labour-hour rate and a machine-hour rate.

Occasionally a combination of both these will be in operation and a composite rate per production hour may be used.

(a) Direct Labour-Hour Rate

Where this system is used, the number of hours of direct labour worked at a production centre is estimated, and the number divided into the total figure shown in the expense summary for that production centre (or costing department) for the corresponding period. The resultant figure gives an amount to be added to the direct cost of the output for every hour of the direct labour used throughout.

Hours may be either the number of hours expected to be worked, or the number of hours which would relate to working at normal capacity.

This is a very satisfactory method, particularly where a production centre uses little elaborate or expensive machinery, and when it may reasonably be said that every hour of direct labour absorbs the same amount of expense. You must remember, however, that separate direct labour-hour rates should be calculated for each production centre and that holidays should be excluded, as should overtime hours, except when this is a regular recurring feature.

The advantages of this system are as follows:

(i) The result is not invalidated by use of skilled and unskilled labour.

(ii) Proper provision is made to deal with fast and slow workers who are paid piece rates.

(iii) The figure of labour hours is a more useful guide to the management than the value of wages paid, because fluctuations due to varying overtime rates and wages increases are avoided.

Formula: $$\frac{\text{Overhead for the period}}{\text{Direct labour hours worked or budgeted to be worked in the period}}$$

= Direct labour-hour rate

(b) Machine-Hour Rate

Where machinery rather than labour is the dominant feature of a production centre, a rate of overhead per hour of machine time should be substituted for a rate per direct labour hour.

The "machine-hour rate" is defined as:

> "A rate calculated by dividing the budgeted or estimated overhead or labour, and the overhead cost, attributable to a machine or group of similar machines by the appropriate number of machine hours.
>
> The hours may be the number of hours for which the machine or group is expected to be operated, the number of hours which would relate to normal working for the factory, or full capacity."

To find this machine-hour rate, it is necessary to estimate the number of hours of operation of the machine or machines in the cost centre during the period under consideration. Allowance must be made for idle time and for cleaning and setting-up time. The total expense is then divided by the number of working machine hours.

As an example, let us return to Example 1 in Section E of this study unit. After the service department's costs had been re-apportioned, the costs attributed to the production departments X and Y were RWF4,050 and RWF5,801 respectively.

Now suppose that Department X has five identical machines working 162 hours each during the period under consideration.

Department Y is not automated and has 20 direct workers, each working 160 hours during the period.

The total number of machine hours worked in Department X is $5 \times 162 = 810$ hours. Therefore the machine-hour rate is:

$$\text{RWF}\frac{4{,}050}{810} = \text{RWF5 per machine hour}$$

The total number of direct labour hours worked in Department Y is $20 \times 160 = 3{,}200$ hours. Therefore the labour-hour rate is:

$$\text{RWF}\frac{5{,}801}{3{,}200} = \text{RWF1.81 per direct labour hour}$$

Suppose that the manufacture of an article takes four machine hours in Department X. It is then passed to Department Y for hand-finishing, which takes six hours. Then the amount of overhead absorbed by this article is:

$$\text{RWF4} \times 5 \text{ (Department X)} + \text{RWF6} \times 1.81 \text{ (Department Y)}$$

$$= \text{RWF30.86}$$

In determining the total cost of the article, this sum would be added to the cost of the direct materials, direct labour and direct expenses incurred.

In the illustration above, only one hourly rate has been calculated for each department. In practice, fixed and variable overhead will, if possible, be kept separate, and a separate absorption rate calculated for each.

(c) Machine-Hour Rate Where Machines Are Not Identical

In the above illustration the department operated identical machines. Where the machines are not identical, however, it is necessary to calculate the rate for each machine separately. You can apply the following principles:

(i) Some expenditure can be directly allocated to the particular machine, e.g. power, cost of repairs, depreciation.

(ii) Overhead chargeable to the production centre in which the machine is located, and not to the individual machine, e.g. rent, rates, heating, is apportioned on the basis of area occupied.

Example

Using the data below, you are required to calculate a machine-hour absorption rate for multi-drilling machine no. 5.

Relating specifically to machine no. 5

Original cost: RWF13,300

Estimate life span: 10 years

Estimated scrap value after 10 years: RWF300

Floor space occupied: 250 square metres

Number of operators: 2

Estimated running hours: 1,800 per annum

Estimated cost of repairs: RWF240 per annum

Estimated cost of power: RWF1,000 per annum

Relating to the department in which machine no. 5 is situated

Floor area: 5,000 square metres

Number of operators: 60

Rent: RWF4,400 per annum

Supervision: RWF3,600 per annum

Solution

In addition to the costs specifically relating to machine no. 5, the following apportioned costs must be taken into account:

(i) Rent - on the basis of floor area occupied.

(ii) Supervision - on the basis of number of operators for machine no. 5 compared with the number employed in the whole department.

Therefore the total costs appropriate to machine no. 5 are as follows:

	RWF per annum
Depreciation: $\text{RWF}\dfrac{13{,}300 - \text{RWF}300}{10}$	1,300
Rent ($\frac{1}{20}$ of department's cost)	220
Supervision ($\frac{1}{30}$ of department's cost)	120
Repairs	240
Power	1,000
Total	RWF2,880 per annum

Therefore the machine-hour rate is:

$$\text{RWF}\frac{2{,}880}{1{,}800} = \text{RWF}1.60 \text{ per machine hour}$$

G. THE USE OF PREDETERMINED ABSORPTION RATES

Introduction

In the examples considered so far, we have been dealing with a known total of overhead which we have allocated or apportioned to cost centres and hence to cost units. In practice, of course, costs are being incurred while production is taking place, so that total costs are not known until the end of the period. But management needs timely information on product costs as they are being incurred. To overcome this problem, predetermined overhead rates are used. These are based on estimated overheads and estimated production levels. Each job then absorbs overhead at the predetermined rate.

Overhead Adjustment Account

At the end of each period it is necessary to compare the overhead which has been absorbed with that actually incurred. Almost certainly there will be differences. Overhead will have been over-absorbed if the production level was greater than anticipated, or if overhead costs were lower than anticipated. Conversely, overhead will have been under-absorbed if the production level was lower than anticipated or overhead costs were greater.

The overhead over- or under-absorbed each month is transferred to an overhead adjustment account, and at the end of the year the net amount over- or under-absorbed is transferred to profit and loss account. This method is preferable to the alternative of carrying forward a balance on the overhead account each month, although this alternative method **is** acceptable if the under- or over-absorption is caused purely by seasonal fluctuations where an average annual rate of overhead absorption is in use. In this case, there will be under-absorption in some periods and over-absorption in other periods because of the seasonal factors, but the net effect over a year will be nil. Nevertheless, since a cost accountant will rarely be in a position to say that **all** under- or over-absorption is due to seasonable factors, it is still considered preferable to operate an overhead adjustment account.

Example

In a period in which 1,600 direct labour hours are expected to be worked, fixed overheads are expected to be RWF20,000. In fact only 1,550 direct labour hours are worked and the actual overhead incurred is RWF19,750.

The predetermined rate for absorption of overhead is RWF12.50 per direct labour hour $\left(RWF\,\frac{20{,}000}{1{,}600}\right)$. Thus, for instance, a job which took 20 hours to complete would absorb RWF250 fixed overhead.

Because 1,550 direct labour hours are worked, the amount of overhead which has been absorbed by the end of the period is 1,550 × RWF12.50 = RWF19,375.

Comparing this with the actual overhead incurred, we see that overhead has been under-absorbed by RWF375.

Extracts from the relevant accounts are shown below:

OVERHEAD CONTROL

	RWF		RWF
Incurred	19,750	Work-in-progress - absorbed overhead	19,375
		Overhead adjustment - under-absorbed overhead	375
	RWF19,750		RWF19,750

WORK-IN-PROGRESS

	RWF		RWF
Direct material		Transferred to finished	
Direct labour		goods stock	
Overhead absorbed	19,375		

OVERHEAD ADJUSTMENT

	RWF		RWF
Overhead control - under-		Profit and loss	375
absorbed overhead	375		
	RWF375		RWF375

Analysis of Under-/Over-Absorbed Overhead

In the last section we arrived at a figure of RWF375 for under-absorbed overhead. It would be useful to management to know the reasons for this under-absorption.

From the above workings, we know that the amount of overhead absorbed is RWF19,375.

Had the expected number of hours been worked, overhead absorbed would have been RWF20,000.

Therefore, because of the shortfall in hours worked, there is under-absorption of RWF625. However, this is offset by RWF250 because the overhead bill of RWF19,750 is less than expected.

To summarise:

	RWF
Under-absorption owing to shortfall in hours	625
Over-absorption owing to lower total cost	250
Net under-absorption	RWF375

"Blanket" Overhead Absorption Rates

Overhead absorption rates should preferably be calculated separately for each department. However, a "blanket" rate for the whole factory may be acceptable in the following circumstances:

(a) Where only one product is manufactured.

(b) Where there are several products but they use approximately equal amounts of the services of all departments.

(c) Where overhead forms a small proportion of total cost, and the extra work involved in calculating departmental absorption rates would not be worthwhile.

H. TREATMENT OF ADMINISTRATION OVERHEAD

It is not generally worthwhile to attempt to be too scientific in apportioning administration costs to products. For pricing purposes, the inclusion of an agreed percentage on production costs will generally be adequate. For other purposes, there is no need to absorb administration costs into product costs: instead they can be treated as period costs to be written off in the profit and loss account.

I. TREATMENT OF SELLING AND DISTRIBUTION OVERHEAD

Variable Elements

Some elements of selling and distribution overhead vary directly with the quantities sold - for instance, commission of so much per unit paid to a salesman. Such items can be charged directly to the product concerned in addition to the production cost.

Fixed Elements

Other items are incurred whether products are sold or not - for instance, rent of showrooms, salaries of salesmen. Such items may be treated as period costs and written off in the profit and loss account or may be absorbed in one of three ways:

(a) Percentage on Sales Value

Selling overheads for year	RWF250,000
Estimated sales value for year	RWF2,500,000

Absorption rate =

$$\frac{\text{Cost}}{\text{Activity}} \times 100 = \frac{250{,}000}{2{,}500{,}000} \times 100 \text{ or } 10\%$$

In this case, we add 10% of the sales value of the cost unit to the cost to cover selling overheads.

This method is useful when prices are standardised and the proportions of each type of article sold are constant.

(b) Rate per Article

Selling overheads for year	RWF250,000
Number of articles to be produced	1,000,000

Absorption rate =

$$\frac{\text{Cost}}{\text{Activity}} \text{ or } \frac{250{,}000}{1{,}000{,}000} \text{ or RWF0.25 per article}$$

For each article produced, 0.25rwf is added to the cost.

The method is particularly applicable where a restricted range of articles is produced, but it can be used for an extended range by evaluating different sizes using a points system.

(c) Percentage of

Selling overheads for the year	RWF250,000
Estimated production cost of sales for year	RWF2,000,000

Absorption rate =

$$\frac{\text{Cost}}{\text{Activity}} \times 100 = \frac{250{,}000}{2{,}000{,}000} \times 100 = 12\tfrac{1}{2}\%$$

12½% of production cost of each unit is calculated and added to that cost.

Care must be taken in applying this method. For instance, suppose a company makes two products, A and B. A costs twice as much as B to produce. Therefore, a percentage on production cost basis would charge A with twice as much selling and distribution overhead as B. However, it may very well be that there is a ready market for A, so there is no need to advertise it, whereas B is in competition with others and the company spends RWF10,000 on advertising B. It is therefore clearly incorrect to charge A with twice the overhead which is charged to B. Indeed, the advertising cost should have been charged directly to B. The method is, however, acceptable if the costs involved are small, or if there is a limited range of products and those costs which do **not** vary with the cost of production can be charged direct.

J. ACTIVITY-BASED COSTING

What is Activity-Based Costing?

The two traditional costing methods are absorption costing and marginal costing, as we have seen. Absorption costing allocates and apportions all overheads to products. In order to do this, companies must allocate and apportion service overheads to the main production departments. Direct labour and/or machine-hour rates are then derived, which are used to calculate the overheads attributable to each product. The approach was developed in the early part of the 20th century and assumes that overheads directly relate to the level of production. This is not always the case under current production methods, as factors such as sales mix, complexity, range and production techniques all influence overhead costs. The method of apportionment can also seem arbitrary and the resulting product costs are sometimes difficult to interpret.

Marginal costing, on the other hand, makes no attempt to apportion overheads and a product's marginal cost only includes direct material, direct labour and directly attributable overheads. Sales less marginal cost establishes the company's contribution, which should be managed in such a way that it covers all fixed overheads and generates the required level of profit. Critics of this approach point to the danger of not apportioning all overheads to products and the possibility that these costs will not be recovered in selling prices. As a result, the company may drift into loss and eventually go out of business.

Absorption costing requires a lot of time and energy put into the basis of overhead allocation and apportionment but often the factors leading to the generation of these costs are obscured. Marginal costing tends to ignore these fixed overheads and relies on budgets to control cost levels. Activity-based costing provides an alternative approach to the treatment of fixed overheads. It focuses on the activities that generate overheads and the factors, or **cost drivers**, that cause costs to change. These cost drivers are at the heart of ABC and are used to determine the basis of overheads attributable to each product. Attention is focused on each activity and the factors that cause cost levels to change. In consequence, the nature of each cost will be better understood and increased control and better decisions should result.

Terms used in Activity-Based Costing

⇒ Activity: Discrete services or related tasks which are carried out repeatedly.

⇒ Cost Driver: The factor or event which causes a cost to occur.

⇒ Cost Pool: All the costs incurred when an activity takes place.

- Professors Kaplan and Cooper of Harvard University created the idea of activity based costing. It was designed to deal with the problem of allocating costs to output where such costs are not related to volume of production.
- In the traditional methods overheads are apportioned to output using a basis such as machine hours.
- For every cost driver the cost per unit of activity is calculated and this is then used to divide costs into individual cost units.

Examples of:	**Activities**	**&**	**Cost Drivers Used**
	– Purchasing Dept		– No. of Invoices
	– Accounting Dept Costs		– No. of Accounting Reports
	– Set up Costs		– No. of Manufacturing Set Ups
	– Engineering Dept. Costs		– No. of Production Orders

Advantages of Activity-Based Costing (ABC)

- Better basis for cost apportionment.
- Overheads are traced to the product.
- ABC brings attention to cost behaviour and helps in the reduction of costs.
- ABC provides a useful means of getting financial and non financial data.
- More realistic product costs.
- Forces managers to consider the drivers of cost in their business.

Disadvantages of Activity-Based Costing

- Difficulty in picking cost drivers.
- Very time consuming.
- The problem of common costs.
- A full ABC systems having numerous cost pools and cost drivers is more complex and more expensive to operate.

The stages involved in ABC are:

(a) Identify the activities that cause overheads to be incurred.

(b) Change the accounting system so that costs are collected by activity rather than by cost centre.

(c) Identify the factors that cause each activity's costs to change. These factors are the cost drivers.
(d) Establish the volume of each cost driver.
(e) Calculate the cost driver rates by dividing the activity's cost by the volume of its cost driver.
(f) Establish the volume of each cost driver required by each product.
(g) Calculate overheads attributable to each product by multiplying (f) by (e).

ABC concentrates on the activities which are essential in order that services are provided or goods produced. All related costs are charged to the activity and each activity is itself necessary for the final product to be produced. Examples could be:

- Personnel department costs
- Material handling
- Spare parts administration.

These activities are known as "cost drivers" (defined as "an activity that generates cost"). Having separated expenses into these cost drivers, then the most appropriate method of allocation is determined for **each** cost driver and used. For example, the total cost of the personnel department might well be allocated on the basis of numbers of personnel in each cost centre, etc.

By having different activity costs, each having different methods of allocation, it is argued that the allocation/apportionment task is refined and, being less arbitrary, more correctly reflects "true cost".

The following example will illustrate how this works.

Worked Example

One of the findings of companies that have used ABC is that high-volume production tends to be over-costed, whilst low-volume, small-batch work is often under-costed. This probably results from the additional overheads associated with short production runs not being adequately reflected in the company's costing system. Our example will therefore consider two products. Product X is manufactured in long production runs, whilst Product Y has more components, greater variety and is manufactured in small batches.

		Product X		**Product Y**
Monthly production		5,000		6,000
Direct material costs	RWF		RWF	
Department A	4.00		5.00	
Department B	4.00		4.00	
Department C	2.00		3.00	
		RWF10.00		RWF12.00
Direct labour costs		RWF5.00		RWF7.00
Machine-hours		Hrs		Hrs
Department A		0.50		0.60
Department B		0.50		0.90
Department C		0.25		0.50
Overheads			RWF	
Production Department A			20,000	
Production Department B			15,000	
Production Department C			10,000	
Purchasing			6,000	
Production control			5,000	
Tool-setting			12,000	
Maintenance			3,000	
Quality control			4,000	

Product Costs Calculated Using Absorption Costing

The first step is to apportion the service department overheads to the production departments. In this example we will use the following basis of apportionment:

	RWF	
Purchasing	6,000	Direct material costs
Production control	5,000	Direct material costs
Tool-setting	12,000	Direct material costs
Maintenance	3,000	Machine-hours
Quality control	4,000	Machine-hours

The monthly material costs and machine-hours can be calculated from the previous data, and are presented on the following page.

	Dept A	**Dept B**	**Dept C**	**Total**
Machine-hours				
Product X	2,500	2,500	1,250	6,250
Product Y	3,600	5,400	3,000	12,000
	6,100	7,900	4,250	18,250
Departmental % of total	33.4%	43.3%	23.3%	100.0%
Direct Material				
Product X	20,000	20,000	10,000	50,000
Product Y	30,000	24,000	18,000	72,000
	50,000	44,000	28,000	122,000
Departmental % of total	41%	36%	23%	100%

The overhead analysis sheet apportioning service department overheads to production departments can now be prepared:

Overheads			Department		
	RWF000	**Basis**	**A**	**B**	**C**
Production Department A	20		20.0		
Production Department B	15			15.0	
Production Department C	10				10.0
Purchasing	6	Material	2.4	2.2	1.4
Production control	5	Material	2.1	1.8	1.1
Tool-setting	12	Material	4.9	4.3	2.8
Maintenance	3	M/C hours	1.0	1.3	0.7
Quality control	4	M/C hours	1.3	1.7	1.0
	75		31.7	26.3	17.0

The machine-hour rates are therefore:

	Cost	**Machine-hours**	**Rate**
	RWF		RWF
Dept A	31,700	6,100	5.20
Dept B	26,300	7,900	3.33
Dept C	17,000	4,250	4.00

Overheads apportioned to each product under a traditional product costing system can be calculated by multiplying the product's machine-hours by the appropriate departmental rate. The answer to these calculations is presented next.

	Product X	**Product Y**
	RWF	RWF
Dept A	2.60	3.12
Dept B	1.67	3.00
Dept C	1.00	2.00
	5.27	8.12

This example has been simplified but is not untypical of systems found in practice. Overheads are apportioned to products based on a machine-hour rate, which in this example does not take into account the fact that Product Y is manufactured in small batches requiring additional tool-setting, production control and quality control effort.

Product Costs Calculated Using ABC

An activity-based costing method would regard these costs as activities that can be controlled, and seek to identify the cost drivers that determine the cost levels. These cost drivers may not necessarily be the number of items produced and in this example we will assume they are as follows:

Activity	Cost Driver
Purchasing	Number of orders
Production control	Number of components produced
Tool-setting	Number of tool changes
Maintenance	Machine-hours
Quality control	Number of components inspected
Production Department A	Machine-hours
Production Department B	Machine-hours
Production Department C	Machine-hours

In order to keep this example simple, it is assumed that the production department overheads are directly related to machine-hours worked. In practice it would be possible to divide each department into a number of different activities, each with its own cost driver.

The additional information required to calculate activity-based costs is:

	Product X	Product Y	Total
Number of orders	300	900	1,200
Components produced	15,000	48,000	63,000
Components inspected	2,000	11,000	13,000
Machine-hours	6,250	12,000	18,250
Tool changes	10	60	70

The cost driver rates are calculated below:

Overheads	RWF	**Cost Driver Volume**	**Rate**	
Production Department A	20,000	6,100	3.28	per m/c hr
Production Department B	15,000	7,900	1.90	" " "
Production Department C	10,000	4,250	2.35	" " "
Purchasing	6,000	1,200	5.00	per order
Production control	5,000	63,000	0.08	per part
Tool-setting	12,000	70	171.43	per change
Maintenance	3,000	18,250	0.16	per m/c hr
Quality control	4,000	13,000	0.31	per inspection

The overhead rate per product under activity-based costing becomes:

		Product X		**Product Y**	
	Rate	**Volume**	**Overhead**	**Volume**	**Overhead**
	RWF		RWF		RWF
Dept A	3.28	2,500	8,200	3,600	11,808
Dept B	1.90	2,500	4,750	5,400	10,260
Dept C	2.35	1,250	2,938	3,000	7,050
Purchasing	5.00	300	1,500	900	4,500
Production control	0.08	15,000	1,200	48,000	3,840
Tool-setting	171.43	10	1,714	60	10,286
Maintenance	0.16	6,250	1,000	12,000	1,920
Quality control	0.31	2,000	620	11,000	3,410
			21,922		53,074
Quantity produced			5,000		6,000
OVERHEAD PER PRODUCT			RWF4.38		RWF8.85

Product Y's cost is greater than that obtained from the traditional absorption costing method and reflects the additional costs involved in its manufacture.

Further Considerations

The ABC approach to ascertaining cost of production was introduced as an important innovation in management accounting in the 20th century. It is a further development in relating overhead expenses to production.

Over recent years, rapid changes in methods of production have resulted in direct labour costs per unit of output being reduced. More expenditure is now indirect overhead not directly related to units of production.

In marginal costing the only variable activity considered is volume of sales. It is established that, at a certain level of production and sales, a breakeven point will be reached; the contribution per unit thereafter is related to profit. In the case of absorption costing, overhead costs are absorbed in the most logical way by units of production. Allocation and absorption is achieved arbitrarily but as logically as possible. As overheads have become a greater proportion of total production cost, any arbitrariness in how they are charged to products becomes more significant.

In activity-based costing the overheads are considered to be related to the use made by production of the facilities (cost drivers) responsible for incurring them. This is considered a more logical way to obtain accurate information on the cost of production. The advocates of ABC consider the following points in promoting this approach:

- It provides more accurate product costs, which should enable the management to make decisions on pricing, most profitable product mix etc. in a more logical manner.
- It is argued that production resources are more efficiently utilised.
- It extends the variable cost approach to short-term and long-term costs and volume changes. This is because these costs are related to the activities and not only to volume of production.
- Costs are considered in more detail as to whether they add value to production or not. In this way management can achieve better cost control.
- The management will have better understanding of the economics of production and of activities performed by the company.

Although ABC is a better approach in relating overheads to production, it is still an arbitrary method. It is in a sense an extension of absorption costing, as ABC product costs are full absorption costs. ABC can be applied to **all** costs incurred in an organisation, not only production costs. It is being used increasingly in service organisations such as hotels, schools and hospitals.

ABC in Service Industries

The nature of the 'product' in service industries means that the cost structure typically differs from manufacturing industries. Direct costs tend to be a smaller proportion of total cost, because the direct material content of a service is usually small. The direct labour content of a service can, however, be significant.

The impetus for the application of ABC in service industries is mainly a desire for more understanding of the costs of providing services, as an aid to decision-making and cost control. There may be a tendency in service industries to view **all** costs as overheads, bearing no direct relationship to the level of service provided. This results in cost control being aimed at the **inputs** to the process rather than the **outputs**, so it will be relatively ineffective. The application of ABC in service industries requires clear specification of what services are provided, so that the activities driven by and underpinning the services can be specified. Examples of cost units used in service industries could include:

Business	**Cost unit**
Healthcare (hospitals)	(a) Bed occupied (b) Out-patient
Hotel & catering	Room/cover
Professional services (accountants, architects, lawyers)	Chargeable hour
Education	(a) Enrolled student (b) Successful student (c) School meal

These cost units could be refined to reflect significant differences in the activities and drivers relating to them. One hospital changed its cost unit on adopting an ABC approach. The initial unit was a patient-day, but analysis of the activities necessary to provide a patient-day revealed a range of activities falling into two broad categories: those relating to the nursing care a patient received, and those relating to bed occupancy. The latter category, such as the provision of ward cleaning services and patients' meals was mainly driven by the number of beds, and these activities were largely independent of the specific types of patient occupying the beds. The nursing care activities, however, were driven by the medical needs of particular types of patient. On the change of cost unit, every ward's head nurse rated each patient and arrived at a level of 'acuity' on a five-point scale. The 'acuity' rating was the driver for the cost of nursing activity, and was used both in charging patients for their hospital stay, and in preparing a flexible budget for nursing costs in each ward.

The solution in this instance of the hospital is compatible with the approach of a traditional costing system - it equates to a manufacturing company changing from a plant-wide absorption rate to cost-centre absorption rates. However, this does not indicate a **general** compatibility between the traditional and the ABC approach in service industries.

A key factor in the ABC approach is the recognition of cost at levels **other** than the unit level. The cost of making a bed available is largely a **facility-level** cost, while the cost of providing nursing care to patients at a particular sickness level is a **unit-level** cost, i.e. it will increase as the number of patients with this level of sickness increases. ABC and traditional costing result in the greatest differences when cost drivers are batch- and product-related, rather than unit- and facility-related.

In some service industries, e.g. public relations, the specific output may be difficult to identify and quantify. Where there are multiple outputs, identifying support activities with particular outputs may be even more difficult. Even strong advocates of ABC acknowledge that the costs of applying it in such circumstances may well outweigh the benefits. For example, a hotel may incur significant costs in tending its gardens and maintaining communal areas. Allocating these facility-sustaining **common costs** to particular 'products', such as overnight stays, must be largely arbitrary.

However, ABC can be very suitable for the service sector in identifying **customer profitability** rather than 'product cost'. Customer focus is vital in service industries - customers may make very different demands even when using the same 'product'. In some cases common costs may be more **easily** identified with customers than products; e.g. a hotel swimming pool may be used more by families than by business people, even though both types of guest are being provided with overnight accommodation. An ABC analysis of customer profitability in service industries may yield valuable information to assist management in, for example, price-setting.

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Study Unit 7

Job Costing/Batch Costing

Contents

A. INTRODUCTION

In management accounting systems, costs are usually accumulated to meet both external management needs and external reporting requirements.

Examples of these are: -

Internal Management Needs: –Pricing decisions

Determining Product Range

Performance of departments

External Reporting Requirements – Inventory Valuation.

The method of accumulating the cost data depends on the type of product or service the company offers.

Job costing is a method of costing used when cost units can be separately identified and need to be costed individually.

It’s essential features are: -

(a) Each job can be accurately identified.

(b) Direct costs are charged directly to each job.

Typical application of job costing can be seen in the engineering, shipbuilding, construction and printing industries.

The classification can be further broken down depending on the duration of the job and the number of individual units to be produced. The main types of job costing and their principal features are: -

"Factory" Sub Costing	-	Comparatively short duration.
	-	Usually carried out in factory, e.g. furniture, machinery
Batch Costing	-	Similar to above but with larger number of units produced, e.g. production of component parts for bulk orders. The job to which costs are assigned is the Batch of units produced.
Contract Costing	-	The duration is usually greater than 1 year. Typical use would be in the construction field, e.g. housing, roads, bridges, etc.

While these three costing situations may be regarded as very distinct from one another they all possess the characteristics of job costing.

B. FACTORY JOB COSTING

Although reference has been made to manufacturing industries the costing technique can apply to the service industries such as vehicle repair, costing of audits and research projects.

Below is a brief outline of the practical procedures involved in the setting up of a job.

(a) A prospective customer approaches the supplier requesting a tender for goods to be supplied.

(b) The supplier agrees precise details of items to be supplied, e.g. quantity, quality, size, colour, delivery date, and any special requirements.

(c) The suppliers estimating department prepares a price for the job.

This will include direct costs, appropriate overheads and where appropriate the cost of any additional equipment required specially for the job.

(d) Finally, the suppliers profit margin is added to give the quoted selling price.

The following is a typical job costing: -

Job No. 1234

As newly appointed chief cost clerk, you find that the selling price of Job No. 1234 has been calculated on the following basis:

	RWF
Materials	12.09
Direct wages (22 hours @ RWF0.25 per hour)	5.50
(Dept A – 10 hours	
Dept B – 4 hours	
Dept C – 8 hours)	
	17.59
Plus 33⅓% on prime cost	5.86
	RWF23.45

An analysis of the previous year's Profit and Loss Account shows the following:

			RWF		RWF
Materials used			77,500	Sales	135,000
Direct wages -	Dept A	5,000			
	Dept B	6,000			
	Dept C	4,000	15,000		
Factory overhead:					
	Dept A	2,500			
	Dept B	4,000			
	Dept C	1,000	7,500		
Gross profit c/d			35,000		
			RWF135,000		RWF135,000
Selling costs			30,000		
Net profit			5,000	Gross Profit b/d	35,000
			RWF35,000		RWF35,000

REQUIREMENT:

(i) Draw up a job cost sheet.

(ii) Add to the total job cost 10% for profit and give the final selling price.

Work to the nearest cent.

<u>Job No. 1234 – Solution</u>

<u>Job Cost Sheet</u>

(i)

	RWF	RWF
Materials used		12.09
Department A		
Direct wages 10 hrs @ RWF0.25	2.50	
Departmental overhead 50% of wages	1.25	3.75
Department B		
Direct wages 4 hrs @ RWF0.25	1.00	
Departmental overhead 66⅔% of wages	0.66	1.66
Department C		
Direct wages 8 hrs @ RWF0.25	2.00	
Departmental overhead 25% of wages	0.50	2.50
FACTORY COST		20.00
Selling overhead 30% on factory cost		6.00
TOTAL COST		RWF26.00

(ii)

Total cost	RWF26.00
Add: 10% profit margin	2.60
SELLING PRICE	RWF28.60

Notes:

(i) Generally the principal types of material would be listed.

(ii) Dept. A overhead calculated as a rate per hour as follows:

$$\frac{\text{Total Overhead}}{\text{Total Wages}} = \frac{2,500}{5,000} = 50\%$$

(iii)

$$\text{Dept. B overhead} = \frac{4,000}{6,000} = 66⅔\%$$

(iv)

$$\text{Dept. C overhead} = \frac{1,000}{4,000} = 25\%$$

(v)

Selling overhead (calculated as a % of cost of sales) $= \dfrac{\text{Total selling cost}}{\text{Total factory costs}}$

$$= \frac{30,000}{100,000} = 30\%$$

(e) If accepted, the job is allocated a unique job number, a material requisition is sent to stores and a purchase requisition prepared for any special materials or equipment required. A job card is raised setting out the stages of work to be performed and an advice is sent to personnel if specialised labour is required.

(f) At the appropriate time the job will be "loaded" onto the factory floor. In an efficient organisation this will be timed to ensure that the delivery date is met and storage costs (for the completed product) are minimised.

Treatment of Overheads:

Direct costs can be charged to the job on an "actual" or "standard" basis depending on the sophistication of the system in use.

Overheads can be divided into fixed and variable and must be applied to the specific jobs using an acceptable basis. Such a basis may be direct labour hours, or direct labour cost (depending on the accuracy required and the cost of the clerical work involved to produce the information).

Annualized Rates:

Overheads are usually grouped for a period of 1 year and a rate calculated, e.g.:

Variable costs for year	60,000	
Fixed costs of year	90,000	
Total costs for year	150,000	
Expected direct labour hours	50,000	Hours
Predetermined O/H rate per hour	3.00	Per hour

$$\text{i.e.}\quad \frac{\text{RWF150,000}}{\text{50,000}}\ \text{Hhs} = \frac{\text{Numerator (Budget O/H)}}{\text{Denominator (Budget Activity)}}$$

The average for one year is taken to: -

1. Overcome the effect of seasonal or calendar variations in overhead costs for the month, e.g. heating, air conditioning, i.e. reasons relating to the numerator – overheads.
2. Overcome the effect of fluctuating monthly production on unit costs, i.e. denominator reasons.

Under/Over Applied Overheads:

Accounting for total factory overhead costs involves: -

(a)	Actual overhead cost incurred,	i.e. the overhead cost incurred on the accruals accounting basis. This is debited to the Factory Overhead Control. Corresponding credits are made to Stores Control, Accrued Wages, Accounts Payable, etc.
(b)	Overhead cost applied, i.e.	The overhead actually applied to jobs in the period. This is debited to W.I.P. Control and credited to Factory Overhead applied. It is computed by multiplying the recovery rate by the number of units of the recover base appropriate to the job rate per hour (RWF3) x 400 Direct labour hours spent on the job = RWF1,200.

The difference between these accounts will represent overheads under/over applied to the jobs completed and in progress at the year end. Strictly speaking, this difference should be prorated over: -

Cost of Sales (if sold)

Finished Goods (in stock at y/e)

WIP (uncompleted items) e.g.

Example:

Factory O/H Incurred	RWF11,000
Factory O/H Applied	RWF10,000

	Direct Costs	O/H's Applied	Total Cost
Cost of sales	30,000	9,000	39,000
Finished Goods	8,000	750	8,750
W.I.P.	2,000	250	2,250
	40,000	10,000	50,000

Proration of Under Applied O/H:

Proration of RWF1,000 under applied overhead on the basis of: -

	O/H		Total Costs		Overhead Applied	Total Cost
	RWF	%	RWF	%	(1)	(2)
Cost of Sales	9,000	90	39,000	78	900	780
Finished Goods	750	7.5	8,750	17.5	75	175
W.I.P.	250	2.5	2,250	4.5	25	45
	10,000	100	50,000	100	1,000	1,000

Column (1) represents the correct treatment whereas Column (2) represents a simpler (less correct) alternative. If the under/over applied O/H is small in relation to total production costs the effect of using the simpler apportionment (Column (ii)) will not be material.

The journal entry to effect this adjustment would be: -

Dr	Cost of Sales	7,800

	Finished Goods	1,750	
	W.I.P.	450	
Cr	Factory Overhead Applied		10,000
		RWF10,000	RWF10,000

Adjustment required to prorate under applied overhead over relevant accounts.

Interim Financial Statements:

The above procedure is used at the year-end. For the extraction of monthly/quarterly accounts any under/over applied overhead can be

(a) Written off to profit and loss account.

(b) Carried forward as an asset/liability to the next month.

Treatment (a) is preferred because it evens out the effect of:

(a) Operating at different levels of activity

(b) Seasonal Costs.

However, "unplanned" or unanticipated under/over applied O/H's should be prorated in the period they occur because they were not expected and do not form part of the expected annual overheads.

e.g. Regular Ltd

Budgeted factory overhead cost	RWF440,000	
Budgeted direct labour hours	200,000	Hrs
Actual factory overhead costs	RWF494,000	
Actual direct labour hours	210,000	Hrs

Location of Production

Cost of Sales	62½%
Finished Goods	25%
W.I.P.	12½%
	100%

REQUIREMENT:

Compute:

(a) Predetermined Overhead Rate

(b) Applied factory O/H Cost

(c) Under/Over Applied O/H

(d) Proration of Above

Answer:

(a) Predetermined O/H Rate $= \dfrac{\text{Budget Factory O/H}}{\text{Budget D.L. Hrs}} \quad \dfrac{\text{RWF440,000}}{\text{200,000}} = \text{RWF2.20 per hr} \quad \text{Hrs}$

(b) Applied factory O/H Cost = Actual D.L. Hrs Predetermined Rate

210,000 Hrs x RWF2.20

= RWF462,000

(c) Under Applied O/H = Actual O/H - Applied O/H

= RWF494,000 - RWF462,000

= RWF32,000

(d) Proration of Under Applied O/H

	Applied	O/H	Under Applied	O/H	Total	O/H
	RWF	%	RWF	%	RWF	%
Cost of Sales	288,750	62.5	20,000	62.5	308,750	62.5
Finished Goods	115,500	25.0	8,000	25.0	123,500	25.0
W.I.P.	57,750	12.5	4,000	12.5	61,750	12.5
	RWF462,000	100	RWF32,000	100	RWF494,000	100

Batch Costing:

Batch costing is a method of costing used when a number of identical items pass through a process or a factory as a distinct and identifiable batch.

It differs from Job Costing in that in job costing the number of items in the job is usually low whereas in Batch Costing the number of identical items is large. However, many of the principles used in job costing can be applied. The costs are broken down into cost per unit only when the batch is completed or taken to a stage where common processing stops, e.g. different types of metallic painting or different packaging.

Batch Size:

An important aspect of batch processing is determining the most economical batch size. This allows a balance to be struck between set up costs and stock holding costs that will minimise the overall cost per unit of items in the batch.

The calculation of the Economic Batch Quantity (EBQ) is similar to that for the Economic Order Quantity (EOQ) in purchasing, but in this case the order costs are replaced by set up costs and the purchase price is replaced by a production cost.

Briefly the calculation of the EBQ is as follows: -

The main factors in determining the EBQ are: -

C = Set up costs for machinery required to produce the batch

P = Unit production cost for each item produced in the production

D = Demand for the unit per annum

I = Stock holding costs expressed as a % of the cost of items in stock

If batch (E) with n units is produced the cost will be: -

En = Set up Costs + Production Costs + Stock Holding costs

$$= \frac{CD}{n} + P + \frac{n}{2} ip$$

Using Calculus:

$$\frac{dE}{dn} = -\frac{CD}{n^2} \quad \frac{ip}{2} = 0$$

$$n^2 = \frac{2CD}{ip}$$

$$n = \sqrt{\frac{2CD}{ip}}$$

Where n = EBQ

Example:

Demand P.A.	2,400	Units
Set up Costs	RWF120	
Production Cost	RWF6	p.u.
Stock Holding Costs	6%	

$$EBQ = \sqrt{\frac{2 \text{ x } 120 \text{ x } 2{,}400}{0.06 \text{ x } 6}}$$

$$= \sqrt{\frac{576{,}000}{0.36}} = \sqrt{1{,}600{,}000}$$

$$= 1{,}265 \text{ units}$$

This formula assumes that production runs take place instantaneously. In reality if the production run is such that a time period exists between the completion of the first and the last unit then due to the continuing demand for the product the stock levels will never reach their full quota n (ignoring stock) because by the time the batch n is completed and put into stock some of the items will have already been sold.

This reduces the stock holding costs and allows the EBQ to increase slightly.

The stock holding costs in the equation are reduced from:

$$ip \text{ ti } ip\left(1 - \frac{D}{R}\right)$$

Where R = Rate of Production

Thus where R is large – in effect instantaneous production the formula is: -

$$EBQ = \sqrt{\frac{2CD}{ip}}$$

But where R is lower the formula is: -

$$EBQ = \sqrt{\frac{2CD}{Ip\left(1 - \frac{D}{R}\right)}}$$

Per the example given the effect is: -

R	=	4,800	p.a.	=	2D	EBQ	=	1,789
	=	9,600	p.a.	=	4D		=	1,461
	=	24,000	p.a.	=	10D		=	1,333
	=	240,000	p.a.	=	100D		=	1,271
	=	Very large					=	1,265

If R = D then EBQ = infinity, i.e. continuous processing

If R < D then production unable to meet demand.

<u>Other problems:</u>

Problems may arise where batches of dissimilar products are brought together for common processing.

e.g. Baking in an oven

Loading and unloading time and oven costs must be apportioned to the batches on an equitable basis. If such costs are small in relation to unit costs then they can be treated as general overhead.

Unfinished batches must be valued at the end of each accounting period. This problem is dealt with under Process Costing.

Accounting For Batch Costs:

Batch costing has the attributes of job costing in so far as costs are assembled for each batch. In addition to materials and to operating labour and overhead costs this would include set-up costs.

Having determined the total cost it is then necessary to apply this cost to the individual units produced. This is done by the same averaging method used in process costing situations, i.e.: -

$$\frac{\text{Batch costs}}{\text{Total Batch Output}} = \text{Batch Cost per Unit}$$

In determining total batch output one often has the problem that units in progress, (at the time of determination of batch output) are at intermediate stages of completion. This is dealt with by treating such units as equivalent whole units depending on the stage of completion, e.g. 200 units 50% complete are treated as 100 equivalent whole units. This concept belongs to process costing in which it is extensively used.

The following is an example of batch costing embracing incomplete work-in-progress.

Example: QUESTION

<u>BATCH NO. 647</u>

At the end of an accounting period Batch No. 647 had been charged with RWF1,000 materials, RWF500 labour and RWF500 overheads. 1,000 units had been put into work, and the normal wastage is 5%. By the end of the accounting period 450 good units had been transferred to finished stock and 400 units were capable of completion. It was estimated that for these uncompleted units 75% of material cost had been incurred, 50% of the labour applied and 50% of the overheads absorbed. Units were only rejected on final inspection when completed. Calculate the cost of the finished units and of the work in progress, and show the summarised Batch Account No. 647 to nearest RWF.

Batch No. 647

Statement of Production

Input Units	Output	Output Units	Equivalent Production (Units)					
			Materials		Labour		Overhead	
			Units	%	Units	%	Units	%
1,000	Normal wastage	50	-	-	-	-	-	-
	Abnormal wastage	100	100	100	100	100	100	100
	Finished production	450	450	100	450	100	450	100
	Work-in-Progress	400	300	75	200	50	200	50
1,000		1,000						
	Equivalent Production		850		750		750	

COMPUTATION OF UNIT COST

AND

STATEMENT OF EVALUATION

			Materials	Labour	Overhead	Total
Total Cost			RWF1,000	RWF500	RWF500	RWF2,000
Equivalent Produciton (units)			850	750	750	
Unit Cost			RWF1.1764	RWF0.6	RWF0.6	
Abnormal waste		100	117.6	66.7	66.7	251.0
Finished Production		450	529.4	300.0	300.0	1,129.4
Work-in-Progress	Materials	300				
	Labour & Overhead	200	353.0	133.3	133.3	619.6
			RWF1,000	RWF500	RWF500	RWF2,000

BATCH NO. 647 ACCOUNT

		Units	RWF		Units	RWF
Units	Introduced	1,000	--	Normal loss	50	--
	Materials		1,000	Abnormal loss	100	251.0
	Labour		500	Finished Production	450	1,129.4
	Overhead		500	Work-in-Progress	400	619.6
		1,000	RWF2,000		1,000	RWF2,000

(**Note**: Since the units represented by the abnormal loss were only rejected on final inspection after completion, they must bear 100% of material, labour and overhead cost.)

C. INTRODUCTION TO BATCH COSTING

The CIMA *Terminology* defines a batch as a "*group of similar units which maintains its identity throughout one or more stages of production and is treated as a cost unit*".

It is a form of specific order costing in which costs are attributed to batches of products. A batch is very similar in nature to job costing, the only real difference being that a number of items are being costed together as a single unit, instead of a single item or service.

Having calculated the cost of the batch, the cost per item of that batch can be determined by dividing the total cost by the number of items produced.

Batch costing can be applied in many situations, including, for example:

- Where customers order a quantity of identical items;
- Where a batch of similar items are produced and held in stock awaiting customers orders
- Where an internal manufacturing order is raised for a batch of identical parts, for example components to be used in production

Examples include a batch of bakery where items are cooked in batches or a batch of identical teddy bears produced by a toy factory.

D. CALCULATION OF COST PER UNIT

As mentioned, the procedure is similar to job costing. The batch is treated as the job and the costs for the batch are collected on the job card which is then subsequently used to value work in progress.

A cost sheet (or computer file) will be used to record the direct and indirect costs incurred by (or allocated to) the production of the batch. This cost sheet is called a batch cost sheet. When the products (or components) are finished, the batch cost sheet is closed and the products will be transferred to stores or charged to sales at the ***average*** cost of the batch.

E. PRODUCT LINE INFORMATION

Batch costing is usually used where a wide variety of products are held in stock. The cost accountant will be called upon to provide detailed information on product costs for the following areas:

Production Planning / Control
Scheduling to maintain stock levels and to meet fluctuations in demand could pose a major problem. It would require continuous information to be ascertained on set-up costs, stock movements and machine utilisation. (Note the Economic Batch Quantity can be calculated to assist in production scheduling – see section F below).

Pricing
Management will require regular analyses of product costs and profits. This information will assist in directing sales effort and help to determine sales policy.

Research
Cost information will be required in the development of new products / improving operations.

F. BATCH PRODUCTION VERSUS CONTINUOUS PRODUCTION

Many organisations operate a continuous production line or series of lines which individually perform tasks, the combined result of which is the finished product.

These organisations do not manufacture to the requirements of a specific customer, per se, but they might employ a version of batch costing to attach a cost to their product. In these circumstances, the costs are ascertained for a batch and an average cost per unit is calculated. The difference, however, is in determining the batch. Often, this is done by reference to time (for example an accounting period).

Batch production differs from a continuous production line because with continuous production, the same product is made all the time (or for long periods of time) without interruption. However, Batch production consists of a sequence of production runs, with a different product made in each batch. The costs of setting up the production line for a new batch and cleaning up after a batch has been produced can be significant. Batch set-up costs are charged to individual batches where they can be identified and recorded.

G. EXAMPLE

Bookillbo Limited manufactures embroidered school uniforms.

The following details are available from the company's budget:

Cost Centre	***Estimated Overheads***	***Estimated Level of Activity***
Cutting and sewing	RWF93,000	37,200 machine hours
Embroidering and packing	RWF64,000	16,000 direct labour hours

Administration, selling and distribution overhead is absorbed into batch costs at a rate of 8% of total production cost. Selling prices are set to achieve a margin of 15%.

An order for 45 school jumpers has been produced for St. Archibald's Boys School. Details of this batch are as follows:

Direct Materials	RWF113.90
Direct Labour: Cutting and sewing: 0.5 hours @ RWF9/hr Embroidering and packing: 29 labour hours @ RWF11/hr	 RWF4.50 RWF319.00
Machine hours worked in cutting and sewing	2
Fee paid to designer of logo for crest on school jumper	RWF140.00

REQUIREMENT:

Calculate the selling price per school jumper

Solution:

	RWF	RWF
Direct material		113.90
Direct labour:		
Cutting and sewing	4.50	
Embroidering and packing	319.00	
		323.50
Design costs		140.00
Prime cost		577.40
Production Overhead:		
Cutting and sewing: 2 mach. hrs x RWF2.50 (w1)	5.00	
Embroidering and packing: 29 lab. hrs x RWF4 (w1)	116.00	
		121.00
Total Production Cost		698.40
Administration etc. (RWF698.40 x 8%)		55.87
Total Cost		754.27
Profit margin (RWF754.27 x 15/85)		133.11
Total selling price of batch		887.38
Selling price per school jumper RWF887.38 / 45		RWF19.72

Working 1

Calculation of overhead absorption rates:

Cutting and sewing: RWF93,000 / 37,200 machine hrs = RWF2.50 / mach. hr
Embroidering and packing: RWF64,000 / 16,000 labour hrs = RWF4.00 / lab. hr

H. ECONOMIC BATCH QUANTITY

When an organisation manufactures its own stock items in batches, it will order a fresh supply of the item as a batch quantity. The Economic Batch Quantity (EBQ) represents the quantity that minimises the aggregate total of the costs of stockholding and the cost of setting up the batch for manufacture.

It is similar in concept to the Economic Order Quantity (EOQ), when ordering goods from an external supplier. However, there is an important difference. When stock is manufactured internally in a batch, units of the stock item can start to be delivered into stores before the batch production run has been completed.

The first units of the batch will therefore be delivered into stores before the final units have been manufactured and these units can be used immediately.

The average stock level is therefore not Q/2, because this is the average stock level when the maximum stock level is Q. With internal batch production, the maximum stock level is:

$Q(1 - D/R)$

Where:

D = the rate of demand for the stock item
R = the rate at which the stock item can be manufactured

The Economic Batch Quantity is therefore:

$$EBQ = \sqrt{\frac{2C_O D}{C_H(1 - D/R)}}$$

Where:

C_O = Fixed Costs per batch

D = Expected annual sales problem

C_H = Holding Cost per stock unit per annum

R = Replenishment Rate

Example

A company uses 60,000 widgets every year. It manufactures these widgets internally and can produce them at a rate of 240,000 units each year. The cost of holding a widget in stock for one year is 4 and the cost of ordering and setting up a batch production run for the widgets is RWF2,025.

What is the Economic Batch Quantity?

Solution

$$\sqrt{\frac{2 \times 2{,}025 \times 60{,}000}{4(1 - 60{,}000 / 240{,}000)}}$$

EBQ = 9,000 units

Study Unit 8

Service Costing

Contents

A. INTRODUCTION

Service costing is defined as *"cost accounting for services or functions, for example canteens, maintenance and HR. These may be referred to as service centres, departments or functions"*.

Service industries are different to manufacturing in that their outputs are intangible. However, service outputs still have a production cost and the organisation must be able to determine these costs in order to run the business efficiently.

It is important to note that no new costing principles are involved when moving from one *type* of business to another. But it must be decided what are the relevant cost units and how the elements of cost in materials, wages and other expenses may be analysed and classified in order to ascertain the cost of these cost units.

B. SERVICE COST UNITS

One of the biggest problems in service industries is identifying a cost unit that represents an appropriate measure of the service provided. A ***composite cost unit*** is often used. The nature of the service provided should determine the cost unit used.

Examples of these composite cost units are given below:

Service	***Cost Unit***
Hospital	Patient days
Accountancy Services	Chargeable man-hours
Electricity generation	Kilowatt hours
Restaurant	Meals served
Transport company	Passenger miles
Carriers	Ton-miles

In addition, some service organisations may use a number of different cost units the measure the various kinds of service that it provides. For example, a hotel provides a variety of services, each of which may be measured separately as follows:

Service	***Cost Unit***
Accommodation	Occupied bed nights or Guest days
Restaurant	Meals served
Function facilities	Time based (e.g. hours)

C. COST COLLECTION AND COST SHEETS

Having decided the cost unit to be used, it is important that the appropriate statistical information is gathered and recorded properly. ***Cost Sheets*** record the costs of each service that is provided.

At regular intervals, these cost sheets are prepared by the cost accountant to provide information to management. The cost sheet would, typically, include the following for both the current period and the aggregate year to date:

(i) Cost information

(ii) Cost units statistics

(iii) Cost per unit. This is the average cost per unit and can be calculated as follows:

$$\frac{\text{Total costs per period}}{\text{No. of service units supplied in period}}$$

(iv) Perhaps some non-cost statistics may also be provided which may be useful to management, for example, average miles per gallon of fuel

The data from these cost sheets are then used to provide cost reports. These reports are a summary of the totals for the period and may be further analysed into fixed and variable costs.

D. INTERNAL SERVICE ACTIVITIES

Most modern organisations have internal services departments, such as HR, stores, maintenance, canteen etc. It is not unusual for these departments to involve significant costs. The cost of these departments must be calculated, principally for two main reasons.

(a) To control costs in the service department. This enables management to compare the cost against a target (budget) and also to compare actual costs against previous period costs for the department.

(b) To control costs of the user department and prevent the unnecessary use of services. If the cost of services is charged to the user departments so that the charges reflect the use made of the departments of the services, the overhead cost of user departments will be established more accurately and may discourage excessive use of the service if that cost is significant.

E. EXAMPLES

1. Sunshine Hotel

The following information is provided for the month of June for the rooms department of the Sunshine Hotel.

	Twin Bed Rooms	Single Bed Rooms
Number of rooms in hotel	260	70
Number of rooms available to let	240	40
Average number of rooms occupied daily	200	30

In addition the following information is available:

Number of guests in the period	6,450
Average length of stay	2 days
Total revenue in period	RWF774,000
Number of employees	200
Payroll costs for the period	RWF100,000
Items laundered in period	15,000
Cost of cleaning supplies in period	RWF5,000
Total cost of laundering	RWF22,500
Listed daily rate for twin-bed room	RWF110
Listed daily rate for single room	RWF70

The hotel calculates a number of statistics, including the following:

Statistic	***Measurement Method***
Room Occupancy	Total number of rooms occupied as a percentage of rooms available to let
Bed Occupancy	Total number of beds occupied as a percentage of beds available
Average Guest rate	Total revenue divided by number of guests
Revenue Utilisation	Actual revenue as a percentage of maximum revenue from available rooms
Average cost per occupied bed	Total cost divided by number of beds occupied

REQUIREMENT:

Prepare a table containing the following statistics, calculated to one decimal place:

(i) room occupancy (%)
(ii) bed occupancy (%)
(iii) average guest rate (RWF)
(iv) revenue utilisation (%)
(v) cost of cleaning supplies per occupied room per day (RWF)
(vi) average cost per occupied bed per day (RWF)

Solution

(i) room occupancy = $\frac{\text{Total number of rooms occupied}}{\text{Rooms available to let}} \times 100$

$= \frac{200 + 30}{240 + 40} \times 100$

$= 82.1\%$

(ii) bed occupancy = $\frac{\text{Total number of beds occupied}}{\text{Total number of beds available}} \times 100$

$= \frac{6{,}450 \text{ guests} \times 2 \text{ days per guest}}{((240 \times 2) + (40 \times 1)) \times 30 \text{ days}}$

$= 82.7\%$

(iii) average guest rate = $\frac{\text{Total revenue}}{\text{No. of guests}}$

$= \frac{\text{RWF}774{,}000}{6{,}450}$

$= \text{RWF}120$

(iv) revenue utilisation = $\frac{\text{actual revenue}}{\text{maximum revenue from available rooms}} \times 100$

$= \frac{\text{RWF}774{,}000}{((240 \times \text{RWF}110) + (40 \times \text{RWF}70)) \times 30 \text{ days}} \times 100$

$= 88.4\%$

(v) Cost of cleaning supplies per occupied room per day

$= \frac{\text{RWF}5{,}000}{(200 + 30) \times 30 \text{ days}}$

$= \text{RWF}0.72$

(vi) Average cost per occupied bed per day

$$= \frac{\text{Total Cost}}{\text{Number of beds occupied}}$$

$$= \frac{\text{RWF100,000 + RWF5,000 + RWF22,500}}{6{,}450 \times 2}$$

$$= \text{RWF9.90}$$

2. DLN Limited is a transport company which operates a regular delivery service from its warehouse in Kigali to a destination near Bukavul. The total annual mileage covered (including 100 outward and return journeys) being 18,000 miles per 10-ton vehicle.

For the outward journey, the vehicle is always fully loaded and in addition there is a regular demand for return loads of 400 tons per vehicle per annum. The standard charge to customers is 24 rwf per ton/mile. The costs of operating this service are as follows:

Vehicle fixed charges	RWF5,400 per annum
Drivers' wages, including normal overtime	RWF10,260 per annum
Vehicle running costs	RWF 0.33 per mile

The company is willing to pay a bonus to drivers of up to 30% of any additional profit for obtaining additional return loads.

REQUIREMENT:

(a) What annual profit would be earned per vehicle without any additional return loads?

(b) What annual bonus would be payable to a driver who consistently obtained an additional 5-ton return load?

(c) What annual bonus would be payable if the additional 5-ton return load involved a detour of 20 miles (on which no income would be earned) and a RWF2 additional overtime pay on each occasion?

Solution

(a) *Annual Profit per vehicle under existing conditions:*

Annual cost per vehicle:			RWF
Fixed charges			5,400
Drivers wages			10,260
Running Costs (18,000 miles x 33rwf / mile)			5,940
			21,600
Income:		Ton / miles	
100 outward journeys			
(9,000 miles x 10 tons)		90,000	
Return journey			
(9,000 mile / 100 journeys)			
= 90 mile x 400 tons	36,000		
		126,000 x RWF24 =	30,240
Annual profit per vehicle			8,640

(b) *Annual bonus on regular route*

			RWF
5 tons x 9,000 miles	=	45,000 ton / miles x RWF	10,800
Bonus at 30%			3,240

(c) *Annual bonus on detour route*

	RWF		RWF
Additional income per above			10,800
Less:			
20 mile x 100 journeys			
= 2,000 miles x RWF33		660	
Overtime			
100 journeys x RWF2	200		
			860
Net additional income			9,940
Bonus at 30%			2,982

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Study Unit 9

Process Costing 1

Contents

A. APPLICATION AND GENERAL PRINCIPLES

Application

Until now we have been considering organisations with a cost unit which can be segregated, and have direct expenses wholly attributed to it. Other types of organisation produce output in which a unit cannot be easily separated, so that the output requires to be treated in bulk. It is then necessary to use the technique known as process costing.

Process costing is applicable in the chemical, paint, carpet, food processing and textiles industries.

General Method

The method is essentially one of averaging, whereby the total costs of production are accumulated under the headings of processes in the manufacturing routine, and output figures are collected in respect of the various processes. The total process cost is divided by the total output of the process, so that an average unit cost of manufacturing is arrived at for each process.

Where there are several processes involved in the production routine, it is usual to cost each process and to build up the final total average cost, step by step. The output of one process may be the raw material of a subsequent one, thus making it necessary to establish the process cost at each stage of the manufacturing operation.

The way to do this is to regard each process carried out as a cost centre, and to collect information regarding the usage of materials, costs of labour and direct expenses exclusively attributable to individual processes. Each process will be charged with its share of overhead expenses and the procedure of building up cost rates per process or cost centre is carried out in accordance with the rules given previously.

Need to Record Losses and Good Production

We have said that an average cost per unit is obtained for each process. This average cost is arrived at by dividing the cost of each process by the number of "good" units of production obtained from it. Hence it is necessary to set up a recording scheme to find the number of units produced by each process. Since it is unlikely that all material entering a process will emerge in the form of good production, the recording scheme should provide records of losses from each process in addition to records of good production achieved.

B. BUILDING UP PROCESS COSTS

Material

The method of charging material usage will depend on the factory layout and organisation. If there is only one input of raw material at the stage of the initial process, the problem is simplified and material usage can be computed from the stores requisitions. In a case such as this, the output of the first process becomes the raw material of the second, and so on.

If further raw material is required at a subsequent process, it may be convenient to establish raw material stores adjacent to the point of usage.

In many cases material may be used which is of low value, e.g. nails, and the volume of paperwork required to record each issue would be prohibitive. In such cases the method of charging would be to issue the anticipated usage for a costing period at one time, the issue being held for use at the point of manufacture. A physical stock-taking at the end of the period would establish actual usage of material, which could be compared with the theoretical usage expected for the output achieved. With all such items the requirement is to maintain some degree of physical control rather than accurate cost allocation.

Labour

Accounting for labour where process costing is in operation is normally straightforward because fixed teams of operatives are associated with individual processes, and the interchange of labour between processes is not normal from the point of view of efficiency. It is often as simple as collating names on the pay sheets to establish the wages cost for a process. Where process labour **is** interchangeable, labour charges per process may be established by issuing job cards to employees to record the time spent on each process.

Direct Expenses

All expenses wholly and exclusively incurred for one particular process will be given the proper process number and attributed to the cost centre on this basis.

Overhead

The indirect material, labour and expenses not chargeable to one particular process must be borne eventually by production. Absorption rates are used as before, and it is necessary that we establish rates in advance for each cost centre. This means that the total overhead expenses of the business must be estimated and apportioned to the processes in terms of the rules which we have already explained. As we have seen, it is necessary to assess the output expected at each cost centre. Then the absorption rates for the cost centres can be calculated by dividing the costs associated with them by the estimated output per cost centre.

In this way we establish a relationship between overhead cost and activity. At the close of each period the actual activity achieved by the cost centre is multiplied by the predetermined rate to give the charge for overheads. However, where marginal costing techniques are being followed (see later study units), overhead costs are **not** included but are dealt with in total as is fundamental to marginal costing.

Conversion Costs

These are the costs of converting material input into semi-finished or finished products, i.e. additional direct materials, direct wages, direct expenses and absorbed production overhead. **They do not include the costs of original new material inputs.** The term "conversion costs" is often referred to in examination questions on process costing and you should understand what the term means.

C. EXAMPLES OF PROCESS COSTING

- Value of opening and closing WIP
- Equivalent units
- FIFO method
- Average method

The techniques used in process costing can be demonstrated with the aid of a series of examples. You should follow them through carefully, making sure that you understand each stage and can follow the double entries in the accounts.

Example 1: Demonstration of Process Accounts and Stock Accounts When the Value of Opening and Closing Work-in-Progress is Given

In this example an organisation produces an item which requires two processes, and it is normal for stocks of goods completed by Process I to be held for some time before being used in Process II. It is therefore necessary to open process stock accounts. (In future examples we shall assume that output from one process is used immediately in the next process, making it unnecessary to keep stock accounts.)

The following information has been collected for costing period no. 3.

		Process I		Process II
Direct materials used		RWF2,000		RWF1,400
Direct labour cost		RWF2,000		RWF2,100
Production overhead			RWF1,150	
Opening Stocks:	Process I	1,000	units valued at RWF0.50 each	
	Finished Goods	1,111	units valued at RWF0.90 each	
Opening Work-In-Progress:	Process I	1,400	units valued at RWF0.25 each	
	Process II	644	units valued at RWF0.155 each	
Closing Work-In-Progress:	Process I	600	units valued at RWF0.25 each	
	Process II	200	units valued at RWF0.50 each	
Closing Stocks:	Process I	1,600	units valued at RWF0.50 each	
	Process II	555	units valued at RWF0.90 each	
Units completed during Period 3:	Process I	9,600	units	
	Process II	9,444	units	

Sales 10,000 units at RWF1.10 each

Production overhead is absorbed at the rate of RWF0.50 per machine hour for Process I and RWF0.25 per machine hour for Process II.

Machine hours worked during Period 3:	Process I	1,200
	Process II	2,000

Process II used 9,000 units of Process 1 output

Solution

(*The asterisked items are those which are found as the balancing figure on the account.)

PROCESS I ACCOUNT

	Units	Unit Cost	Total Cost		Units	Unit Cost	Total Cost
		RWF	RWF			RWF	RWF
Opening WIP	1,400	0.25	350	Process I stock	9,600	0.50*	4,800*
Material	8,800*		2,000	WIP c/d	600	0.25	150
Labour			2,000				
Overhead							
(1,200 × 0.5)			600				
	10,200		4,950		10,200		4,950
WIP b/d	600	0.25	150				

Notice that both the "Units" and the "Total Cost" columns **must** balance.

PROCESS I STOCK ACCOUNT

	Units	Unit Cost	Total Cost		Units	Unit Cost	Total Cost
		RWF	RWF			RWF	RWF
Balance b/f	1,000	0.50	500	Process II	9,000	0.50	4,500
Process I	9,600		4,800	Balance c/f	1,600	0.50	800
	10,600	0.50	5,300		10,600	0.50	5,300
Balance b/f	1,600	0.50	800				

As the opening stock had the same value as the units transferred from Process I during the period (50rwf per unit), there is no problem over valuing the 9,000 units issued to Process II.

If the unit costs had been different, either the FIFO method or the averaging method would have been used to value the units issued to Process II, and the closing stock.

PROCESS II ACCOUNT

	Units	Unit Cost	Total Cost		Units	Unit Cost	Total Cost
		RWF	RWF			RWF	RWF
Opening WIP	644	0.155	100	Finished stock	9,444	0.90*	8,500*
Process I				WIP c/d	200	0.50	100
stock	9,000	0.50	4,500				
Material			1,400				
Labour			2,100				
Overhead							
(2,000 × 0.25)			500				
	9,644		8,600		9,644		8,600
WIP b/d	200	0.50	100				

FINISHED STOCK ACCOUNT

	Units	Unit Cost	Total Cost		Units	Unit Cost	Total Cost
		RWF	RWF			RWF	RWF
Balance b/f	1,111	0.90	1,000	Profit & loss a/c			
Process II	9,444	0.90	8,500	Cost of sales	10,000	0.90	9,000
				Balance c/f	555	0.90	500
	10,555	0.90	9,500		10,555	0.90	9,500
Balance b/f	555	0.90	500				

PRODUCTION OVERHEAD ACCOUNT

	RWF		RWF
Actual expenditure	1,150	Absorbed: Process I	600
		Absorbed: Process II	500
		Profit and loss a/c:	
		under-absorbed overhead	50
	1,150		1,150

PROFIT AND LOSS ACCOUNT

	RWF		RWF
Cost of sales	9,000	Sales	11,000
Production/overhead			
Under-absorbed	50		
Profit	1,950		
	11,000		11,000

Example 2: Introduction to "Equivalent Units" - Work-in-Progress at End of Period Only

In Process I the costs incurred during January were:

	RWF
Materials	2,000
Labour	2,700
Overhead	1,600
	RWF6,300

There was no opening work-in-progress. 1,100 units were introduced into the process. 700 were completed during January and the remaining 400 were:

75% complete as to materials,

50% complete as to labour,

25% complete as to overhead.

Calculate: cost per unit, total value of finished production, value of closing work-in-progress.

Draw up the process account.

Solution

Note: "Equivalent units" or "effective units" are a notional quantity of completed units substituted for an actual quantity of incomplete physical units in progress, when the aggregate work content of the incomplete units is deemed to be equivalent to that of the substituted quantity of completed units.

The idea of equivalent units is that 200 units half-complete are equivalent to 100 units fully-complete, in terms of cost. In the above example we have different degrees of completion for the different elements of cost. The meaning is that the units comprising the closing WIP have had 75% of the required material incorporated in them; this has taken 50% of the labour processing time necessary to complete a full unit and the overhead content is put at 25% of that for a full unit (e.g. the units concerned have had 25% of the necessary machine time).

The layout shown on the next page is recommended for all questions where percentage completion is given.

Since there is no mention of overhead absorption rates in this question, we assume that overhead is charged to production as it is actually incurred, rather than by the use of predetermined absorption rate.

CALCULATION OF EQUIVALENT UNITS AND COST PER UNIT

		Material		Labour		Overhead	
		% Completion	Equivalent Units	% Completion	Equivalent Units	% Completion	Equivalent Units
	Completed units (700) transferred to next process	100	700	100	700	100	700
	WIP c/d (400)	75	300	50	200	25	100
A	Total equivalent units		1,000		900		800
B	Costs incurred RWF		2,000		2,700		1,600
	Cost per equivalent unit (B/A)		2		3		2

Valuations

Total cost per equivalent unit = RWF7 (RWF2 + RWF3 + RWF2)

Value of finished production = RWF7 × 700 = RWF4,900

Value of closing WIP (ascertained by reference to no. of equivalent units for each category of cost):

		RWF
Material	300 × RWF2 =	600
Labour	200 × RWF3 =	600
Overhead	100 × RWF2 =	200
		RWF1,400

PROCESS I ACCOUNT

	Units	RWF		Units	RWF
Material	1,100	2,000	Process II	700	4,900
Labour		2,700	WIP c/d	400	1,400
Overhead		1,600			
	1,100	6,300		1,100	6,300
WIP b/d	400	1,400			

Example 3: Work-in-Progress at Both Beginning and End of the Period: FIFO Method

Process No. 2 had opening work-in-progress of 200 units valued at RWF1,692, completed as to:

Previous process	100%
Added materials	80%
Labour	60%
Overhead	75%

During the month a further 2,200 units were received from the previous process, valued at RWF4 per unit (total RWF8,800).

The following costs were incurred:

	RWF
Materials added	5,060
Labour	5,450
Overhead absorbed	3,906

At the end of the month 400 units were still in process, completed as to:

Materials added	90%
Labour	75%
Overhead	80%

Calculate the division of costs incurred during the month between: completion of opening work-in-progress, units started and completed during the month, and closing work-in-progress, and draw up the process account.

Solution

The implication in this question, where we are told the percentage completion of the opening work-in-progress (and can therefore see how much work remains to be done on it this month in order to complete it), and are asked to show the cost of completing the opening work-in-progress, is that FIFO is to be used. That is, we are to assume, for costing purposes, that the opening work-in-progress is completed first, before any new units are worked on. (It does not matter whether or not that is what happens in practice: it is a reasonable assumption to make for costing purposes.)

The method is very similar to that illustrated in Example 2. Because of our FIFO assumption, we can say that the output from Process 2 must be:

200 units - opening work-in-progress, now complete

1,800 units - started and finished this period.

CALCULATION OF EQUIVALENT UNITS AND COST PER EQUIVALENT UNIT (PROCESS 2)

		Material		Labour		Overhead	
		% Completion	Equivalent Units	% Completion	Equivalent Units	% Completion	Equivalent Units
	Completion of opening WIP (200)	20	40	40	80	25	50
	Units started and finished this month (1,800)	100	1,800	100	1,800	100	1,800
	Closing WIP (400)	90	360	75	300	80	320
a	Total equivalent units		2,200		2,180		2,170
b	Costs incurred this month RWF		5,060		5,450		3,906
	Cost per equiv. unit (b/a) RWF		2.3		2.5		1.8

Division of this month's costs

(1) Completion of opening WIP:

			RWF
Material added	40 × RWF2.3	=	92
Labour	80 × RWF2.5	=	200
Overhead	50 × RWF1.8	=	90
			RWF382

(2) Units fully processed this period:

Total cost per unit = RWF2.3 + RWF2.5 + RWF1.8 = RWF6.60

∴ cost of 1,800 units = 1,800 × RWF6.60 = RWF11,880

(3) Closing WIP:

			RWF
Material added	360 × RWF2.3	=	828
Labour	300 × RWF2.5	=	750
Overhead	320 × RWF1.8	=	576
			RWF2,154

Valuation of Closing WIP

	RWF
Process 2 costs incurred on closing WIP (from above)	2,154
Add: Cost b/f from Process I (400 @ RWF4)	1,600
Total value of closing WIP	3,754

Calculation of Cost Transferred to Process 3

	RWF
Opening valuation of opening WIP	1,692
Add: cost of completing opening WIP (from above)	382
Total cost of the first 200 units of output	2,074
Cost of the remaining 1,800 units:	
Cost b/f from Process I (1,800 × 4)	7,200
Processing cost this month (from above)	11,880
Total cost of output	RWF21,154

PROCESS 2 ACCOUNT

	Units	RWF		Units	RWF
WIP b/f	200	1,692	Transferred to		
Transferred from			Process 3	2,000	21,154
Process 1	2,200	8,800	WIP c/f	400	3,754
Materials added		5,060			
Labour		5,450			
Overhead		3,906			
	2,400	24,908		2,400	24,908

Example 4: Work-in-Progress at Both Beginning and End of Period: Average Method

At the beginning of March the work-in-progress in Process I was 7,000 units, valued as follows:

	RWF
Materials	29,600
Labour	7,600
Overhead	6,000
	43,200

During March a further 32,000 units were introduced and additional costs during the month were:

	RWF
Materials	110,800
Labour	33,650
Overhead	31,950
	176,400

At the end of the month 30,000 units had been fully processed and passed to the next process and 9,000 units remained in Process I, completed as follows:

Material	100% complete
Labour	$33\frac{1}{3}$% complete
Overhead	$33\frac{1}{3}$% complete

Make the necessary calculations and draw up the process account.

Solution

In this example it is impossible to use the FIFO method just described, because we do not know how much work remains to be done to complete the opening WIP.

The average method is therefore used, in which the costs incurred in previous months on the opening WIP and the costs incurred in March are averaged over the total number of units processed (30,000).

CALCULATION OF EQUIVALENT UNITS AND COST PER EQUIVALENT UNIT

		Material		Labour		Overhead	
		% Com-pletion	Equiv-Alent Units	% Com-pletion	Equiv-alent Units	% Com-pletion	Equiv-alent Units
	Units transferred to next process (30,000)	100	30,000	100	30,000	100	30,000
	Closing WIP (9,000)	100	9,000	33 ⅓	3,000	33 ⅓	3,000
A	Total equiv. units		39,000		33,000		33,000
	Costs incurred in previous periods (value of opening WIP) RWF		29,600		7,600		6,000
	Costs incurred in March RWF		110,800		33,650		31,950
B	Total cost RWF		140,400		41,250		37,950
	Cost per equivalent unit (B/A) RWF		3.60		1.25		1.15

Cost of units transferred to next process

Total cost per equivalent unit = RWF3.60 + RWF1.25 + RWF1.15 = RWF6

Cost of completed units = 30,000 × RWF6 = RWF180,000

Valuation of closing work-in-progress

					RWF
Material	9,000	×	3.60	=	32,400
Labour	3,000	×	1.25	=	3,750
Overhead	3,000	×	1.15	=	3,450
					39,600

PROCESS I ACCOUNT

	Units	RWF		Units	RWF
WIP b/f	7,000	43,200	Transferred		
Materials	32,000	110,800	to Process II	30,000	180,000
Labour		33,650	WIP c/f	9,000	39,600
Overhead		31,950			
	39,000	219,600		39,000	219,600
WIP b/f	9,000	39,600			

Essential Differences Using FIFO and Average Methods

It is important to understand the essential differences between the FIFO and average methods, and when each may be used. Although the average method may appear somewhat easier, in examinations you are recommended to use **FIFO** whenever possible, i.e. when the percentage completion is given for both opening and closing WIP.

In practice FIFO is used when the costs do not fluctuate significantly from month to month, and the average method is used where there are larger fluctuations.

The essential differences you will see between the two methods are:

(a) The equivalent units calculation under FIFO shows percentage of work required to complete opening WIP, whereas under the average method, opening WIP and units fully processed (started and finished) this period are grouped together.

(b) Under FIFO only one cost (the cost incurred this period) is used to work out the cost per equivalent unit. The value of opening WIP is not brought in until later. In the average method the value of opening WIP is added to the cost incurred this period.

(c) In Example 3, we were looking at Process 2 and consequently had a cost brought forward from Process 1. By leaving this element until the very end of the calculations, no difficulties were encountered. This element is slightly more difficult to introduce in the average method. The best way is to have a four-column instead of a three-column layout for the calculation of equivalent units, treating the units transferred from the previous process as “Material 1” and the material introduced in the present process as “Material 2”. All units, whether fully complete at the end of the period or closing WIP, are of course 100% complete in respect of “Material 1”.

This technique can also be applied to the FIFO method, and is illustrated by the following alternative solution to Example 3 (using the FIFO method).

Example 5: Alternative Layout Where a Process Other Than the First is Involved - *The layout is shown below.*

CALCULATION OF EQUIVALENT UNITS AND COST PER EQUIVALENT UNIT

		"Material 1" (Transfer from Process 1)		Materials Added		Labour		Overhead	
		%	Equiv. Units	%	Equiv. Units	%	Equiv. Units	%	Equiv. Units
	Completion of opening WIP (200)	-	-	20	40	40	80	25	50
	Units started and finished this period (1,800)	100	1,800	100	1,800	100	1,800	100	1,800
	Units started this period and in process at close (400)	100	400	90	360	75	300	80	320
A	Total equivalent units		2,200		2,200		2,180		2,170
B	Costs introduced this month RWF		8,800		5,060		5,450		3,906
	Cost per equivalent unit RWF		4		2.3		2.5		1.8

Division of Costs

(a) Completion of opening WIP - as before.

(b) Units fully processed this period:

			RWF
Process 1 Cost	1,800 × 4	=	7,200
Process 2 Cost	1,800 × 6.60	=	11,880
			19,080

(c) Closing WIP - as before.

D. LOSSES IN PROCESS COSTING – NORMAL LOSSES AND ABNORMAL LOSSES

Losses - The Terminology

You should familiarise yourself with the following CIMA terminology. Make sure you understand the difference between scrap and waste.

(a) Scrap

Discarded material which has some recovery value and which is usually either disposed of without further treatment (other than reclamation and handling), or re-introduced into the production process in place of raw material.

(b) Waste

Discarded substances having no value.

Normal Loss

All loss, theoretically, is avoidable, and it can be said that inefficiency exists wherever waste occurs. However, no factory ever completes its manufacturing programme without producing some loss, so loss up to a certain level must be expected and regarded as normal. Every effort must be made to reduce it to an absolute minimum by the proper use of materials, machines, methods and effective controls.

The normal loss in processes is usually readily recognisable, and can be expressed as a percentage of the total input of material. The cost of normal loss **is borne by the process**, less any incoming credit in respect of the sale of loss. Where there is no sale value of the normal loss, then of course in the examples which follow, normal loss **value** would be nil.

Example

Cost of process RWF2,000

Number of units entering process 1,000

Percentage of input regarded as normal loss 10%

Value of loss per unit 25rwf

The process account will be written as follows:

PROCESS ACCOUNT

	Units	RWF		Units	RWF
Input in units	1,000		Normal loss	100	25
Cost of process		2,000	Cost of normal		
			Output	900	1,975
	1,000	RWF2,000		1,000	RWF2,000

Calculations:

(a) Normal loss - 10% of input = 100 units

(b) Credit value of (a) above, 100 units at 25rwf per unit = RWF25

(c) Cost of normal output per unit = $\frac{rwf\,2{,}000-25}{900}$ = RWF2.19

From this example you can see that the cost of normal loss is written into the cost of good production, but that credit is given for scrap value, if any.

Abnormal Loss or Gain

If losses are greater than normal, there is said to be an abnormal loss, while if losses are less than normal there is an abnormal gain. Normal loss is treated in exactly the same manner as above, i.e. its scrap value is credited to the process account and the cost per unit of normal output is found. Abnormal losses or gains are valued at the same value as good production and transferred to abnormal loss or gain account and thence to profit and loss account, after making any adjustments for the income from the sale of abnormal loss. This procedure highlights any abnormalities so that any necessary explanations may be incorporated in the periodic management accounts, thus facilitating the taking of corrective action.

Examples

Example 1

Total cost of process = RWF7,385

No. of units input = 700

Normal loss = 5% of input

Actual loss = 40 units

Scrapped units are sold at RWF2 each

Show the process account, abnormal loss account and scrap account.

Solution

Workings

Normal loss: 5% of 700 = 35 units

Scrap value of normal loss = 35 × RWF2 = RWF70

Actual loss = 40 units

$\therefore$ Abnormal loss = 5 units

Normal output expected = 700 – 35 = 665 units

Cost per unit of normal output = $\frac{(rwf\,7{,}385 - 70)}{665}$

(allowing credit for scrap value of normal loss)

= RWF11 per unit

i.e. abnormal loss and good production are each valued at RWF11/unit.

$\therefore$ Cost of abnormal loss = 5 × RWF11 = RWF55

$\therefore$ Cost of good production = 660 × RWF11 = RWF7,260

PROCESS I ACCOUNT

	Units	RWF		Units	RWF
Input	700	7,385	Normal loss		
			(scrap value)	35	70
			Process II	660	7,260
			Abnormal loss	5	55
	700	7,385		700	7,385

NORMAL LOSS ACCOUNT

	Units	RWF		Units	RWF
Process I a/c	35	70	Scrap a/c	35	70

ABNORMAL LOSS ACCOUNT

	Units	RWF		Units	RWF
Note (a)			Scrap a/c	5	10 (b)
Process I a/c	5	55	Profit & loss a/c	-	45 (c)
	5	55		5	55

SCRAP ACCOUNT

	Units	RWF		Units	RWF
Note (d)					
Normal loss a/c	35	70	Cash	40	80 Note (e)
Note (b)					
Abnormal loss a/c	5	10		—	—
	40	80		40	80

Notes on Abnormal Loss Account and Scrap Account

(a) This is the double entry of the "abnormal loss" appearing in the process account.

(b) These are the two halves of a double entry and represent the scrap value of abnormal loss
(5 units @ RWF2).

(c) This is the loss to be transferred to profit and loss account, arising from the abnormal loss. It is found as the balancing figure on the account.

(d) This is the double entry of the normal loss entry in the process account.

(e) This is the cash which would be received from sale of both normal and abnormal loss (40 units @ RWF2).

Example 2

Same data as Example 1 except that the actual loss is 30 units.

Solution

Calculation of cost per unit of normal output - as before (RWF11 per unit).

Actual loss = 30 units; normal loss = 35 units

Abnormal gain = 5 units

Abnormal gain and good production are each valued at RWF11 per unit.

Value of abnormal gain = 5 × RWF11 = RWF55

Cost of good production = 670 × RWF11 = RWF7,370

In the process account, the abnormal gain must appear on the opposite side of the account to the losses. (It is like having an extra input to the process.)

PROCESS I ACCOUNT

	Units	RWF		Units	RWF
Input	700	7,385	Normal loss -		
Abnormal loss	5	55	(scrap value)	35	70
	___	_____	Process II	660	7,260
	705	7,440		705	7,440

NORMAL LOSS ACCOUNT

	Units	RWF		Units	RWF
Process I a/c	35	70	Abnormal gain a/c	5	10
	__	__	Scrap a/c	30	60 Note (b)
	35	70		35	70

ABNORMAL GAIN ACCOUNT **Note (a)**

	Units	RWF		Units	RWF
Normal loss a/c	5	10	Process I a/c	5	55
Profit & loss a/c	__	45		__	__
	5	55		5	55

SCRAP ACCOUNT

	Units	RWF		Units	RWF
Normal loss a/c	30	60	Cash	30	60

Notes on the Abnormal Gain Account, Normal Loss Account and Scrap Account

(a) The entries made in the abnormal gain account are as follows:

Credit the abnormal gain account with the difference between the actual output and normal output at full cost.

Debit the abnormal gain account with the variance in units at their scrap value, e.g. 5 units at RWF2 each = RWF10. These units and value are then credited to the **normal loss account** to reduce the normal loss to the actual loss.

Debit the abnormal gain account with the difference in value between the abnormal gain at full cost and the foregone scrap value of the gain, i.e. RWF55 – 10 = RWF45.

This amount is credited to the profit and loss account.

If an abnormal gain arises, remember to make the above accounting entries in the order shown.

(b) This entry is transferred to the scrap account and represents the actual loss in units at their scrap value, e.g. 30 units at RWF2 each = RWF60.

Study Unit 10

Process Costing 2

Contents

A. OPERATING COSTING

The Method Described

Those organisations which provide a service to their customers use this method to establish the costs of their service. The service is regarded in the same way as the process is regarded in process costing and is the cost centre to which cost is attributed. If several types of service are provided, there will be a series of <u>cost centres</u> and it <u>will be necessary to evolve a technique of apportioning overheads with a view to building up an overhead absorption rate system</u>.

The direct costs associated with each service will be collected under the service heading, and overheads will be charged to them by use of the predetermined overhead absorption rates. Costs of services are therefore <u>built up in the same way as</u> the costs of <u>processes are found in an orthodox process costing system</u>. ***The main difference between ordinary process costing and operating costing is the selection of the unit of activity whereby unit costs are arrived at.***

Units of Operating Costing

As we can see by reference to transport organisations, buses, railways, airlines, carriers, etc., there are several possible units of division. We could calculate the cost per mile of running, per passenger carried or per ton of freight moved. Each of these possibilities has some merit, but it is usual to combine the two main factors - the distances travelled and the weights or numbers of goods or passengers carried over these distances.

We therefore establish the total cost of a service during a period, and evaluate the activity relating to that service in terms of ton-miles or passenger-miles for the same period. Dividing the total service cost by the total activity will give the unit cost of each ton-mile or passenger-mile, i.e. the cost of moving one ton (or one passenger) a distance of one mile.

The necessary data is available from the drivers' logbooks, which would specify loads carried, mileage travelled, pick-up points and delivery points. Additional control is available by analysing the vehicle's tachograph.

Example

A vehicle leaves its depot carrying a load of 10 tons, travels 4 miles to A, at which point it offloads 6 tons, travels 6 miles to B, uplifts 2 tons and offloads 4 tons, proceeds 5 miles to C and offloads entirely. The vehicle returns empty by the same route to its depot.

From	**To**	**Miles**	**Tons**	**Ton-Miles**
Depot	A	4	10	40
A	B	6	4	24
B	C	5	2	10
C	Depot	15	0	0
				74

The total cost of this operating trip will be divided by 74 to ascertain the cost per ton-mile of the journey.

Use of Operating Costing

A list of types of organisation which would be likely to use this method of costing is given below, with a note of the different units for which costs may be ascertained.

Organisation	**Cost Unit**
Road Transport	Running hour
	Ton carried
	Mile
	Passenger-mile
	Ton-mile
Railways	Engine-mile
	Ton-mile
	Passenger-mile
	Wagon-mile
Gas Production	1,000 cubic ft produced
	1,000 cubic ft sold
	Ton of coal carbonised
Electricity Production	1,000 units generated
	1,000 units sold
Hospitals	Available bed-day
	Occupied bed-day

Example

The following information relates to the running of a hotel, for one year.

	RWF
Rent and rates	420,000
Maintenance	130,000
Insurance	165,000
Lighting and heating	93,000
Postage, stationery and other overheads	137,000
Wages and salaries	170,000
Food	225,000
Total operating cost	1,340,000

Number of rooms: 65 doubles

30 singles

Average number of nights' letting per annum per room: 250

REQUIREMENT:

(a) Calculate the costs per single room and per double room.

(b) Calculate the cost per person per nightly stay.

Solution

Costs should be apportioned on the basis of the number of beds.

(a) Cost per Room

		RWF
Total operating costs		1,340,000
Number of beds	65 × 2 = 130	
	30	
	160	

Cost per bed per annum $\frac{\textit{rwf}\,1{,}340{,}000}{160}$ = RWF8,375

Cost per room

doubles RWF8,375 × 2 = RWF16,750

singles RWF 8,375

(b) Cost per Person per Nightly Stay

This can be found by dividing the cost per bed by the average number of lettings per annum.

$\frac{\textit{rwf}\,8{,}375}{250}$ = RWF33.50

B. PROCESS COSTING INVOLVING BOTH LOSSES AND WORK-IN-PROGRESS

To further explain process costing and to help your overall understanding, here are some examples of process costing where both work-in-progress and abnormal loss/gains are involved.

Example 1

Process No. 1

Opening work-in-progress: 300 units valued at RWF1,380

Degree of completion: materials 80%, labour 60%
overheads 40%.

During the month 4,300 units were introduced and costs incurred were:

	RWF
Materials	11,885
Labour	9,400
Overheads	7,540
	RWF28,825

Normal loss = 10%, actual loss = 500 units.

Losses are ascertained by inspection **at the end of the process**.

Scrapped units can be sold for RWF1 each.

Closing work-in-progress 500 units;

Degree of completion: materials 75%, labour 50%, overheads 40%.

Carry out the necessary calculations and draw up the Process 1 account, abnormal loss/gain account and scrap account.

Solution

Since the percentage completion is given for both opening and closing work-in-progress, the FIFO method is the appropriate one.

The comment that losses are ascertained by inspection at the end of the process means that we do not simply take 10% of input - the closing work-in-progress must be excluded since, not being finished, it will not form part of the inspection.

Opening WIP	300
Add units introduced	4,300
	4,600
Less closing WIP	500
Units available for inspection	4,100
Normal loss 10%	410
Expected good units	3,690
Abnormal loss	90
Actual output	3,600

Total loss = 500 units, i.e. abnormal loss = 90 units

This output of 3,600 units consists of the opening 300 units WIP, now completed, and a further 3,300 units started and finished this period.

Cost per Equivalent Unit

		Material		Labour		Overhead	
		%	Equiv. Units	%	Equiv. Units	%	Equiv. Units
	Completion of opening WIP (300)	20	60	40	120	60	180
	Units started and finished this period (3,300)	100	3,300	100	3,300	100	3,300
	Abnormal loss (90)	100	90	100	90	100	90
	Closing WIP (500)	75	375	50	250	40	200
A	Total equivalent units		3,825		3,760		3,770
	Cost RWF		11,885		9,400		7,540
	Less scrap value of normal loss RWF		410		-		-
B	Net cost		11,475		9,400		7,540
	Cost per equivalent unit B/A RWF		3		2.5		2

Note that normal loss does not appear in the equivalent units calculation (except for the credit for scrap value).

Cost of completing opening WIP

RWF

Material	(60 × RWF3)	180
Labour	(120 × RWF2.50)	300
Overhead	(180 × RWF2)	360
		840

Cost of units fully processed this period

Cost per equivalent unit = RWF3 + RWF2.50 + RWF2 = RWF7.50

∴ of fully processed units = 3,300 × RWF7.50 = RWF24,750

Cost transferred to next process

	RWF
Cost of units fully processed this period	24,750
Cost of completing opening WIP	840
Add opening value of WIP	1,380
Transferred to Process 2	RWF26,970

Cost of abnormal loss

90 units @ RWF7.50 = RWF675

Value of closing WIP

		RWF
Material	(375 x RWF3)	1,125
Labour	(250 x RWF2.50)	625
Overhead	(200 x RWF2)	400
		RWF2,150

PROCESS I ACCOUNT

	Units	RWF		Units	RWF
WIP b/d	300	1,380	Process 2	3,600	26,970
Material	4,300	11,885	Abnormal loss	90	675
Labour		9,400	Normal loss -		
Overheads		7,540	scrap value	410	410
			WIP c/d	500	2,150
	4,600	30,205		4,600	30,205
WIP b/d	500	2,150			

ABNORMAL LOSS ACCOUNT

	Units	RWF		Units	RWF
Process 1	90	675	Scrap	90	90
			Profit and loss		585
	90	675		90	675

NORMAL LOSS ACCOUNT

	Units	RWF		Units	RWF
Process 1 A/c	410	410	Scrap A/c	410	410

SCRAP ACCOUNT

	Units	RWF		Units	RWF
Abnormal loss	90	90	Cash	500	500
Normal loss	410	410			
	500	500		500	500

Example 2

Process No. 1

Opening work-in-progress 1,500 units valued at RWF4,120.

Degree of completion: materials 70%, labour and overheads 60%.

During the month 10,300 units were introduced and costs incurred were:

	RWF
Materials	13,945
Labour	13,250
Overheads	8,800
	RWF35,995

Normal loss = 10%. Losses are ascertained by inspection at the end of the process.

Scrapped units are sold for 40rwf each.

At the end of the month, 9,200 units had been passed to the next process and 1,800 units were still in process, complete as follows:

Materials 60%, labour and overheads 40%.

Make the necessary calculations and prepare the process account.

Solution

Opening WIP	1,500	
Units introduced	10,300	
	11,800	
Less closing WIP	1,800	
Units available for inspection	10,000	Normal loss 10% = 1,000 units Expected output = 9,000 units
Units passed to next process	9,200	1,500 units opening WIP 7,700 units started and finished this period
Actual loss	800	Abnormal gain 200 units

Calculation of Equivalent Units and

Cost per Equivalent Unit

		Material		Labour and Overheads	
		%	Equiv. Units	%	Equiv. Units
	Completion of opening WIP (1,500)	30	450	40	600
	Units started and finished this period (7,700)	100	7,700	100	7,700
	Abnormal gain (200)	100	(200)	100	(200)
	Closing WIP (1,800)	60	1,080	40	720
A	Total equivalent units		9,030		8,820
	Cost RWF		13,945		22,050
	Less scrap value of normal loss RWF		400		-
B	Net cost RWF		13,545		22,050
	Cost per equiv. unit (B ÷ A) RWF		1.5		2.5

Cost of completing opening WIP

	RWF
Material (450 × RWF1.50)	675
Labour and overhead (600 × RWF2.50)	1,500
	2,175

Cost of units started and finished this period

Total cost per unit = RWF4

Cost of fully processed units = 7,700 × RWF4 = RWF30,800

Cost transferred to next process

	RWF
Cost of units fully processed this period	30,800
Cost of completing opening WIP	2,175
Add opening value of WIP	4,120
Cost transferred to next process	37,095
Cost of closing WIP	
Material (1,080 × RWF1.50)	1,620
Labour and overhead (720 × RWF2.50)	1,800
	3,420

Value of abnormal gain

200 units @ RWF4 = RWF800

PROCESS 1 ACCOUNT

	Units	RWF		Units	RWF
WIP b/f	1,500	4,120	Normal loss -		
Material	10,300	13,945	scrap value	1,000	400
Labour		13,250	Process 2	9,200	37,095
Overhead		8,800	WIP c/f	1,800	3,420
Abnormal gain	200	800			
	12,000	40,915		12,000	40,915

ABNORMAL GAIN ACCOUNT

	Units	RWF		Units	RWF
Normal loss	200	80	Process 1	200	800
Profit and loss	___	720		___	___
	200	800		200	800

NORMAL LOSS ACCOUNT

	Units	RWF		Units	RWF
Process 1 a/c	1,000	400	Abnormal gain a/c	200	80
	_____	___	Scrap a/c	800	320
	1,000	400		1,000	400

SCRAP ACCOUNT

	Units	RWF		Units	RWF
Normal loss a/c	800	320	Cash	800	320

Further Complications

Further complications might arise, for instance, units being rejected part-way through a process instead of at the end. This is covered in the next example.

Example

1,000 units of material, at a cost of RWF9,000, are input to Process 1. Normal loss is 10% of input. Normal loss is discovered at the end of the process and has no scrap value. During Period 2, labour costs of RWF3,750 and overhead costs of RWF4,000 were incurred. Due to a fault on one of the machines, there was an exceptional amount of faulty work, i.e. 250 units. These were discovered half-way through processing. The material content of these units was salvaged and will be re-input to the process in the next period. 150 other units were lost at the end of processing.

Prepare the process account.

Solution

	Material % Completion		Labour/Overhead % Completion	
Fully processed units (600)	100	600	100	600
Abnormal loss (250)	100	250	50	125
Abnormal loss (50)	100	50	100	50
Total equivalent units		900		775

	Material RWF	Labour/Overhead RWF
Costs: period 2	9,000	7,750
Cost per equivalent unit	10	10
Cost of abnormal loss:		
loss half-way through	2,500	1,250
loss at end	500	500
		RWF4,750

PROCESS ACCOUNT

	Units	RWF		Units	RWF
Input	1,000	9,000	Normal loss	100	Nil
Labour		3,750	Abnormal loss	300	4,750
Overhead		4,000	Finished goods	600	12,000
	1,000	16,750		1,000	16,750

ABNORMAL LOSS ACCOUNT

	Units	RWF		Units	RWF
Process account	300	4,750	Process account next period (material salvaged 250 @ RWF9)	250	2,250
			Waste	50	Nil
			P& L		2,500
	300	4,750		300	4,750

NORMAL LOSS ACCOUNT

	Units	RWF		Units	RWF
Process a/c	100	Nil	Waste	100	Nil

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Study Unit 11

Marginal v Absorption Costing

Contents

A. INTRODUCTION

In previous study units we have considered only costing systems that arrange for all costs to be included in or absorbed into individual costs, i.e. absorption costing. This approach aims at identifying the total cost of an activity or a unit of production, and is frequently applied to job costing and process costing.

Marginal costing makes no attempt to apportion fixed costs to individual cost units. This means that in calculating the profit for a period using marginal costing, the unit cost of sales would be equal to the marginal or variable cost, which would be deducted from selling price to give contribution. All fixed costs would be written off in the period in which they are incurred, i.e. they would be deducted from total contribution, to give the profit for the period.

In contrast to marginal costing, in absorption costing (sometimes known as total absorption costing or full costing) all production costs are absorbed into cost units, including a share of fixed production overhead. This means that in a situation where stock is carried forward to future periods, with absorption costing a certain amount of fixed production overhead would also be carried forward, and therefore the reported profit figure would be different from that obtained with marginal costing.

B. LIMITATION OF ABSORPTION COSTING

Let us consider the following scenario. B Bloggs & Co., a small company, manufactures three products - A, B and C. It follows the principle of absorption costing, allocating both its factory overheads and its selling overheads on what it considers to be a correct basis. After six months, the following profit statement was produced.

Profit Statement - Total Cost Basis

Element of Cost		**Total Cost**	**Product A**	**Product B**	**Product C**
		RWF	RWF	RWF	RWF
Direct wages		12,000	3,000	4,000	5,000
Direct material		14,000	6,000	6,000	2,000
Factory overheads					
	Variable	1,500	600	600	300
	Fixed	3,000	1,000	1,000	1,000
Selling overheads					
	Variable	3,000	2,000	700	300
	Fixed	4,500	1,500	1,500	1,500
Total cost		38,000	14,100	13,800	10,100

Sales value	48,000	21,000	18,000	9,000
Profit/(Loss)	10,000	6,900	4,200	(1,100)

As a result of this situation, the decision is taken to stop production of Product C since it is a loss-making product. As it is a small company, it is easy to dispense with the services of the workforce producing Product C since they are largely part-timers. Production will concentrate on making Products A and B only. No increase in sales of A and B is possible in the next six months and fixed costs are not capable of being reduced. However, management looks forward to a better second half of the year with levels and standards of production being maintained. They assume their second half-yearly profits to be RWF11,100 (RWF10,000 + RWF1,100).

The second half of the year profit statement shows:

Profit Statement - Total Cost Basis

Element of Cost		**Total Cost**	**Product A**	**Product B**
		RWF	RWF	RWF
Direct wages		7,000	3,000	4,000
Direct material		12,000	6,000	6,000
Factory overheads				
	Variable	1,200	600	600
	Fixed	3,000	1,500	1,500
Selling overheads				
	Variable	2,700	2,000	700
	Fixed	4,500	2,250	2,250
Total cost		30,400	15,350	15,050
Sales value		39,000	21,000	18,000
Profit/(Loss)		8,600	5,650	2,950

The peril of using absorption costing! Management realised eventually by studying these figures that while they had "saved" the loss on Product C of RWF1,100, Products A and B had to bear the RWF2,500 fixed costs which previously had been borne by Product C, hence the profits from A and B were RWF2,500 less in total. Therefore + RWF1,100 – RWF2,500 = – RWF1,400. Hence the profit dropped by RWF1,400 from RWF10,000 to RWF8,600.

It will be clear that however "correct" the basis on which fixed costs are allocated, it is nevertheless arbitrary. Consider the situation in the first six months if, instead of allocating the fixed factory and selling overheads equally between Products A, B and C, they had been allocated in the ratio 3 : 2 : 1 (for some good reason). The profit statement for the first six months would have been:

Profit Statement - Total Cost Basis

Element of Cost	**Total Cost**	**Product A**	**Product B**	**Product C**
	RWF	RWF	RWF	RWF
Direct wages	12,000	3,000	4,000	5,000
Direct material	14,000	6,000	6,000	2,000
Factory overheads				
Variable	1,500	600	600	300
Fixed	3,000	1,500	1,000	500
Selling overheads				
Variable	3,000	2,000	700	300
Fixed	4,500	2,250	1,500	750
Total cost	38,000	15,350	13,800	8,850
Sales value	48,000	21,000	18,000	9,000
Profit/(Loss)	10,000	5,650	4,200	150

Perhaps management might not then have considered taking corrective action to improve the situation!

It is the allocation of fixed costs which can cause wrong management decisions to be made in situations such as this.

Marginal costing takes an alternative approach by making no attempt to apportion fixed costs over different products. It is assumed that, within limits, fixed costs genuinely are fixed and are therefore not affected by the volume of production. In attempting to make rational management decisions by comparing alternative production strategies, it is often useful to remove the complication of fixed costs, as misleading results may be produced if production levels are different from those budgeted.

You should note that the terms marginal cost/variable cost/direct cost are generally regarded as interchangeable and also that the strict economic definition of marginal cost relates to the cost of producing a single additional unit.

C. FIXED, VARIABLE AND SEMI-VARIABLE COSTS

Before going any further, it is necessary to recall the definitions of fixed, variable and semi-variable cost given in an earlier study unit.

Fixed Cost (See diagram in Study Unit 3: Cost behaviour Patterns)

A fixed cost is one which tends to remain fixed regardless of the level of production. Examples are rent, rates, salary of the production manager. It should be clear that any expense classified as "fixed" is only fixed for a certain time period and only within certain levels of production.

For instance, the uniform business rate is likely to increase once a year or once every few years, so clearly rates are not fixed for ever. However, within the year, they are fixed regardless of the level of production at the factory. If, though, production increased so greatly that it was necessary to acquire a new factory, clearly there would be additional rates to pay. Therefore a fixed cost can only be regarded as fixed over a certain period of time and only within certain levels of production.

Variable Cost

This is a cost which tends to follow (in the short term) the level of activity. Consider a selling expense such as travellers' commission. If the organisation makes no sales, no payment or expense will arise; but as sales begin to rise from zero the cost of commission will increase according to the level of sales achieved. This is an example of variable cost.

Semi-Variable Cost (See diagram in Study Unit 3: Cost behaviour Patterns)

Between these two extremes, one of which reacts in complete sympathy with production activity, while the other is not affected by activity, there is another type of overhead which is partly fixed and partly variable. It is known as a semi-fixed or semi-variable cost, that is to say, a cost containing both fixed and variable elements, and which is thus partly affected by fluctuations in the level of activity. An example is the charge for electricity, which consists of a standing charge per quarter (the fixed element) and a charge per unit of usage (the variable element). Any semi-variable cost can be separated into fixed and variable components, as follows.

High-Low Method

The total cost for two different levels of output is:

Output (units)	40,000	50,000
Total cost	RWF320,000	RWF360,000

The increase in total cost for the increase in output is first calculated. This is a **variable** cost.

	High Output	Low Output	Increase (Variable Cost)
Units	50,000	40,000	10,000
Total cost	RWF360,000	RWF320,000	RWF40,000 i.e. RWF4 per unit

The total cost can now be divided into its fixed and variable elements by examining either level of output.

At 40,000 units	RWF
Total cost	320,000
Variable cost 40,000 × RWF4	160,000
Fixed cost is	160,000

The variable cost per unit is calculated by dividing the increase in total cost by the increase in output:

$$\frac{RWF\,40{,}000}{10{,}000} = \text{RWF4}$$

Note: Total cost = Fixed cost + Variable cost.

D. DEFINITION OF MARGINAL COST

The Chartered Institute of Management Accountants defines marginal cost as: ***"The variable cost of one unit of a product or a service; i.e. a cost which would be avoided if the unit was not produced or provided."***

From the above descriptions of fixed, variable and semi-variable cost, it should be clear to you that producing one item less does not avoid any fixed cost or any of the fixed element of semi-variable costs.

A <u>statement of cost on a marginal basis</u> will therefore contain only the variable cost, built up as follows:

		Cost per unit
	RWF	RWF
Direct material		x
Direct labour		x
Direct expenses		<u>x</u>
Prime cost		x
Add: Variable overheads:		
Factory	x	
Selling	<u>x</u>	<u>x</u>
Marginal cost		<u>x</u>

E. THE MARGINAL COST EQUATION: TERMINOLOGY OF MARGINAL COSTING

When the total variable (or marginal) cost of a number of products is deducted from the total sales revenue, the amount that is left over is called the **contribution**. Since fixed costs have not yet been taken into account, this contribution has to cover fixed costs and then any amount remaining is profit. (That is why it is called the contribution - it is a contribution towards fixed costs and then profit.) We can write this symbolically as S – V = F + P. This is the basic equation of marginal costing. (Sales revenue – Variable cost = Fixed cost + Profit.)

The term “contribution” is defined as the difference between sales value and the variable cost of those sales, expressed either in absolute terms or as a contribution per unit.

Contribution is not profit, it is sales less variable cost.

	RWF	
Sales		x
Less Variable Costs	x	
= Contribution	x	

We can also talk about the **contribution per unit** of a product: this is simply the selling price minus the variable (marginal) cost. It should be clear to you that under marginal costing we cannot talk about the profit from any one product, since fixed costs are only considered in total and are not apportioned to the individual products. However, a number of decisions can be made by looking at the contribution - clearly if a company maximises its contribution it is also maximising its profit, provided fixed costs are truly fixed.

A profit statement for the three products, A, B and C in our first example in this study unit, built up on a marginal costing basis, would have been:

	Total	**Product A**	**Product B**	**Product C**
Sales	48,000	21,000	18,000	9,000
Direct wages	12,000	3,000	4,000	5,000
Direct material	14,000	6,000	6,000	2,000
Variable overhead				
Factory	1,500	600	600	300
Selling	3,000	2,000	700	300
Marginal cost	30,500	11,600	11,300	7,600
Contribution	17,500	9,400	6,700	1,400
Fixed overhead				
(Factory & Selling)	7,500			
Profit	10,000			

With this layout of the profit statement, management would have been able to determine that Product C, whilst not the best product to produce, nevertheless made a contribution towards covering fixed costs of RWF1,400. Note that it is this lost contribution of RWF1,400 which reduced the profit figure from RWF10,000 to RWF8,600 in the first example.

At this point it is worth considering what **is** the best product to produce. By calculating the contribution per RWF of sales for each of the three products, we can rank them as to their relative ability to cover fixed costs and generate profits:

- Product A provides RWF9,400 contribution from RWF21,000 sales, i.e. RWF0.4476 per RWF1 of sales.
- Product B provides RWF6,700 contribution from RWF18,000 sales, i.e. RWF0.3722 per RWF1 of sales.
- Product C provides RWF1,400 contribution from RWF9,000 sales, i.e. RWF0.1556 per RWF1 of sales.

Clearly the ranking is A - B - C and with no production or sales limitations, total production and sales of A would maximise contribution and therefore profit.

F. USES OF MARGINAL COSTING

Deciding on a Selling Price

Marginal costing is useful when a company has carried out some market research to ascertain the likely sales of a product at different selling prices.

Example 1

The variable costs of Product A are RWF10 per unit. The company has undertaken market research which indicates that the likely sales at each of a number of possible selling prices would be:

Selling price	RWF12	RWF15	RWF20
Sales (thousands)	20	10	4.5

The company wishes to know which selling price it should adopt.

Solution

Selling Price

		RWF12	RWF15	RWF20
(a)	Contribution per unit			
	(Selling price – Variable cost)	RWF2	RWF5	RWF10
(b)	Sales (thousands)	20	10	4.5
	Total contribution (a) × (b)	RWF40,000	RWF50,000	RWF45,000

Clearly the company should sell the product at RWF15 each as this maximises the contribution it will make.

Example 2

DPS Ltd is experiencing a recession in trade. As a result, the Board of Directors is very anxious to obtain all possible business.

A request for a quotation is received from RLY and Co. for a special type of machine. The costing department of DPS Ltd has estimated the following costs for the machine:

Direct material cost	RWF30
Direct labour cost	RWF25 (100 hours)
Overhead costs:	

Variable - RWF0.50 per direct labour hour; Fixed – RWF1 per direct labour hour.

Special jigs and other equipment required to produce the machine are estimated to cost RWF100. There is no possibility of further use for these in the future.

You are required to calculate the lowest price which should be quoted for the order.

Solution
Quotation for Machine for RLY & Co.

	RWF
Direct material	30
Direct labour 100 hours	25
Direct expense (special equipment)	100
	155
Variable overhead costs:	
100 hours @ 50RWF per direct labour hour	50
Marginal cost	RWF205

The marginal cost of the machine is, therefore, RWF205. This represents the lowest possible price and it may be quoted when the factory is being operated even though not covering fixed costs, e.g. as a policy of keeping workers employed.

Normally an addition would be made to the RWF205, thus allowing some contribution to be made towards reducing fixed costs. If working at normal capacity, the fixed cost content of the job would be found by multiplying the number of direct labour hours by the rate per hour, i.e.
100 hours × RWF1 = RWF100.

In the circumstances envisaged, the company may perhaps attempt to recover half the fixed costs, i.e. RWF50, thus making a total price of RWF255. However, this figure is purely hypothetical in that the percentage of total fixed costs to be taken is determined by reference to the degree of urgency involved. If there is no possibility of further orders then a low contribution should be included to ensure that DPS Ltd's price is competitive, giving them a good chance of winning the order. On the other hand, if there is a reasonable possibility of further orders, a higher recovery of fixed overhead should be attempted.

Deciding Whether to Accept an Additional Contract
In times when it is short of work, a firm can accept additional work provided that the sales revenue is more than the marginal cost of that work and any **additional** fixed costs incurred. This is because, although the new work might not show a profit on an absorption full cost basis (where it was given a share of the total fixed costs), it will provide an additional contribution and so reduce any overall loss (or increase overall profit). In the long term, of course, a firm will not survive unless it covers **all** its fixed costs.

Example 1

A company manufactures articles for RWF6 each (variable cost) and normally sells them at RWF10 each. Fixed costs are RWF10,000 per month. The firm is currently short of work - it is only selling 2,000 units a month. It has the chance of an additional contract for 500 units a month for four months if it will accept a reduced selling price of RWF8 per unit. Fixed costs will not be increased if the contract is accepted. Advise the company whether or not to accept the contract.

Solution

The contribution per unit on the additional contract would be RWF2 (RWF8 – RWF6). Since this is positive (i.e. selling price is greater than marginal cost) the contract should be accepted (but see below).

Demonstration that this will reduce the loss

On present sales of 2,000 units the contribution is RWF4 per unit (RWF10 – RWF6).

Total contribution is 2,000 × RWF4	=RWF8,000	(per month)
Fixed costs	RWF<u>10,000</u>	" "
Loss	RWF <u>2,000</u>	" "

If the new contract is accepted, the additional contribution is 500 × RWF2 = RWF1,000 per month. Therefore the loss is reduced by RWF1,000, to RWF1,000.

Note: Since the contract is for four months, the company would have to take into account the likelihood of sales at the normal selling price picking up within that time. Obviously, if sales are likely to pick up, the company would prefer full price sales rather than being tied to a reduced price contract. But if sales are unlikely to improve, the reduced price contract is better than nothing!

Example 2

A company manufactures articles at a variable cost of RWF5 each, which it usually sells for RWF10 each. It has the chance of an additional contract for 600 articles at RWF9 each but is unsure whether to accept, as fixed costs would be increased by RWF1,500.

What is your advice?

Solution

Contribution per unit on the extra sales = RWF4

Total additional contribution = 600 × RWF4 =RWF2,400

Additional fixed costs incurred	RWF1,500
Additional profit	RWF 900

Therefore the company should accept the contract.

Setting a Selling Price for Additional Work

In the long run, of course, a company must set selling prices which ensure that **all** its costs are covered. However, in the short term, it will accept work at lower prices than normal, rather than lose the work altogether, if it is short of work. Marginal costing can be used to determine the minimum price which should be charged for such additional work.

Example

A company manufactures articles at a marginal cost of RWF12 each, which it sells for RWF20. It has been approached by a charity who would purchase 2,000 articles if a mutually acceptable reduced price could be negotiated. Fixed costs are expected to increase by RWF6,000 if the extra 2,000 articles are produced. What is the minimum price which the company should quote for the contract?

Solution

The contribution from the extra 2,000 articles must at least cover the extra fixed costs incurred, i.e.

extra contribution needed is RWF6,000 minimum.

$\therefore$ extra contribution needed per unit is RWF $\frac{6,000}{2,000}$ minimum

= RWF3 minimum.

$\therefore$ minimum price to be quoted is marginal cost + RWF3 = RWF15 each.

$\therefore$ minimum price for whole order is 2,000 × RWF15 = RWF30,000.

Deciding Whether to Cease Production of Unprofitable Items

Our very first example in this study unit, B Bloggs & Co., is an example of this use of marginal costing.

G. ARGUMENTS AGAINST MARGINAL COSTING

The above examples have illustrated situations where marginal costing must be used for better decision-making. There are, however, some arguments against marginal costing.

Inadequate Sales Mixture

A company which is short of work will accept reduced-price work provided the selling price covers marginal cost and any additional fixed costs incurred. This was illustrated in Section F of this study unit. Indeed, in the short term, a firm might even accept work at a price below marginal cost, if it wanted to avoid laying off workers. However, if a company takes on too much reduced-price work, it will be unable to take on more profitable work which becomes available at a later date. Therefore, the indiscriminate use of marginal costing techniques can lead to an inadequate sales mixture, with the firm being unable to concentrate on its most profitable product.

Price-Fixing Policy

We have studied an example where marginal costing was used to establish a short-term price (see Section F of this study unit). However, as already pointed out, such a method could not be used for fixing long-term prices.

Where a total cost system is in operation, selling prices can be fixed by finding the total cost of each product and adding on a percentage to give the desired level of profit. If marginal costing is used, however, the percentage added on has to cover fixed costs as well as profit, and this makes the selling price very difficult to calculate.

This is a serious objection to marginal costing for those businesses which do one-off jobs to customers' specifications, and where a price must be worked out for each order individually. For businesses which have a ready market for their product, however, the objection is not quite as serious. This is because in practice few companies are entirely free to determine their own selling price. It is in part determined for them by the extent of the competition and what the market will bear. They will lose sales if they charge much more than their competitors and/or more than people are willing to pay. Therefore many businesses must take the selling price as given, and concentrate on keeping their costs down in order to make a profit.

Stock Valuation

When marginal costing is used, valuations of the closing stock of finished goods or work-in-progress exclude any element of fixed cost. This is contrary to the IAS International Accounting Standard No. 2 which says that these stock valuations should include a fair share of production overheads.

H. ASSUMPTIONS OF MARGINAL COSTING

(i) Fixed expenses will remain unchanged over the relevant period. In the short term it may be valid but over the longer term unforeseen circumstances may arise which will require additional fixed expenses being incurred (e.g. renting of additional premises). This can create stepped fixed expenses with multiple break even points.

(ii) Selling price will remain constant. A drop in demand may lead to a reduction in the selling price to maintain a reasonable share of the market. Some goods may be sold below normal selling price to attract customers who will then buy more profitable goods (loss leaders).

(iii) The contribution percentage will remain constant. This ignores economy of scale which enables variable costs to be reduced. It also assumes that materials will be available at the same price during the relevant period. The recent fluctuations in the price of fuel due to political instability and regional conflicts are a very good example of circumstances, which can completely invalidate break even assumptions.

(iv) Only one product is sold. For multiple products break even analysis is very complicated and assumptions are made that the ratio of sales of the different products will remain constant. An average contribution is calculated. This assumption may prove to be inaccurate over an extended period of time.

(v) Expenses can be categorised into variable and fixed. There are a number of grey areas and different firms will treat some expenses as variable whereas others may treat them as fixed.

I. WORKED EXAMPLE

You will be aware of both types of costing, so we can usefully start by refreshing your memory with a practical exercise. Try the following.

Question

Using the information given below, prepare profit statements for the months of March and April using:

(a) Marginal costing

(b) Absorption costing

	RWF
Per unit:	
Sales price	50
Direct material cost	18
Direct wages	4
Variable production overhead	3
Per month:	
Fixed production overhead	99,000
Fixed selling expenses	14,000
Fixed administration expenses	26,000
Variable selling expenses 10% of sales value	

Normal capacity was 11,000 units per month.

	March units	**April units**
Sales	10,000	12,000
Production	12,000	10,000

Answer

The valuation of units of production and stock will be different with each of the methods:

(a) Marginal Costing

All units will be valued at the variable production cost of RWF25:

	RWF
Direct material cost	18
Direct wages	4
Variable production overhead	3
Total variable production cost	25

PROFIT STATEMENTS FOR MARCH AND APRIL USING MARGINAL COSTING

	March		**April**	
	Units	RWF000	**Units**	RWF000
Sales @ RWF50	10,000	500	12,000	600
Less Cost of sales:				
Opening stock @ RWF25	-	-	2,000	50
Variable cost of production @ RWF25	12,000	300	10,000	250
	12,000	300	12,000	300
Less Closing stock @ RWF25	2,000	50	-	-
	10,000	250	12,000	300
Variable selling expenses		50		60
Total variable cost of sales		300		360
		RWF000		RWF000
Contribution		200		240
Less Fixed costs:				
Production overhead	99		99	
Selling expenses	14		14	
Administration expenses	26	139	26	139
Net profit		61		101

Total net profit for March and April = RWF162,000

(b) Absorption Costing

The valuation of units of production and stock will include a share of the fixed production overhead for the month.

SSAP 9 Stocks and Long-term Contracts states that the allocation of overheads in the valuation of stocks must be based on the company's normal level of activity. The cost of unused capacity (i.e. under-absorbed overheads) should be written off in the current year. In this example, therefore, the rate for absorption of fixed production overheads should be based on an activity level of 11,000 units per month.

$\therefore$ Fixed production overhead absorption rate:

$$\frac{rwf\,99{,}000}{11{,}000} = \text{RWF9 per unit}$$

$\therefore$ Full production cost for one unit, to be used in stock valuations:

	RWF **per unit**
Variable cost	25 (as before)
Fixed production cost	9
	34

PROFIT STATEMENTS FOR MARCH AND APRIL USING ABSORPTION COSTING

	March		April	
	Units	RWF000	**Units**	RWF000
Sales @ RWF50	10,000	500	12,000	600
Less Cost of sales:				
Opening stock @ RWF34	-	-	2,000	68
Production cost absorbed @ RWF34	12,000	408	10,000	340
	12,000	408	12,000	408
Less Closing stock @ RWF34	2,000	68	-	-
	10,000	340	12,000	408
Gross profit		160		192
Adjustment for over/(under) absorption of overheads (Note 1)		9		(9)
		169		183
		RWF000		RWF000
Less				
Variable selling expenses	50		60	
Fixed selling expenses	14		14	
Fixed administration expenses	26	90	26	100
Net profit		79		83

Total net profit for March and April = RWF162,000

Note 1: Calculation of over/(under) absorption of fixed production overheads

	Production (units)	Overhead absorbed per unit	Total overhead absorbed	Overhead incurred	Over/(under) absorption
March	12,000	RWF9	RWF108,000	RWF99,000	RWF9,000
April	10,000	RWF9	RWF90,000	RWF99,000	(RWF9,000)

Notice that the net profits for March and April together are the same using both methods, RWF162,000. This is because all of the stock is sold by the end of April, and therefore all costs have been charged against sales.

The net profit figure for March is RWF18,000 higher using absorption costing, due to RWF18,000 of fixed production overhead being carried forward in stock, to be charged against the sales revenue for April. (Stock = 2,000 units × RWF9 = RWF18,000.)

Having reminded yourself of the technique, you can now go on to look at a problem that the examiner might set. In which circumstances would you use marginal costing; in which absorption costing?

J. WHEN PRODUCTION IS CONSTANT BUT SALES FLUCTUATE

Absorption costing is usually considered more suitable in these circumstances.

Example

MC Ltd manufacture and sell a single product. Cost and revenue details of the product are as follows:

Per unit:	RWF
Sales price	20
Variable cost of production	6
Per month:	
Fixed production overhead	5,000

Fixed selling and administration overhead	3,000

It is MC's policy to maintain a constant production output at the normal capacity of 1,000 units per month, despite fluctuations in monthly sales levels. Sales achieved for the months of January to April were as follows:

	Units
January	400
February	500
March	1,400
April	1,700

You are asked to prepare profit statements for January to April using:

- Marginal costing
- Absorption costing

Answer

(a) Profit Statements Using Marginal Costing

	January		February		March		April	
	Units	**RWF**	**Units**	**RWF**	**Units**	**RWF**	**Units**	**RWF**
Sales @ RWF20	400	8,000	500	10,000	1,400	28,000	1,700	34,000
Less Cost of sales:								
Opening stock @RWF6	-	-	600	3,600	1,100	6,600	700	4,200
Variable production cost @RWF6	1,000	6,000	1,000	6,000	1,000	6,000	1,000	6,000
	1,000	6,000	1,600	9,600	2,100	12,600	1,700	10,200
Less Closing stock @ RWF6	600	3,600	1,100	6,600	700	4,200	-	-
	400	2,400	500	3,000	1,400	8,400	1,700	10,200
Contribution		5,600		7,000		19,600		23,800
	RWF		**RWF**		**RWF**		**RWF**	
Less Fixed Costs:								
Production overhead	5,000		5,000		5,000		5,000	
Selling and administration overhead	3,000		3,000		3,000		3,000	
		8,000		8,000		8,000		8,000
Profit/(loss)		(2,400)		(1,000)		11,600		15,800

Total profit for the four months = RWF24,000

Answer

(a) Profit Statements Using Absorption Costing

	January		February		March		April	
	Units	**RWF**	**Units**	**RWF**	**Units**	**RWF**	**Units**	**RWF**
Sales @ RWF20	400	8,000	500	10,000	1,400	28,000	1,700	34,000
Less Cost of sales:								
Opening stock @RWF11	-	-	600	6,600	1,100	12,100	700	7,700
Full production cost @RWF11	1,000	11,000	1,000	11,000	1,000	11,000	1,000	11,000
	1,000	11,000	1,600	17,600	2,100	23,100	1,700	18,700
Less Closing stock @ RWF11	600	6,600	1,100	12,100	700	7,700	-	-
	400	4,400	500	5,500	1,400	15,400	1,700	18,700
Gross Profit		3,600		4,500		12,600		15,300
Less Fixed Costs:								
Selling and administration overhead		3,000		3,000		3,000		3,000
Net profit		600		1,500		9,600		12,300
Net Profit		600		1,500		9,600		12,300

Total profit for the four months = RWF24,000

(b) Fixed production overhead absorption rate $= \dfrac{rwf\,5{,}000}{1{,}000}$ = units

= RWF5 per unit

∴ Full production cost = RWF5 + RWF6 variable cost per unit

= RWF11 per unit

Note that there will be no over- or under-absorption of fixed production overheads, because the production for every month is equal to the normal capacity of 1,000 units.

Answer

(a) Profit Statements Using Absorption Costing

	January		February		March		April	
	Units	RWF	Units	RWF	Units	RWF	Units	RWF
Sales @ RWF20	400	8,000	500	10,000	1,400	28,000	1,700	34,000
Less Cost of sales:								
Opening stock @RWF11	-	-	600	6,600	1,100	12,100	700	7,700
Full production cost @RWF11	1,000	11,000	1,000	11,000	1,000	11,000	1,000	11,000
	1,000	11,000	1,600	17,600	2,100	23,100	1,700	18,700
Less Closing stock @ RWF11	600	6,600	1,100	12,100	700	7,700	-	-
	400	4,400	500	5,500	1,400	15,400	1,700	18,700
Gross Profit		3,600		4,500		12,600		15,300
Less Fixed Costs:								
Selling and administration overhead		3,000		3,000		3,000		3,000
Net profit		600		1,500		9,600		12,300
Net Profit		600		1,500		9,600		12,300

Total profit for the four months = RWF24,000

You can see, therefore, that when production is constant but sales fluctuate each month, absorption costing will cause fewer profit fluctuations than marginal costing. Managers could have been caused unnecessary concern if marginal costing had been used because of the losses which this method would show in January and February. With absorption costing, the fixed production overheads were carried forward in stock to be matched against the relevant revenue when it arose in March and April.

Be prepared to explain to an examiner why a particular method should be used.

K. WHEN SALES ARE CONSTANT BUT PRODUCTION FLUCTUATES

This is not very likely to occur in practice, but in this situation marginal costing would show a constant level of profit linked to the constant sales.

Example

Consider again the previous example of MC Ltd, and prepare profit statements using (a) marginal costing and (b) absorption costing for January to April, based on the same cost data, and the following activity levels:

	Sales Units	**Production Units**
January	1,000	1,900
February	1,000	1,000
March	1,000	600
April	1,000	500

Note: 1,000 units per month is still considered to be normal capacity.

Answer

(a) Profit Statements Using Marginal Costing

	January		February		March		April	
	Units	**RWF**	**Units**	**RWF**	**Units**	**RWF**	**Units**	**RWF**
Sales @ RWF20	1,000	20,000	1,000	20,000	1,000	20,000	1,000	20,000
Less Cost of sales:								
Opening stock @RWF6	-	-	900	5,400	900	5,400	500	3,000
Variable production cost @RWF6	1,900	11,400	1,000	6,000	600	3,600	500	3,000
	1,900	11,400	1,900	11,400	1,500	9,000	1,000	6,000
Less Closing stock @ RWF6	900	5,400	900	5,400	500	3,000	-	-
	1,000	6,000	1,000	6,000	1,000	6,000	1,000	6,000
Contribution		14,000		14,000		14,000		14,000
	RWF		**RWF**		**RWF**		**RWF**	
Less Fixed Costs:								
Production overhead	5,000		5,000		5,000		5,000	
Selling and administration overhead	3,000		3,000		3,000		3,000	
		8,000		8,000		8,000		8,000
Net Profit		6,000		6,000		6,000		6,000

Total profit for the four months = RWF24,000

Answer

(a) Profit Statements Using Absorption Costing

	January Units	January RWF	February Units	February RWF	March Units	March RWF	April Units	April RWF
Sales @ RWF20	1,000	20,000	1,000	20,000	1,000	20,000	1,000	20,000
Less Cost of sales:								
Opening stock @RWF11	-	-	900	9,900	900	9,900	500	5,500
Full production cost @RWF11	1,900	20,900	1,000	11,000	600	6,600	500	5,500
	1,900	20,900	1,900	20,900	1,500	16,500	1,000	11,000
Less Closing stock @ RWF11	900	9,900	900	9,900	500	5,500	-	-
	1,000	11,000	1,000	11,000	1,000	11,000	1,000	11,000
Gross Profit		9,000		9,000		9,000		9,000
Adjustment for over/(under) - absorbed overheads		4,500		-		(2,000)		(2,500)
		13,500		9,000		7,000		6,500
Fixed selling and administration overheads		3,000		3,000		3,000		3,000
Net Profit		10,500		6,000		4,000		3,500

Total profit for the four months = RWF24,000

Calculation of over/(under)-absorption of fixed production overheads

	Production (units)	Overhead absorbed per unit	Total overhead absorbed	Overhead incurred	Over/(under) absorption
		RWF	RWF	RWF	RWF
January	1,900	5	9,500	5,000	4,500
February	1,000	5	5,000	5,000	-
March	600	5	3,000	5,000	(2,000)
April	500	5	2,500	5,000	(2,500)

L. MARGINAL AND ABSORPTION COSTING COMPARED

Most management accounting theorists agree that marginal costing is more useful in decision-making, where a choice has to be made between alternatives. Marginal costing would provide information about differential costs, which would be most relevant to the situation.

However, a choice has to be made between marginal and absorption costing in the routine internal cost accounting system. There is no straightforward answer as to which system should be used. The system designer must consider all the advantages and disadvantages and what is required from the system, before making a decision.

Remember these points if you are given a scenario in the examination and need to decide on the best option.

Arguments in Favour of Absorption (Full) Costing

(a) When production is constant but sales fluctuate, absorption costing will cause fewer profit fluctuations than marginal costing in periods when stocks are being built up to match future increased sales demand (see the example in Section C).

(b) No output could be achieved without incurring fixed production costs, and it is therefore logical to include them in stock valuations.

(c) If managers continually use marginal cost pricing, there is a danger that they may lose sight of the need to cover fixed costs. Absorption costing values all production at full cost, so that managers are always aware of fixed costs.

(d) SSAP 9 Stocks and Long-term Contracts states that in order to match costs and revenues, the cost of stock should include all costs incurred in bringing the stock to its present condition. These costs should include all related production overheads, even if they accrue on a time basis (i.e. do not fluctuate with the level of activity - fixed overheads).

Arguments in Favour of Marginal Costing

(a) When sales are constant but production fluctuates, marginal costing will give a more logical, constant profit picture.

(b) Since fixed costs accrue on a time basis, it is logical to charge them against sales in the period in which they are incurred. The recommendations of SSAP 9 are for external profit reporting purposes, but the internal costing system simply has to meet the information needs of managers. The marginal costing system will also give a better indication of the actual cash flow of the business.

(c) Under- or over-absorption of overheads is not a problem with marginal costing, and managers are never working under a false impression of profit being made, which could be totally altered by an adjustment for under- or over-absorbed overheads in absorption costing.

Further Points

It is important to remember that the difference between absorption and marginal costing arises from the treatment of the fixed costs of production. As direct material cost and direct labour cost will always vary with production, it is the overhead cost which creates the difficulties.

In absorption costing all the overheads are absorbed using various logical bases. It is essential to prepare an overhead summary prior to a period, dividing anticipated overheads into production and service departments. The overheads allocated or apportioned to service departments are then apportioned to production using the most logical basis; an absorption rate is calculated on the basis of whether the production departments are labour, machines or material intensive.

In marginal costing, direct cost of production is calculated by adding direct material cost, direct labour cost and overheads which can be related to one unit of production. By deducting this marginal cost of production (cost to produce one extra unit) from the sales revenue, a contribution towards fixed overheads from each unit of production is calculated. Total fixed overheads divided by contribution per unit establishes the breakeven point. This is where all fixed overheads are recovered and the business starts making contribution towards profit.

Limitations of absorption costing:

- In absorption costing the main difficulty arises in dividing overhead expenses between production and service departments. If they relate to one department they can be easily allocated; but if they need to be apportioned between departments then the most logical basis of apportionment has to be established.

- The cost of production is calculated **after** the production has taken place. The profit or loss is therefore calculated after the event, reducing any opportunity for the management to take action to control the cost in order to improve profitability.
- Because the absorption rate is calculated on the basis of anticipated production, and the overheads themselves are estimated, at the end of the period there will always be over- or under-absorption of overheads as actual production or actual overheads will be more or less than the estimate.
- Absorption costing does not assist management by giving accurate information that helps in preparing quotations for future contracts or in establishing a correct selling price. This is because the overheads in the following period may be different and they may change in their variability.

Limitations of marginal costing:

- The main difficulty in marginal or direct costing is to establish variability of overhead expenses. In reality most overheads are semi-variable. They are neither strictly variable with production nor strictly fixed for any level of production. Their variability can be calculated by techniques such as scattergraphs etc. Therefore the basic argument in favour of marginal costing is flawed.
- In the case of a business producing more than one product, it is difficult to calculate breakeven points for each product. The best we can achieve is usually to calculate an overall breakeven point based on level of activity or total sales revenue. This again reduces the usefulness of marginal costing.

Absorption costing is useful to management because it is **easy to operate**. Once the basis of apportionment and rates of absorption are agreed, adjustments can be made annually to bring them in line with the current situation. Marginal costing is very useful to management in **making decisions**, e.g. on make or buy, levels of production, pricing of products.

In conclusion, both methods can and should be used by management - absorption costing for the benefits it gives in cost accumulation and cost control, and marginal costing to assist in managerial decisions.

Example 2

The following information relates to product J for quarter three, which has just ended:

	Production (units)	**Sales** (units)	**Fixed Overheads** RWF000	**Variable Costs** RWF000
Budget	40,000	38,000	300	1,800

Actual	46,000	42,000	318	2,070

The selling price of product J was RWF72 per unit.

The fixed overheads were absorbed at a predetermined rate per unit.

At the beginning of quarter three there was an opening stock of product J of 2,000 units valued at RWF25 per unit variable costs and RWF5 per unit fixed overheads.

REQUIREMENT:

(a) (i) Calculate the fixed overhead absorption rate per unit for the last quarter, and

Present profit statements using FIFO (first in, first out) using:

(ii) Absorption costing, and

(iii) Marginal costing, and

(iv) Reconcile and explain the difference between the profits or losses.

(b) Using the same data, present similar statements to those required in part (a), using the AVECO (average cost) method of valuation, reconcile the profit or loss figures, and comment briefly on the variations between the profits or losses in (a) and (b).

Answer

(a) (i) **Fixed overhead absorption rate per unit**:

$$\frac{\text{Budgeted fixed overheads}}{\text{Budgeted production}} \quad \frac{rwf\,300{,}000}{40{,}000} = \text{RWF7.5}$$

(ii) **Absorption Costing (FIFO) Profit Statement**

	RWF000	RWF000
Sales (42000 × RWF72)		3,024
Less Cost of sales:		
Opening stock (2,000 × RWF30)	60	
Add Production (46,000 × RWF52.5) (W1)	2,415	
	2,475	
Less Closing stock (6,000 × RWF52.5)	315	2,160
		864
Add Over-absorption (W2)		27

Profit		891

Workings

	Per unit RWF	
(1) Variable cost	45	$\left(\frac{rwf\,1{,}800{,}000}{40{,}000}\right)$
Fixed overhead	7.5	
	52.5	
(2) Fixed overhead absorbed	46,000 ×RWF7.5 =	345,000
Less Actual		318,000
		RWF27,000

(iii) **Marginal Costing (FIFO) Profit Statement**

	RWF000	RWF000
Sales		3,024
Less Cost of sales		
Opening stock (2,000 × RWF25)	50	
Add Production (46,000 × RWF45) (W1)	2,070	
	2,120	
Less Closing stock (6,000 × RWF45)	270	1,850
Contribution		1,174
Less Fixed overheads (actual)		318
Profit		856

(iv) **Reconciliation**

	Profit
Absorption	891
Marginal	856
	35
Fixed overheads in closing stock	
(6,000 × RWF7.50)	45
Less Opening stock (2,000 × RWF7.50)	10
	35

The difference is due to fixed overheads being carried forward in stock valuations. The figures under absorption give a higher profit because more of the fixed overheads are carried forward into the next accounting period than were brought forward from the previous one. The fixed overhead absorption rate depends on estimates of both production units and fixed overheads, and actual figures may vary. The over-absorption of fixed overheads is adjusted for at the end of the period.

Under marginal costing fixed overheads are treated as period costs and not carried forward in stock valuations; under- or over-absorption does not arise. Marginal costing, by taking only the variable costs, shows how much contribution is being made, and is regarded as giving more useful figures for decision-making.

(b) Absorption Costing (AVECO) Profit Statement

	RWF000	RWF000
Sales		3,024
Less Cost of sales		
Opening stock plus production (48,000 × RWF51.56)	2,475	
Less Closing stock (6,000 × RWF51.56)	309	2,166
		858
Plus Over-absorption		27
Profit		885

Marginal Costing (AVECO) Profit Statement

	RWF000	RWF000
Sales		3,024
Less Cost of sales		
Opening stock plus production		
(48,000 at RWF44.17)	2,120	
Less Closing Stock (6,000 × RWF44.17)	265	1,855
Contribution		1,169
Less Fixed overheads		318
Profit		851
Reconciliation:		
Difference in profits		34
Absorption closing stock	309	
Less Marginal closing stock	265	44
Less Fixed costs in absorption opening stock		10
		34

The variations in the profits in (a) and (b) of RWF6,000 and RWF5,000 respectively are caused by using different methods of valuation (FIFO and AVECO). The valuation method can affect profit/loss for both absorption and marginal approaches, and could lead to much wider variations than here.

Study Unit 12

Break Even Analysis

Contents

A. BREAK-EVEN ANALYSIS

For any business there is a certain level of sales at which there is neither a profit nor a loss, i.e. the total income and the total costs are equal. This point is known as the break-even point. It is very easy to calculate, and it can also be found by drawing a graph called a break-even chart.

Calculation of Break-Even Point – Example

As shown in the last unit, you must be able to layout a marginal cost statement before doing Break Even formulas.

Marginal Cost Statement

Sales	x
- Variable Cost	(x)
= Contribution	x
- Fixed Costs	(x)
= Profit/Loss	xx

Let us assume that the organising committee of a dinner have set the selling price at RWF8.40 per ticket. They have agreed with a firm of caterers that the meal would be supplied at a cost of RWF5.40 per person. The other main items of expense to be considered are the costs of the premises and orchestra which will amount to RWF80 and RWF100 respectively. The variable cost in this example is the cost of catering, and the fixed costs are the amounts for premises and orchestra.

The first step in the calculations is to establish the amount of contribution per ticket.

Contribution

	RWF
Price of ticket (sales value)	8.40
Less Catering cost (marginal cost)	5.40
Contribution	3.00

Now that this has been established, we can evaluate the fixed expenses involved.

Fixed Costs

	RWF
Hire of premises	80
Orchestra fee	100
Total fixed expenses	RWF180

The organisers know that for each ticket they sell, they will obtain a contribution of RWF3 towards the fixed costs of RWF180. Clearly it is only necessary to divide RWF180 by RWF3 to establish the number of contributions which are needed to break even on the function. The break-even point is therefore 60, i.e. if 60 tickets are sold there will be neither a profit nor a loss on the function. Any tickets sold in excess of 60 will provide a profit of RWF3 each.

Formulae

The general formula for finding the **break-even** point in volume is:

$$\boxed{\frac{\text{Fixed costs}}{\text{Contribution per unit}}}$$

(this is, of course, exactly what we did in the example).

If the break-even point is required in terms of sales **value,** rather than sales **volume**, the formula that should be used is as follows:

$$\text{Break-even point} = \frac{\text{Fixed costs}}{\text{C / s ratio}}$$

$$\boxed{\text{The C/s ratio is } \frac{\text{Contribution}}{\text{Sales}} \times 100.}$$

For example, the contribution earned by selling one unit of Product A at a selling price of RWF10 is RWF4.

$$\text{C/s ratio} = \frac{RWF4}{RWF10} \times 100 = 40\%$$

In our example of the dinner-dance, the break-even point in revenue would be:

$$\frac{\frac{rwf180}{3}}{rwf8.40} = \text{RWF504}$$

The committee would know that all costs (both variable and fixed) would be exactly covered by revenue when sales revenue earned equals RWF504. At this point no profit nor loss would be received.

Suppose the committee were organising the dinner in order to raise money for charity, and they had decided in advance that the function would be cancelled unless at least RWF120 profit would be made. They would obviously want to know how many tickets they would have to sell to achieve this target.

Now, the RWF3 contribution from each ticket has to cover not only the fixed costs of RWF180, but also the desired profit of RWF120, making a total of RWF300. Clearly they will have to sell 100 tickets (RWF300 divided by RWF3).

To state this in general terms:

Volume of sales needed to achieve a given profit =

$$\boxed{\frac{\text{Fixed costs} + \text{Desired profit}}{\text{Contribution per unit}}}$$

Suppose the committee actually sold 110 tickets. Then they have sold 50 more than the number needed to break even. We say they have a **margin of safety** of 50 units, or of RWF420 (50 × RWF8.40), i.e.

Margin of safety = Sales achieved – Sales needed to break even.

The margin of safety is defined as the excess of normal or actual sales over sales at break-even point.

It may be expressed in terms of sales volume or sales revenue.

Margin of safety is very often expressed in percentage terms:

$$\boxed{\frac{\text{Sales achieved} - \text{Sales needed to break even}}{\text{Sales achieved}} \times 100\%}$$

i.e. the dinner committee have a percentage margin of safety of 50/110 × 100% = 45%.

The significance of margin of safety is that it indicates the amount by which sales could fall before a firm would cease to make a profit. Thus, if a firm expects to sell 2,000 units, and calculates that this would give it a margin of safety of 10%, then it will still make a profit if its sales are at least 1,800 units (2,000 – 10% of 2,000), but if its forecasts are more than 10% out, then it will make a loss.

The profit for a given level of output is given by the formula:

(Output × Contribution per unit) – Fixed costs.

It should not, however, be necessary for you to memorise this formula, since when you have understood the basic principles of marginal costing, you should be able to work out the profit from first principles.

Consider again our example of the dinner. What would be the profit if they sold (a) 200 tickets (b) RWF840 worth of tickets?

(a) We already know that the contribution per ticket is RWF3.

Therefore, if they sell 200 tickets, total contribution is 200 × RWF3 = RWF600.

Out of this, the fixed costs of RWF180 must be covered: anything remaining is profit.

Therefore profit = RWF420. (Check: 200 tickets is 140 more than the number needed to break even. The first 60 tickets sold cover the fixed costs; the remaining 140 show a profit of RWF3 per unit. Therefore profit = 140 × RWF3 = RWF420, as before.)

(b) RWF840 worth of tickets is 100 tickets, since they are RWF8.40 each.

	RWF
Total contribution on 100 tickets =	300
Less fixed costs	180
Profit	RWF120

B. BREAK-EVEN CHART

Information Required

(a) Sales Revenue

When we are drawing a break-even chart for a single product, it is a simple matter to calculate the total sales revenue which would be received at various outputs.

As an example let us take the following figures:

Output (units)	**Sales revenue (**RWF**)**
0	0
2,500	10,000
5,000	20,000
7,500	30,000
10,000	40,000

(b) Fixed Costs

We must establish which elements of cost are fixed in nature. The fixed element of any semi-variable costs must also be taken into account.

Let us assume that the fixed expenses total RWF8,000.

(c) Variable Costs

The variable elements of cost must be assessed at varying levels of output.

Output (units)	**Variable costs (**RWF**)**
0	0
2,500	5,000
5,000	10,000
7,500	15,000
10,000	20,000

Plotting the Graph

The graph is drawn with level of output (or sales value) represented along the horizontal axis and costs/revenues up the vertical axis. The following are the stages in the construction of the graph:

(a) Plot the sales line from the above figures.

(b) Plot the fixed expenses line. This line will be parallel to the horizontal axis.

(c) Plot the total expenses line. This is done by adding the fixed expenses of RWF8,000 to each of the variable costs above.

(d) The break-even point (often abbreviated to BEP) is represented by the meeting of the sales revenue line and the total cost line. If a vertical line is drawn from this point to meet the horizontal axis, the break-even point in terms of units of output will be found.

The graph is illustrated in Figure 1.

Note that, although we have information available for four levels of output besides zero, one level is sufficient to draw the chart, provided we can assume that sales and costs will lie on straight lines. We can plot the single revenue point and join it to the origin (the point where there is no output and therefore no revenue). We can plot the single cost point and join it to the point where output is zero and total cost = fixed cost.

In this case, the break-even point is at 4,000 units, or a revenue of RWF16,000 (sales are at RWF4 per unit).

This can be checked by calculation:

Sales revenue	= RWF4 per unit
Variable costs	= RWF2 per unit
∴ Contribution	= RWF2 per unit
Fixed costs	= RWF8,000
Break-even point	$= \dfrac{\text{Fixed costs}}{\text{Contribution per unit}}$
	= 4,000 units.

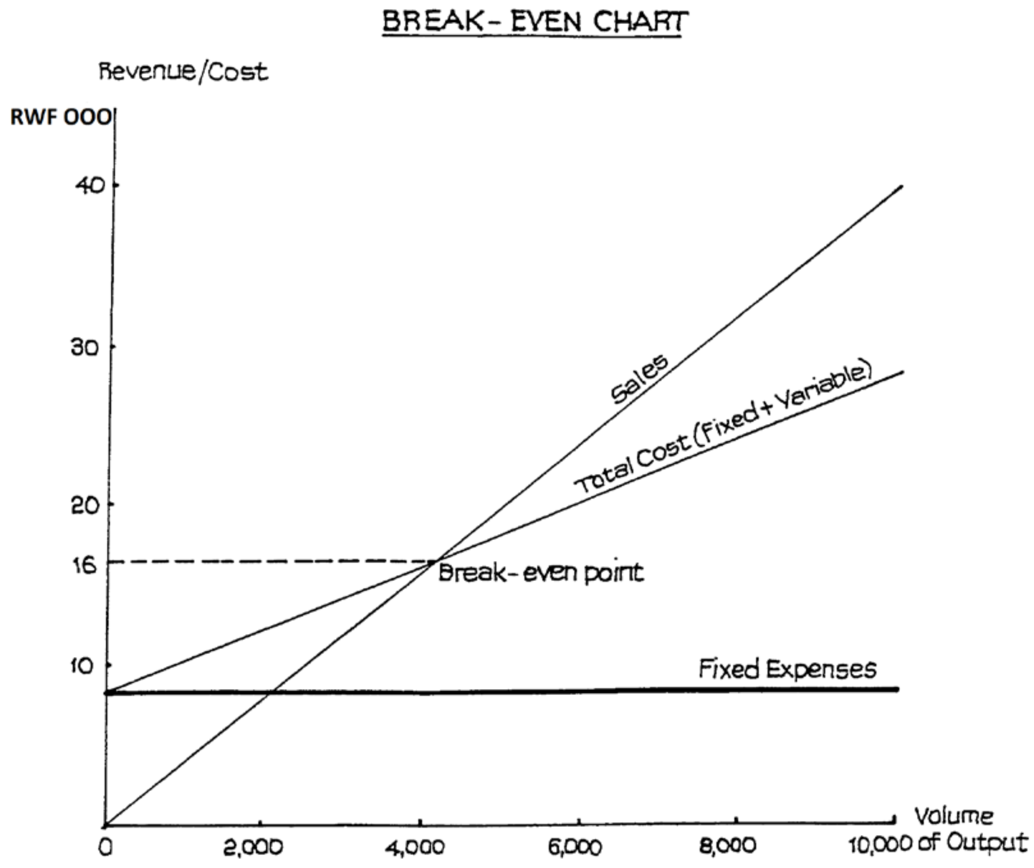

Figure 1

Break-even Chart for More Than One Product

Because we were looking at one product only in the above example, we were able to plot "volume of output" and straight lines were obtained for both sales revenue and costs. If we wish to take into account more than one product, it is necessary to plot "level of activity" instead of volume of output. This would be expressed as a percentage of the normal level of activity, and would take into account the mix of products at different levels of activity.

Even so, the break-even chart is not a very satisfactory form of presentation when we are concerned with more than one product: a better graph, the profit-volume graph, is discussed in the next study unit. The problem with the break-even chart is that we should find that, because of the different mixes of products at the different activity levels, the points plotted for sales revenue and variable costs would not lie on a straight line.

Assumptions and Limitations of Break-Even Charts

Apart from the above point about the difficulty of dealing with more than one product, you should bear the following points in mind:

(a) Break-even charts are only accurate within fairly narrow levels of output. This is because if there were to be a substantial change in the level of output, the proportion of fixed costs could change.

(b) Even with only one product, the income line may not be straight. A straight line implies that the manufacturer can sell any volume he likes at the same price. This may well be untrue: if he wishes to sell more units he might have to reduce the price. Whether this increases or decreases his total income depends on the elasticity of demand for the product. Therefore the sales line may curve upwards or downwards, but in practice is unlikely to be straight.

(c) Similarly, we have assumed that variable costs have a straight line relationship with level of output, i.e. variable costs vary directly with output. This might not be true. For instance, the effect of diminishing returns might cause variable costs to increase beyond a certain level of output.

(d) Break-even charts only hold good for a limited time-span. Nevertheless, within these limitations a break-even chart can be a very useful tool. Managers who are not well-versed in accountancy find it easier to understand a break-even chart than a calculation showing the break-even point.

General Points on the Interpretation of Break-Even Charts

The skeleton break-even chart (Figure 2) illustrates the following points:

(a) Margin of Safety

The margin of safety - i.e. the extent by which sales could fall before a loss was incurred - is easily read from the graph.

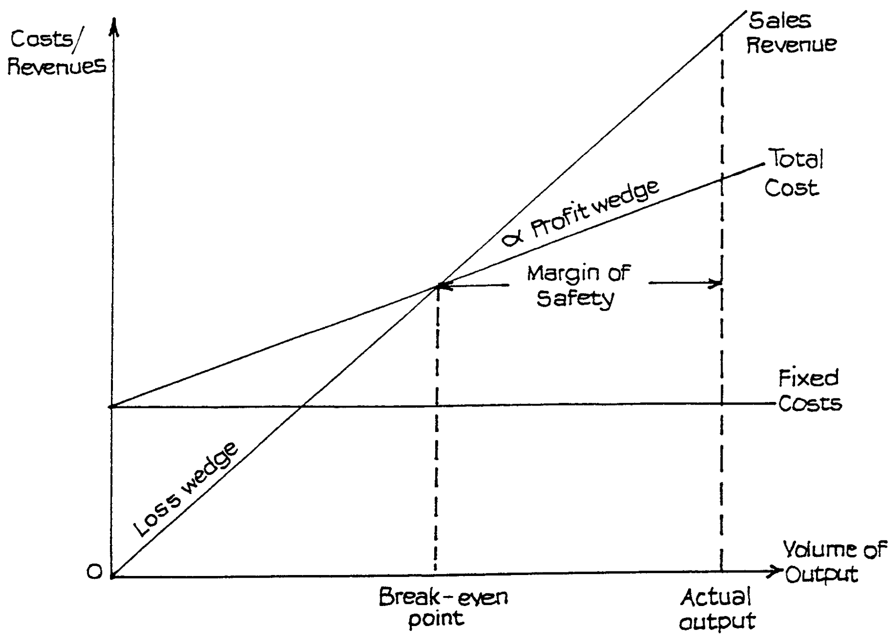

Figure 2

(b) Angle of Incidence

The angle a marked on the chart is referred to as the angle of incidence. This shows the rate at which profits increase once the break-even point is passed. A large angle of incidence means a high rate of earning (equally it means that if sales fell below break-even point, the loss would increase rapidly). This is also illustrated by the size of the profit and loss wedges.

Changes in Cost Structure

If costs increase, the break-even point will be reached at a higher level of sales. The break-even chart (Figure 3) illustrates the effect of changes.

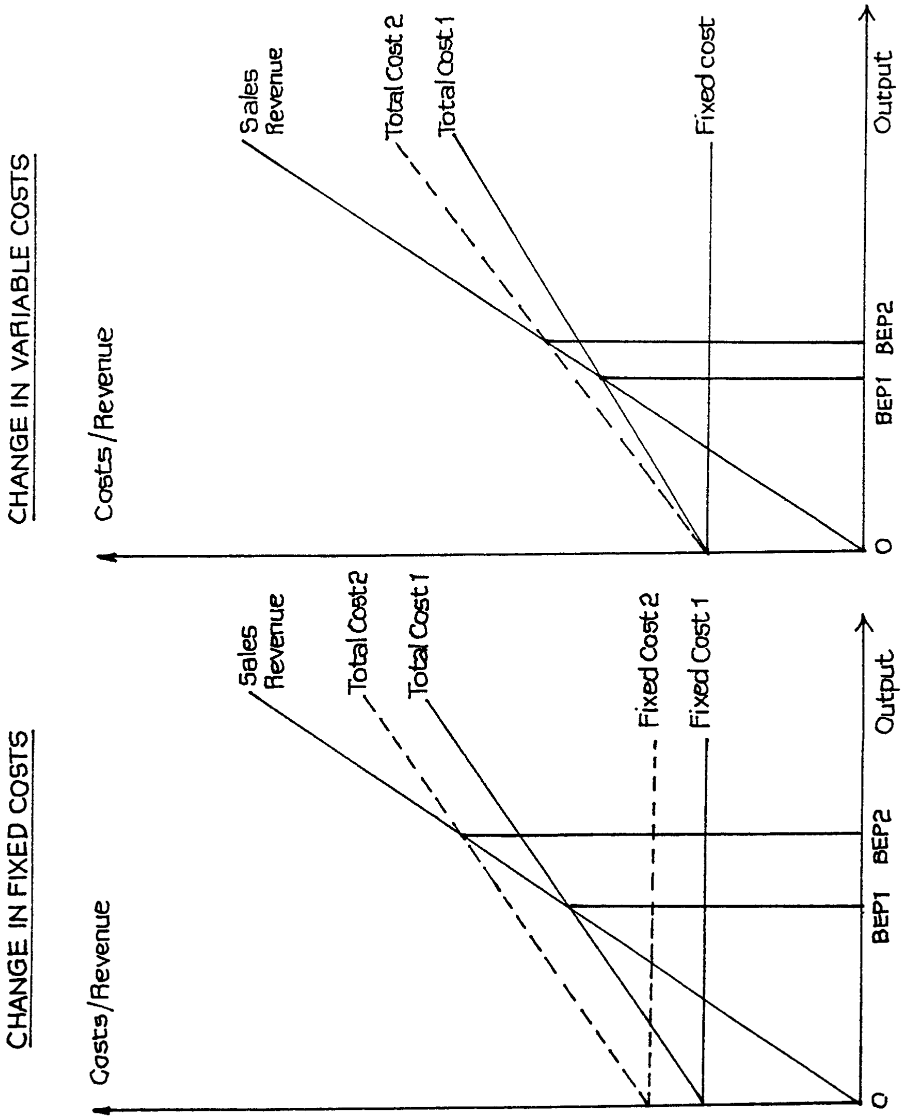

Figure 3

Example

A long-distance coach company expects 80,000 tickets to be sold on a particular route in a three-month period at a price of RWF30 each. Fixed overhead for the period is budgeted at RWF412,500 and expected net profit is RWF247,500.

REQUIREMENT:

Calculate:

(a) the contribution/sales ratio;

(b) the total contribution;

(c) the contribution per ticket;

(d) the additional profit arising from selling a further 1,250 tickets;

(e) the additional sales required to earn the same profit as that shown above if the price per ticket is reduced to RWF27.75.

Solution

(a) The contribution must first be calculated.
Fixed costs + Profit: RWF412,500 + RWF247,500 = RWF660,000.

Contribution/sales ratio

$$= \frac{\overset{rwf}{660{,}000}}{80{,}000 \text{ tickets} \times \text{RWF}30} \times 100 = 27.5\%$$

(b) Total contribution = RWF660,000.

(c) Contribution per ticket: this is the total contribution divided by the number of tickets to be sold

$$\frac{\text{RWF } 660{,}000}{80{,}000} = \text{RWF}8.25$$

(d) Additional profit arising from selling a further 1,250 tickets: as the company is already trading at above its break-even point, any additional contribution earned by additional sales will be profit.

The additional profit is 1,250 × RWF8.25 = RWF10,312.50

(e) The additional sales required to produce a profit of RWF247,500 if the selling price per ticket is reduced to RWF27.75 is calculated as follows:

Target contribution	RWF660,000
Selling price per ticket	RWF30
No. of tickets sold	80,000

Revised position

Target contribution	RWF660,000
Selling price per ticket	RWF27.75

Fixed costs remain the same. Therefore the reduction in selling price reduces contribution by the same amount:

RWF30 – RWF27.75 = RWF2.25. This reduces contribution per ticket from RWF8.25 to RWF6.00.

To earn a target profit of RWF660,000, sales must now be $\frac{rwf\,660,000}{rwf\,6}$ = 110,000.

This means that an additional number of 30,000 (110,000 – 80,000) tickets must be sold.

Contribution Break-Even Chart

An alternative form of break-even chart is one which shows the contribution earned. Instead of starting by measuring the fixed costs from the base line, the variable costs are taken. The fixed costs are then shown above the variable costs.

Example

Variable costs RWF2 per unit

Fixed costs RWF80,000

Maximum sales RWF200,000

Selling price per unit RWF20

REQUIREMENT:

Prepare a contribution break-even chart. (See Figure 4)

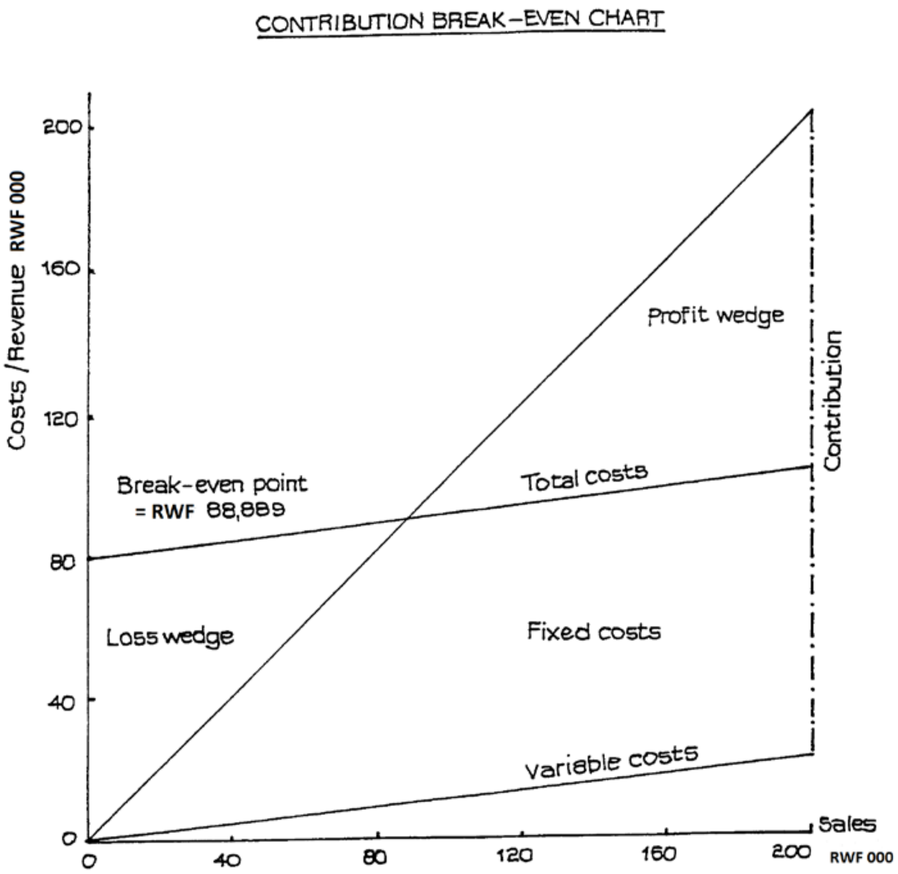

Figure 4

C. THE PROFIT VOLUME GRAPH

The profit volume graph provides an alternative presentation to the break-even chart discussed in the previous study unit. It may be more easily understood by managers who are not used to accountancy or statistics.

In this graph, sales revenue is plotted on the horizontal axis, against profit/loss on the vertical axis. It is therefore necessary to work out the profit before starting to plot the graph. This is done using the marginal costing equation.

Sales revenue – Variable cost = Fixed cost + Profit or   Profit = Sales revenue – Variable cost × Fixed cost

or   Profit = Contribution per unit × No. of units – Fixed cost

The general form of the graph is illustrated in Figure 6.

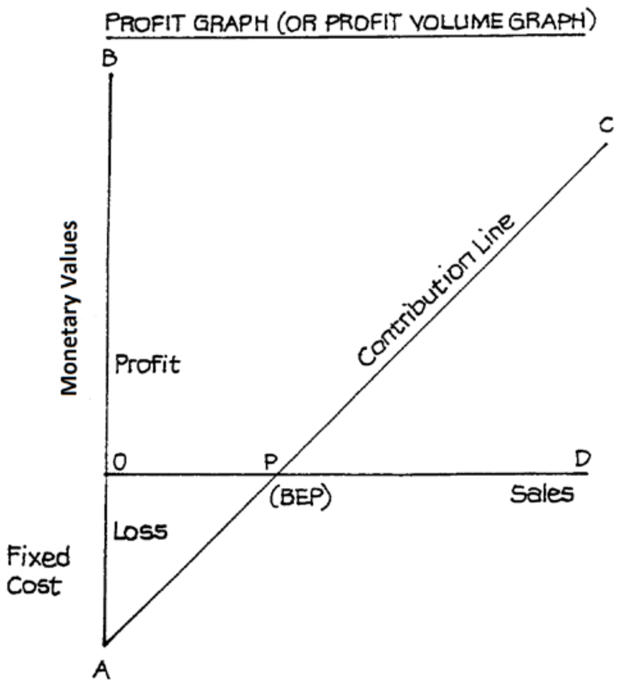

Figure 6

The distance AO on the graph represents the amount of fixed cost, since when no sales are made there will be a loss equal to the fixed cost.

D. USE OF THE PROFIT VOLUME GRAPH FOR MORE THAN ONE PRODUCT

In order to draw a profit volume graph for several products it is necessary to calculate:

(a) Sales revenue for each product and cumulative sales revenue.

(b) Contribution for each product, cumulative contribution and hence profit.

The graph is easiest to draw and interpret if the products are taken in order, starting with the most profitable and working back to the least profitable, “profitability” in this context being measured by the relationship which contribution bears to sales revenue.

Example

The Works Director of XY Ltd, a company manufacturing and marketing a number of different products, considers that the profit could be increased by restricting the number of products. He wishes to eliminate production of the two lines which contribute proportionately least, and he is satisfied that the output and sale of the remaining products would be increased proportionately so that the total value of sales is unaffected.

He asks you to help him by preparing from the following data a suitable graph which would indicate the products which should be eliminated, and would assist him in presenting his point of view to his colleagues on the Board.

Product	**Variable Cost**	**Profit**		**Sales**
	RWF	RWF		RWF
A	11,000	3,000	(Loss)	12,000
B	18,000	3,000		22,000
C	17,000	500		20,000
D	21,500	9,500		44,000
E	6,000	8,000		23,000
F	8,000	2,000	(Loss)	10,000
				131,000

Fixed expenses are at a level of RWF33,500.

Solution

The first step is to establish the contribution made towards fixed expenses by the individual products. The second is to calculate the contribution as a percentage of sales revenue. At this stage we will be able to eliminate the least profitable lines.

Product	**Sales**	**Variable Cost**	**Contribution**	**Contribution as Percentage of Sales Revenue**
	RWF	RWF	RWF	%
A	12,000	11,000	1,000	8.3
B	22,000	18,000	4,000	18.2
C	20,000	17,000	3,000	15.0
D	44,000	21,500	22,500	51.1
E	23,000	6,000	17,000	74.0
F	10,000	8,000	2,000	20.0

It is clear that A and C are proportionately the two least profitable products, and should be eliminated.

Since the question states that the total value of sales will remain the same, we must gross up the sales of the remaining items.

Product	**Former Sales**	**Share of Increase**	**Revised Sales**
	RWF	RWF	RWF
E	23,000	7,440	30,440
D	44,000	14,220	58,220
F	10,000	3,230	13,230
B	22,000	7,110	29,110
	RWF99,000	RWF32,000	RWF131,000

We must now calculate revised contributions for each product.

Product	Sales	Percentage Contribution	Revised Contribution
	RWF	%	RWF
E	30,440	74	22,500
D	58,220	51	29,750
F	13,230	20	2,650
B	29,110	18.2	5,300

The method of obtaining the points to be plotted is as follows:

Present Basis

Product	**Sales**	**Contribution**	**Profit (Contribution Less Fixed Costs)**
	RWF	RWF	RWF
E	23,000	17,000	–16,500
D	44,000	22,500	
	67,000	39,500	+ 6,000
F	10,000	2,000	
	77,000	41,500	+ 8,000
B	22,000	4,000	
	99,000	45,500	+12,000
C	20,000	3,000	
	119,000	48,500	+15,000
A	12,000	1,000	
	RWF131,000	RWF49,500	+16,000

Revised Basis

Product	**Sales**	**Contribution**	**Profit (Contribution Less Fixed Costs)**
	RWF	RWF	RWF
E	30,440	22,500	–11,000
D	58,220	29,750	
	88,660	52,250	+18,750
F	13,230	2,650	
	101,890	54,900	+21,400
B	29,110	5,300	
	RWF131,000	RWF60,200	+26,700

The graph is shown in Figure 7. (on the page 301)

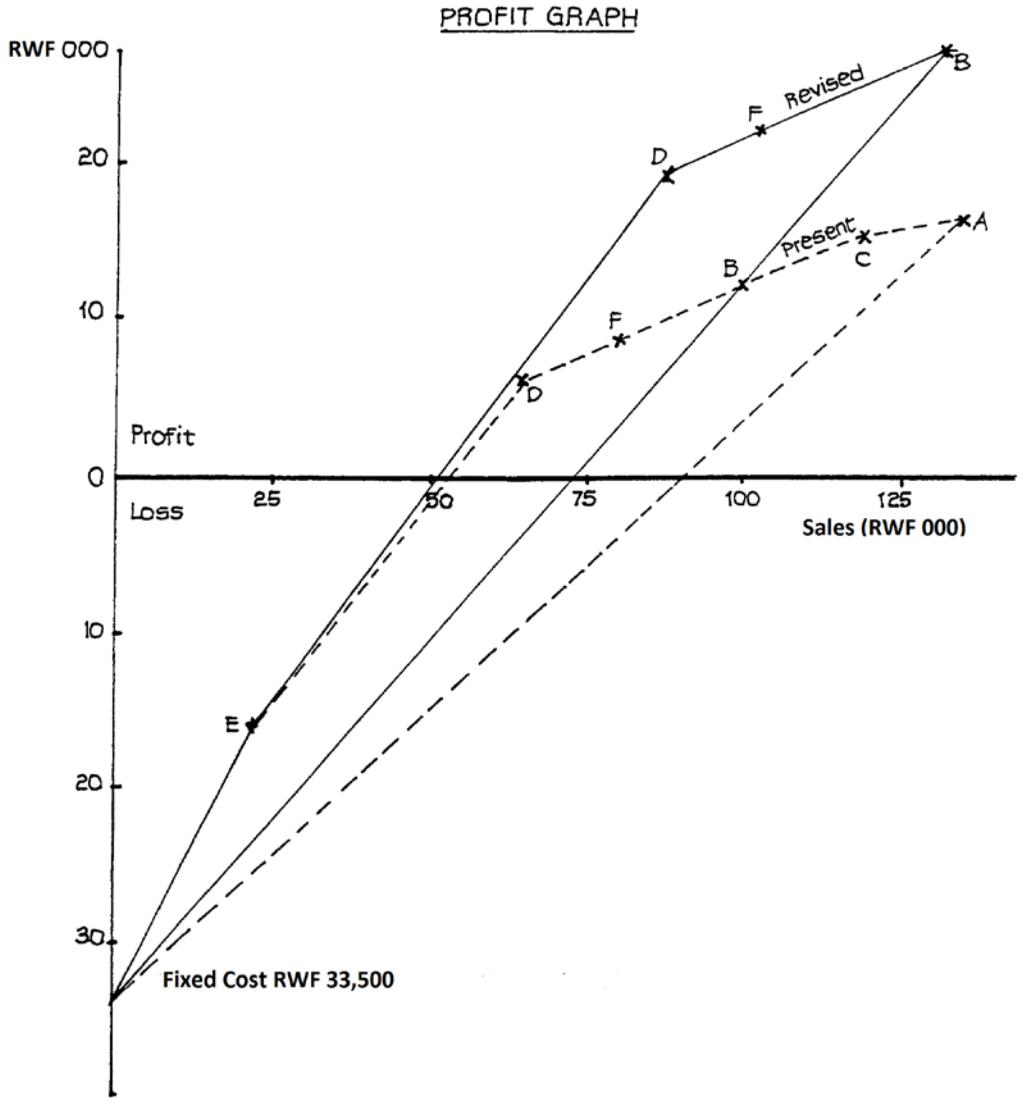

Figure 7

From the graph we can read:

(a) Revised profit is RWF26,700.

(b) Present profit is RWF16,000.

(c) Revised BEP is RWF72,900.

(d) Present BEP is RWF88,700.

E. THE PROFIT/VOLUME OR CONTRIBUTION/SALES RATIO

Calculation

In the calculations for the profit graph in the previous example, we made use of the ratio "contribution: sales" (expressed as a percentage). This ratio has historically been referred to as the "profit: volume ratio". This is not a very sensible name, because it does not describe what the ratio actually is. In fact, examiners now call it by the more descriptive name of "contribution : sales ratio" (C/S ratio) but you should watch out for the alternative terminology P/V ratio in older textbooks.

The ratio may be calculated as either:

$$\frac{\text{Selling price per unit} - \text{Variable cost per unit}}{\text{Selling price per unit}}$$

or

$$\frac{\text{Total sales revenue} - \text{Total variable cost}}{\text{Total sales revenue}}$$

Alternatively, it may be calculated when variable costs are not known, provided the sales revenue and profit figures are known for two different levels of output.

Example

Calculate the contribution: sales (C/S) ratio from the following information:

	Sales Figures	**Profit Figures**
	RWF	RWF
Activity Level I	3,500	625
Activity Level II	3,000	500

The calculation of the ratio is as follows:

(a) Variation in profits: Level I - Level II is RWF625 – RWF500 = RWF125.

(b) Variation in sales: Level I - Level II is RWF3,500 – RWF3,000 = RWF500.

This means that for additional sales of RWF500 there is an additional profit of RWF125.

(c) Contribution: sales ratio $\frac{(a)}{(b)}$ or $\frac{125}{500}$ = 0.25

This figure can be checked by drawing up profit statements for the two activity levels, bearing in mind that if the ratio is 0.25, i.e. contribution is 0.25 per RWF of sales, then variable costs will be 0.75 per RWF of sales. We must also remember that fixed cost = contribution – profit, and that the fixed cost will by definition be the same at each of the two activity levels.

	Level I	**Level II**
	RWF	RWF
Sales	3,500	3,000
Less marginal cost (0.75 per RWF1)	2,625	2,250
Contribution	875	750
Less fixed expenses	250	250
Profits	625	500

Use of Ratio

(a) Profit at Different Levels of Sales

Using the data in the last example, what would be the profit on RWF2,000 sales?

What sales level would be required to produce a profit of RWF1,000?

(i) **Sales of** RWF**2,000**

a.	Sales as above	RWF2,000
b.	C/S percentage as calculated	25%
c.	Contribution on RWF2,000 sales, 25% of RWF2,000	RWF500
d.	Fixed expenses as calculated	RWF250
e.	Profit on RWF2,000 sales (c. – d.)	RWF250

(ii) **Profit Requirement of RWF1,000**

a.	Profit requirement as above	RWF1,000
b.	Fixed expenses as calculated	RWF250
c.	Total contribution required (a. + b.)	RWF1,250
d.	C/S percentage as calculated	25%
e.	Sales required RWF1,250 $\times \frac{100}{25}$	RWF5,000

(b) Calculation of Break-Even Point

We saw earlier that the formula for calculating the break-even point in sales value is:

$$\frac{\text{Fixed Cost}}{\text{C / s ratio}}$$

This gives the breakdown point in terms of sales value.

Using the same data again, break-even point will be

$$\frac{250}{0.25} = 250 \times \frac{100}{25} = 1{,}000$$

i.e. the break-even point occurs when sales are RWF1,000.

Typical Examination Question

(a) Define and illustrate by means of simple arithmetical examples:

(i) Contribution/sales ratio;

(ii) Margin of safety.

(b) Demonstrate the relationship between a firm's contribution/sales ratio, its percentage margin of safety, and its profit/sales ratio.

(c) What is the significance of a firm's margin of safety?

(d) The following details relate to Product X:

	RWF	RWF
Selling price		120
Costs:		
Material	60	
Labour	15	
Variable overhead	5	
Fixed overhead	10	90
Profit		RWF30

During the forthcoming year it is expected that material costs will increase by 10%, wages by $33\frac{1}{3}$% and other costs by 20%.

You are required to calculate the percentage increase in the selling price of X which would maintain the firm's contribution/sales ratio.

Solution

(a) (i) The contribution/sales ratio is the contribution that is sales revenue - variable cost, expressed as a proportion of sales.
For example, if selling price = RWF100 and variable cost/unit = RWF75, the contribution/unit is RWF25 and the C/S ratio 0.25 or 25%.

(ii) The margin of safety is the difference between a firm's actual or expected sales, and the sales which would be needed to break even. It may be expressed as a percentage of the actual sales.

For example, using the data above and supposing fixed costs to be RWF2,500, the sales volume required to break even would be 100 units ($\frac{2,500}{25}$).

If the firm's actual sales were 200 units, its margin of safety would be 100 units or $\frac{100}{200} \times 100\% = 50\%$.

(b) A firm's profit/sales ratio can be obtained by applying its percentage margin of safety to its C/S ratio. This is illustrated using the above data:

	RWF
Actual sales (200 units @ RWF100)	20,000
Marginal cost of sales (200 @ RWF75)	15,000
Contribution (= 25% of revenue)	5,000
Less fixed costs	2,500
Profit (= 12½% of revenue)	2,500

Contribution/sales ratio × percentage margin of safety

= 25% × 50% = 12½%

which is the profit/sales ratio, as required.

(c) A firm's margin of safety shows its ability to withstand adverse trading conditions: for instance, in the above example the firm can afford for sales to drop by up to 50% before it will be in real difficulties.

(d)

	Present Costs	Increase	Expected Costs
	RWF	%	RWF
Material	60	10	66
Labour	15	$33\frac{1}{3}$	20
Variable overhead	5	20	6
Marginal cost	80		92

Since current sales revenue is RWF120 per unit, the current C/S ratio is 40/120 or $33\frac{1}{3}$%. The variable cost: sales ratio is $66\frac{2}{3}$%.

If the C/S ratio is to remain the same, the variable cost : sales ratio will also remain the same,

i.e. $66\frac{2}{3}$% of the new selling price is RWF92.

Therefore the new selling price must be RWF138

$(\frac{92}{66\frac{2}{3}} \times 100)$.

		RWF
Check:	Selling price	138
	Less variable cost	92
	Contribution	RWF46 which is $\frac{1}{3}$ of sales revenue, as required.

The two most important points to notice about this part of the question are:

(i) The examiner gave the fixed cost per unit as a "red herring". In marginal costing we are only interested in the fixed costs in total; fixed cost per unit is relevant only to absorption costing. As it transpired, in this question we did not need any information at all about fixed costs.

(ii) The variable (marginal) cost to sales ratio and the contribution to sales ratio are complementary ratios, i.e. when expressed as percentages they add up to 100%, and if one of them remains constant, then so does the other.

F. MARGINAL PROFIT AND LOSS ACCOUNT

Advantages

In the orthodox trading and profit and loss account, the opening and closing stocks are debited and credited respectively, and the valuations placed upon them include a share of production fixed overheads. Accountants who believe in using marginal costing take the view that all fixed costs should be written off in the period in which they are incurred and that there can be no justification for carrying part of one period's costs forward to the next period in closing stock. They argue that fixed costs are incurred on a time basis, regardless of the level of production or sales in any period. They claim, therefore, that a closing stock valuation which excludes any element of cost is more "accurate". The exclusion of fixed costs does ensure that the writing off of fixed costs is not deferred until a later period. The main advantage of the marginal form of profit and loss account is, therefore, that the profit will not be affected simply because of a significant change in the stock figures: profit is clearly related to the level of sales.

Example of Layout

	Total	**Product A**	**Product B**
Sales revenue	xxxx	xxx	xxx
Less Variable costs of goods sold:			
Direct material	xxx	xx	xx
Direct labour	xxx	xx	xx
Variable overheads	xxx	xx	xx
Total variable cost	xxx	xxx	xxx
Contribution	xxx	xxx	xxx
Less Fixed costs	xxx		
	RWFxxx		

Layout When Some Fixed Costs Can Be Allocated

If some of the fixed costs can be directly associated with a particular product or department, then clearly these costs should be shown separately and not grouped with the general fixed costs. This is best illustrated by an example.

Example

A company manufactures goods in three separate factories. The projected figures for the next year are as follows:

	Edinburgh	York	Gloucester
	RWF	RWF	RWF
Sales	440,000	400,000	700,000
Branch expenses:			
Salaries	42,000	38,000	62,000
Advertising	8,000	15,000	10,000
Other	10,000	8,000	11,000

There is a central office in London which is estimated to cost RWF154,000.

Variable costs amount to 75% of sales for each factory.

The marginal profit and loss account for this company would appear as follows:

	Edinburgh	York	Gloucester	Total
	RWF	RWF	RWF	RWF
Sales	440,000	400,000	700,000	1,540,000
Less variable cost of sales	330,000	300,000	525,000	1,155,000
Gross contribution	110,000	100,000	175,000	385,000
Less branch fixed costs	60,000	61,000	83,000	204,000
Contribution to central expenses and profit	50,000	39,000	92,000	181,000
Less central expenses				154,000
Profit				RWF27,000

Comparison of Absorption and Marginal Costing Methods

Example

The Melody Radio Co. Ltd which manufactures the "Melody" radio receiver, commenced trading on 1 April last. The company's budget for each four-week period is as follows:

	RWF	RWF
Sales - 20,000 receivers		400,000
Manufacturing cost of goods sold:		
Variable costs	240,000	
Fixed overhead	60,000	300,000
Gross profit		100,000
Selling and distribution costs (fixed)		20,000
Net profit		RWF80,000

The following data relates to the first two trading periods:

	Period 1	**Period 2**
Production	24,000	18,000
Sales	18,000	21,000

REQUIREMENT:

(a) Prepare operating statements for each of the two periods:

(i) Where fixed manufacturing overhead is absorbed into product costs at the budgeted rate and selling and distribution costs are treated as period costs.

(ii) Where all fixed costs are treated as period costs.

You may assume that the selling price, fixed costs, and unit variable costs for the two periods are in line with budget.

(b) Comment upon the results revealed by your statements.

Solution

Workings

Variable costs = RWF $\frac{240{,}000}{20{,}000}$ = RWF12 per unit.

Fixed overhead absorption rate = RWF $\frac{60{,}000}{20{,}000}$ = RWF3 per unit.

Selling price = RWF $\frac{400{,}000}{20{,}000}$ = RWF20 per unit.

Stock figures

	Period 1	**Period 2**
	Units	Units
Opening stock	0	6,000
+ Production	24,000	18,000
	24,000	24,000
– Sales	18,000	21,000
Closing stock	6,000	3,000

Fixed overheads are fully absorbed by production of 20,000 units.

In Period 1, fixed overheads will be over-absorbed by 4,000 × RWF3 = RWF12,000.

In Period 2, fixed overheads will be under-absorbed by 2,000 × RWF3 = RWF6,000.

The wording of the question is taken to mean that closing stock should be valued at the budgeted rate (RWF15 per unit) and under- or over-absorption written off in the relevant period.

The alternative would be, taking Period 1 as an example, to value closing stock as:

Variable cost: 6,000 × RWF12 =RWF72,000
Fixed cost: ¼ of RWF60,000 =RWF15,000 (since closing stock is ¼ of the period's production)

RWF87,000

(i) Absorbing Fixed Manufacturing Overhead at the Budgeted Rate

	Period 1		Period 2	
	RWF	RWF	RWF	RWF
Sales		360,000		420,000
Opening stock (@ RWF15/unit)			90,000	
Production (@ RWF15/unit)	360,000		270,000	
	360,000		360,000	
Less closing stock (@ RWF15/unit)	90,000		45,000	
	270,000		315,000	
Fixed manufacturing overhead over- absorbed	(12,000)			
Fixed manufacturing overhead under- absorbed		6,000		
Total manufacturing cost of goods sold		258,000		321,000
Gross profit		102,000		99,000
Less selling and distribution costs		20,000		20,000
Net profit		82,000		79,000

(ii) All Fixed Costs Treated as Period Costs (Marginal Costing)

	Period 1		Period 2	
	RWF	RWF	RWF	RWF
Sales		360,000		420,000
Opening stock (@ RWF12 per unit)	-		72,000	
Production (@ RWF12 per unit)	288,000		216,000	
	288,000		288,000	
Closing stock (@ RWF12 per unit)	72,000		36,000	
Marginal cost of sales		216,000		252,000
Contribution		144,000		168,000
Fixed manufacturing cost		60,000		60,000
Gross profit		84,000		108,000
Selling and distribution cost		20,000		20,000
Net profit		64,000		88,000

(b) Comments

The marginal costing statement relates profit clearly to sales: when sales rise, profit rises. The absorption costing statement shows a lower profit in Period 2, despite the rise in sales, because of the change in the stock position.

The profits under the two methods may be reconciled as follows:

Period 1	Closing stock valuation - absorption costing -		RWF90,000
	Closing stock valuation - marginal costing	-	RWF72,000
	Difference in closing stock valuation = difference in profit between the two methods		RWF18,000
Period 2	Fall in stock during period = 3,000 units		
	Valuation - absorption costing - 3,000 @ RWF15	=	RWF45,000

Valuation - marginal costing - 3,000 @ RWF12	=	RWF36,000

Difference = difference in profit between the two methods
RWF9,000

Taking the two periods together

Total profit – absorption costing	RWF161,000
Total profit – marginal costing	RWF152,000

Difference = difference in Period 2 closing stock valuation
RWF 9,000

It should be clear that over several periods taken together such that stock at the beginning of the first period and at the end of the last period was nil, the absorption and marginal costing methods would give the same total profit, but the amount of profit in each individual period would be different under the two methods.

Study Unit 13

Decision Making

Contents

A. INTRODUCTION

Accountants have an important role in the preparation of relevant data for decision making purposes.

For decision making purposes information is required which is relevant to the particular decision under consideration. In all decisions there must be a "status quo" (or position the decision making entity will be in if no decision is taken) and an alternative position (or several alternative positions) which will result as a direct consequence of the decision to be taken. Relevant information is that which relates to the differences between the basic, or status quo outcome and the alternatives. Therefore the decision should be appraised by making a comparison of the financial effects between the two sets of outcomes. Information concerning events which are common to all outcomes possibilities may be ignored as such events are not decision variables. The decision variables are not to be measured by the historic costs utilised in regular management accounting reports as the historic costs relate to past transactions and not, therefore, decision variables for the purpose of any current decision. Past transactions are common to all future or current actions and as such are events which are common to all outcomes hence they may be ignored. Relevant information concerns future incremental (or avoidable) costs and revenues (as these can be altered by the current decisions) as well as current opportunity values of existing assets.

Hence the figures incorporated in regularly produced management accounting reports are generally based on past actions and are not to be used for decision making which is concerned with current and future alternative actions. However, frequently, the figures used in the regularly produced statements will be a good first approximation for the values which should be attributed to the relevant decision variables – but this cannot be relied upon to be always the case.

Relevant costs for decision making purposes are:

(i) Opportunity costs of existing assets or past expenditure.

Assets currently held as a result of past expenditure bestow benefits to the owner. It is not the past expenditure which bestows the benefits but the current ownership of the asset and benefits can be measured only by considering the uses to which the asset can be put. Hence for decision making purposes the historic cost is irrelevant as it is the measurement of a past transaction and it does not measure the current benefit derivable from the asset. If a current asset is used for one purpose then its alternative use will be foregone – for the purposes of deciding whether it is worthwhile to forego this alternative use then the benefits which would be derived from that use should be attributed to the asset as its opportunity cost. Opportunity cost is therefore the net revenue which avoidable as a result of the decision.

(ii) Incremental, attributable future costs.

Future costs may be relevant but the essential point is that the future costs be avoidable as a result of the decision. If accepting a decision incurs (or saves) a cost and rejecting the decision does incur (or saves) a cost and rejecting the decision does incur (or save) that cost then the cost is a decision variable. However care must be taken to ensure that only truly avoidable costs are included as relevant, and all truly avoidable costs are treated as relevant – apportioned fixed overhead is not relevant but actual changes in total fixed overhead are relevant to the decision which would cause the change.

These are the types of cost which are relevant for decision making but the actual application of the concept depends upon the precise decision to be made. There is no such thing as the costs for decision purposes which can be applied to an asset on a regular basis – there are instead a variety of relevant costs depending upon the nature of the decision to be made. Thus figures used in routinely produced statements are not useful for decision making purposes as relevant information is situation dependant.

B. THE PRACTICAL USE OF RELEVANT COSTS

There are a number of specific areas where accountants can use the concept of relevant costs and these will be illustrated now: -

(a) Make or buy decisions

(b) Joint product decision i.e. sell or reprocess

(c) Special orders

(d) Key factor decisions

(e) Addition/discontinuance of products

(f) Pricing

(g) Continue/close down decisions

(a) *Make or Buy Decisions*

A common type of decision is a make-buy decision in which the decision maker chooses between buying an item or manufacturing it e.g. should a furniture manufacturer buy in seat cushions or should they try and manufacture them themselves.

The decision may not simply be for tangible products but could be a service facility e.g. sub contract out computer services of use own personnel. Regardless of the type of make-buy decisions the analytical process is the same. Managers attempt to isolate the costs relevant to the decision at hand.

To illustrate let us assume, KA Tractors Limited manufacture a line of garden tractors. Currently the company purchases sub-assemblies for RWF80 a unit which is expected to rise to RWF90 next year. The company is currently operating at 70% capacity and has the ability to manufacture the sub-assemblies itself. This would incur additional leasing costs of RWF25,000 per annum. Current requirements are 5,000 units.

The current costs of manufacturing are as below: -

	RWF		
Direct material	25		
Direct labour	30		
Variable overhead	20		
Additional fixed overhead	5		
Allocated fixed overhead	12		
Total manufacturing cost	92	X 5,000 =	RWF460,000
Purchase alternative	90	X 5,000 =	RWF450,000
	2		RWF10,000

Manufacturing appears to cost RWF2 more per unit. However the figures contain costs which are not relevant to the decision i.e. allocated fixed overhead RWF12 which will be incurred whether manufactured or purchased. These SUNK COSTS should be disregarded because they are already committed and the decision will not alter them.

The relevant cost is only RWF92 - RWF12 = RWF80 and the company can save RWF10 a unit by manufacturing.

However let us assume that the company is operating at full capacity and therefore by producing the sub assemblies it will have to forego the use of the space for alternative production. This alternative may be to produce engine blocks selling at a contribution (i.e. Sales less variable cost of manufacturing) of RWF15 per unit. The decision will therefore be altered so it is better to earn a contribution of RWF15 rather than save RWF10 and thus the company should sub-contract out. The alternative income of the engine blocks are known as the OPPORTUNITY COSTS of the manufacturing decision.

(b) *Joint Product Decision I.E. Sell Or Reprocess*

In general joint product decisions can be categorised as those affecting single products and those affecting the entire group. Allocated joint costs are not relevant to the former decision but are to the latter.

Let us examine AG. Brewing Limited which produces 2 joint products lager and beer and we use 2 of the most common methods of joint cost allocation i.e. physical units and gross profit methods. The schedule of total product costs is as follows: -

Physical Units Method

Product	Sales Price RWF	Production			Joint Costs RWF	Post Split off Costs RWF	Total Cost RWF	Per unit cost RWF
Lager	20	50,000	(G)	(5/6)	625,000	180,000	805,000	16.1
Beer	50	10,000	(G)	(1/6)	125,000	120,000	245,000	24.5
		60,000	(G)		750,000	300,000	1,050,000	

Gross Profit Method

Product	Sales Price RWF	Production			Joint Costs RWF	Post Split off Costs RWF	Total Cost RWF	Per unit cost RWF
Lager	20	50,000	(G)	(82/120)	520,000	180,000	700,000	14
Beer	50	10,000	(G)	(38/120)	230,000	120,000	350,000	35
		60,000	(G)		750,000	300,000	1,050,000	

We can now assume a competitor SUPERBEER comes on to the market at RWF32.50. What decision do we make as the physical units methods says we should continue in production whereas the gross profit method leaves us with a closure decision as the cost of RWF35 exceed revenue by RWF2.50 per unit. Which is correct?

The answer lies in disregarding the joint costs as they are SUNK and are committed anyway. The relevant cost is the costs incurred after split off of RWF120,000 or RWF12 per gallon produced and compare this with the additional (incremental) income generated of RWF32.5 therefore the company should continue production. A contribution of RWF20.5 is earned towards recovering the joint costs which represents increased profit of RWF205,000 from the alternative of discontinuing the line.

Taking this further let us assume that lager can be sold for RWF10 a gallon without processing beyond the split off point. Revenue falls by RWF10 and costs by RWF3.60 (RWF180,000 ÷ 50,000 gallons). Since loss in revenue exceeds costs saved by RWF6.40 the decision must be to continue the product to completion as there would be an overall fall of RWF320,000 in the years profits.

However if instead we can assume that Beer can be sold for RWF27.50 at split off or at RWF32.50 on full completion then the fall in income at split off is only RWF5 a gallon compared with cost savings of RWF12 (RWF120,000 ÷ 10,000 gallons). A net saving of RWF7 a gallon would result increasing profits by RWF70,000.

Joint costs become relevant when an alternative is to discontinue production of all the joint products in the group. For example the company may have a target gross profit on its joint products of say 25% then the following are the relevant costs: -

	RWF
Joint Costs	750,000
Post split-off costs	300,000
Target gross profit (25% x RWF1,325,000)	331,250
	1,381,250
*Sales	1,325,000
Shortfall	(56,250)

*Lager	50,000 gallons at RWF20 =	RWF1,000,000
Beer	10,000 gallons at RWF32.5 (competitor) =	RWF325,000
		RWF1,325,000

(c) *Special Orders*

Often a company is faced with a decision to take on special orders or “one off” orders which have different characteristics than on going orders. Each order should therefore be evaluated based on costs relevant to the situation.

Let us assume the CL Toy Co is currently operating at only 60% capacity. A national toy company approaches the company with a proposal that the firm should produce 200,000 assorted toys at RWF7 each (normal price RWF10).

The firms accountant produces the following information: -

	RWF
Direct materials	2
Direct labour	3
Variable selling and distribution costs	1
Manufacturing overhead allocated	2
	8

It would appear that the company would lose RWF1 for each toy sold but manufacturing overhead is already “sunk” therefore it cannot be relevant to the decision being taken. The additional costs are only RWF6 and therefore each unit sold will make a positive RWF1 contribution towards recovery of fixed overheads and towards profits.

However it would be wrong simply to judge the special order on its quantitative merits along. There are a number of side effects which should be carefully considered in conjunction with the above?

(i) Will acceptance result in further orders from this customer and if I charge this price of RWF7 am I stuck to it?

(ii) What effect will this reduced price have on other customers. Will they demand price decreases or are they likely to turn elsewhere for their business?

(iii) By accepting the special order could I be losing out on other more profitable work elsewhere?

(iv) How long will this spare capacity last?

These are just a few of the problems created by this decision and these may very well in the end outweigh the financial advantages computed as per above.

(d) *Key Factor Decisions*

Contribution Per Key Factors

Sometimes a decision has to be made on whether to produce one product or another. This happens when a multi-product plant is operating at capacity and a decision has to be made as to which orders to accept i.e. the production capacity is the limiting factor.

The contribution approach supplies the data for a proper decision, because the decision is determined by the product that makes the largest total contribution to profit. The objective is to maximise total profits which depend on getting the highest contribution margin per unit of the constraining factor.

A company has two products:

	Product A	Product B
Selling Price	10	15
Variable Expense	7	9
Contribution Margin	3	6
P/V ratio	30%	40%

B seems more profitable than A.

But if there are only 1000 hours of capacity available and that:

A - takes ⅓ hours to produce and

B - takes 1 hour to produce

It follows

	A	B
Units per hour	3	1
Contribution Margin per hour	9	6

Product A should be produced because it contributes the greater contribution per hour.

We can prove this by calculating the profits under both decisions: -

Product A

1000	Hours maximum capacity	1000	Hours maximum capacity
⅓	Hours required for each unit	1	Hour required for each unit
∴ 3000	Total production	∴ 1000	Total production possible
RWF3	Unit contribution	RWF6	Unit contribution
∴ RWF9000	Total contribution	∴ RWF6000	Total contribution

A is clearly the better product to produce despite the fact that each unit is only earning half that of product B. However, the important factor is that product A takes ⅓ of the time to produce as B and therefore with a limiting factor of 1000 hours this outweighs any contribution/unit disadvantage.

Constraining Factor is Labour

1 Unit of A takes 2 hours to produce and a unit of B takes 3 hours

	A	B
Direct material	.25	.15
Direct labour at .05 per hour	.10	.15
Variable overhead at .03 per hour	.06	.09
	.41	.39
Contribution	.59	.81
Selling Price	1.00	1.20
P/V ratio	59%	67%
Contribution per hour	.30	.27

∴ Product A becomes more important when labour is the constraining factor.

Very often where labour is the constraining factor one is asked to indicate possible methods of providing the estimated missing productive capacity which would include the following:

(a) Recruit and train additional personnel.

(b) Resort to employing existing labour on an overtime basis. During the overtime periods, a premium would be paid which would have to be more than offset by the additional contribution. Also to be considered is whether fixed costs and variable overhead will change as a result of the extended use of personnel and facilities. In addition, the effect of the overtime on labour efficiency should be considered.

(c) The production might be contracted out to another manufacturer. In this case the main factor would be the external contract price which would have to be included in the contribution analysis.

(d) Install a second shift.

(e) *Addition/Discontinuance Of Products*

The various reasons for adding or discontinuing products to a company's range are usually to increase profits or reduce the losses. Provided that no fixed investment is required then the incremental analysis should provide a solution.

Let us assume that the firm has spare capacity. An opportunity arises for regular turnover of 10,000 units/month of a new product "x" at a price of RWF1 each. No investment is required. If we assume material and labour to cost 75rwf per unit, additional fixed overheads to cost RWF1,500 per annum then provided there are no better alternatives available the project should go ahead: -

	RWF	RWF
Sales		10,000
Variable costs	7,500	
Additional fixed costs	1,500	
		9,000
Increased contribution		RWF1,000

If facilities were not idle and there were other possibilities then in addition to the above costs OPPORTUNITY COSTS should be considered.

In relation to the decision to discontinue a product the only relevant costs are those which are AVOIDABLE as a result of the decisions. For example a product profitability report could well look as follows: -

	RWF	RWF
Sales		2,500
Variable costs	2,000	
Fixed costs	700	
		2,700
Net Loss		RWF(200)

It would appear that the product should be discontinued but we may find that we can only reduce our fixed overheads by say RWF400 in which case the cost savings are RWF2,400 only which would be less than the RWF2,500 revenue lost. It is therefore essential to analyse expenses to identify how much could be avoided if the product were dropped and ascertain whether any other costs would be incurred e.g. redundancy costs.

(f) *Pricing*

Pricing Decisions: Long Run And Short Run

Pricing a product is one of the most difficult areas for management decision. There are basically two aspects of the problem: -

(a) Long-run pricing policy and

(b) Short-run pricing policy.

(a) Long-run pricing policy

The objective in the long run of a company is to maximise profit. Basically this boils down to maximising the difference between: -

(ii) Total Revenue = units x price and

(iii) Total costs = (units x variable costs) + fixed costs.

In many firms today the pricing policy is quite often simply to add a margin to total cost giving a sales figure. This COST PLUS PRICING can be seriously in error for it fails to take into account the effect of that decision on sales volume. It may be possible to reduce prices and increase profits if the volume is sufficiently elastic in relation to price changes or it may not affect volume and therefore decrease profits. Sufficient to stress that pricing policies should not be reviewed in isolation.

When comparing the effect on unit sales of varying prices what is critical is the contribution margin since fixed costs are unaffected by volume changes. The aim of contribution pricing is to maximise contribution and therefore profits at the same time.

Example

CP Limited prices products at cost plus 50%. Its cost structure and current activity level are as follows: -

	Volume (units)	Capacity Usage	Per Unit RWF	Total RWF
Variable costs	6,000	60%	5	30,000
Fixed costs				50,000
Total cost				80,000
Mark-up (50%)				40,000
Sales	6,000	60%	RWF20	RWF120,000

Market research indicates that a 10% price reduction would increase sales volume by 25%. A contribution approach to the pricing problem clearly shows that profit is higher after the price change than before.

	Volume		Per Unit		Total	
	Before (units)	After (units)	Before RWF	After RWF	Before RWF	After RWF
Sales	6,000	7,500	20	18	120,000	135,000
Capacity usage	60%	75%				
Variable costs	6,000	7,500	5	5	30,000	37,500
Contribution	6,000	7,500	15	13	90,000	97,500
Fixed costs					50,000	50,000
Operating profit					RWF40,000	RWF47,500

However, there are a number of dangers inherent in this approach: -

(i) Fixed costs are only fixed within the RELEVANT RANGE OF ACTIVITY. Once outside this range then we must take account of the impact of the pricing decision on fixed costs. (Example below illustrates this point in a short run context.)

(ii) In the long run all costs will vary.

These two dangers should lead to caution in using a rigid classification of costs.

(iii) By concentrating on contribution management could lose sight of the long term problem of covering fixed costs. This often happens when management allow a short run price which slightly exceeds marginal cost to become the long run price. (See (c) Special Orders above).

(b) Short run pricing policy

In the short term a company can accept orders at a price above marginal cost but below normal full cost provided there is surplus capacity available in the factory and that it does not displace other more profitable work or affect the relationship that the company has with its present customers who may well ask for price reductions as well. This type of marginal cost pricing is used in the public sector a great deal e.g. railway cheap fares in off-peak periods, electricity cheaper off peak usage etc.

Let us now look at an example dealing with varying levels of activity.

Example:

AY Limited is a manufacturing company. At present it is operating at 60% level of activity at which level its sales (at RWF20 per unit) are RWF120,000.

Variable costs are RWF5.00 per units.

Fixed costs amount to RWF50,000 but it is estimated that to achieve 80% - 90% activity level would cause fixed costs to increase by RWF10,000.

The sales manager of the company has proposed that the price of the product should be reduced by 25% so as to reach a wider sales market. As a result the board of directors require a statement showing:

(i) The operating profit of the company at activity levels of 60%, 70%, 80% and 90% assuming:

  (a) No change in price is effected

  (b) A reduction in selling price of 25% is effected and

(ii) The percentage increase on present output which will be required to maintain the present profit if the company reduces the selling price.

Solution

(i) Statement of Operating Profit

	(a)	(b)
	Present Policy	New Policy
	RWF	RWF
Selling Price per unit	20	15
Variable costs per unit	5	5
Contribution cost per unit	15	10

Activity level	60%	70%	80%	90%	60%	70%	80%	90%
Sales units	6,000	7,000	8,000	9,000	6,000	7,000	8,000	9,000
Contribution (RWF)	90,000	105,000	120,000	135,000	60,000	70,000	80,000	90,000
Fixed Costs (RWF)	50,000	50,000	60,000	60,000	50,000	50,000	60,000	60,000
Operating Profit (RWF)	40,000	55,000	60,000	75,000	10,000	20,000	20,000	30,000

(ii) Increase in Production Required:

To maintain the present profit level, one must ascertain the change in contribution i.e. at 60%

Contribution at selling price of RWF20	=	90,000
Contribution at selling price of RWF15	=	60,000
Change		30,000

To offset this falling contribution production must be increased by:

$$\frac{30,000}{60,000} \text{ or } 50\%$$

The production would have to be increased by 3,000 units. Unfortunately, this represents 90% activity level at which level (in fact any level above 80%) fixed costs are increased by RWF10,000 thus reducing profit by the same amount. Therefore, to maintain its existing profit level, the company must cover this extra RWF10,000 by increased contribution from extra units produced.

$$\text{i.e.} \quad \frac{\text{Increased Fixed Costs}}{\text{Contribution per unit}} \quad = \quad \frac{10{,}000}{10} = 1{,}000 \text{ units}$$

Thus in order to maintain its existing profit level the company must produce an extra 4,000 units to offset the effect of its reduced selling price i.e.

6,000 + 4,000 units =	10,000 @ New Contribution =	100,000
	Less Fixed Costs	60,000
	Net Profit	40,000

The above example illustrates how marginal costing may be used to simplify complicated pricing and production decisions, by concentrating on the effect on contribution but at the same time care must be taken that all "relevant" costs are taken into consideration e.g. the increase in fixed costs of RWF10,000 is a "relevant" cost for this decision.

The conclusion should not be reached that all variable costs are relevant and that all fixed costs are irrelevant. This approach over-simplifies the problem as all costs become variable in the long run.

Certain costs may be variable but because of the nature of the decision to be made become irrelevant. Furthermore fixed costs are often affected by a decision. For example the decision to buy (or not to buy) a second car is usually influenced by the fixed costs that go with the second car.

If the length of time under consideration is long enough no cost is fixed. Yet decisions often have to be made in conditions where the length of time is short enough for costs to be fixed.

Fixed costs should therefore, be considered when they are expected to be altered either immediately or in the future by the decision at hand.

C. MARKET VULNERABILITY ANALYSIS

Price Competition and Volume Shortfalls

A simple examination of a firm's cost structure will show how vulnerable it is to market changes in the downward direction.

In particular a businessman with a high variable cost is vulnerable to price competition from competitors who have a low variable cost per unit. They will still be generating a contribution at a price below his variable cost, so that he must sell each unit at a gross loss to compete.

However in conditions of low demand for the product where the price is maintained (i.e. where price reductions will not generate increased demand) the business with the low variable costs and high fixed costs will fare worse. This is because volume shortfalls at a high contribution per unit have a greater impact on profit than at a low contribution per unit. The business with the low variable cost will usually have high fixed costs with the result that volume shortfalls quickly give rise to losses.

Example

Two businesses, A Limited and B Limited, sell the same type of product in the same type of market. Their budgeted Profit and Loss Accounts for the year ending 31st December 19X6 are as follows:

	A Limited		B Limited	
	RWF	RWF	RWF	RWF
Sales (10,000 units)		150,000		150,000
Less:				
Variable costs	120,000		60,000	
Fixed costs	15,000	135,000	75,000	135,000
Net Profit		RWF15,000		RWF15,000

When one considers: -

(a) The break-even points of each business:

(b) The minimum selling price each business can sustain without incurring a gross loss.

(c) The profit (loss) of each business in the event of sales falling to 5,000 units per annum.

These points as to price and volume vulnerability are clearly illustrated.

D. CONTINUE/CLOSE DOWN DECISIONS

A similar decision to the addition/discontinuance of products is the decision whether to continue or close down a department/business. Again the relevant costs in the decision are the AVOIDABLE COSTS.

Let us examine a simple department store with 3 departments whose results are as follows:

	Total	Groceries		Hardware		Furniture	
	RWF	RWF		RWF		RWF	
Sales	490,000	100,000		180,000		210,000	
Variable costs	332,000	80,000		126,000		126,000	
Contribution	158,000	20,000	(20%)	54,000	(30%)	84,000	(40%)
Fixed costs	76,000	21,000		20,000		35,000	
	82,000	(1,000)		34,000		49,000	

At first glance we should close down the grocery departments as there is a loss of RWF1,000. However this assumes that all RWF21,000 of fixed costs will be save. This is unlikely as there are a number of COMMON COSTS which have been apportioned to all 3 products.

As well as that there are a number of other considerations: -

(i) Will I have customers for my other two departments if I close groceries down i.e. groceries are a loss leader.

(ii) Are there alternatives for other new departments which might make a larger contribution.

(iii) Could I expand on hardware and furniture in the space now occupied by groceries and earn a higher contribution.

Let us assume that after further analysis of the fixed costs we discover that of the RWF21,000 fixed costs, RWF6,000 are unavoidable. Thus the decision to close down the grocery department would result in a net revenue loss of RWF5,000 (100,000 – 95,000). However, taking this further we could assume that the idle space now left, could be used by the expanding hardware department when sales could increase of RWF150,000 which at a contribution of 30% should result in RWF45,000 additional contribution. In order to do this, however, additional capital investment of RWF10,000 is essential together with an additional member of staff costing RWF6,000. The net effect of all this is to increase contribution from the original by RWF24,000 as follows:

	Original	Close Groceries Extend Hardware	Difference
	RWF	RWF	RWF
Sales	490,000	540,000	50,000
Variable costs	332,000	357,000	(25,000)
Contribution	158,000	183,000	25,000
Fixed costs	76,000	77,000	(1,000)
	82,000	106,000	24,000

E. MARGINAL COSTING IN DECISION MAKING

Question 1

You are consulted by XYZ and Company Ltd to advise on the sales policy which they should adopt. The following information is available from the system of total costing in operation for the year end 30 June.

	Product Classifications			
	A	**B**	**C**	**D**
	RWF	RWF	RWF	RWF
Expense Element				
Material costs	2,000	4,000	1,000	3,000
Labour costs	1,000	1,500	500	1,250
Fuel and power costs	300	500	100	200
Direct expenses	400	800	700	500
Sales Levels	10,000	14,000	6,000	12,000

You evaluate the cost structure of the expense elements and find it to be as follows:

Material costs	-	100% variable
Labour costs	-	20% fixed
Fuel and power costs	-	10% fixed
Direct expenses	-	10% variable

The overhead expenses are established at the following figures, and your assessment of the cost structure is also shown:

Factory overheads	-	10% variable	RWF6,500
Admin. overheads	-	80% fixed	RWF2,000
Sales overheads	-	60% fixed	RWF10,000

The administration overheads should be spread equally between factory and sales overheads. The variable sales overheads are directly related to sales value, and the factory overheads of a variable nature are related to direct labour costs.

Prepare a statement which shows management in the clearest possible fashion which product is most profitable, and also a statement to show the effect of two proposals made by the sales manager:

(a) That the sale of C can be increased by 10% if a better grade of material is used. This will increase the variable material cost by 5% per unit.

(b) That A and D are similar in market appeal, and if A were eliminated the sales of D would rise by 50%.

Solution

XYZ & CO. LTD

Profit Statement - Year End 30 June

	A	**B**	**C**	**D**	**Total**
	RWF	RWF	RWF	RWF	RWF
Direct material - 100%	2,000	4,000	1,000	3,000	10,000
" labour - 80%	800	1,200	400	1,000	3,400
" fuel and power - 90%	270	450	90	180	990
" expenses - 10%	40	80	70	50	240
	3,110	5,730	1,560	4,230	14,630
Add Variable works cost					
25% on direct labour	200	300	100	250	850
Variable selling					
cost 10% on sales					
value	1,000	1,400	600	1,200	4,200
Marginal cost	4,310	7,430	2,260	5,680	19,680
Sales value	10,000	14,000	6,000	12,000	42,000
Contribution	5,690	6,570	3,740	6,320	22,320

Less fixed expenses	16,570
Net profit for half year	RWF5,750

Calculations

(a) **Statement of Fixed Expenses**

			RWF
Labour costs	-	20%	850
Fuel and power	-	10%	110
Salaries and expenses	-	90%	2,160
Works overheads	-	90%	5,850
Admin. overheads	-	80%	1,600
Selling overheads	-	60%	6,000
			RWF16,570

(b) **Calculations of Overhead Absorption Rates**

(i) Direct labour costs - variable RWF3,400

(ii) Variable factory overheads - 10% RWF650
Share of admin. variable
overheads - 50% of 20% RWF200 RWF850

(iii) Overhead absorption rate =

$$\frac{\text{Cost}}{\text{Activity}} \times 100 = \frac{850 \times 100}{3,400} = 25\% \text{ on direct labour}$$

(iv) Total sales value RWF42,000

(v) Variable selling overheads
- 40% RWF4,000
Share of admin. variable
overheads - 50% of 20% RWF200 RWF4,200

(vi) Overhead absorption rate =

$$\frac{\text{Cost}}{\text{Activity}} \times 100 = \frac{4,200}{42,000} \times 100 = 10\% \text{ on sales value}$$

Revised Profit Statement

Giving Effect to Sales Manager's Proposals

	B	C	D	Total
	RWF	RWF	RWF	RWF
Direct materials	4,000	1,155	4,500	9,655
" labour	1,200	440	1,500	3,140
" fuel and power	450	99	270	819
" expenses	80	77	75	232
	5,730	1,771	6,345	13,846
Add Variable works cost	300	110	375	785
Variable selling cost	1,400	660	1,800	3,860
Marginal cost	7,430	2,541	8,520	18,491
Sales value	14,000	6,600	18,000	38,600
Contribution	6,570	4,059	9,480	20,109
Less Fixed expenses				16,570
Revised net profit				RWF3,539

Conclusion
The suggestion that the grade of material used in Product C should be improved is worth pursuing, since the contribution made by that product will be increased.

However, the suggestion that Product A be dropped is not worthwhile, since the extra contribution gained by Product D does not compensate for the contribution lost on Product A.

Question 2
The XL Co. Ltd manufactures four products, "Mainline", "Trimline", "Exline" and "Superline". The costs and revenues are as follows:

XL CO. LTD.

	Mainline	**Trimline**	**Exline**	**Superline**
	RWF	RWF	RWF	RWF
Revenue for year	10,000	15,000	30,000	15,000
* Variable costs	5,000	6,000	20,000	9,000
Fixed costs	6,000	4,000	5,000	8,000
Total costs	11,000	10,000	25,000	17,000
PROFIT		RWF5,000	RWF5,000	
LOSS	RWF(1,000)			RWF(2,000)

* Note that variable costs include prime costs and variable overhead costs.

The directors are considering whether or not to eliminate the products on which losses are being incurred and concentrate only on the products earning profits. The sales of these latter products, they are advised, are unlikely to increase and this fact makes the problem more difficult.

You, as management accountant, are required to present the information in the most appropriate manner and advise the board of directors on the best course to follow.

Answer

(a) Marginal Profit and Loss Statement

Product	Sales Value	Marginal Cost	Contribution
	RWF	RWF	RWF
Mainline	10,000	5,000	5,000
Trimline	15,000	6,000	9,000
Exline	30,000	20,000	10,000
Superline	15,000	9,000	6,000
	70,000	40,000	30,000
Less Fixed costs			23,000
		Net Profit	RWF7,000

(b) Position when Trimline and Exline Only are Produced

Product	Sales Value	Marginal Cost	Contribution
	RWF	RWF	RWF
Trimline	15,000	6,000	9,000
Exline	30,000	20,000	10,000
	45,000	26,000	19,000
Less Fixed costs			23,000
		Loss	RWF4,000

Clearly the position portrayed (RWF4,000 loss) shows that the elimination of Mainline and Superline will result in a loss instead of a profit.

(c) Position when Superline Only is Eliminated

Product	Sales Value	Marginal Cost	Contribution
	RWF	RWF	RWF
Mainline	10,000	5,000	5,000
Trimline	15,000	6,000	9,000
Exline	30,000	20,000	10,000
	55,000	31,000	24,000
Less Fixed costs			23,000
		Profit	RWF1,000

(d) Position when Mainline Only is Eliminated

Product	Sales Value	Marginal Cost	Contribution
	RWF	RWF	RWF
Trimline	15,000	6,000	9,000
Exline	30,000	20,000	10,000
Superline	15,000	9,000	6,000
	60,000	35,000	25,000
Less Fixed costs			23,000
		Profit	RWF2,000

(e) Recommendations

(i) If sales volumes of the four products cannot be increased, then all four should be produced as at present. In this way the total possible net profit of RWF7,000 per annum is earned.

(ii) "Mainline" makes a contribution of RWF5,000, so it is worth continuing.

(iii) "Superline" makes a contribution of RWF6,000, so that too is worth continuing.

(iv) If apportionments of fixed overheads are felt to be essential, then a more accurate basis for the calculation may have to be found.

(v) A market research investigation into the potentialities of the products is recommended. Possibly a sales campaign may allow larger volumes to be produced which, in turn, would result in a larger total contribution.

F. DECISION MAKING INVOLVING A SINGLE LIMITING FACTOR

“A limiting factor is any factor that is in scarce supply and that prevents the organisation from expanding its activities further, i.e. it limits the organisation’s activities”

For many organisations, the limiting factor is sales because they simply cannot sell as many units as they would like. Therefore, their ability to expand is restricted or limited.

But other factors may also be limited (and this is especially the case in the short term). For example, machine capacity, raw materials or the supply of skilled labour may be limited for the period (or until some remedial action resolves the situation)

If an organisation is facing a situation involving a ***single*** limiting factor (i.e. where only one resource is in short supply), then it must ensure that a production plan is established that maximises the organisation’s profit using the available capacity of this resource.

Assuming that fixed costs remain constant, this is the same as saying that that the ***contribution*** must be maximised from the use of the scarce resource. The profit of an organisation in this situation will be maximised by ***maximising the contribution per unit of the limiting factor.*** This is the decision rule that must be followed.

Example 1
NT Ltd manufactures three products; X, Y and Z. All three products use two materials A and B. Due to adverse weather conditions and poor growth yield, the supplier of the materials has informed NT that the supply of A and B will be limited to the following quantities for the next period:

Material A	1,030 kg
Material B	1,220 kg

No other source of supply can be found for the next period.
Information relating to the three products manufactured by NT Ltd is as follows:

	X	**Y**	**Z**
Quantity of material used per unit manufactured:			
Material A (kg)	2	1	4
Material B (kg)	5	3	7
Maximum sales demand (units)	120	160	110
Contribution per unit sold (RWF)	15.00	12.00	17.50

Because the products are perishable, no finished goods stocks are held

REQUIREMENT:

(a) Recommend a production mix that will maximise the profits of NT Ltd for the forthcoming period

(b) NT Ltd has a valued customer to whom they wish to guarantee the supply of 50 units of each product next period. Would this alter your recommendation?

Solution

(a) The first step is to check whether the supply of each material is adequate or whether either or both of them represent a limiting factor.

	X	**Y**	**Z**	**Total**
MAXIMUM SALES DEMAND (UNITS)	**120**	**160**	**110**	
Material A required per unit (kg)	2	1	4	
Total Material A required (kg)	240	160	440	840
Material B requires per unit (kg)	5	3	7	
Total Material B required (kg)	600	480	770	1,850

It can be seen that there will be sufficient material A to satisfy the maximum demand for the products but material B will be a limiting factor.

Thus, we employ the decision rule mentioned earlier, i.e. maximise the contribution per unit of limiting factor. Rank material B in this order and then allocate according to this ranking.

	X	**Y**	**Z**
Contribution per unit sold	RWF15	RWF12	RWF17.50
Material B per unit (kg)	5	3	7
Contribution per kg of material B	RWF3	RWF4	RWF2.50
Ranking	2	1	3

Therefore, NT Ltd. should produce as much of Product Y as possible. Then, when maximum demand for Y has been met, produce Product X and finally, with any material B leftover, produce product Z.

The optimal production plan for the next period will be:

Product	Recommended Production (units)	Material B Utilised (kg)	Total Contribution (RWF)
Y	160	480	1,920
X	120	600	1,800
		1,080	3,720
Z	20*	140(balance)	350
		1,220	4,070

* After satisfying the demand for X and Y, 140 kg of Material B will be available for the production of Product Z. Since Product Z requires 7 kg of Material B per unit, a maximum 20 units of Product Z can be produced.

(b) The recommended production plan in part (a) does not include sufficient Product Z to satisfy the requirements of 50 units for the valued customer. Some of the material allocated to Product X (second in the ranking) must be allocated to Product Z. The recommended production plan will now be as follows:

Product	Recommended Production (units)	Material B Utilised (kg)	Total Contribution (RWF)
Y	160	480	1,920
X	78*	390(balance)	1,170
		870	3,090
Z	50	350	875
		1,220	3,965

* since the original production plan did not meet the needs of the valued customer, it will be necessary to divert resources so that sufficient Product Z will be produced.

Then the maximum amount of Product Y will be produced (first in the ranking) and the remainder of Material B will be used to produce Product X

It can be seen that the total contribution will be lower than the production plan in part (a). But the altered plan makes the best use of the available material B within the restriction of market requirements. Failure to meet the requirements of the valued customer might lead to loss of future business as this customer may take their business elsewhere.

Example 2

ELG Ltd. manufactures three products A, B and C. The products are all finished on the same machine. This is the only mechanised part of the process. During the next period, the production manager is planning an essential major maintenance overhaul of the machine. This will restrict the available machine hours to 4,200 hours for the next period.

Data for the three products is:

	A	**B**	**C**
	RWF per unit	**RWF per unit**	**RWF per unit**
Selling price	90	51	63.00
Variable Cost	39	18	27.00
Fixed Production Cost	30	24	18.00
Other fixed cost	6	3	10.50
Profit	15	6	7.50
Maximum demand (units per period)	750	420	390

No stocks are held.
Fixed production costs are absorbed using a machine hour rate of RWF6 per machine hour.

REQUIREMENT:

Determine the production plan that will maximise profit for the forthcoming period.

Solution

Firstly, calculate how many machine hours are required for each product:

	A	B	C	Total
Fixed production costs per unit at RWF6 per hour	RWF30	RWF24	RWF18	
Machine hours per unit	5	4	3	
Maximum demand (units)	750	420	390	
Maximum hours required	3,750	1,680	1,170	6,600

Since 6,600 machine hours are required and only 4,200 are available, machine hours are a ***limiting factor***. To maximise profit for the period, it is necessary to ***<u>maximise the contribution</u> per unit of scarce resource***. In other words, maximise the contribution per hour of machine time

(Note: Do not allocate hours according to profit per hour or profit per product)

Now, calculate the contribution per machine hour from each of the products:

	A RWF	B RWF	C RWF
Selling price per unit	90	51	63
Variable cost per unit	39	18	27
Contribution per unit	51	33	36
Machine hours per unit	5	4	3
Contribution per hour	RWF10.20	RWF8.25	RWF12.00
Ranking	2	3	1

The available hours can be allocated according to this ranking.

Product	Units to be produced	Machine Hours
C	390 (maximum demand)	1,170
A	606 (balance)*	3,030
		4,200

* After producing the maximum number of Product C, there will be 3,030 machine hours left available. Product A is the second ranking product, requiring 5 machine hours per unit. Therefore, only 606 can be produced in the available time. This is less than the maximum market demand of 750 units. Consequently, no units of Product B will be produced as there is no machine time available.

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Study Unit 14

Standard Costing and Variance Analysis

Contents

Standard Costing and Variance Analysis

Contents (Continued)

A. INTRODUCTION

Planning and Control

One of the principal objects of any management accounting system should be to assist in the planning and control of operations. The techniques of budgetary control and standard costing can help management carry out this vital function.

In this study unit and the next we will be looking at the objectives and methods of standard costing; these will help you understand its purpose, the methods by which standards are set, the procedures for calculating variances, and the interpretation of variances. In subsequent study units we will look in detail at budgetary control.

Budgetary Control and Standard Costing Compared

Whereas budgetary control is concerned with the **overall plans** of the organisation and assignment of responsibilities for control over revenues and expenditure, standard costing is concerned with the establishment of **detailed performance levels**, together with the related costs and revenues per unit and in total for the planned activities of the organisation.

Both budgetary control and standard costing have certain features in common:

- The setting of targets or standards
- The recording of actual results
- The comparison of actual results with standards (or budgeted)
- The computation of variances and their analysis

These all assist in defining the 'gatekeeper' role of the management accountant.

Definitions

The Chartered Institute of Management Accountants, in its terminology, gives the following definitions:

(a) Standard Costing

A technique which uses standards for costs and revenues for the purpose of control through variance analysis.

(b) Standard Cost

A predetermined calculation of how much costs should be under specified working conditions. It is built up from an assessment of the value of cost elements and correlates technical specifications and the quantification of materials, labour and other costs to the prices and/or wage rates expected to apply during the period in which the standard cost is intended to be used. Its main purposes are to provide bases for control, through variance accounting, for the valuation of stock and work in progress and, in some cases, for fixing selling prices.

Value and Use of Standards

We can see from these definitions that standards are compiled prior to production taking place, and that they relate to **specific assessments** of physical quantities and cost. They are, in fact, yardsticks against which actual quantities and costs or revenues can be measured. If circumstances or conditions change, then a revision of standards will be required - so the standards in use reflect the current specifications. The standards may also be subject to annual or periodic **updating**.

B. TYPES OF STANDARD COST AND SYSTEM

- **Ideal Standard Costs**

  These are based on **ideal** conditions - i.e. 100% efficiency is expected from workers, machinery and management: it is only in an automatic and very efficiently run factory that ideal standard costs are likely to be achieved.

- **Attainable Standards**

  These are based on **attainable** conditions, and they are more realistic than ideal standard costs. Provided that all the factors of production are made as efficient as possible **before** the standards are set, the standard costs are likely to be of great practical value. They represent, to workers and management, realistic figures, capable of achievement. The variances really do mean increased or reduced efficiency.

- **Basic Standard Costs**

  These are a special type of standard cost. The idea is to select a ‘base year’, and then set the standards (ideal or attainable **at that time**). The standard costs then remain in force for a number of years without being revised.

  Their main advantage is that **trends in costs** over a number of years can be seen quite easily. Another advantage is that the **actual value** of stocks is known - and so there is no problem of converting standard costs to actual costs for use in final accounts. This assumes, of course, that it is desirable to use the actual cost of the stocks. There is a tendency to advocate the use of the standard costs for stock valuation and, if this view is taken, there is no disadvantage in using ordinary standard costs.

The chief weakness of basic standards is that they do not allow the **efficiency achieved to be measured**.

- **Current Standard Costs**
  These are standard costs which represent **current conditions** - i.e. they are kept up-to-date. Ideal standards and attainable standards are current standard costs, which are changed when conditions change (normally once a year).

C. SETTING STANDARDS

- **Direct Materials**
- **Direct Labour**
- **Variable Overheads**
- **Fixed overheads**
- **Sales Variances**

Essential Prerequisites

(a) Before manufacturing costs can be predetermined, the following factors must be stated:

  (i) The **volume** of output.

  (ii) The relevant, clearly-defined, **conditions** of **working** (grade of materials, etc.).

  (iii) The predetermined **level of efficiency**.

  Each element of cost - material, labour and overhead - must be taken in turn, and the standard cost for each product determined. The object must be to ascertain what the costs **should** be, not what they **will** be.

(b) Before any attempt is made to set the standards, all functions entering into production should be examined and made efficient. Only then will it be possible to have standard costs which represent true measures of efficiency.

(c) The following have then to be predetermined:

  (i) Standard Quantities

Due allowance should be made for normal losses or wastage. Abnormal losses should be excluded from the standards, as these are not true costs.

(ii) Standard Prices or Rates

The aim should be to estimate the trend of prices or rates, and then predetermine these having full regard to expected increases or reductions.

(iii) Standard Quality or Grade of Materials, Workers or Services

Unless the appropriate grade of material or worker is clearly defined when the standards are set, there will be great difficulty in measuring accurately any variance which may arise. A lower-grade material may mean an adverse material usage variance and a favourable material price variance - the one tending, to some extent, to cancel out the other. This sort of situation is bound to arise, unless materials are standardised and the appropriate grade for a product strictly defined: all variances are, in some way, **related to each other**.

Application of Standard Costing

Standard costing is applied most successfully to **continuous or repetitive operations**, where **large volumes of a standard product** are produced. The application of standard costing principles to job costing systems is more difficult, as products will vary - each one may be unique. As the products themselves are not standardised, the emphasis will be on the machines and operations concerned. Standard feeds and speeds for machines may be developed, as well as output for handwork operations. These standards will then be applied to the specifications for individual products.

Setting Standard Costs for Direct Materials

The product is analysed into its **detailed material requirements**, and all the materials are listed on a form called a standard material specification.

(a) Material Quantities

Determination of material quantities may be accomplished by one of the following methods:

(i) Referring to past records - e.g. stores records kept when historical costing was adopted.

(ii) Making a model of the product, noting all significant facts when the test runs are carried out.

(iii) Establishing the relationship between the size or weight of the product and the material content, thereby calculating the standard quantity - in the case of screws, for example, the weight of the screws will indicate the metal content, and a standard quantity can then be fixed.

Great care must be exercised in calculating a reasonable allowance to cover **unavoidable material wastage** - owing to cutting, for example.

(b) Material Prices

Standard prices for materials will be set by the purchasing officer and the accountant.

The actual practice adopted can vary from company to company. Some companies set standards based on what is **expected** to be the average price ruling during the budget year. This has the effect of over-costing products during the first half of the year, and under-costing them during the second half. These differences are called **variances**; we will cover their calculation in the next study unit.

An alternative approach is to set standard prices based on actual prices ruling on the first day of the new financial year. This can be completed before the year begins, as suppliers generally notify price increases in advance. As standards are based on actual prices at the beginning of the year, it is necessary to calculate a budget for material price variances which is the company's estimate of the impact **inflation** will have on material prices.

This approach has the advantage that costs are based on actual prices and not on forward estimates which may or may not be accurate. The standard cost represents the actual cost on the first day of the year and can be used with confidence by the marketing team. As the year progresses the actual material prices will be compared with these standard prices and the financial impact on the company calculated. By comparing actual prices with the prices ruling on the first day of the year, it is possible to get an accurate assessment of the rate of inflation applicable to material purchases. This information will be compared with the forecast rate of inflation built into the company's budget, and can be used to assess the need for selling price adjustments or other corrective actions.

(c) Standard Cost

The standard cost is obtained as follows:

Standard quantity × Standard price

This will be done for each type of material, and the totals added together to arrive at the **standard material cost** for the product.

Setting Standard Costs for Direct Labour

An analysis of the **operations required** to manufacture each product will be essential before the standards are set. The correct **grade of worker** for each operation must also be established.

(a) Standard Time for Each Operation

The standard time for each operation will be set by one of the following methods:

(i) Referring to **past records**, and then adjusting to allow for any changes in conditions.

(ii) Use of **time-studies based on work study**. Each element of an operation is timed, and then a total standard is determined by adding together all the element times and adding on allowances for relaxation, interruption, etc.

(iii) Employment of **synthetic time-studies**. This is really a combination of (a) and (b). Detailed records are built up by the use of the time-studies, and then, from these records, the appropriate elemental times are selected to arrive at the total standard time for any operation which has not been timed.

(b) Standard Wage Rates

As with material prices, the actual practice adopted will vary from company to company. Some companies base their standards on what they expect to be the average rate during the budget year. This means that they have to anticipate wage increases and changes in methods. An alternative approach is to base standard labour costs on the rates and methods applicable on the first day of the financial year, and then forecast variances based on projected wage increases and changes in methods. In this way the standard labour cost for each product represents the actual cost on the first day of the financial year, and provides similar advantages to those which we outlined in the previous section on material prices.

When an incentive method of payment is in operation, setting the standard rate may be relatively simple. For example, for a piece-rate system, the standard rate will be the fixed rate per piece. To avoid having too many rates, **average rates** may be used.

To summarise, the standard cost for direct labour is:

Standard direct labour-hour × Standard direct labour rate

Setting Standard Costs for Overheads - Variable
- Fixed

Overhead costs are often the most difficult costs to predetermine.

(a) Preliminary Classification

One of the first steps will be to divide such costs into the following three classes:

- Fixed overhead costs
- Variable overhead costs
- Semi-variable overhead costs

(i) Fixed Overhead Costs

In this class, the total remains the same irrespective of output, and they are often known as **policy costs**. Top management determines the extent of the fixed costs when formulating policy.

(ii) Variable Overhead Costs

In this class, the total increases with increased output, and reduces with decreased output, since variable overhead costs are fixed at so much per unit of output or standard hour. For example, the rate may be RWF0.35 per unit - so, for each additional unit of output to be produced, a further RWF0.35 must be included in the budget.

(iii) Semi-variable Overhead Costs

These are partly fixed and partly variable, and they have to be divided into two parts - thus showing quite clearly the fixed element and the variable element. Once the division has been made, predetermination of the costs is greatly facilitated. The two methods used for separating fixed and variable costs are both statistical techniques:

- Use of a regression chart
- Use of the method of least squares

(b) Determination of Standard Amounts

This may be done by using past records or by using a form of time-study, when work can be divided into work units. For example, it may be possible to estimate the requirements so far as factory cleaners are concerned by fixing a time per square yard of floor for sweeping, washing, or other appropriate tasks.

The volume of output must be predetermined, especially so that total variable costs for each type of expense may be calculated. Particular attention must be paid to the allowances to be made for normal time losses (labour absenteeism, waiting for material, tools, etc.) and also the abnormal time losses owing to a falling-off in the volume of sales. It has been suggested that up to 20%, or even more, may have to be deducted to arrive at a 'normal capacity to manufacture', and a **further** 20% or thereabouts deducted to arrive at a figure to cover losses of sales (known as the 'normal capacity to produce and sell'). In the latter case, the long-term (say, six or seven years) figures are taken, and then a net yearly average is calculated.

(c) Preparation of Budgets for Factory Overheads

Once the appropriate capacity has been selected and the costs have been classified into fixed or variable, the factory budgets can be prepared. Usually they are prepared departmentally - i.e. a separate budget for each cost centre or department. The hourly rate (machine-hour or direct labour-hour) is then calculated for each cost centre, and applied on the appropriate standard cost card.

For each volume of output, it is possible to have a cost equation, which may take the following form:

(Variable Units to)

Total for each class of expenses = Fixed costs + (cost per unit × be made)

The 'units to be made' may be expressed in terms of physical units or in standard hours. The variable cost per unit will have been ascertained from the direct material and labour content, together with variable overheads. Once the variable cost per unit has been calculated, the budget may be built up stage by stage, by entering each expense, and then its amount.

Note in particular the fact that in practice two types of budget are in use:

(i) Fixed Budget

This shows the output and costs for one volume of output only; it thus represents a rigid plan.

(ii) Flexible Budget

A number of outputs will be shown, together with the cost for each type of expense. The fixed costs will be the same for all volumes of output, whereas the variable costs will increase with increases in activity.

Standard Product Costs

Standard product costs are compiled for each product made. This is done by bringing together the standard product materials specifications, the standard operations, the performance standards, and the standard rates. A standard product cost card is shown in Figure 5.1.

Machine Time or Operator Time

So far, the standard rates for labour and overheads have been expressed in terms of operator time. However, in some circumstances the direct process time is relevant to the machine-hour, rather than the labour-hour. In these cases, labour and overhead are expressed in terms of a **machine-hour rate**.

STANDARD PRODUCT COST				
Product Group: Supershields			**Part No. - S12**	
			UNIT - PER PART	
Standard materials spec.	Std Qty	Std Price	Cost	Work-in-progress
	lb	RWF	RWF	RWF
EN 2.A.1.25 steel	30.0	0.04	1.200	1.200
Scrap and swarf*	(12.0)	0.004	(0.048)	(0.048)
Standard mtls cost	18.0		1.1520	1.1520
Standard operations	Std time	Std m/c hr rate	Cost	
	Std hrs	RWF	RWF	
Press out on 70 ton Press	0.01	1.32	0.0132	1.1652
Turn on capstan	0.04	1.26	0.0504	1.2156
Braze	0.02	1.22	0.0244	1.2400
Pack	0.05	1.20	0.0600	1.3000
Works std cost				1.3000
Admin. overhead - 10% of wks std costs				0.1300
Selling overhead - 3% of wks std cost				0.0390
Total std cost				1.4690
Std selling price				1.60
Std gross margin (on wks std cost)			18.75%	0.30

(*Brackets denote a minus figure.)

Figure 5.1: Standard Product Cost Card

Computerised Systems

The standard-setting process is enhanced if the company has invested in computerised Material Requirements Planning (MRP) systems which require a detailed breakdown of every component and sub-component used in the finished product. These systems are used in the production planning and purchasing functions, and allow companies to ‘explode’ the forecast production programme into a detailed list of all the material and components required to manufacture it. This requirement can then be compared with the company’s stock positions so that order quantities can be calculated. It is therefore relatively easy to add the standard cost of each component to the computer system, which then enables the computer to calculate the standard cost of each product. The purchasing system is often linked into MRP systems and as a result it is also possible to update standard costs to actual costs.

D. TYPES OF VARIANCE

The difference between a standard cost (or budgeted cost) and an actual cost is known as a **variance**.

Favourable and Adverse Variance

Variances may be favourable or adverse. If actual cost exceeds standard or budgeted cost, then the variance is **adverse**. On the other hand, if actual cost is less than standard or budgeted cost, then the variance is **favourable**. Note that overhead volume variance is an exception to this general statement. An adverse variance is usually shown in brackets.

Classification According to Cost Element

To make the variances as informative as possible, they are analysed according to each **element of cost** - i.e. material, labour and overhead. A further analysis is then made, under each heading (material, etc.), according to price and quantity.

We will be discussing further subdivisions of some of these variances later.

E. THE STANDARD HOUR

CIMA Definition

Perhaps the most satisfactory way of explaining this expression is to consider the definition put forward in the CIMA terminology. This defines the standard hour/minute as:

> *The quantity of work achievable at standard performance, expressed in terms of a standard unit of work in a standard period of time.*

Measure of Output Achieved

From this definition, you can see that a **standard hour refers to a measurement of output**, and not to the physical passage of time. If an operative works harder than envisaged by the standards, he may produce 1.25 standard hours within the physical time of 60 minutes; and, conversely, if he works more slowly than standard he may only produce 0.75 standard hours in 60 minutes.

In assessing output, the time passage will be 60 minutes and the number of units produced in that time will be recorded to establish the output of a standard hour. Suppose a factory produces rulers, and in 60 minutes it is observed that an operative can produce 400 rulers, then 1 standard hour's output will be assessed at 400 rulers. Further, suppose that, in the course of an 8-hour day, the output of an operative was 3,600 rulers; on the basis of the agreement the output would be assessed at 9 standard hours.

Note: 9 standard hours have been produced in 8 clock hours. This distinction between standard hours and clock hours is vital to the statistics of standard costing.

Example

AB & Co. Ltd produces cars of differing engine capacity, the output being assessed in standard hours as shown overleaf:

Engine Capacity	Standard Hours Per Unit
1,000	20
1,500	32
2,000	40
2,600	50

The output statement for a week could then be shown in the following way:

AB & CO. LTD

OUTPUT - WEEK NO. 14

Product (Engine Capacity)	Standard Hours per Unit	No. of Cars Produced	Output in Standard Hours
1,000	20	120	2,400
1,500	32	140	4,480
2,000	40	30	1,200
2,600	50	25	1,250
			9,330

Obviously, when there are changes in methods of production, output comparisons week by week will not be valid. The figures produced above are not affected by changes in rates of pay or any change in the value of money.

The standard overhead cost is expressed as:

Standard hours × Standard overhead rate

F. MEASURES OF CAPACITY

CIMA Definitions

The CIMA terminology includes three measures of capacity:

(a) Full Capacity
Production volume expressed in standard hours that could be achieved if sales orders, supplies and workforce were available for all installed workplaces.

(b) Practical Capacity
Full capacity less an allowance for known unavoidable volume losses.

(c) Budgeted Capacity

Standard hours planned for the period, taking into account budgeted sales, supplies and workforce availability.

Level of Activity Ratios

Using the above measures as a starting point, various ratios can be developed to show the level of activity attained, and the **efficiency of production**. The CIMA terminology refers to three ratios: idle capacity, production volume and efficiency.

You can see that full capacity refers to an ideal situation, where there are no losses of any kind. Practical capacity reflects an attainable level of performance, while budgeted capacity takes into account anticipated conditions in relation to sales, production and labour facilities which will be available.

Let's assume the following data for an accounting period:

(a)	Practical capacity expressed in standard hours	10,000
(b)	Budgeted capacity in standard hours assuming 80% efficiency	8,000
(c)	Standard hours produced	7,000
(d)	Actual hours worked	8,500

The following ratios can be produced:

(i) Idle capacity ratio

$$\frac{(a)-(b)}{(a)} = \frac{10,000-8,000}{10,000} = 20 \text{ per cent}$$

(ii) Production volume ratio

$$\frac{(c)}{(b)} = \frac{7,000}{8,000} = 87.5 \text{ per cent}$$

(iii) Efficiency ratio

$$\frac{8,500}{10,000} \text{ X } 100 = 85\%$$

G. LIMITATIONS OF STANDARD COSTING

There are criticisms of the appropriateness of standard costing in the modern industrial environment. The main ones include:

- Standard costing was developed when the business environment was more stable and operating conditions were less prone to change. Stable conditions cannot be assumed in today's dynamic environment.
- Performance to standard used to be considered satisfactory, but constant improvement must now be aimed for in order to remain competitive.
- The emphasis on labour variances is no longer appropriate with increasingly automated production methods.

A business's decision to use standard costing must depend on its effectiveness in helping managers make correct decisions. Standard costing may be useful even where the final output is not standardised. It may be possible to identify various standard components and activities for which standards can be set and used effectively in planning and control. Also, the use of demanding performance levels in standard costs may help to encourage continuous improvement.

Remember that if comparison between actual and standard cost is to be meaningful, standards must be valid and relevant, so it is important for standard cost to be kept as up-to-date as possible. **Frequent updating of standards** may be required to ensure that they fairly represent the latest methods and operations, and the latest prices which must be paid for the resources being used.

H. PURPOSE OF VARIANCE ANALYSIS

Guide to Management Action

Having established quantity standards for sales, materials and direct labour with the relevant standard sales and cost values, actual operational results are compared with the standard allowances. The differences between the money values for the actual and standard results are known as variances. These variances are intended as a guide to the management, to identify the causes of discrepancies between actual and standard performance and to provide a basis for corrective action and decision-making.

Follow-up Procedures

It is important that **follow-up procedures** are established to investigate the causes of significant variances - otherwise the full benefits of standard costing will not be realised.

I. MEANING AND POSSIBLE CAUSES OF VARIANCES

In studying the analysis of variances, you should not only understand the techniques of the calculations but also the meaning and possible causes of variances.

Scheme of Analysis: Absorption Costing

Variances are calculated for

- Sales
- Direct wages
- Direct materials
- Variable overheads
- Fixed overheads

In each case, the variances are classified according to their **nature** - whether price, efficiency or volume - each type of variance having its own title. The analysis of variable and fixed overheads will depend upon whether absorption or marginal costing methods are used. In the following calculations, **absorption costing** principles are adopted. The forms of analysis used when marginal (variable) costing methods are employed will be given later. The chart in Figure 6.1 shows the main variances produced under absorption costing methods.

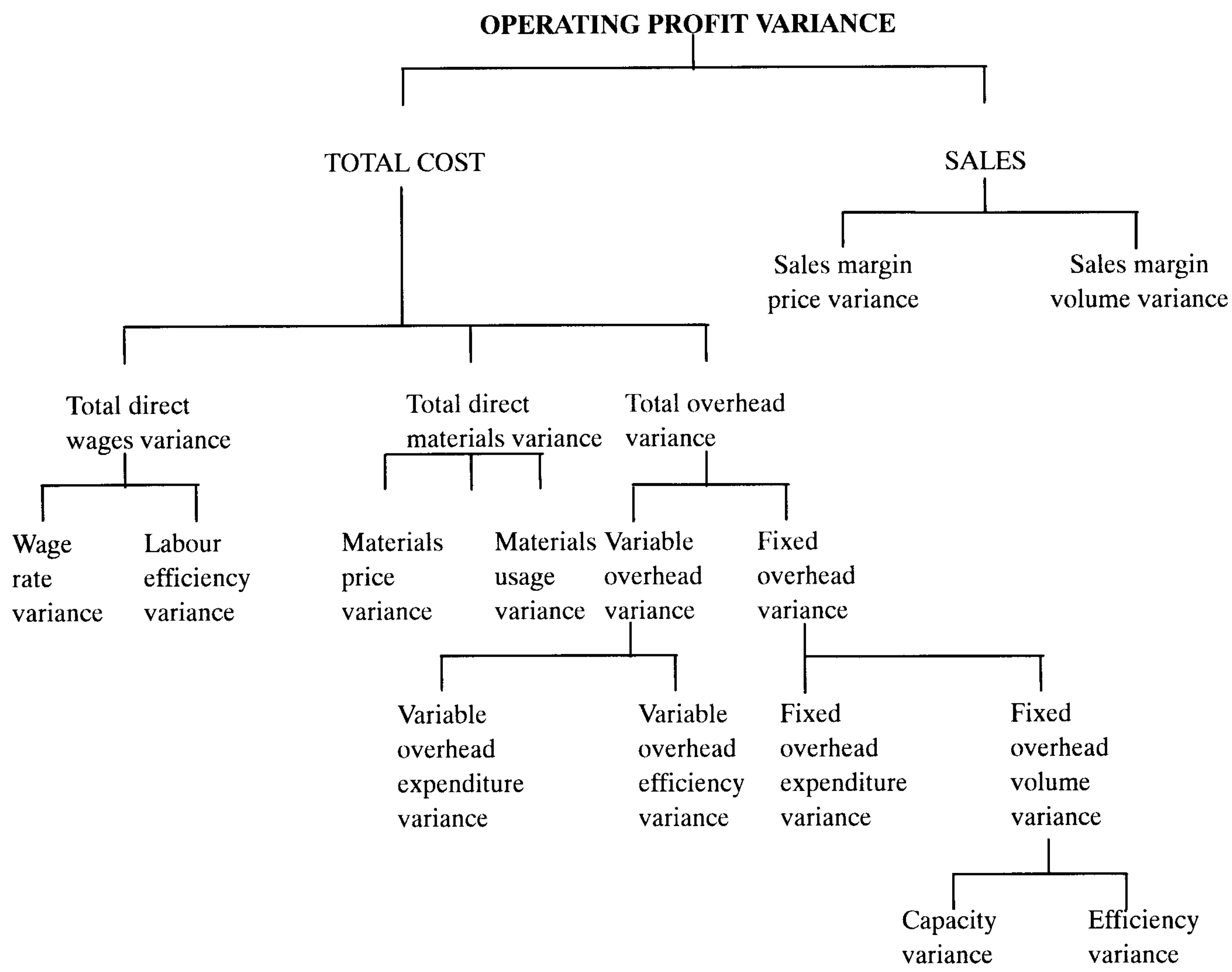

Figure 6.1: Absorption Costing - Variances Produced

The variances can be summarised as follows:

Sales	- Sales margin price variance Sales margin volume variance
Direct wages	- Wage rate variance Labour efficiency variance
Direct materials	- Materials price variance Materials usage variance
Variable overheads	- Variable overheads expenditure variance Variable overheads efficiency variance
Fixed overheads	- Fixed overheads expenditure variance Fixed overheads volume variance, divided into: - Capacity variance - Efficiency variance

There are also other sub-variances for sales, direct materials and direct wages.

Variance Calculations

In our calculations we shall assume that an organisation has the following estimated (or budgeted) and actual results:

Budgeted Results

	RWF	RWF
Sales (10,000 units at RWF20 per unit)		200,000
Costs		
Direct materials (10,000 kg at RWF4 per kg)	40,000	
Direct wages (20,000 hours at RWF3 per hour)	60,000	
Variance overheads (20,000 hours at RWF2 per hour)	40,000	
Fixed overheads	20,000	160,000
Net profit		RWF40,000

Actual Results

	RWF	RWF
Sales (9,500 units)		185,000
Direct materials (9,800 kg)	38,500	
Direct wages (19,400 hours)	56,000	
Variable overheads	37,500	
Fixed overheads	19,500	151,500
Net profit		RWF33,500

The standard selling price and costs per unit can be calculated from the budgeted figures as follows:

	Per Unit
	RWF
Selling price	20
Direct materials (1 kg at RWF4)	4
Direct wages (2 hours at RWF3)	6
Variable overheads (2 hours at RWF2)	4
Fixed overheads (2 hours at RWF1)	2
	16
Standard net profit per unit	4

(a) Direct Materials

The standard cost for direct materials is made up of two parts:

- Standard quantity
- Standard price

Where the actual quantity differs from the standard quantity, there will be a **usage** variance. Where the actual price differs from the standard price, there will be a **price** variance.

(i) Direct Materials Price Variance

The formula for calculating the materials price variance is:

(Actual quantity × Actual price) – (Actual quantity × Standard price)

This may be abbreviated to:

(AQ × AP) – (AQ × SP) = (AP – SP) × AQ

Using the figures given, the price variance may be calculated:

AQ × AP	AQ × SP
	9,800 × RWF4
RWF38,500	RWF39,200

Price variance: RWF38,500 – RWF39,200 = RWF700 (we ignore the minus sign, but must decide whether the variance is favourable or not - see below).

The AQ × AP calculation had already been given, RWF38,500, so that no additional calculations were required. Questions may sometimes be set where it is necessary to multiply the actual quantity used by the actual price.

Having calculated that there is a variance of RWF700, we must now determine whether it is **favourable** or **adverse**. Had the company paid the standard price for the material, the cost would have been **greater** than the actual amount paid. So there is a **favourable** (F) variance in this case.

The variance could also have been calculated by using the following formula:

AQ × (AP – SP)

The actual price per kg is: RWF38,500 ÷ 9,800 = RWF3.93

The formula then becomes:

9,800 × (RWF3.93 – RWF4) = RWF686 (difference owing to rounding)

Reasons for the Variance

An essential part of variance analysis is to look at the possible reasons for, or possible causes of, the variances. The materials price variance can be attributed to the purchasing department. Where the actual purchase prices are **below** standard prices, the difference may arise from special purchase terms, discounts, a general reduction in prices, or the purchase of lower-quality materials.

Where the purchase prices are **above** standard, the cause may be a general rise in prices, a change in materials specifications, or the purchase of smaller quantities from more than one supplier, with a loss of discounts or less favourable terms.

(ii) Direct Materials Usage Variance

The formula for calculating this variance is:

(Actual quantity × Standard price) – (Standard quantity × Standard price)

This may be abbreviated to:

(AQ × SP) – (SQ × SP) = (AQ – SQ) × SP

The calculation from our data is

AQ × SP SQ × SP

9,800 kg × RWF4 = RWF39,200 9,500 kg × RWF4 = RWF38,000

Usage variance = RWF1,200 (adverse)

The variance is **adverse**, because there was an excess usage of 300 kg of material which, at the standard price of RWF4 per kg, caused a variance of RWF1,200.

Note that, in calculating the standard quantity of material, the amount is based on the **actual units sold - not** the budgeted quantity, otherwise the variance would not be meaningful. This procedure of adjusting the budget figures is usually known as **flexing the budget**.

Reasons for the Variance

The material usage variance is primarily the responsibility of the factory foreman or supervisor. It may be caused by faulty machinery; loss or pilferage; excess wastage; lower quality of materials; faulty handling; or changes in inspection or quality standards.

A summary of the direct material cost variances is:

	RWF	RWF
Actual cost		38,500
Price variance (favourable)	700	
Usage variance (adverse)	(1,200)	(500)
Standard cost		RWF38,000

(b) Direct Labour

The direct labour standard cost is made up of direct labour hours multiplied by the standard direct labour wage rate. Both the actual labour hours and actual wage rates may differ from the standards, and it is necessary to separate these two differences in order to analyse any variation between standard costs and actual costs. As shown in Figure 6.1, the two variances are direct wage rate variance and direct labour efficiency variance.

(i) Wage Rate Variance

This is equivalent to the materials price variance, as it reflects the difference in the price or rate paid for direct labour hours.

The formula is:

(Actual hours × Actual rate) – (Actual hours × Standard rate)

or (AH × AR) – (AH × SR) = (AR – SR) × AH

Using our data, the calculation is:

(AH × AR) – (AH × SR)

19,400 hrs × RWF3

RWF56,000 – RWF58,200

Wage rate variance = RWF2,200 (favourable)

The variance is favourable, since the actual cost is **below** the standard cost for the actual hours worked.

Reasons for the Variance

The wage rate variance can be caused by changes in wage rates not provided for in the standards, or the use of a different class or grade of labour from that specified in the standards. Unscheduled overtime premiums or shiftwork rates may also account for variations in labour rates. Where wage rates have changed since the standards were prepared, the variance will not be within the control of managers. Where a different grade of labour is used from that specified, the manager or foreman may be held responsible, and the matter would require further investigation.

(ii) Direct Labour Efficiency Variance

The standard hours for direct labour were produced on the assumption of a given level of output or performance. These hours multiplied by the standard direct labour hourly rate give the standard cost per unit.

The formula for the labour efficiency variance is:

(Actual hours × Standard rate) – (Standard hours × Standard rate)

or (AH × SR) – (SH × SR) = (AH – SH) × SR

Using our data, the relevant calculations are:

AH × SR		SH × SR
19,400 hrs × RWF3	-	19,000 × RWF3
RWF58,200	-	RWF57,000

Labour efficiency variance = RWF1,200 (adverse)

Note that the actual sales of 9,500 units were **below** the budgeted amount of 10,000 units. In order to make a relevant comparison between actual and standard hours, the standard must be based on the equivalent standard time for 9,500 units:

9,500 × 2 hours = 19,000 hours

Reasons for the Variance

The responsibility for the labour efficiency variance will, generally, rest with the supervisor or factory foreman. It may arise through the use of a different machine or machines from those specified; machine breakdown; lack of maintenance of plant; the use of defective or sub-standard materials; the use of different grades of labour from those specified; changes in operating arrangements or inspection standards; or faulty rate-setting. Delays in production can also arise from lack of instructions or bad organisation.

The labour cost variances can be summarised as follows:

	RWF	RWF
Actual cost		56,000
Wage rate variance (favourable)	2,200	
Labour efficiency variance (adverse)	(1,200)	1,000
Standard cost		RWF57,000

(c) Variable Overheads

These overheads are related to volume of production or sales. Variable production overheads may be related to machine or direct labour hours, or as a percentage of costs, depending upon which is most appropriate. From our data, it is clear that the variable overheads have been calculated in relation to direct labour hours.

The analysis of variable overhead variances follows the pattern already illustrated for direct materials and direct labour costs. In this case the variances are the expenditure and the efficiency variance.

(i) Variable Overhead Expenditure Variance

The formula is:

(Actual variable overhead) – (Actual hours × Standard rate)

or AVO – (AH × SR)

The figures from our data are:

AVO	AH × SR		
	19,400 × RWF2		
RWF37,500	RWF38,800	=	RWF1,300 (favourable)

The actual overhead incurred is **below** the standard cost of the hours worked.

Reasons for the Variance

The variance indicates that the total of the individual items making up the variable cost is below the standard cost of those items for the number of hours worked. It will be necessary to examine each item in detail in order to show the causes of the difference. The costs covered under this heading will be the variable elements of indirect wages, indirect materials and indirect expenses. It will also be necessary to establish which managers or executives are responsible for the control of these costs.

(ii) Variable Overhead Efficiency Variance

The formula is:

(Actual hours × Standard rate) – (Standard hours × Standard rate)

or (AH × SR) – (SH × SR) = (AH – SH) × SR

Using the figures from our data:

AH × SR	SH × SR		
19,400 × RWF2	19,000 × RWF2		
RWF38,800	RWF38,000	=	RWF800 (adverse)

As with the calculation for labour costs, the standard hours are based upon **actual output**.

Reasons for the Variance

The variable overhead efficiency variance follows the same pattern as that for the calculation for direct labour efficiency and therefore the same causes will apply.

Summary of variable overhead variances:

	RWF	RWF
Actual variable cost		37,500
Expenditure variance (favourable)	1,300	
Efficiency variance (adverse)	(800)	500
Standard cost		RWF38,000

(d) Fixed Overheads

We are assuming that the company uses absorption costing methods. As you will remember, under absorption costing methods fixed overheads are allocated to products for the purpose of calculating unit costs and stock values. We have already established that the standard cost for fixed overheads is RWF1 per hour, and this will be used for the purpose of calculating overhead variances.

(i) Fixed Overhead Expenditure Variance

As the fixed overheads are unaffected by changes in volume within certain ranges, the budget figure can be used for the purpose of comparison with the actual overhead incurred.

The formula is:

Actual fixed overhead – Budgeted fixed overhead

(AFO) (BFO)

The relevant figures from our data are:

AFO BFO

RWF19,500 RWF20,000 = RWF500 (favourable)

Reasons for the Variance

The favourable variance in this calculation indicates that the total cost of the items making up the fixed overheads is **below** the budgeted cost. As with the variable overheads, the individual items must be examined to identify where the savings have been made - or, in the case of an adverse variance, where overspending has occurred. In the case of fixed overheads, it is likely that a number of the items will be outside the control of production managers or supervisory staff.

(ii) Fixed Overhead Volume Variance

This variance shows the effect on the absorption of fixed overhead costs resulting from changes in the volume of production.

The formula is:

Budgeted fixed overhead – (Standard hours × Standard rate)

(BFO) (SH × SR)

Using our data:

(BFO) SH × SR

19,000 × RWF1

RWF20,000 RWF19,000 = RWF1,000 (adverse)

This variance indicates the value of fixed overhead under- or over-absorbed by reason of a higher or lower number of hours than anticipated in the budget. In this case the variance is adverse, because the number of actual hours recorded was 1,000 **below** the budget figure, resulting in a shortfall of RWF1,000 in recovery of overheads.

The fixed overhead volume variance can be further sub-analysed into two main causes: capacity and efficiency.

(iii) Fixed Overhead Capacity Variance

In this case the budgeted fixed overhead cost is compared with the actual hours worked at the standard fixed overhead rate per hour:

BFO - (Actual hours × Standard rate)

(AH × SR)

19,400 × RWF1

RWF20,000 RWF19,400 = RWF600 (adverse)

This variance indicates that the factory was under-employed to the extent of 600 hours during the period, and investigations would be required to find the cause. It would be necessary to find whether the cause was **external** (through falling demand), or **internal** (through bad management or production delays or difficulties).

(iv) Fixed Overhead Efficiency Variance

The second subvariance arising from the volume variance is related to efficiency. We have seen, in calculating the labour and variable overhead efficiency variances, how the variance is derived. The same procedure applies in the case of fixed overheads.

The formula is:

(Actual hours × Standard rate) – (Standard hours × Standard rate)

(AH × SR) (SH × SR)

RWF19,400 RWF19,000 = RWF400 (adverse)

The efficiency variance arises from the same causes as the other efficiency variances. The usefulness of attaching an hourly value to fixed overheads is sometimes doubted, since these costs are sunk costs, and have little relevance to the level of efficiency obtained. The variance merely indicates the value of fixed overheads under- or over-absorbed through a change in the level of efficiency.

We can now summarise the fixed overhead variances as follows:

	RWF	RWF
Actual fixed overhead cost		19,500
Expenditure variance (favourable)	500	
Capacity variance (adverse)	(600)	
Efficiency variance (adverse)	(400)	(500)
Standard fixed overhead cost		RWF19,000

(e) Sales Variances

Under absorption costing methods, the sales variances are based on **profit margins**. The two main variances are the sales margin price variance and sales margin volume variance.

(i) Sales Margin Price Variance

This variance is intended to show the difference in profit arising from changes in the standard selling price. In our data, actual sales were 9,500 units, which resulted in a sales value of RWF185,000. Had the units been sold at the standard selling price of RWF20, the sales value would have been 9,500 × RWF20 = RWF190,000. The loss of profit arising from the variation in selling prices is RWF**5,000**. This variance is adverse, since selling prices were **below** the standard price. Expressed as a formula this becomes:

[(Actual quantity × Actual selling price) – Standard cost] –

[(Actual quantity × Standard selling price) – Standard cost]

$= \; [(AQ \times ASP) - SC] \quad - \quad [(AQ \times SSP) - SC]$

RWF185,000 – RWF152,000	RWF190,000 – RWF152,000
= RWF33,000	= RWF38,000 = RWF5,000 (adverse)

The standard cost of RWF152,000 represents 9,500 units at RWF16.

Reason for the Variance

This variance, together with the sales margin volume variance, is the responsibility of the sales department. The change in selling prices may have resulted from sales at specially discounted prices or from allowances for quantity purchases. The company might operate in an industry in which prices are determined by market leaders, and it may be forced to follow the market trends. The sales department must also check that price concessions given by its sales staff are justified, and take care that any major price reductions are authorised by senior staff.

(ii) Sales Margin Volume Variance

This variance shows the profit or loss arising from changes in sales volume.

The formula is:

(Actual quantity × Standard margin) – (Budgeted quantity × Standard margin)

(AQ × SM)	(BQ × SM)
9,500 × RWF4	10,000 × RWF4
RWF38,000	RWF40,000 = RWF2,000 (adverse)

The result shows that there is a loss of profit of RWF2,000, because 500 fewer units were sold than were budgeted.

Reasons for the Variance

This variance may be caused by internal factors (through failure to achieve sales targets set in the budget) or sales targets for representatives may have been set too optimistically and not be attainable in practice. External factors might include a general depression in the industry concerned, or the entry of new competitors.

Summary of Variances

It is now possible to summarise the variances, to show the reconciliation between the budgeted profit of RWF40,000 and the actual profit of RWF33,500 in our original data:

SUMMARY OF VARIANCES

	Adverse	Favourable	
	RWF	RWF	RWF
Budgeted profit			40,000
Variances			
Sales:			
Price	5,000		
Volume	2,000		
Direct materials:			
Price		700	
Usage	1,200		
Direct wages:			
Wage rate		2,200	
Labour efficiency	1,200		
Variable overheads:			
Expenditure		1,300	
Efficiency	800		
Fixed overheads:			
Expenditure		500	
Capacity	600		
Efficiency	400		
Net adverse variance			(6,500)
Actual profit			RWF33,500

Analysing Variances: Marginal Costing

The variance analysis has so far been based on a system of absorption costing. Under a variable or marginal costing system, there would be only **one** variance for fixed overheads - the **expenditure** variance - as, in this method of costing, all fixed overheads would be charged to the accounting period concerned, and no allocations would be made to production units. The fixed overhead variances for capacity and efficiency would not apply but it would become part of the **sales margin volume variance**.

Comparing Variances Resulting Under Absorption and Marginal Costing

We can now tabulate our data to give comparison of variances resulting under each system:

	Absorption Costing		**Variable Costing**	
	Adverse	**Favourable**	**Adverse**	**Favourable**
	RWF	RWF	RWF	RWF
Fixed overheads:				
Expenditure		500		500
Capacity	600		-	
Efficiency	400		-	
Sales:				
Sales volume	2,000		3,000	
	3,000	500	3,000	500

You can see that, under marginal costing, the sales margin volume variance reflects the amount of **contribution** lost through the deficiency in sales - not the loss of net profit. The contribution is RWF6 per unit, and 500 fewer units were sold than were budgeted - giving a variance of RWF3,000. The variances for materials, wages and variable overheads will be identical under both absorption and marginal costing methods.

J. RELATIONSHIPS BETWEEN VARIANCES AND INVESTIGATION OF THEIR CAUSES

Interrelationship of Variances

Variances may be interrelated through some connecting factor. Frequently, a favourable variance for one cost factor may result in an adverse variance for another. Lower-quality materials may be purchased, giving a favourable materials price variance. However, this possibly results in production delays or difficulties - giving an adverse variance for labour efficiency. A lower, less skilled, grade of labour may be used at a lower rate of pay - producing a favourable direct wage rate variance. This may result in extended production times - giving an adverse labour efficiency variance. Similarly, a greater volume of sales may be achieved by selling at lower prices than standard - giving a favourable sales volume variance but an adverse sales price variance. These (and other) linking causes should be considered in analysing standard costing variances, so that individual variances are not considered in isolation.

Significant Variances

As we have already noted, the full benefits of standard costing will not be realised unless variances are analysed and investigated, and **corrective action** taken where shown to be necessary.

Not every variance will justify the time and expense of investigation, and some consideration must be given to determining what are to be regarded as significant variances. Minor variations, either in terms of money value or as percentages of the amounts involved, need not call for investigation. It will be necessary to decide for each element of cost the **control limits** within which variances can be allowed to occur without investigation. Upper and lower control limits may be set, and only when variances are outside these limits will investigation be required.

(a) Materials Price, Mix and Yield Variances

In process industries it is common for two or more materials to be mixed together to produce a new material. There will be a standard specification for the proportion of each material to be used - a **standard mix**, or mixture - which will also specify the allowance for normal wastage from a given input of material. This specification will usually be a standard batch of mixture, according to the normal quantity of input, to produce a given volume of output. This type of operation can lead to variances arising from variations in the mix of materials or the amount of wastage incurred, and the yield obtained from a given input. The material usage variances can therefore be analysed to show the causes arising from these two factors.

Example

A company mixes three chemicals together to produce a new material for further processing. The standard specification is:

Input per batch material	1,000 kg Quantity (kg)	Price per kg RWF
A	500	1.00
B	300	3.00
C	200	5.00

The standard output per batch is 900 kg.

During an accounting period in which five batches of the mix were processed, the following results were recorded:

Input	Quantity (kg)	Price per kg RWF
A	2,500	1.20
B	1,600	2.80
C	900	5.20
	5,000	

Output for the period: 4,320 kg

There are three variances - price, mix and yield.

The **price** variance is already familiar to us.

The **mix** variance represents the gain or loss arising from departures from the standard percentages or proportions in which materials are mixed.

The **yield** variance represents the gain or loss arising from greater or smaller wastage than that specified in the standard.

The steps in the analysis are:

(i) Calculate the **actual cost of input**.

(ii) Calculate the **standard cost of the actual input**.

(iii) Restate the total input quantity in the **standard** proportions specified.

(iv) Calculate the **standard input required for the actual output**, and multiply by the standard cost to give the standard cost of the actual output.

The calculations are as follows:

	AQ	AP	AQ x AP	AQ	SP	AQ x SP	AQ_{SM}	SP	AQ_{SM} x SP	SQ_{AQ}	SP	SQ_{AQ} x SP
	kg	RWF	RWF	kg	RWF	RWF	kg	RWF	RWF	kg	RWF	RWF
A	2,500	1.20	3,000	2,500	1.00	2,500	2,500	1.00	2,500	2,400	1.00	2,400
B	1,600	2.80	4,480	1,600	3.00	4,800	1,500	3.00	4,500	1,440	3.00	4,320
C	900	5.20	4,680	900	5.00	4,500	1,000	5.00	5,000	960	5.00	4,800
	5,000		12,160	5,000		11,800	5,000		12,000	4,800		11,520
			(a)			(b)			(c)			(d)

(a) = Actual quantity x Actual price (AQ x AP)
(b) = Actual quantity x Standard price (AQ x SP)
(c) = Actual quantity in standard mix x Standard price (AQ_{SM} x SP)
(d) = Standard quantity for actual output x Standard price (SQ_{AQ} x SP)

The variances are:

(a) – (b)	materials price variance: = (RWF360) (adverse)	RWF12,160 – RWF11,800
(b) – (c)	materials mix variance: = RWF200 (favourable)	RWF11,800 – RWF12,000
(c) – (d)	materials yield variance: = RWF(480) (adverse)	RWF12,000 – RWF11,520

Summary:	RWF	RWF
Actual cost		12,160
Materials price variance	(360)	
Materials mix variance	200	
Materials yield variance	(480)	
Net variance		(640)
Standard cost of actual output		RWF11,520

Interpretation of Variances:

(i) Materials Price Variance

As we described earlier, this variance shows the gain or loss where purchase prices differ from standard.

(ii) Materials Mix Variance

This variance shows the gain or loss arising from a change in the input mixture. Our actual mixture used more of the cheaper materials A and B and less of material C - giving a favourable mix variance when the same mix is stated in standard proportions. Enquiries would be needed to find the reason for the change in mix - shortage of the required materials or human error in preparing the batch mixes.

(iii) Materials Yield Variance

This variance shows the gain or loss arising from excess or lower than standard wastage allowances. 4,800 kg should have been used to produce the output of 4,320 - bearing in mind that the standard loss is 10 per cent of input. The excess usage might have been caused by using the cheaper materials in the batch mixtures. The variance of RWF480 represents the standard cost of the excess 200 kg, valued at standard prices.

(b) Sales Variances

In the same way as the materials usage mix can be subdivided, so the sales volume variance can be further analysed into mix and volume variances, where more than one product is sold. These additional variances show the gains or losses arising from a change in the **composition of sales**. Different products are likely to have different profit margins - therefore, although gross sales figures may be above budget levels, the profitability of sales may not be as high as budgeted if more units are sold of a less profitable product.

Example

Out of Style Ltd has the following budgeted and actual sales for an accounting period:

Budget

Product	Units	Selling Price per Unit	Standard Cost per Unit	Standard Profit per Unit
		RWF	RWF	RWF
A	5,000	10.00	8.00	2.00
B	2,000	30.00	20.00	10.00
C	3,000	15.00	6.00	9.00
	10,000			

Actual

Product	Units	Selling Price per Unit	Standard Cost per Unit	Actual Profit per Unit
		RWF	RWF	RWF
A	6,000	11.00	8.00	3.00
B	3,000	28.00	20.00	8.00
C	2,000	13.00	6.00	7.00
	11,000			

Variance Analysis

	AQ	AP	AQ x AP	AQ	SP	AQ x SP	AQ_{SM}	SP	AQ_{SM} x SP	BQ	SP	BQ x SP
	kg	RWF	RWF	kg	RWF	RWF	kg	RWF	RWF	kg	RWF	RWF
A	6,000	3.00	18,000	6,000	2.00	12,000	5,500	2.00	11,000	5,000	2.00	10,000
B	3,000	8.00	24,000	3,000	10.00	30,000	2,200	10.00	22,000	2,000	10.00	20,000
C	2,000	7.00	14,000	2,000	9.00	18,000	3,300	9.00	29,700	3,000	9.00	27,000
	11,000		56,000	11,000		60,000	11,000		62,700	10,000		57,000
			(a)			(b)			(c)			(d)

(a) AQ x AP = Actual quantity x Actual profit margin

(b) AQ x SP = Actual quantity x Standard profit margin

(c) AQSM x SP = Actual quantity in standard proportion x Standard profit margin

(d) BQ x SP = Budgeted quantity x Standard profit margin

Variances:

Sales price margin variance

(a) – (b) = RWF56,000 – RWF60,000 = (RWF4,000) (adverse)

Sales mix margin variance

(b) – (c) = RWF60,000 – RWF62,700 = (RWF2,700) (adverse)

Sales volume margin variance

(c) – (d) = RWF62,700 – RWF57,000 = RWF5,700 (favourable)

Summary:

	RWF	RWF
Actual profit		56,000
Sales price margin variance	(4,000)	
Sales mix margin variance	(2,700)	
Sales volume margin variance	5,700	
Net adverse variance		(1,000)
Budgeted profit		RWF55,000

Interpretation of Variances:

(i) Sales Price Margin Variance

This variance, as we explained earlier, shows the profit or loss arising from changes in **selling prices**. This is a responsibility of the sales department.

(ii) Sales Mix Margin Variance

This variance shows the variation in profit arising from a different composition of sales from the budgeted amounts. It may be caused by falling demand for some products and rising demand for others. Some products may be more easily sold, and salespeople have concentrated on products which have a more rapid turnover but possibly less profit. Our adverse variance has been shown because more products with lower profit margins have been sold than budgeted, and investigations would be required to find the cause. The advent of new competition can be a factor.

(iii) Sales Volume Margin Variance

This variance indicates the loss or gain in profit through sales quantities being above or below budget levels. The causes for this variance have been previously outlined.

(c) Costing Method in Use

In answering examination questions on the subject of sales variances, take care to find whether answers should be based on standard **contributions** or standard **profit margins** - depending upon whether marginal or absorption costing methods are to be used.

K. PLANNING AND REVISION VARIANCES

Outdated Standards

Standards may become outdated because of changes in market prices, wage rates, selling prices or other causes. In many organisations the standards will be revised only once a year, so that any changes which take place during the year will give rise to variances.

Material Price Change

At the time of setting a standard price for a particular material, a price of RWF5 per kg may appear to be realistic but, owing to factors outside the control of the organisation, the price may rise to RWF6 per kg. The rise of RWF1 will be uncontrollable so far as the purchasing department is concerned. But the purchasing department may sometimes be able to secure materials on slightly more favourable terms than the general rise in prices. Two variances can then be calculated:

(a) A **planning** revision variance, reflecting the general rise in prices

(b) A **price** variance arising from the purchasing department's efficiency in purchasing above or below the current market price.

Example

Standard price of material	RWF10.00 per kg
Current market price	RWF13.00 per kg
Quantity purchased	10,000 kg
Price paid	RWF12.80 per kg

The variances may be calculated as follows:

Actual Quantity	Actual Price RWF	Actual Cost RWF	Current Price RWF	Current Cost RWF	Standard Price RWF	Standard Price RWF
10,000	12.80	128,000	130,000	130.00	10.00	100,000

Variances:

Price variance

RWF128,000 – RWF130,000 = RWF2,000 (favourable)

Planning revision variance

RWF130,000 – RWF100,000 = RWF30,000 (adverse)

Interpretation of variances:

(a) The **price** variance, in this case, shows the purchasing department's efficiency in purchasing supplies below the current market price.

(b) The **planning** revision variance shows the effect of price changes which have arisen since the standards were prepared, and it is uncontrollable so far as the purchasing department is concerned.

Similar variances can be prepared for wage rate variances or other cost or sales factors where changes in wage rates or other changes have occurred after the standards have been prepared.

Revision Variances

Various changes may occur during the period when standards are in operation, so the standard cost of production may change.

- **Temporary changes** - if the changes that take place during production are of a temporary nature, usual variance analysis will indicate the influence on the standard cost of production. Management action should follow to correct the situation.
- **Permanent changes** - if the changes are in material used, grade of labour used, or in methods of production and are of a permanent nature, the standards themselves will need to be revised. Under such circumstances revision variances could be calculated for a short period of time. On revising the whole structure of standard costs and variance analysis, say at the end of a year, any permanent changes will be incorporated.

Generally, temporary changes tend to be controllable requiring management action, whilst permanent changes are often outside the control of the management.

L. WORKED EXAMPLE

Examination questions frequently require the computation of variances, and much examination time can be wasted if you do not fully understand the methods of calculating, presenting and reconciling variances. You should work through the following question carefully, before comparing your answer with the one given.

Question

X Ltd had the following budgeted and actual results for a recent accounting period:

Budgeted:		
	RWF	RWF
Sales (2,000 units)		50,000
Costs		
Direct materials (4,000 kg @ RWF3)	12,000	
Direct wages (4,000 hours @ RWF4)	16,000	
Variable overheads (4,000 hours @ RWF1)	4,000	
Fixed overheads	2,000	34,000
Net profit		16,000
Actual:		
Sales (1,900 units)		47,000
Costs		
Direct materials (3,900 kg)	11,500	
Direct wages (3,700 hours)	15,500	
Variable overheads	3,900	
Fixed overheads	2,100	33,000
Net profit		14,000

The company uses variable (marginal) costing methods.

REQUIREMENT:

Prepare all variances for the period, and a statement reconciling the budgeted and actual profits.

Answer

Variance Analysis

Direct materials:

AQ × AP	AQ × SP	SQ × AP
	3,900 × RWF3	3,800 × RWF3
RWF11,500	RWF11,700	RWF11,400
(a)	(b)	(c)

Materials price variance:	(a) – (b)	RWF200	(favourable)
Materials usage variance:	(b) – (c)	(RWF300)	(adverse)

Direct wages:

AH × AR	AH × SR	SH × SR
	3,700 × RWF4	3,800 × RWF4
RWF15,500	RWF14,800	RWF15,200
(a)	(b)	(c)

Direct wages rate variance:	(a) – (b)	(RWF700)	(adverse)
Labour efficiency variance:	(b) – (c)	RWF400	(favourable)

Variable overheads:

AO	AH × SR	SH × SR
	3,700 × RWF1	3,800 × RWF1
RWF3,900	RWF3,700	RWF3,800
(a)	(b)	(c)

Variable overhead expenditure variance:	(a) – (b)	(RWF200)	(adverse)
Variable overhead efficiency variance:	(b) – (c)	RWF100	(favourable)

Fixed overheads:

AO	SO
RWF2,100	RWF2,000

Fixed overhead variance: (RWF100) (adverse)

Sales variances:

AQ × AP	AQ × SP
	1,900 × RWF25
RWF47,000	RWF47,500

Sales price margin variance:(RWF500) (adverse)

Act. Sales – std con	Budgeted sales – std con. RWF50,000 – RWF32,000
RWF17,100	RWF18,000

Sales volume margin variance: (RWF900) (adverse)

Reconciliation of Budgeted and Actual Profit

	Adverse	**Favourable**	
	RWF	RWF	RWF
Budgeted profit			16,000
Variances			
Sales:			
Sales price	500		
Sales volume	900		
Direct materials:			
Price		200	
Usage	300		
Direct wages:			
Wage rate	700		
Labour efficiency		400	
Variable overheads:			
Expenditure	200		
Efficiency		100	
Fixed overheads	100		
	2,700	700	
Net adverse variance			2,000
Actual net profit			14,000

Study Unit 15

Budgets – Planning and Control

Contents

A. DEFINITIONS

Budget (A plan in money)

A budget is defined as:

> *"A plan quantified in monetary terms, prepared and approved prior to a defined period of time, usually showing planned income to be generated and/or expenditure to be incurred during that period and the capital to be employed to attain a given objective."*

A budget is therefore an agreed **plan** which evaluates in financial terms the various **targets** set by a company's management. It includes a forecast profit and loss account, balance sheet, accounting ratios and cash flow statements which are often analysed by individual months to facilitate control.

Budgets are normally constructed within the broader framework of a company's long-term strategic plan covering the next five to ten years. This strategic plan sets out the company's long-term objectives, whilst the budget details the actions that must be taken during the following year to ensure that its short and long-term goals are achieved.

Budgetary Control

A definition of budgetary control is:

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

Companies aim to achieve objectives by constantly comparing actual performance against budget. Differences between actual performance and budget are called **variances**. An adverse variance reduces profit and a favourable variance improves profitability.

Budgetary control therefore allows management to review variances to identify aspects of the business that are performing better or worse than expected. In this way a company will be able to monitor its sales performance, expenditure levels, capital expenditure projects, cash flow, and asset and liability levels. Corrective action will be taken to reduce the impact of adverse trends.

Financial budgets are prepared in the same format as the company's profit and loss, balance sheet and cash flow statements. In this way it is easy to compare actual and budgeted results and calculate variances.

Here is a typical statement comparing actual and budgeted results:

PROFIT AND LOSS ACCOUNT - MAY

	MONTH					**YEAR TO DATE**				
Description	**Budget**		**Actual**		**Variance**	**Budget**		**Actual**		**Variance**
	RWF	%	RWF	%	RWF	RWF	%	RWF	%	RWF
Sales										
Tickets										
Catering										
Souvenirs										
Other										
Total										
Gross Profit										
Tickets										
Catering										
Souvenirs										
Other										
Total										
Overheads										
Staff costs										
Rent & local authority tax										
Electricity										
Gas										
Cleaning										
Repairs										
Renewals										
Advertising										
Entertainment										
Commissions										
Laundry										
Motor expenses										
Total overheads										
NET PROFIT										

You can see that this statement details the month's performance together with that for the year to date. It covers the whole company; in order to obtain even greater control it is necessary to prepare operating statements evaluating the contribution from each area of the business. These additional statements usually cover the activities of individual managers to identify which of them are failing to achieve their targets. A typical operating statement is as follows:

OPERATING STATEMENT

Maintenance Department

Month of May . . . .

		Month			**Cumulative**	
Description	**Budget**	**Actual**	**Variance**	**Budget**	**Actual**	**Variance**
	RWF	RWF	RWF	RWF	RWF	RWF
Salaries	16,000	15,500	500	70,000	67,000	3,000
Wages	51,000	53,000	(2,000)	250,000	255,000	(5,000)
Indirect materials	2,000	1,900	100	10,000	12,000	(2,000)
Maintenance	6,000	6,000	-	24,000	23,900	100
Electricity	8,000	10,000	(2,000)	40,000	39,000	1,000
Gas	6,500	7,000	(500)	26,500	28,000	(1,500)
Total	89,500	93,400	(3,900)	420,500	424,900	(4,400)

This statement includes all expenditure under the control of the maintenance manager. It details expenditure for the month of May and the cumulative position for the year to date. The statement identifies the month's main areas of overspend as wages, electricity and gas. For the year to date the main problem areas are wages, indirect materials and gas.

Under a system of budgetary control the maintenance manager will be asked to prepare a report explaining all variances and the action being taken to bring the department back onto budget. These actions will be monitored in the following months to ensure that the corrective measures have been taken.

B. ADVANTAGES OF BUDGETARY CONTROL SYSTEMS

Agreed Targets

Budgets establish targets for each aspect of a company's operations. These targets are set in conjunction with each manager. In this way managers are committed to achieving their budgets. This commitment also acts as a motivator.

Problems Identified

Budgets systematically examine all aspects of the business and identify factors that may prevent a company achieving its objectives.

Problems are identified well in advance, which in turn allows a company to take the necessary corrective action to alleviate the difficulty. For example, a budget may indicate that the company will run short of cash during the winter period because of the seasonal nature of the service being provided. By anticipating this position the company should be able to take corrective action or arrange additional financing.

Scope for Improvement Identified

Budgets will identify all those areas that can be improved, thereby increasing efficiency and profitability.

Positive plans for improving efficiency can be formulated and built into the agreed budget. In this way a company can ensure that its plans for improvement are actually implemented.

Improved Co-ordination

All managers will be given an outline of the company's objectives for the following year. Each manager will then be asked to formulate their own plans so as to ensure that the company's overall objectives are achieved.

All the managers' plans will be combined and evaluated so that a total budget for the company can be prepared. During this process the company will ensure that each individual plan fits in with the company's overall objectives.

Control

It is essential for a company to achieve, if not exceed, its budget.

Achievement of budget will be aided by the use of a budgetary control system which constantly monitors actual performance against the budget. **All variances will be monitored**

and positive action taken in order to correct those areas of the business that are failing to perform.

Raising Finance

Any provider of finance will want to satisfy itself that the company is being managed correctly and that a loan will be repaid and interest commitments honoured.

The fact that a company has established a system of budgetary control will help to demonstrate that it is being managed correctly. The budget will also show that the company is able to meet all its commitments.

C. TYPES OF BUDGET

There are a number of different types of budget covering all aspects of a company's operations. These can be summarised into the following categories.

Operating Budgets

Master budgets cover the overall plan of action for the whole organisation and normally include a budgeted profit and loss account and balance sheet.

The master budget is analysed into **subsidiary budgets** which detail responsibility for generating sales and controlling costs. Detailed schedules are also prepared showing the build-up of the figures included in the various budget documents.

Capital Budgets

These budgets detail all the projects on which capital expenditure will be incurred during the following year, and when the expenditure is likely to be incurred. Capital expenditure is money spent on the acquisition of fixed assets such as buildings, motor cars and equipment.

The capital budget enables the fixed asset section of the balance sheet to be completed and provides information for the cash budget.

Cash Budgets

This budget analyses the cash flow implications of each of the above budgets. It is prepared on a monthly basis and includes details of all cash receipts and payments. The cash budget will also include the receipt of finance from loans and other sources together with forecast repayments.

D. PREPARATION OF BUDGETS

Timetable

Each company prepares its budgets at a specific time of the year. The process is very time-consuming and allowance must be made for:

- Each manager to prepare his estimates
- The accumulation of the managers' estimates so that a provisional budget can be built up for the whole company
- The provisional budget to be reviewed and any changes to be agreed

A large company with a January to December financial year will therefore probably commence its budget preparation in August of the preceding year. This will allow 4-5 months for the work to be completed. If it is to be completed successfully, it is essential that a timetable is prepared detailing what information is required and the dates by which it must be submitted. The preparation of budgets is a major project and it must be managed correctly.

Organisation

As we have just said, the preparation of budgets is a very important task which is given a high level of visibility within the company. The overall co-ordination of the budgeting process is therefore handled at a high level.

Budgeting may be the responsibility of the Finance Director, who will have responsibility for bringing together the directors and managers' initial estimates. The Finance Director will specify the information that is required and the dates by which it is required. S/he will also circulate a set of economic assumptions so that all directors and managers are preparing their forecasts against the same economic background.

The **Financial Director** will eliminate most of the obvious inconsistencies from the initial estimates and submit a preliminary budget to the Chairman of the company and its Board of Directors. The Board will consider the overall framework of this preliminary budget so as to ensure that the budget is acceptable and that it gives the desired results.

The **Board** must also ensure that the budget is realistic and achievable. If the Board does not accept any part of the budget then it will be referred back to the relevant managers for further consideration.

Some companies set up a **budget committee** to co-ordinate the budgeting process. This committee carries out similar functions to those we described earlier, but will involve more of the company's senior directors and managers. This committee will probably be chaired by the **Chairman** of the company.

The final budget must be accepted by the Board of Directors. It will then form the agreed plan for the following year against which performance will be monitored and controlled.

Profit and Loss Account

(a) Limiting Factors

A company's financial performance will be constrained by what are known as **limiting factors**, which may include:

- Demand for products
- Supply of skilled labour
- Supply of key components
- Capacity or space

Each of these constraints limit the company's ability to generate sales and profits. Sales cannot exceed the demand for products, and production cannot exceed the limits imposed by labour and material availability and capacity.

It is essential that a company recognises the fact that it may have a limiting factor, as this will govern the overall shape of its budget.

(b) Sales

Sales budgets are normally prepared by the company's marketing department. The sales budget of a small company may be set by its managing director working in conjunction with his sales team. The sales budget will take into account the following factors:

- What is the sales trend for each product/service? Are sales increasing or decreasing and why?
- Will any new product/service be launched and when?
- Will any of the existing products/services be phased out?
- What price increases can be obtained during the year?
- What is the advertising and promotional budget likely to be?
- What will be the pattern of sales throughout the period covered by the budget?
- What will the company's competitors be doing?
  - Are they introducing new products?
  - What is their pricing policy?
  - Are they being aggressive in order to gain market share?
  - What is their advertising expenditure likely to be?
  - Are there any new competitors entering the market?

(c) Cost of Sales

Having established a preliminary sales budget, it is necessary to calculate the cost of sales. Most companies know how much each of their products cost to produce. These costs must be updated to allow for the forecast level of price increases and proposed changes to specifications or methods.

(d) Labour Costs

Labour costs will be calculated by multiplying the number of people required to complete the budget by their rates of pay. Full allowance will have to be made for any planned wage increases.

(e) Overheads

The sales budget will be circulated to all managers with responsibility for controlling costs. These documents will enable each manager to understand the proposed scale of the company's operations. Each manager will consider the items of expenditure that he must incur in order to ensure that the company can achieve its sales targets.

Each manager will already understand the cost of running his area and from this information he should be able to estimate the cost levels required for the budget year. By accumulating all the managers' individual estimates it is possible for the company to build up a total cost budget.

(f) Profit before Tax

Sales – Cost of sales – Overheads = Profit before tax

(g) Taxation

From the budgeted level of profit, the company will be able to calculate the level of corporation tax payable.

(h) Dividends

Dividends will be budgeted based on the forecast level of profits and the company's overall financial policy.

(j) Retained Earnings

Profit before tax – Tax – Dividends = Retained earnings

Retained earnings will be added to the balance sheet reserves.

The preceding data will be converted into a budgeted profit and loss account which should be analysed to individual months and prepared in the same format as the company's management accounts.

There will also be detailed operating statements which allocate costs to individual managers. These statements are also prepared on a monthly basis so that actual expenditure can be compared with budget.

Balance Sheet

Having completed a budgeted profit and loss account, it is then necessary to complete a budgeted balance sheet.

(a) Fixed Assets

(i) Capital Budgets

Each manager will be asked to submit details of his capital expenditure requirements, together with a brief summary of the reasons why the expenditure is necessary. A more detailed appraisal will be required before the expenditure is actually committed.

The capital budget will include items such as:

- New buildings
- Machinery and equipment
- Office equipment
- Computers
- Commercial vehicles
- Motor cars

The sum total of all the managers' capital expenditure requirements will form a provisional capital budget.

(ii) Disposals

Fixed assets may be sold or dismantled during the year. These will be listed and an estimate made of any sales proceeds that may arise.

If a company sells a fixed asset for more than its net book value then a profit will be made. A loss will result if an asset is sold for less than its net book value.

(iii) Depreciation

The first step in completing budgeted depreciation is to calculate the charge for the year on the assets already owned by the company. This will require the company to examine each of its assets and calculate the depreciation charge.

All companies are required to keep a fixed asset register, which includes details of all their fixed assets. Many companies have computerised their fixed asset registers, which considerably improves the speed with which this part of the budgeting process can be completed.

A company must also calculate the depreciation charge on the projects included in its capital budget. A total depreciation charge can then be derived.

(iv) Net Book Value

We can now see how a company can complete the fixed assets section of its budgeted balance sheet. Here is an example:

	Cost	**Depreciation**	**Net Book Value**
	RWF	RWF	RWF
Balances as at 1 Jan	125,000	(35,000)	90,000
Asset disposals	(7,000)	6,000	(1,000)
Depreciation for year		(12,000)	(12,000)
Additions	55,000	(2,000)	53,000
Balances as at 31 Dec	173,000	(43,000)	130,000

(b) Working Capital

(i) Stocks

Companies calculate stock turnover ratios in order to monitor their stock control function. The formula for calculating stock turnover is:

$$\text{Stock turnover} = \frac{\text{Cost of sales}}{\text{Average stock}}$$

Companies strive for a high stock turnover, which means they are carrying low stocks and managing the function effectively. It is therefore possible to **target improved performance** by setting a higher stock turnover target for the following year, which can be converted into a stock valuation by adopting the following formula:

$$\text{Budgeted average stock} = \frac{\text{Budgeted cost of sales}}{\text{Stock turnover}}$$

(ii) Debtors

A company will also calculate debtors' ratios in order to monitor the effectiveness of its credit control function. From these ratios it will **establish target ratios** which can be used to calculate budgeted debtors in a similar way to the above stock calculation.

$$\text{Debtors ratio} = \frac{\text{Debtors}}{\text{Creditors sales}} \times 365\ \text{days}$$

$$\text{Budgeted debtors} = \frac{\text{Debtors ratio} \times \text{Credit sales}}{365}$$

(iii) Cash in Hand and at Bank

In practice the budgeting process will use cash as the balancing figure in the balance sheet. This approach may seem strange but, if you think about it, you will see that a company's cash position will be the result of everything else that the company does.

(iv) Creditors

Creditors will be calculated in a very similar way to the above debtors calculation. A **target creditors ratio** will be determined, which will then be applied to the purchases figure derived from other parts of the budgeting process.

$$\text{Creditors ratio} = \frac{\text{Creditors}}{\text{Credit purchases}} \times 365\,\text{days}$$

$$\text{Budgeted creditors} = \frac{\text{Creditors ratio} \times \text{Credit purchases}}{365}$$

(v) Bank Overdraft

The cash budgeting process may indicate that a bank overdraft will be required.

(c) Share Capital

The value of a company's share capital will only change if new shares are issued. This decision will be taken at the highest level within a company.

(d) Reserves

The opening balance on reserves will be known. The final figure will be the opening balance plus or minus the value of retained earnings taken from the budgeted profit and loss account.

(e) Loans

The opening position will be known. The final figure will be the opening position plus the value of any new loans less the value of loans repaid.

All the preceding data will be presented in the budgeted balance sheet in the same format as the company adopts for its monthly accounts. This statement will also be prepared on a monthly basis to facilitate comparison with actual results.

Budget Review

The company has now completed provisional profit and loss, capital, cash and balance sheet budgets.

The provisional budget will be considered by the Board of Directors. The Board must satisfy itself that the budget is achievable and consistent with the company's overall strategy. If the Board accepts the budget it will become the standard by which the company will be monitored throughout the following year. If the Board does not accept part of the budget then it will be referred back to management for further work.

In large groups of companies, the budget will also have to be approved by the Board of the company's holding company.

E. CONTROL MECHANISM

The budget will detail all aspects of the company's operations. The company will prepare monthly profit and loss accounts, operating statements, cash flow statements and balance sheets. Each of the figures in these documents will be compared with the budget. Variances will be calculated (the differences between actual and budgeted results). Excessive costs and inadequate sales will be highlighted and positive action will be required in order to ensure that the company corrects any adverse variances.

Management by Exception

When a system of budgetary control is in operation, the principle of management by exception can be applied, i.e. when presenting information on actual results to management, attention should be given mainly to those areas where there is a **deviation** from budget.

Regular Presentation of Information

The accounting function should be organised to produce the actual figures for comparison with the budgets at the earliest possible point of time. The accounts headings should be the same as the budget headings, so that the minimum processing work is necessary on the figures.

The expense involved in collecting the cost figures must be borne in mind. A balance should be struck between keeping costs to the minimum and obtaining the maximum amount of useful information.

The budget committee should be in possession of the comparison between actual and budget expenses within two to three weeks from the close of an accounting period. Each period should be examined in detail by the budget committee, and managerial action taken where necessary.

Prompt presentation of information is important because any adverse trends will probably be continuing while data is being collected and analysed. If action is to be taken to contain the results for the succeeding period, it must be taken quickly, so the time required to collect and analyse the data must be minimised.

Variance Interpretation

Any variances shown by the budget statements should be interpreted by the budget officer. He should give his view on whether the variance is regarded as controllable or non-controllable.

This part of the operation is most important. The skill and experience of the budget officer will be of the greatest value to management, who wish to know not only the extent of any deviation from plan, but more importantly, the reasons for it and any action being taken to correct it.

Note that the purpose of such information is not to punish any individual for not keeping to his budget (though it may sometimes be necessary to point out that results are unacceptable) but rather to obtain information that will assist management to ensure that future budgets are accurate and that greater effort is made to achieve them. The budget may also need to be updated in the light of results achieved to date, by preparing a re-forecast.

Remember that one possible cause of variances is poor initial forecasting and budgeting. Techniques should be kept under constant review and improved over time in the light of experience.

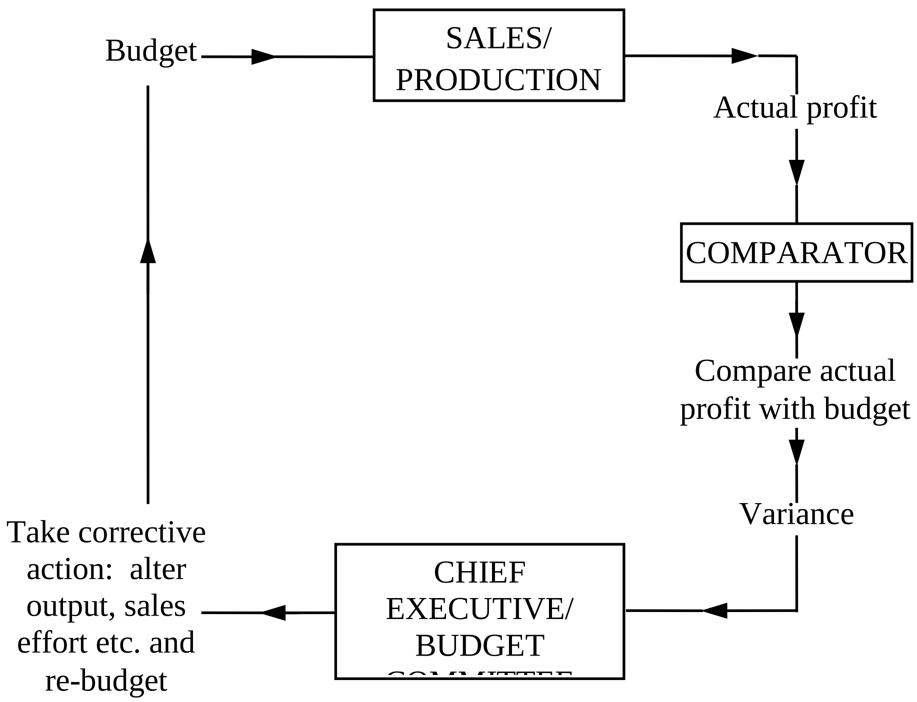

Figure 7.1: Budgetary Control System

Example
The principles involved in presenting information, and a suggested layout, are illustrated in the following example.

PQ Co. is operating a budgetary control system. The overhead costs for service department X are as follows:

Flexible Budget for Dept X - January

Units of service:	10,000	12,000	14,000
	RWF	RWF	RWF
Cleaning	300	340	380
Consumable stores	200	230	260
Depreciation	180	200	220
Insurance	150	200	250
Light and fans	200	230	260
Power	240	260	280
Repairs	160	190	220
Wages – indirect	700	740	780
	2,130	2,390	2,650

For January the units supplied were 13,000 and the costs incurred were:

	RWF
Cleaning	370
Consumable stores	250
Depreciation	210
Insurance	230
Light and fans	250
Power	270
Repairs	210
Wages - indirect	750

You are required to draft an operating statement showing the variances from each type of expense. Complete the statement by showing possible reasons for the variances.

Answer
The costs (budgeted and actual) should be compared for the **actual level of activity achieved**. Accordingly, on the operating statement shown below, the actual activity of 13,000 units forms the basis of the calculation of the budgeted costs. The variability of the

costs can be seen quite clearly from the **flexible budget** (see next section). Thus, for example, cleaning costs increase by RWF40 for 2,000 units of service or, in other words, RWF20 for 1,000 units. Therefore, to find the cost for 13,000 units it is necessary to take the cost for 12,000 units (RWF340) and add the cost for 1,000 units (RWF20), making a total of RWF360.

OPERATING STATEMENT

X Department — Month: January

Output: 13,000 units

Types of Expense	**Activity Achieved** 13,000 units		**Variances**		**Reasons for Variances**
	Actual	Budgeted	Fav.	Adverse	
	RWF	RWF	RWF	RWF	
Cleaning	370	360		10	Maintenance work has brought extra cleaning
Consumable stores	250	245		5	Extra materials consumed - maintenance
Depreciation	210	210	-	-	
Insurance	230	225		5	Increased premium
Light and fans	250	245		5	Extremely hot - extra cooler used
Power	270	270	-	-	
Repairs	210	205		5	Large machine major breakdown
Wages - indirect	750	760	10		Overtime anticipated not worked
	2,540	2,520			

This example is very simple, but the same principles apply with more difficult problems. The basis for the calculation of activity may be the volume of **sales** or **production**.

In problems in examinations it is not always clear what level of activity has been achieved - this may have to be calculated from details of sales, stocks and other information.

Profit Variance

Management will be especially interested in why **profit** was different from budget (not just costs). The following presentation may be adopted to compare budgeted and actual profit:

	RWF
Budget profit	x
Plus/minus variance due to sales)	
volume/selling prices)	x
	x
Plus/minus cost variance	x
Actual profit	x

F. FLEXIBLE BUDGETS

Many companies use budgeting simply to compare actual performance with the budget that was set during the previous financial year. This directs attention towards achieving the agreed financial targets. The budget is **fixed** and all variances are reported.

However, as we saw in the previous section, if sales are greater than budget then it can be expected that cost of sales and variable overheads will also be higher. It is possible to compare actual results with what is therefore known as a **flexible budget**. A flexible budget is defined as:

> *"A budget which, by recognising the difference in behaviour between fixed and variable costs in relation to fluctuations in output, turnover, or other variable factors such as number of employees, is designed to change appropriately with such fluctuations."*

Let's take a look at another simple example:

	Budget	**Actual**
Sales (units)	1,000	1,100
	RWF	RWF
Selling price	10	10
Material cost each	3	4
Labour cost each	2	2
Variable overhead each	1	1
Fixed overheads	2,000	2,000

Comparison with the original (or fixed) budget would give the following variances:

	Budget	Actual	Variance
	RWF	RWF	RWF
Sales	10,000	11,000	1,000
Material cost	3,000	4,400	(1,400)
Labour cost	2,000	2,200	(200)
Variable overhead	1,000	1,100	(100)
Fixed overheads	2,000	2,000	-
Profit	2,000	1,300	(700)

In this statement there are adverse labour and variable overhead variances even though their actual cost per product is exactly the same as budget. The **only** genuine adverse variance is material, where the actual cost per product is RWF1 per product greater than the budget.

This would be better highlighted by preparing a flexible budget which shows the expected level of costs for the actual level of sales at budgeted selling prices. This would result in the following statement of variances which more accurately reflects the control variances and highlights only the overspend in material costs of RWF1,100:

	Flexed Budget	Actual	Variance
	RWF	RWF	RWF
Sales	11,000	11,000	-
Material cost	3,300	4,400	(1,100)
Labour cost	2,200	2,200	-
Variable overhead	1,100	1,100	-
Fixed overheads	2,000	2,000	-
Profit	2,400	1,300	(1,100)

We will be looking at flexible budgeting in further detail later.

G. BEHAVIOURAL IMPLICATIONS

Budgetary control is a very powerful tool which highlights all departures from the agreed budget. It is therefore vitally important that **all managers are involved** in the budget-setting process so that they feel committed to achieving their targets. It also needs to be recognised that managers will play the 'budget game' and endeavour to ensure they have achievable targets. It is quite common to find that the company's first budget estimates show it plunging into massive losses. Sales and marketing staff have been cautious with their sales estimates and views on price increases, whilst line managers have been unduly pessimistic about costs and endeavour to secure the maximum capital budget so that they can implement all their projects.

It takes time to tease out their genuine expectations, and this process must be handled very carefully in order to avoid the appearance of imposing budgetary targets on managers. The eventual target should be realistic but stretching - so as to provide a challenge to the people involved.

Having constructed the budget, it is also important to recognise that some managers may attempt to bend the system so that adverse variances are not reported in their area. It is not unknown for managers to put incorrect codes on their purchase orders so that costs are shown in another manager's operating statement, or reported elsewhere on their own. Naturally this does nothing to help define better budgets in the following years.

It is also essential that the basis of the budget-setting process is understood. In practice it is often based on the company's current position and then updated for changes expected in the forthcoming year. This can lead to established inefficiencies being built into next year's targets. An alternative approach is called **zero-based budgeting**, which challenges the accepted way of doing things and attempts to construct budgets based on the way operations would be established if they were being set up for the first time. The budget must obviously start from the company's current position, but this type of analysis should encourage the company to progress towards a better way of structuring its activities.

We will cover zero-based budgeting in detail later.

H. BUDGETING AND LONG-TERM OBJECTIVES

Budgetary control is important, but the correct balance needs to be maintained between the company's short and long-term goals. Budgetary control tends to highlight short-term financial objectives, and this highlighting is sometimes reinforced by management incentive schemes geared to achieving budget. Great care must therefore be exercised to ensure that decisions are not taken which protect short-term profitability at the expense of the long-term position of the company. For example, research and development costs can be cut without any immediate impact on the company; however, it is likely to have a major impact on the company's long-term position.

I. PUBLIC SECTOR BUDGETS

Preparation of the Budget

This section details specific steps in the budget preparation process, as it's one of the core functions of the Chief Budget Manager. The budget preparation process is coordinated by the National Budget Department at MINECOFIN and all the budget related documents are posted at their website http://www.minecofin.gov.rw/ministry/directorates/nb.

The First Budget Call Circular

The budget preparation call circular is triggered by the issuance of the First Budget Call Circular (BCC). The BCC is issued in accordance with Article 28 of OBL, and provides information to guide the Chief Budget Managers in the preparation of the budget. The 1st BCC is normally issued in October and it is important that Chief Budget Managers start using it from October.

The 1st BCC is not intended to seek budget submissions from budget agencies but is rather aimed at giving advance information to facilitate timely coordination and effective planning within the sectors to allow formulation of policy based budgets within individual budget agencies at a later stage. The 1st BCC is aimed at inducing discussions at the sector level on priority activities to be funded through the Government budget for the following financial year. These priorities should be reflected in joint sector review report and should be the basis for submission of the budget requests in response to the 2nd BCC, normally issued in early December.

The Second Budget Call Circular

As indicated above, the 1st BCC issued in October is meant to provide advance information to budget agencies to better prepare and make informed plans and budgets. The 2nd Budget Call Circular is issued in early December requiring budget agencies to prepare detailed budget submissions for the following financial year. The 2nd BCC, which is also prepared by National Budget Department, includes:

(a) The total indicative resource envelope derived from the macro-fiscal framework consistent with the broad policy objectives. The indicative ceilings are issued at high level at line ministries, provinces and other high level government institutions. This is to allow coordination and prioritization of activities at the high level of Government programmes. The parent institutions (Ministries and other high level institutions) that have been allocated ceilings are required to immediately undertake consultative process with all affiliated agencies to agree on individual agency ceilings that shall be the basis for the detailed budget estimates to be entered in the budget system (SmartFMS).

(b) Budget submission formats (Annexes) to be submitted by each budget agency to assist in preparation of the Finance Law (including externally and internally financed projects, internally generated revenues, earmarked transfers to districts, Agency MTEFs, Strategic Issues Papers (SIPs).

Strategic Issues Papers (SIPs)

The Strategic Issues Papers (SIPs) and Agency MTEFs are prepared by line ministries after consultation with their affiliated agencies, projects and districts. At this stage, information is gathered regarding projects support and sector budget support.

The SIPs and agency MTEFs are submitted to MINECOFIN and analyzed by NBD. Budget consultations are then held between line ministries and MINECOFIN (in March) to agree on final ceilings to submit to Cabinet & Parliament.

As indicated above, budget preparation is one of the most important responsibilities for a Chief Budget Manager. Chief Budget Managers should ensure that the contents of the guidelines are strictly adhered to and all issues therein are addressed in their draft budget estimates.

Submission and approval of budgets

The procedures for preparation, presentation and approval of budgets are provided for under Chapter III Articles 28-45.

It should be noted that no budget should be provided for urgent and unforeseen expenditures with a budget of a central government agency as provided in article 31 of the OBL. Such a budget is only provided under the budget of Ministry of Finance and Economic Planning. However, each district may provide for such expenditure in its own budget as provided under article 32 of the law.

Article 35: Expenditure estimates shall be prepared by budget Agencies, based on the available resources and the guidelines issued by the Minister. Each budget Agency shall have a separate budgetary line (vote) in the budget. Expenditure estimates of each budget Agency are organized in a programmatic, economic and functional classification, in line with international classification standards.

Article 6 of the OBL obliges government institutions to reflect all the revenues including grants and all expenditures within their budgets. Chief Budget Managers should ensure during budget preparation that this requirement is respected.

In order to meet the constitutional obligation as per Article 79 to submit the draft budget estimates and MTEF to parliament before commencement of the budget session, the draft estimates of Budget Agencies should reach MINECOFIN not later than January 28th, in hard copies and electronically through SmartFMS. This gives NBD time to analyse the budgets and conduct Budget Hearings for all Sector Ministries. In months 8-9 (February/March), the detailed draft budget is prepared by MINECOFIN along with accompanying Budget Framework Paper (BFP).

The BFP sets out the macroeconomic context of the draft budget as well as the key policy choices underlying the proposed resource allocation. The BFP is discussed by Cabinet and recommendations are incorporated. The BFP and draft Budget is discussed with donors at the second Joint Budget Support Review. It is at this point that Development Partners make firm commitments for the coming year.

In accordance with article 79 of the Constitution of the Republic of Rwanda of June 4, 2003 as amended to date, the Cabinet shall submit the draft budget to the Chamber of Deputies before the beginning of the budget session. This is further elaborated in Article 42 of OBL. The Minister presents the draft estimates and BFP to Parliament in the 10^{th} month of the financial year (April).

The Parliamentary Committee on Budget and State Property in collaboration with other sectoral committees scrutinizes the BFP and the draft budget estimates and submits a report to plenary containing recommendations to the Executive for improvement of the BFP and draft budget estimates. This report is normally submitted before the end of May and becomes the basis for revising the BFP and preparing the draft Finance Law.

After the approval of the draft finance law by Cabinet around the first week of June, the draft finance is submitted to Parliament and is officially laid before the Parliament by the Minister of Finance and Economic Planning during the second week of June. The budget is ordinarily voted and approved by Parliament before commencement of the next fiscal year.

Preparation and approval of Local Government Budgets

The Intergovernmental Fiscal Relations Unit (IGFR) in MINECOFIN acts as the coordinating unit between the district and national budget cycle.

Districts carry out their own review of last year's performance which is discussed at the Joint Action Forum in month 2 (August). During budget preparation, districts participate in consultations with line ministries on Earmarked Transfers. MINECOFIN (IGFR) sends out the District Budget Call Circular for Districts to prepare their budgets. Following the finalization of the BFP at the national level, districts prepare their detailed budget based on final resource envelopes agreed at Districts' Joint Action Forum and transfers from Central Government communicated by the Ministry of Finance and Economic Planning.

As required under article 43 of the OBL, the draft budgets of local administrative entities shall be submitted to the executive committee of such an entity for further analysis before submission to the local council of such an entity for examination and approval. When the draft budget of local administrative entities has been approved by Council, they shall make it public to the general meeting of the residents convened by the Executive Committee of the local administrative entity, in each sector.

Revised Budget

Article 45 of OBL provides for revision of budget after six months of implementing the budget. The proposed changes shall be consistent with the approved medium-term strategies and budget framework; and if they are different from the approved budget framework, the reasons thereof shall be notified to the Parliament or to the local Council of such an entity.

Accordingly, the Chief Budget Managers are required to monitor closely the implementation of their budget by keeping a close eye on issues that might require revision after six months of implementing the budget. These should be the issues that cannot be handled through budget re-allocation like information on project funds that has just been communicated by the donor, under- spending of a project that might require some adjustment in the procurement plan and thus budget revision etc.

Requests for budget revision should be communicated to the Ministry of Finance and Economic Planning by the first week of December to have an informed decision of whether a budget revision is warranted or not by the end of December.

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Study Unit 16

Preparation Techniques and Considerations of Budgets

Contents

A. FUNCTIONAL BUDGETS

Sample Data

VT Ltd produces two products - X and Y. The products pass through two departments - Department 1 and Department 2. The following standards have been prepared for direct materials and direct wages:

	Product	
	X	**Y**
Material A	5 kg	8 kg
Material B	4 kg	9 kg
Direct labour:		
Department 1	3 hours	2 hours
Department 2	2 hours	4 hours

The standard costs for direct material and direct labour are:

	RWF per kg
Material A	2.00
Material B	1.20
Direct wages:	RWF per hr
Department 1	3.00
Department 2	3.50

Standard selling prices are:

Product	RWF per unit
X	50.00
Y	80.00

The budgeted sales for each product for the coming year are:

Product	**Units**
X	8,000
Y	10,000

The company plans to increase the stocks of finished goods, so that the closing stock of product X will be 2,000 units and the closing stock of product Y will be 3,000 units.

Opening stocks of finished goods are:

Product	**Units**

X	1,000
Y	2,000

Finished goods are valued at variable production cost.

Opening stocks of direct material are:

Material	kg
A	12,000
B	15,000

The required closing stocks of materials are: material A 19,000 kg; material B 15,000 kg.

	Dept 1 per direct labour-hour	**Dept 2 per direct labour-hour**
	RWF	RWF
Light, fans, power	0.20	0.20
Consumable stores, indirect materials	0.40	0.30
Indirect wages	0.30	0.50
Repairs and maintenance	0.20	0.30

Standard variable selling and distribution expenses are:

	Product X per RWF **of sales value**	**Product Y per** RWF **of sales value**
	(%)	(%)
Commission	5	5
Carriage, packing, transport	4	2.5
Telephone, postage, stationery	2	2

Fixed production, selling and distribution, and administration overheads are budgeted to be as follows:

	Production RWF	Selling and Distribution RWF	Administration RWF
Salaries:			
Dept 1	10,000		
Dept 2	12,000		
Selling and distribution:			
Product X		20,000	
Product Y		30,000	
Administration			22,000
Depreciation:			
Dept 1	20,000		
Dept 2	22,000		
Selling and distribution:			
Product X		5,000	
Product Y		6,000	
Administration			6,000
Stationery, postage, telephone:			
Dept 1	1,100		
Dept 2	1,200		
Selling and dist. product X		800	
product Y		1,000	
Administration			2,500
Sundry expenses:			
Dept 1	1,400		
Dept 2	1,300		
Selling and dist. product X		1,200	
product Y		1,500	
Administration			1,500

The company's balance sheet at the beginning of the year was:

BALANCE SHEET

		RWF	RWF
Fixed assets at cost			1,000,000
Less: accumulated depreciation			200,000
			800,000
Current Assets			
Stock:	material	42,000	
	finished goods	145,100	
Debtors		150,000	
Cash		40,000	
		377,100	
Current Liabilities			
Creditors		110,000	
Net current assets			267,100
			1,067,100
Represented by:			
Share capital			800,000
Reserves			267,100
			1,067,100

The budgeted cash flows per quarter are:

	Quarter			
	(1)	**(2)**	**(3)**	**(4)**
	RWF	RWF	RWF	RWF
Debtors	250,000	200,000	300,000	300,000
Creditors	110,000	100,000	100,000	122,000
Wages	90,000	90,000	92,000	92,000
Expenses	83,000	84,000	87,000	88,000

You are required to prepare the following budgets:

- Sales
- Production
- Materials purchases
- Direct materials cost
- Direct labour cost
- Production overheads
- Selling and distribution overheads
- Administration overheads
- Trading and profit and loss account
- Balance sheet at year-end
- Cash

Sales Budget

The sales budget will frequently be the starting point of the budget, and it is in our example. The sales figures will usually determine the **production requirements** - subject, as in this case, to any required adjustment to the stocks of finished goods. The sales budget will be derived from salespeople's reports, market research, or other intelligence or information bearing on future sales levels and demand for the company's products. The sales budget would be analysed according to the regions or territories involved, with monthly budget figures for territories, salespeople and products, so that sales representatives would have specific targets against which actual performances could be measured.

The total sales budget in terms of units and values for the two products will be:

Product	**Units**	**Unit Price**	**Sales Value**
		RWF	RWF
X	8,000	50.00	400,000
Y	10,000	80.00	800,000
			1,200,000

Production Budget

The purpose of this budget is to show the **required production** for the coming year, so that production scheduling can be completed in advance and individual machine loading schedules can be prepared. This will enable the production department to assess the budgeted usage of plant, the labour requirements and the extent of any under- or over-capacity. As with the sales budget, the total annual requirements must be analysed into monthly figures.

The total budget for the year is:

	Product X	Product Y
	units	units
Sales	8,000	10,000
Plus closing stock required	2,000	3,000
	10,000	13,000
Less opening stock	1,000	2,000
Production requirement	9,000	11,000

Materials Purchase Budget

This budget sets out the **purchasing requirements** for each type of material used by the organisation, so that the purchasing department can place orders for deliveries, to take place in accordance with production requirements - the essential need being that production should not be held up for lack of materials. Purchase orders should be placed, and deliveries phased, according to the production schedules, care being taken that no excessive stocks are carried. The standard for the products will also specify the quality of material required, so that the purchasing department will be responsible for obtaining the materials required, of the standard quality.

As with other budgets, the purchasing budget should show the monthly quantities to be purchased, allowing for any lead time in suppliers' deliveries.

	Materials A	Materials B
	kg	kg
Production: Product X	45,000	36,000
Product Y	88,000	99,000
	133,000	135,000
Plus required closing stock	19,000	15,000
	152,000	150,000
Less opening stock	12,000	15,000
Purchases required	140,000	135,000

Direct Materials Cost Budget

The figures for this budget flow from the materials purchases budget, and they show the **financial implications of the planned purchases**, for purposes of financial control and cash flow requirements.

	Material A	**Material B**
Purchases required	140,000 kg	135,000 kg
Price per kg	RWF2.00	RWF1.20
Cost of purchases	RWF280,000	RWF162,000

Note that the quantities for production represent the number of production units in the production budget multiplied by the kg per unit.

Direct Labour Cost Budget

This budget shows the **number of direct labour-hours required to fulfil the production requirements** and the monetary value of those hours. Departmental figures are given, so that departmental supervisors are made aware of the labour-hours and costs over which they are expected to exercise control. Periodic reports would be made to supervisors, showing the output achieved and the relevant standard hours and costs for that output (and, where necessary, the reports required on any significant variances from the standards).

Direct labour-hours:

PRODUCT

Departmen t	X			Y			Combined totals
	Units	Hours per unit	Total hours	Units	Hours per unit	Total hours	
1	9,000	3	27,000	11,000	2	22,000	49,000
2	9,000	2	18,000	11,000	4	44,000	62,000

Direct labour costs:

Department	Hours	Rate	
		RWF	RWF
1	49,000	3.00	147,000
2	62,000	3.50	217,000
	111,000		364,000

Production Overhead Budget

The variable and fixed overheads are shown by department. The departmental supervisors will be expected to exercise control over those items for which they are responsible, and monthly reports, highlighting the variances from budget, will be provided to assist them. The variable overheads are expressed as amounts per direct labour-hour - but these could also be shown in relation to some other factor, such as machine time, units of production, materials to be consumed, or other relevant factors. In practice a combination of these factors might be used.

Variable overheads:

	Department 1		**Department 2**	
	(Dir. lab-hours 49,000)		**(Dir. lab-hours 62,000)**	
	Per hour		**Per hour**	
	RWF	RWF	RWF	RWF
Light, heat, power	0.20	9,800	0.20	12,400
Consumable stores, indirect materials	0.40	19,600	0.30	18,600
Indirect wages	0.30	14,700	0.50	31,000
Repairs, maintenance	0.20	9,800	0.30	18,600
		53,900		80,600

Fixed overheads:

	Dept 1	**Dept 2**
	RWF	RWF
Salaries	10,000	12,000
Depreciation	20,000	22,000
Stationery, postage, telephone	1,100	1,200
Sundry expenses	1,400	1,300
	32,500	36,500

Selling and Distribution Overheads Budget

As with other overhead budgets, the object of this budget is to **identify the overheads to be controlled** by the management - in this case the sales management. Further analyses of the overheads would be required to show the budgeted costs on a monthly basis, and by regions and representatives where appropriate.

Variable overheads:

	Product			
	X		**Y**	
Sales	RWF400,000		RWF800,000	
	% of sales	RWF	% of sales	RWF
Commission	5	20,000	5	40,000
Carriage, packing, despatch	4	16,000	2.5	20,000
Telephone, postage, stationery	2	8,000	2	16,000
		44,000		76,000

Fixed overheads:

	X	Y
Salaries	20,000	30,000
Depreciation	5,000	6,000
Stationery, postage, telephone	800	1,000
Sundry	1,200	1,500
	27,000	38,500

Administration Overheads Budget

The administration overheads are likely to be mainly of a fixed character, and not affected by production or sales levels, except where there are wide fluctuations. These overheads will cover the general administration and accounting services of the organisation, and they will be the responsibility of the chief executive concerned. Separate budgets for the accounting, company secretarial and other departments will be required in larger organisations. The budgets will be prepared after detailed studies have been made of the level of service required to provide the necessary accounting, secretarial and other administrative services needed. Where a complete review is required, an **organisation and methods study** may be undertaken. Monthly reports will show actual and budgeted results, as with other functions, and variances shown for further investigation. (The costs in this problem have been assumed to be entirely fixed.)

	RWF
Salaries	22,000
Depreciation	6,000
Stationery, postage, telephone	2,500
Sundry expenses	1,500
	32,000

B. MASTER BUDGETS

(This is not examinable for Formation 2; however it is useful for information purposes)

Budgeted Trading and Profit and Loss Account

This account is part of the master budget as it brings together all the functional and subsidiary budgets and it shows the expected trading profit or loss based on the sales and cost budgets previously prepared. In the light of these results, the management may decide to recommend changes to the sales and cost figures, to bring the expected results into line with a required return on capital or gross and net profit percentages related to sales. Once the final figures have been approved, the budgeted trading and profit figures become the target for the company as a whole. Using the figures arising from the previous budgets, the budgeted trading and profit and loss account would be as follows:

VT LTD

BUDGETED TRADING AND PROFIT AND LOSS ACCOUNT
FOR THE YEAR ENDED . . . .

	RWF	RWF
Sales		1,200,000
Opening stock of materials	42,000	
Purchases	442,000	
	484,000	
Less Closing stock of materials	56,000	
	428,000	
Direct wages	364,000	
Variable production overheads	134,500	
	926,500	
Opening stock of finished goods	145,000	
	1,071,500	
Less Closing stock of finished goods	236,000	835,500
Gross profit		364,500
Overhead Expenses		
Variable selling and distribution overhead	120,000	

Fixed overheads:		
Production	27,000	
Selling and distribution	54,500	
Administration	26,000	
Depreciation:		
Production	42,000	
Selling and distribution	11,000	
Administration	6,000	286,500
Net profit		78,000

Budgeted Balance Sheet

This also forms part of the master budget, and it shows the **expected overall financial position** resulting from the budgets. It enables assessments to be made of the return on capital and ratios of profitability and liquidity - for example, the current asset/current liability position, credit collection periods, and other financial ratios. This may also be part of a review process in which some revisions may be required before final approval is given.

VT LTD

BUDGETED BALANCE SHEET AS AT . . . .

	RWF	RWF
Fixed assets at cost		1,000,000
Less: accumulated depreciation		259,000
		741,000
Current Assets		
Stock of materials	56,000	
Stock of finished goods	236,000	
Debtors	300,000	
	592,000	
Current Liabilities		
Creditors	120,000	
Bank overdraft	48,000	
	168,000	
Net current assets		424,000
		1,165,000
Represented by:		
Share capital		800,000
Reserves		365,000
		1,165,000

C. CASH BUDGET

This budget enables management to see the timing of projected cash flows and the **net cash flow position** for each period. Monthly cash flow figures would be provided to show the anticipated cash position at each point. In the light of this budget, it may be necessary to make arrangements for overdraft facilities for short-term needs or investment of surplus funds. In very large organisations the management of funds may require constant attention to ensure that effective use is made of all available funds. Also separate cash budgets may be required for **operational** cash flows and **financing** cash flows. The operational cash flows relate to trading operations, and financing cash flows to longer-term financing with related interest charges.

Construction of Cash Budgets

It is very important that you understand how to construct a cash budget (this topic forms a frequent examination question).

Cash budget detail the **cash effect** of all transactions included in a company's budgeted profit and loss account and balance sheet. There are two methods of preparing them. One method calculates **receipts and payments**, whilst the other looks at the change in the opening and closing **balance sheet positions**.

We will examine a budget covering a three-month period. We will ignore the effect of VAT.

Example

Cashflow Ltd's budgeted profit and loss account and balance sheets are as follows:

BUDGETED PROFIT AND LOSS ACCOUNT

	January		**February**		**March**	
	RWF	RWF	RWF	RWF	RWF	RWF
Sales		80,000		70,000		90,000
Opening stock	7,000		13,000		11,000	
Purchases	30,000		19,000		30,000	
	37,000		32,000		41,000	
Closing stock	(13,000)		(11,000)		(14,000)	
Cost of sales		(24,000)		(21,000)		(27,000)
Gross profit		56,000		49,000		63,000
Overheads						
Wages and salaries	10,000		10,000		10,000	
Depreciation	4,000		4,000		4,000	
Other overheads	20,000	(34,000)	18,000	(32,000)	22,000	(36,000)
Net profit		22,000		17,000		27,000

BUDGETED BALANCE SHEETS

	As at 1 Jan		As at 31 Mar	
	RWF	RWF	RWF	RWF
Fixed Assets				
Cost	175,000		200,000	
Depreciation	(20,000)		(32,000)	
Net book value		155,000		168,000
Current Assets				
Stock	7,000		14,000	
Debtors	100,000		90,000	
Cash	10,000	117,000	81,000	185,000
Current Liabilities				
Trade creditors	(50,000)		(52,000)	
Taxation	(24,000)		-	
Dividends	(7,000)	(81,000)	-	(52,000)
Capital employed		191,000		301,000
Financed by:				
Share capital	100,000		150,000	
Reserves	25,000		91,000	
Shareholders' funds		125,000		241,000
Loans		66,000		60,000
		191,000		301,000

Additional Notes:

- All sales and purchases are made on one month's credit.
- Wages and salaries are paid in the same month as the expense is incurred.
- The increase in the value of fixed assets results from the purchase of equipment costing RWF25,000. The cash payment was made in March.
- The debtor balance as at 1 Jan will be received in January.
- The trade creditor balance as at 1 Jan will be paid in January.
- The balance sheet taxation figure shown as part of current liabilities relates to a tax provision made on a previous year's profits. The tax is due for payment in February.
- The balance sheet dividends figure shown as part of current liabilities relates to a proposed dividend payable on the previous year's profits. This dividend is payable in March.
- The increase in share capital results from the issue of new shares. Cash to the value of RWF25,000 is receivable in February with the balance due in March.
- A RWF6,000 loan repayment is to be made in January.

(a) Receipts and Payments Method

The cash budget prepared on the receipts and payments basis is presented below:

CASH BUDGET

	January	**February**	**March**
	RWF	RWF	RWF
Receipts			
Cash from sales	100,000	80,000	70,000
Issue of shares		25,000	25,000
Total receipts	100,000	105,000	95,000
Payments			
Purchases	(50,000)	(30,000)	(19,000)
Wages and salaries	(10,000)	(10,000)	(10,000)
Other overheads	-	(20,000)	(18,000)
Purchase of fixed assets	-	-	(25,000)
Taxation	-	(24,000)	-
Dividends	-	-	(7,000)
Loan repayment	(6,000)	-	-
Total payments	(66,000)	(84,000)	(79,000)
Net cash flow for month	34,000	21,000	16,000
Opening cash position	10,000	44,000	65,000
Cash inflow	34,000	21,000	16,000
Closing cash position	44,000	65,000	81,000

Explanatory notes on preparation of cash budget:

(i) Sales

All sales are made on one month's credit. This means that January's sales will be paid for in February, February's sales will be paid for in March and March's sales will be paid for in April.

Cash from March's sales will be received in April, which is not covered by the cash budget. At the end of March, RWF90,000 is owed to the company which will be shown as debtors in March's balance sheet.

(ii) Purchases

The company obtains one month's credit on all its purchases. January's purchases will be paid for in February. February's purchases will be paid for in March and March's purchases will be paid for in April.

At the end of March the company owes its suppliers RWF30,000, which will be shown as part of creditors in March's balance sheet.

(iii) Wages and Salaries

Wages are paid out in the same month as the expense is incurred.

(iv) Depreciation

Depreciation covers the reduction in value of a company's fixed assets. **Depreciation is not a cash payment**. It is an accounting provision which reduces profits and the value of assets in the balance sheet.

Cash flow statements are concerned only with **cash payments** and **cash receipts**. As depreciation does not affect cash, it will **not appear** in a budgeted cash flow statement.

(v) Other Overheads

Other overheads are bought on one month's credit. The cost, included in January's profit and loss account, is included in February's cash flow, and so on.

At the end of March the company owes its suppliers RWF22,000 which will be shown as part of creditors together with the RWF30,000 owed for its other purchases.

(vi) Cash Balances

The opening cash position in January is taken from the balance sheet as at 1 Jan. The closing cash position for January becomes the opening cash position in February. February's closing cash position becomes the opening cash position in March.

(b) Comparison of Opening and Closing Balance Sheets Method

It is also possible to prepare a cash budget by examining the opening and closing balance sheet positions.

Completion of the cash budget on a receipts and payments basis will identify the level of **debtors** and **creditors**. The debtors figure will represent sales made on credit for which payment has not been received. The creditors figure will represent purchases made on credit that have not yet been paid for. The statement will also establish the cash or bank overdraft position.

As an alternative, it is possible to calculate debtors and creditors by using target ratios or other information that will always be given to you in an examination question.

Cash Flow Statement

You should be aware from your financial accounting studies that, from a budgeted balance sheet and profit and loss account, it is possible to prepare a cash flow statement. The layout of this type of statement is presented below. The information in this statement is taken from Cashflow Ltd's accounts detailed earlier.

CASH FLOW STATEMENT

	RWF	RWF
Operating profit	66,000	
Add back depreciation	12,000	
Changes in working capital:		
Stocks	(7,000)	
Debtors	10,000	
Creditors	2,000	
Cash flow from operating activities		83,000
Taxation		(24,000)
Capital expenditure		(25,000)
Dividends		(7,000)
Sources of new finance:		
Share capital		50,000
Loan repayments		(6,000)
Cash inflow (represented by a change in the cash balance)		71,000

This type of statement starts with a company's **profits**. It then adds back the amount of depreciation included in the profit and loss account as this does not involve a payment of cash. Operating profit is then further adjusted for **changes in the working capital position**:

- An **increase in stocks** will reduce cash.
- A **reduction in debtors** means that the company has received a greater value of cash than it has invoiced out in the form of credit sales. This will benefit a company's cash position.
- An **increase in the value of creditors** means that the company has paid less to its suppliers than it has been allowed in credit. This will improve the cash position.

The effect of **raising new share capital** will benefit cash and the payment of tax and dividends and repayment of a loan will obviously reduce the cash balance.

The final figure in the statement is the company's **net cash flow** for the period, which is represented by a change in the company's cash position. The opening cash position was RWF10,000 and the closing balance was RWF81,000. The company must therefore have generated a positive cash flow of RWF71,000.

The advantage of this type of statement is that it clearly identifies those areas of the business that must be controlled in order effectively to manage its cash resource:

– Profit must be maximised.

– Capital expenditure must be controlled. Investment should lead to improved levels of profitability.

– Stock must be kept to a minimum.

– Debtors must be kept to a minimum.

– Creditors must be controlled so that the maximum benefit is obtained from this form of finance.

We will look at cash flow statements again in a later study unit.

Benefits of Cash Budgets

The preparation of cash budgets will also generate the following benefits:

(a) Cash budgeting highlights the impact that all other decisions have on a company's **financial resource**.

(b) Cash may be a **limiting factor** and restrict a company's plans. The preparation of a cash budget will indicate if this is the case.

(c) Budgeting will identify any **cash problems** that may occur during the period covered by the budget. Advance warning will enable a company to take corrective action.

(d) Cash budgets are very useful documents when talking to banks and other financial institutions. These organisations want to see that a company is **controlling its cash**, and that it will be in a position to meet its obligations as they fall due.

D. FLEXIBLE BUDGETS

Use of Flexible Budgets

Fixed budgets are used to **plan** the activity of the organisation. **Cost control** begins by comparing actual expenditure with budget. Remember, though, that if the level of activity differs from that expected, some costs will change, and the individual manager cannot be expected to control the whole of that change. If activity is greater than budgeted, some costs will rise; if activity is less than budgeted, some costs will fall. The question is whether the manager has kept costs within the level to be expected, given the **activity level**.

A **flexible budget**, as we mentioned in an earlier study unit, is one which - by recognising the difference in behaviour between fixed and variable costs in relation to fluctuations in output, turnover, or other variable factors, such as number of employees - is designed to change appropriately with such fluctuations. It is the flexible budget which is used for control purposes, not the fixed budget we have discussed so far.

Cost Behaviour

In order to understand flexible budgets, we must recall our earlier definitions of fixed and variable costs:

(a) Fixed Cost

This is a cost which accrues in relation to the passage of time and which, within certain output and turnover limits, tends to be unaffected by fluctuations in the level of activity. Examples are rent, , insurance and executive salaries.

(b) Variable Cost

This is a cost which, in the short term, tends to follow the level of activity. Examples are all direct costs, sales commission and packaging costs.

(c) Semi-variable Cost

This is a cost containing both fixed and variable elements, which is, therefore, partly affected by fluctuations in the volume of output or turnover. There are two main methods of predicting semi-variable costs at various levels of output or turnover:

(i) Separation of Fixed and Variable Elements

Provided the cost is known for two different levels of output/turnover, the fixed and variable elements can be separated, and the level of cost at any other level of output/turnover predicted. If more than two items of data are available, the highest and lowest are selected (the **high and low point method**).

Example

At output levels of 1,000 units, 1,200 units, 1,500 units and 1,800 units costs are RWF2,000, RWF2,200, RWF2,500 and RWF2,800 respectively. Taking the low and high points (1,000 units and 1,800 units), an extra 800 units of output causes an extra RWF800 of cost: the variable element of the cost must be RWF1 per unit. Therefore, considering the total cost for RWF1,000 units, the fixed element of cost must be RWF1,000.

(ii) Graphical Method for 'Curve Expenses'

The calculation made in (i) is an oversimplification of the situation that is found in practice in respect of semi-variable costs: it was assumed that, after a certain initial expense, incremental costs varied in direct proportion to output - in other words, that the graph of the cost looked like that in Figure 10.1:

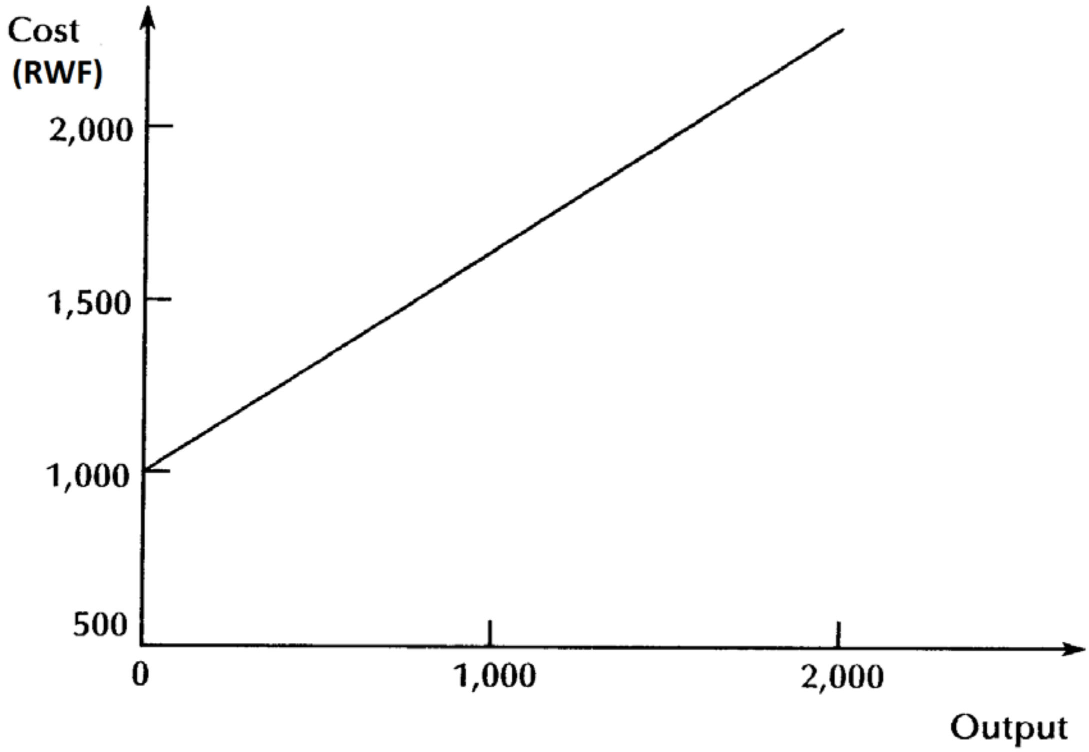

Figure 10.1: Cost Varying in Direct Proportion to Output

In practice, the graph of semi-variable expenses appears as a **curve**. The following procedure should be adopted:

a. Find the expense level for various levels of activity.

b. Plot these levels of cost on a graph.

c. Draw a line of best fit, so that the cost for any other activity level can be found by interpolation.

To obtain the graph in Figure 10.2, investigation has been carried out at activity levels of 10%, 30%, 50%, 70%, 90% and 100% of the budgeted level, and the values plotted. The line of best fit has then been drawn between them.

It has been assumed that an activity of 64% has been achieved, and the broken line projected to find the cost which should be associated with this activity level - i.e. RWF5,000.

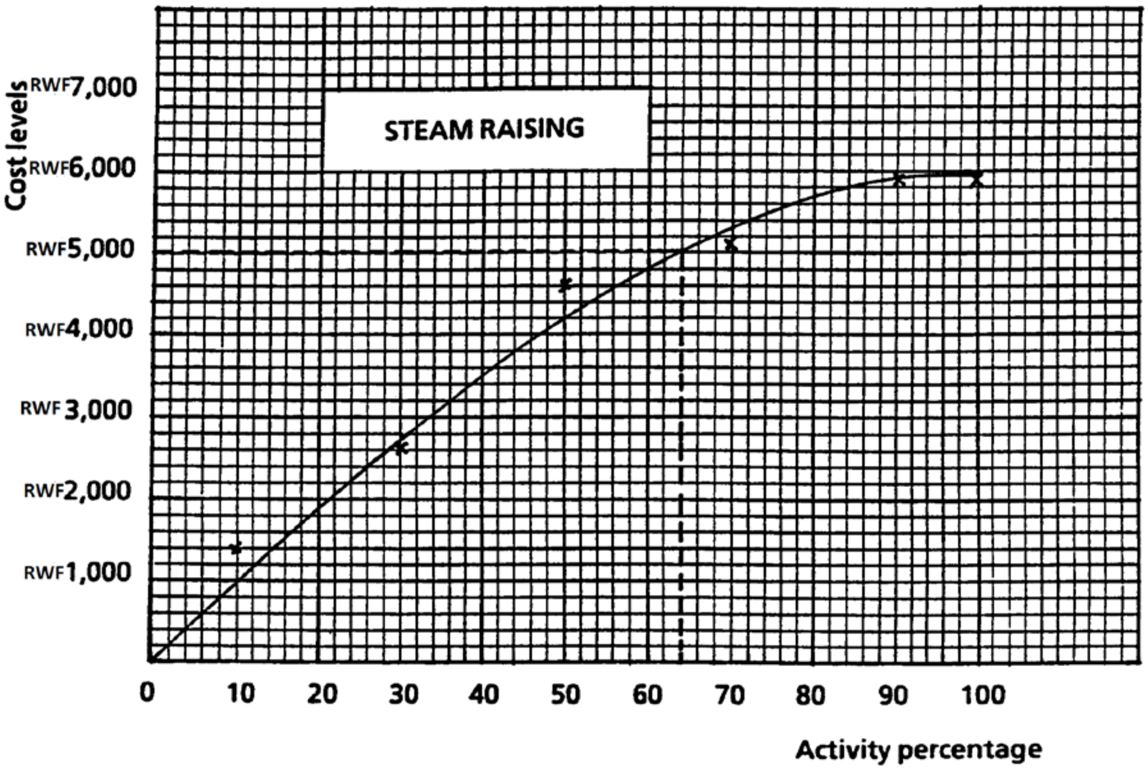

Figure 10.2: Activity Level and Cost

(d) Discretionary Cost

This is a fourth category of cost, which may be incurred or not, at the manager's discretion. It is not directly necessary to achieving production or sales, even though the expenditure may be desirable. Examples are research and development expenditure.

Discretionary costs such as this are a prime target for cost reduction when funds are scarce, precisely because they are not related to current production or sales levels. This might be a very short-sighted policy - nevertheless, it is useful to have these costs separately identified in the budget.

(e) Controllable Costs or Managed Costs

As we know, the emphasis in budgeting is on responsibility for costs (budgetary control is one form of **responsibility accounting**). The aim must be to give each manager information about those costs he **can control**, and not to overburden him with information about other costs. A controllable cost is one chargeable to a budget or cost centre which can be influenced by the actions of the person in control of the centre.

Given a long enough time-period, all costs are ultimately controllable by someone in the organisation (e.g. a decision could be taken to move to a new location, if factory rent became too high). Controllable costs may, however, be controllable only to a limited extent. Fixed costs are generally controllable only given a reasonably long time-span. Variable costs may be controlled by ensuring that there is no wastage but they will still, of course, rise more or less in proportion to output.

Preparation of Flexible Budgets

Example 1

The fixed budget for budget centre A is shown below. This is the budget based on the **expected level of output**, and it will therefore be the budget used to plan the resources needed in that department. Note that the activity level is given in standard hours. Remember that the standard hour is a measure of **output**, not of time: it is the quantity of output or amount of work which **should be performed** in 1 hour. This concept is used because it enables us to compare different types of work. Instead of saying '400 units of X which take 2 hours per unit plus 200 units of Y which takes 1 hour per unit' we can simply say '1,000 standard hours'.

BUDGET CENTRE A

Budget - Period 3 **Activity 1,000 std hrs**

	Fixed	**Variable**	**Total**
	RWF	RWF	RWF
Process labour		2,000	2,000
Indirect labour	50	85	135
Fuel and power	450	800	1,250
Consumable stores	5	15	20
			3,405

From the above figures, we can evaluate a level of expense which is appropriate to any level of output, within fairly broad limits. The figures have been set as the total allowance of expense which is expected to be incurred at an output level of 1,000 standard hours. Should, however, the output not be as envisaged, the allowance of cost can be varied to compensate for the change in level of activity. This adjustment is known as **flexing a budget for activity**.

We would expect that if 1,000 standard hours were produced, the cost incurred would be RWF3,405. If the level of output changes for some reason, the level of cost usually changes. We will assume that the levels of output attained were 750 standard hours in period 4 and 1,200 standard hours in period 5. The budgets would be flexed to compensate for the changes which have taken place in the actual output compared with those anticipated.

BUDGET CENTRE A

Budget - Period 4 **Actual output** **750 std hrs**

Budgeted output **1,000 std hrs**

Production volume ratio 75%

	Basic Budget			Flexed Budget			Actual
	F RWF	V RWF	Total RWF	F RWF	V RWF	Total RWF	RWF
Process labour	-	2,000	2,000	-	1,500	1,500	1,509
Indirect labour	50	85	135	50	64	114	126
Fuel and power	450	800	1,250	450	600	1,050	986
Consumable stores	5	15	20	5	11	16	19

In this instance, the fixed expenses are deemed to have remained the same but the basic budget variable figures have been allowed at only 75% of the full budget. We thus attempt to show that activity has had its effect on cost. For example, we expected that only RWF1,500 would be expended on process labour for the output achieved but, in fact, we spent RWF1,509, and we exceeded the allowed cost by RWF9.

Now consider the effect on the budget in period 5 of having gained a greater output than that envisaged originally:

BUDGET CENTRE A

Budget - Period 5 **Actual output** **1,200 std hrs**

Budgeted output **1,000 std hrs**

Production volume ratio 120%

	Basic Budget			**Flexed Budget**			**Actual**
	F RWF	V RWF	Total RWF	F RWF	V RWF	Total RWF	RWF
Process labour	-	2,000	2,000	-	2,400	2,400	2,348
Indirect labour	50	85	135	50	102	152	193
Fuel and power	450	800	1,250	450	960	1,410	1,504
Consumable stores	5	15	20	5	18	23	19

Here we have used a factor of 120% as applied to the variable elements of the basic budget. For fuel and power we observe that the fixed element has remained constant, but we have assumed that the variable element of RWF800, having risen in sympathy with the level of output, will have gone up by 20%, to RWF960. The flexed budget figure for fuel and power thus becomes RWF1,410, compared with the basic budget figure of RWF1,250.

It is clearly more reasonable to compare the actual cost of fuel and power for the period - i.e. RWF1,504 - with the flexed budget rather than with the basic budget. This explains the entire purpose of flexible budgeting, insofar as it attempts to provide a value comparison between the **actual figure of cost and the budget figure**.

Comment: Budget centre A involved a production budget. The flexing for activity was therefore carried out according to different levels of **output**. The definition of flexible budgets given earlier referred to fluctuations in output, turnover, or other factors. Obviously, the selling costs budget will be flexed according to turnover (i.e. number of units sold) rather than to output levels, while the canteen will be flexed according to number of employees.

Now work out the following problem for yourself **before** checking with the answer.

Example 2

From the following selected data of a department the normal and expected workload of which is 3,000 hours per month:

(a) Compile a flexible budget for 2,000, 2,800 and 3,600 hours of work.

(b) Compile a fixed budget.

(c) Calculate the departmental hourly overhead rate for the total of the following items:

Expense Heading	**Behaviour of Expense**
Supervision	RWF250 up to 2,000 hours
	An extra RWF60 for steps of 400 hours above 2,000
	A further RWF30 from 3,600 hours upward
Depreciation	RWF400 up to 3,000 hours
	RWF550 above 3,000 hours and up to 4,200 hours
Consumable supplies	RWF12 per 100 hours
Heat and fans	RWF45 from 1,200 to 2,000 hours inclusive
	RWF55 above 2,000 hours and RWF60 above 3,000 hours
Power	RWF15 per 100 hours up to 3,200
	RWF12 per 100 hours for hours above 3,200
Cleaning	RWF30 up to 2,800 hours
	RWF40 above 2,800 hours
Repairs	RWF75 up to 1,600 hours
	Additional RWF25 for steps of 400 hours up to 3,200 hours
	Additional RWF40 above 3,200 hours
Indirect wages	RWF20 per 100 hours
Rent	RWF180

Answer

	(a) Flexible Budget per Month		(b) Fixed Budget per Month	
Hours of work	2,000	2,800	3,600	3,000
	RWF	RWF	RWF	RWF
Expense:				
Supervision	250	370	490	430
Depreciation	400	400	550	400
Consumable supplies	240	336	432	360
Heat and fans	45	55	60	55
Power	300	420	528	450
Cleaning	30	30	40	40
Repairs	100	150	215	175
Indirect wages	400	560	720	600
Rent	180	180	180	180
	1,945	2,501	3,215	2,690

(c) Departmental hourly overhead rate $= \frac{\text{Budgeted expense}}{\text{Budgeted hours}}$

$= \frac{rwf\ 2{,}690}{3{,}000}$

= RWF0.8966

Notes:

(a) Supervision

This is a semi-variable expense, and it rises only when extra hours are worked - e.g. when the number of employees increases, or when the firm increases the number of supervisors. The allowance for 2,001 hours to 2,400 hours would be RWF310, and between 2,801 and 3,200 the allowance would be RWF430.

Following this line of reasoning, up to and including 3,600 hours would have an allowance of RWF490. Anything above 3,600 would have a budget of RWF580 - i.e. including the extra RWF30.

(b) Depreciation

This is normally a fixed expense - but fixed only within certain ranges of production activity. Remember that no expense is fixed over a long period or over a wide range of production activities.

(c) Consumable Supplies

This is a variable expense in this example - it rises or falls in a direct ratio to the number of hours worked.

(d) Heat and fans

This is a semi-variable expense; probably the figures are based on past experience or a technical estimate.

(e) Power

This is a variable expense but, at certain levels of activity, power is supplied at a cheaper rate.

(f) Cleaning

This is a semi-variable expense.

(g) Repairs

Again, a semi-variable expense. Presumably, when the number of hours worked increases, more repairs will be required - but not in a direct ratio to the increase in hours.

(h) Indirect Wages

These are, in this case, a variable expense.

(j) Rent

Here, this is a fixed expense.

(k) Calculation of Departmental Hourly Overhead Rate

It is most important to realise that this rate is always calculated from the **fixed budget** - not from a flexible budget. This is because the rate has to be applied throughout the budget period as it proceeds, and the actual level of output is not known until the end of the period, so that we would not know which flexible budget to choose. Remember that **the fixed budget is used for planning purposes, the flexible budget for control**.

The difference between the flexible budget at a certain level of activity and the actual cost incurred is, as we know, termed a **variance**. This may be either favourable or adverse.

Example 3

The flexible budget for the transport department of a manufacturing company contains the following extract:

Flexible Budget for Four-weekly Period

Ton-miles to be run	80,000	100,000	120,000
Costs:	RWF	RWF	RWF
Depreciation	240	240	240
Insurance and road tax	80	80	80
Maintenance materials	160	190	190
Maintenance wages	120	120	160
Replacement of tyres	40	50	60
Rent	110	110	110
Supervision	130	130	130
Drivers' expenses	200	400	600
	1,080	1,320	1,570

In the four-weekly period No.7, the budgeted activity was 100,000 ton-miles but the actual activity was 90,000 ton-miles. The actual expenditure during that period was:

Costs:	RWF
Depreciation	240
Insurance and road tax	80
Maintenance materials	165
Maintenance wages	115
Replacement of tyres	35
Rent	110
Supervision	130
Drivers' expenses	315
	1,190

Prepare a tabulation of the variances from budget in relation to period No.7.

Answer

	Budgeted Activity	**Flexed Budget**	**Actual Expense**	**Expense Variance**	
Ton-miles	100,000	90,000	90,000		
Expense:	RWF	RWF	RWF	RWF	
Depreciation (F)	240	240	240	-	
Insurance and road tax (F)	80	80	80	-	
Maintenance materials (S–V)	190	190	165	25	saving
Maintenance wages (S–V)	120	120	115	5	saving
Replacement of tyres (V)	50	45	35	10	saving
Rent (F)	110	110	110	-	
Supervision (F)	130	130	130	-	
Drivers' expenses (V)	400	300	315	15	overspending
	1,320	1,215	1,190	25	saving

Maintenance materials may cause a little difficulty. There is no indication in the problem at what level of activity the rise from RWF160 to RWF190 takes place. From the information given, it could be taken as 80,000 ton-miles or 99,999 ton-miles. You will have to make a decision on which to take - but remember that the level of activity taken in the solution is 80,001 ton-miles and, above this level, the budgeted expense will be RWF190.

E. ZERO-BASE BUDGETING (ZBB)

Basic Approach

Some aspects of the budget are easy to quantify. For example, if the required output is known then the materials budget can be calculated from known data - material usage per unit of output, wastage, planned stock changes, expected losses, etc. However, many aspects of the budget cannot be so easily quantified - the outcome of indirect and service areas cannot easily be related to sales and production targets. In these areas, traditionally, an **incremental** approach to budgeting has been adopted. Typically, the manager starts from his current head count and activities and estimates how much more (or, in times of hardship, less) he needs.

The advantages of this approach are:

- It is based on known factors (current expenditure).
- It is probably the least time-consuming approach to budgeting.

But:

- It encourages an easy-going, 'live and let live' approach.
- Considerable inertia is built into the company's procedures. Change will be difficult to manage.
- Existing services are accepted as necessary without question, whereas a critical eye might see worthwhile savings.

It was to combat the disadvantages of traditional budgeting that zero base budgeting (ZBB) was introduced. ZBB is an attempt to eliminate unnecessary expenditure being retained in budgets. It rejects the common approach of setting budgets by taking last year's expenditure as the starting point for this year's budget, and instead requires that the budget be **built up from scratch**. In this way activities are rejustified each year. The CIMA defines ZBB as:

> "A method of budgeting whereby all activities are re-evaluated each time a budget is formulated.
>
> Each functional budget starts with the assumption that the function does not exist and is at zero cost. Increments of cost are compared with increments of benefit, culminating in the planned maximum benefit for a given budgeted cost."

The way in which ZBB is implemented will vary from one organisation to another, but the following steps may be taken:

- The organisation is divided into **decision units**, each representing a readily identifiable part of the business, such as a function, division, department or section.

- Managers will be required to prepare **decision packages**, i.e. documents defining the objectives, targets and resources which will be needed. It may also be necessary to prepare alternative budgets based on different levels of production or service.
- Where different levels of budgets are set for decision units, a grading of priorities will be required in order to assist in the final choice of packages and allocation of available resources.

The technique is most useful when applied to service and support functions such as research and development and administration, where there is considerable discretion as to the level of expenditure, and it has been used in non-profit-making organisations such as local government. When funds are scarce, such a technique is the only way of introducing new projects, as otherwise existing projects always have first claim on the scarce resources.

Expenditure may be **committed** (the minimum essential to meet statutory requirements, for example for safety, or to ensure operations continue). It may also be **engineered** (changing with activity levels) or **discretionary** (depending on management, e.g. conference costs).

ZBB exercises are very time-consuming and costly and some organisations would only carry out a full ZBB approach, say every three to five years, and would use previous years' costs and revenues as a starting point in the intervening years. There may also be communication problems in explaining ZBB to managers, and lack of co-operation as managers see ZBB as a threat to their 'empires' and status.

How the System Works

Where ZBB differs from the traditional approach is that managers must scrutinise very carefully from scratch their future requirements In other words, in principle it ignores all previous expenditure and performance associated with the company's activities, and looks afresh at these activities with a view to possible **cost reduction**, **elimination** of an activity, **new ways** of achieving objectives, or **redistribution** of resources.

A company operating ZBB demands full co-operation and participation from its managers in producing their respective assessments of requirements. They are made fully responsible for their decisions. The process requires each manager to **justify his total budget** (and, subsequently, justify the use of resources).

(a) Decision Packages

The system requires a manager to prepare decision packages for all activities (e.g. projects, job functions) within his responsibility, and these packages must clearly lay out the minimum level of performance essential, and any additional costs and additional benefits linked with these costs. Decision packages must be produced where it is considered that there may be alternative approaches (buy-in or sub-contract, for example) and finally an indication (cost effect) of **not continuing** with any particular activity. Decision packages represent units of intended activity.

Examples of activities within the management accountant's responsibility could be: material control unit; payroll purchase ledger; sales ledger; data processing unit. The manager of each of these areas would be required to produce decision packages on the basis just outlined.

(b) Ranking and Evaluation

Having produced batches of decision packages, the manager would then rank them in order of importance, after carrying out a **cost/benefit analysis** for each package. All packages would then be forwarded to top management, who would compare and evaluate the relative organisational needs, and fund accordingly - taking due note of high and low priority packages. Their considerations would extend to those decision packages which might cover redundant or duplicated activities.

(c) Need for Educated Managers

In using ZBB there is a strong inference that managers are well informed in the area of information collecting and evaluation. They must, further, be trained in cost/benefit analysis, in order to rank the decision packages. This is a potential weakness - not in the system of ZBB itself, but in the means of producing it.

(d) Comparison with Traditional Budgeting

Whereas traditional budgeting paints with a very broad brush, assuming that all activities will continue during the budget year, ZBB paints with a thin brush, providing very fine economic detail (and, thus, fine control of individual activities and operations within the organisation). Because the funding of activities is considered in detail by means of decision packages, company resources are carefully directed and monitored.

Implications and Value of ZBB

- ZBB, in principle, starts from scratch but, in practice, it would start from a **minimum cost level** for each activity, and build up decision packages by changing the inputs. This contrasts with traditional budgeting which assumes all activities are **necessary and continuing** - there is very little 'weeding out'.
- Managers are made aware of the **corporate effect** of their departments' operations.
- ZBB allows questions to be asked **before** committing funds, and not afterwards, as in traditional budgeting.
- **Inefficient, redundant** or **obsolete operations** are identified before the budget is finalised.
- Greater **managerial detail** is available to the top management.
- Low and middle managers are made fully aware of the **smallest details** of the many activities for which they are responsible.
- Managerial education must be at a very high level, with its attendant **high training cost**.

Question

A manufacturing company intends to introduce zero-based budgeting in respect of its service departments.

(a) Explain how zero-based budgeting differs from incremental budgeting and explain the role of committed, engineered and discretionary costs in the operation of zero-based budgeting.

(b) Give specific examples of committed, engineered and discretionary costs in the operation of zero-based budgeting.

Answer

(a) Incremental budgeting uses the budget of the previous year as a starting point and adjustments are made for volume, price changes and efficiency. The basic structure of the budget is regarded as acceptable as it stands.

Zero-based budgets place the onus on the departmental manager to justify all proposed expenditure. Nothing is accepted as being necessary expenditure. Each department will need to consider possible options for the year, which will be ranked and used to decide total budgets within the overall master budget of the organisation.

The role of a committed cost in zero-based budgeting is to set the minimum level of expenditure necessary for statutory requirements to be met or for business operations to take place.

An engineered cost is one that is incurred in proportion to activity. These differ under each level of activity projected under zero-based budgeting.

Discretionary costs are those which management decide whether to incur or not. They will be assessed on a cost/benefit analysis and accepted or discarded depending on the result.

(b) The following are examples of each kind of costs. You may have suggested others relevant to your organisation.

Committed:

– Anti-pollution measures required by law
– A minimum level of maintenance and repair costs
– Requirement of a limited company to prepare annual accounts backed by adequate accounting records; cost of audit

Engineered:

– Machine guards for each machine used
– Routine replacement of laser printer cartridges
– Costs of invoicing per order/statement per customer

Discretionary:

– Updating conferences; attendance expenditure
– Expenditure on management accounting function

F. BUDGETARY CONTROL AND STANDARD COSTING - BEHAVIOURAL CONSIDERATIONS

Throughout our studies on budgetary control and standard costing, the emphasis has been on the **economic aspect**. There is, however, another - and very important - side to the concept, and this is the effect on the human beings who will operate - and be judged by - the budgetary system.

It was only in the 1980s that the results of years of study of interpersonal relationships percolated into the field of management accountancy. It is now recognised that failure to consider the effect of cost control on the people could result in a lowering of morale, reducing motivation and company loyalty. The effect of this would be a reduction in profits or cost-saving.

- **Control Aspects of Budgeting**

  In preparing budgets in the first instance, managers should be consulted in respect of their anticipation of costs which are controlled by them. It is true that an overall objective is set by the higher levels of management, but the actual achievement of that objective is left for the lower levels of management to plan.

  Control is achieved by continuous comparison between actual and budgeted results. Instead of using the term 'variances', as used in standard costing, it may be better to call them **differences**.

  These differences could be related to how well managers are performing their functions. It is necessary to relate the differences in results to performance indicators.

  The ultimate purpose of preparing budgets and calculating variances (differences) between actual and budgeted results is to initiate **managerial action**. In the case of controllable variances, speedy authoritative action would result in stemming adverse variances or encouraging favourable variances. In the case of non-controllable variances, caused by external factors, swift management action to search for alternatives would be necessary.

- **Levels of Management Information**

  It is necessary to consider the frequency of comparative information made available to management at different levels. Lower levels of management require information speedily, for example weekly, to stem adverse movements, while higher levels of management, to prevent unnecessary paperwork, could receive summarised information, for example on a monthly basis.

The information given to management should be in units easily understood by the level to which it is directed. The lower levels may be more interested in labour or machine-hours or kg materials used, while higher levels would require the information in monetary values.

- ## Motivation and Co-operation

Any system of cost control, to be fully effective, must provide for **motivation** and **incentive**. If this requirement is not satisfied, managers will approach their responsibilities in a very cautious and conservative manner. Praise should be forthcoming if budgets are bettered: unfortunately, it is losses and adverse variances which attract attention and investigation.

Personal goals and ambitions are strongly linked with **organisational goals**; these personal goals may include a desire for a higher social standing and a betterment of the individual's status. To satisfy the goals of both the organisation and the individual, there must be **goal congruence**. Without this mutual understanding, the economic atmosphere of the organisation will be much less healthy.

The success of a budget procedure depends, at all times, on people. They must work within the system in an understanding and co-operative manner. This can be achieved only by individuals who have a total involvement at all stages of the budgetary procedure, and who share in its favourable as well as its adverse revelations.

- ## Results of Goal Antagonism

Some of the most damaging and negative results of non-motivation created by a budgetary control system are:

(a) Suspicion of being manipulated by the budget system: it is seen as a **pressure device**.

(b) **Competition between cost centres** may arise and thus diminish the unifying effect of budgetary control.

(c) A discouraging atmosphere will be created by failure to commend favourable results, and by criticism of adverse results.

- ## Other Effects on Management Behaviour

The way standard costing and budgetary control systems are used can influence management behaviour in a number of other ways:

(a) Standard costing and budgetary control systems concentrate on the **short term**. It must be recognised that managers may therefore be placed in a situation whereby they make decisions that satisfy the short-term control systems but damage the future position of the business. For example, a manager may decide to reduce his research and development costs in order to stay within budget. This may satisfy the short-term objectives but will clearly have long-term implications for the business.

(b) Standard costing and budgetary systems sometimes include in operating statements a number of costs over which the manager has **no control**. This approach can be counter-productive and demotivating as a manager cannot be held responsible for costs that he cannot control.

(c) Unless constant vigilance is maintained it will be possible for managers to incur expenditure but have it charged to another manager's cost centre. This practice can result in **conflict within the business** which can cause a great deal of harm.

(d) Managers may feel that they have fully to spend their budgets so as to justify their original predictions and in so doing avoid having their following year's budget reduced. This approach may cause **waste** within the business.

BLANK

Study Unit 17

Cost Book-Keeping

Contents

A. COST ACCOUNTING SYSTEMS

The Principle of Double Entry

In some businesses, the cost accounts may consist of little more than statistical memoranda, but in a business of any size or complexity, it is preferable for the cost accounts to be kept on a double entry basis, as this will provide more detailed information and a check on the arithmetical accuracy of the entries.

While double entry cost accounts are generally to be preferred, you must remember that the system has to suit the business and not the reverse. An elaborate system should not be introduced merely for the sake of theory; the purpose of cost accounting is to provide management with information.

We shall assume that you are familiar with the elements of double entry book-keeping, and the arguments which show the necessity of keeping the financial accounts on a proper double entry basis. The same arguments apply to the cost accounts. As in financial accounts, the golden rule applies - "for every credit there is a debit" - and if you keep to this you will not go far wrong.

Main Classification

Accounting systems which are used for costs may be classified as follows:

(a) Interlocking Systems

In these systems two separate ledgers are kept, one for costing figures (the cost ledger) and one for financial figures (the financial ledger). Most figures in the cost ledger will have been extracted from the financial ledger. For example, materials entering the store, which will be recorded in the cost ledger, will already appear in the purchases account in the financial ledger. This is why the systems are described as "interlocking". Since both ledgers describe the transactions of the business during the same period, they must be capable of reconciliation.

(b) Integrated or Integral Systems

In these systems one ledger is kept, in which both the financial and cost data are recorded.

B. INTEGRATED OR INTEGRAL SYSTEMS

Description

Integrated accounts are a set of accounting records which provide financial and cost accounts using a **common** input of data for **all** accounting purposes.

An integrated accounting system avoids the need to open a cost ledger control account and to reconcile the cost and financial accounts.

Figure 2 shows the accounting flow within an integrated system. If you compare this flowchart with Figure 1 you will see that they are very similar. In the integrated system the debtors, creditors, bank and fixed assets accounts have replaced the cost ledger control account.

In the interlocking system these accounts were, of course, part of the financial ledger, and the cost ledger control account was the means of interlocking the two ledgers, transferring items from the financial to the cost ledger. The integrated system is more straightforward as this intermediate step is eliminated.

If you now compare the integrated system with what you learned about the financial ledger in your Accounting Framework course, you will notice that the integrated system has dispensed with the purchases account. The figure of purchases is derived from the creditors control account and posted straight to the stores control account.

Worked Example

In view of what we have said about integrated systems, you may be surprised that separate cost and financial profit and loss accounts are asked for. The cost profit and loss account is not in fact part of the double entry system. It is a memorandum account only, prepared to show what the profit would be without the effect of purely financial items. Company policy determines whether two accounts are prepared or whether one is considered adequate.

Question

ABC Ltd started the year with the following trial balance:

	RWF	RWF
Capital		100,000
Fixed Assets	30,000	
Debtors	10,000	
Stores	20,000	
Work-in-Progress	20,000	
Finished Goods	30,000	
Creditors		20,000
Bank	10,000	
	120,000	120,000

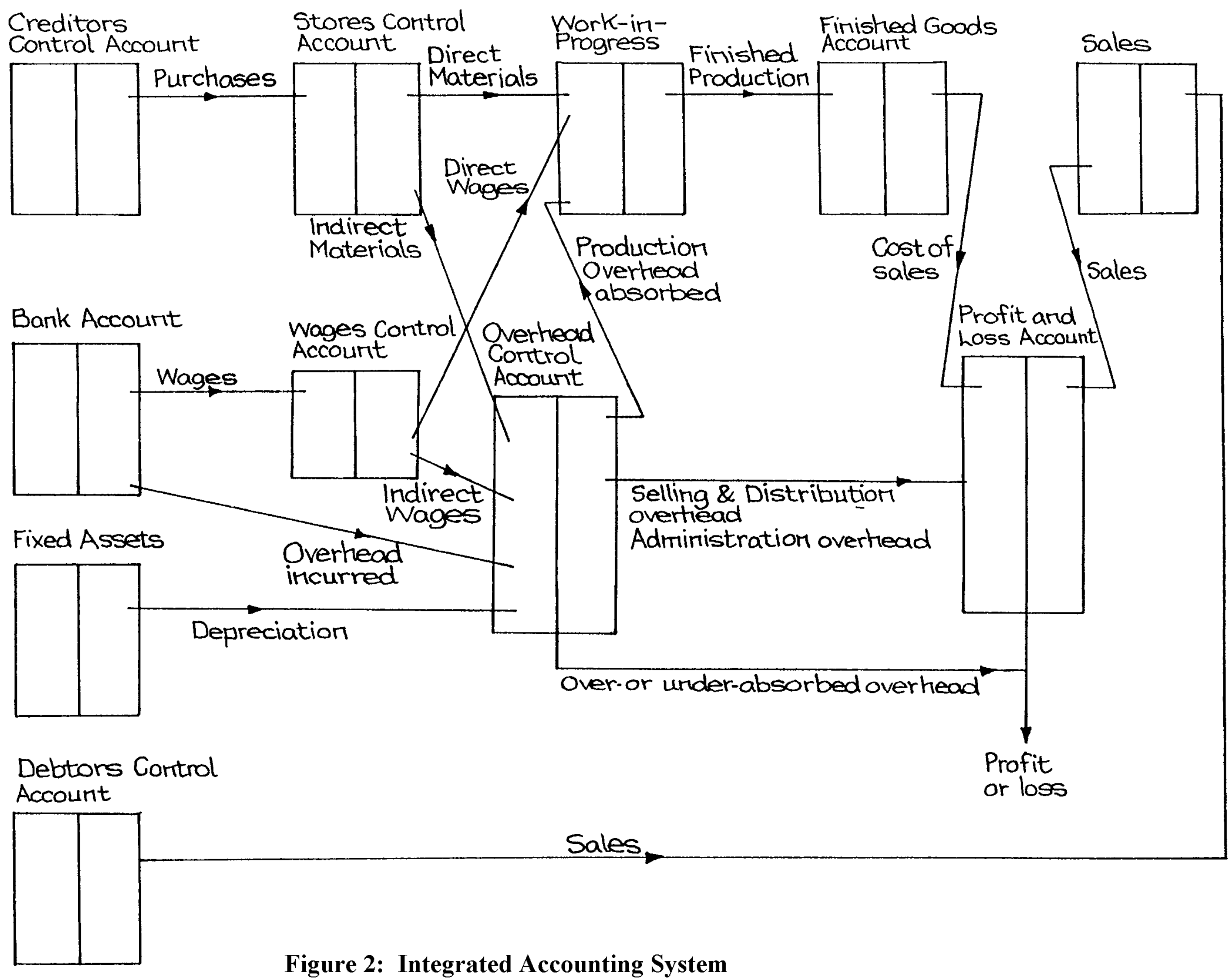

Figure 2: Integrated Accounting System

During January the following transactions took place:

	RWF
Raw materials purchased on credit	20,000
Sales on credit	25,000
General operating expenses (cash)	10,000
Wages	10,000
Discounts allowed	1,500
Discounts received	1,000
Creditors paid	15,000
Payments by debtors	20,000
Issues from Raw Material Store	30,000
Issues from Finished Goods Store	20,000
Finished production entering Finished Goods Store	40,000

Depreciation was taken as 1% for the month on fixed assets.

Prepare:

(a) All ledger accounts;

(b) Cost profit and loss account;

(c) Financial profit and loss account;

(d) Trial balance as at the month end.

Answer

* The asterisked items are the balancing figures in the accounts.

CAPITAL

		20..	RWF
		Balance b/f	100,000

DEBTORS

20..	RWF	20..	RWF
Balance b/f	10,000	Bank	20,000
Sales	25,000	Discounts Allowed	1,500
		Balance c/f	13,500*
	35,000		35,000
Balance b/f	13,500		

WORK-IN-PROGRESS

20..	RWF	20..	RWF
Balance c/f	20,000	Finished Goods	40,000
Stores	30,000	Balance c/f	30,300*
Bank (Wages)	10,000		
Overhead Control	10,300		
	70,300		70,300
Balance b/f	30,300		

CREDITORS

20..	RWF	20..	RWF
Bank	15,000	Balance b/f	20,000
Discounts Received	1,000	Stores	20,000
* Balance c/f	24,000		
	40,000		40,000
		Balance b/f	24,000

BANK

20..	RWF	20..	RWF
Balance b/f	10,000	Work-in-Progress (Wages)	10,000
Debtors	20,000	Overhead Control	10,000
* Balance c/f	5,000		15,000
	35,000		35,000
		Balance b/f	5,000

FIXED ASSETS

20..	RWF	20..	RWF
Balance	30,000		

STORES CONTROL ACCOUNT

20..	RWF	20..	RWF
Balance b/f	20,000	Work-in-Progress	30,000
Creditors (Materials Purchased)	20,000	Balance c/f	10,000*
	40,000		40,000
Balance b/f	10,000		

FINISHED GOODS

20..	RWF	20..	RWF
Balance c/f	30,000	Cost of Sales	20,000
Work-in-Progress	40,000	Balance c/f	50,000*
	70,000		70,000
Balance b/f	50,000		

PROVISIONS FOR DEPRECIATION

20..	RWF	20..	RWF
Balance c/f	300	Overhead Control	300
	300		300
		Balance b/f	300

OVERHEAD CONTROL

20..	RWF	20..	RWF
Bank	10,000	Work-in-Progress	10,300
Provision for Depreciation	300		
	10,300		10,300

COST OF SALES

20..	RWF	20..	RWF
Finished Goods	20,000	Profit and Loss	20,000
	20,000		20,000

SALES

20..	RWF	20..	RWF
Profit and Loss	25,000	Debtors	25,000
	25,000		25,000

DISCOUNTS ALLOWED

20..	RWF	20..	RWF
Debtors	1,500	Profit and Loss	1,500
	1,500		1,500

DISCOUNTS RECEIVED

20..	RWF	20..	RWF
Profit and Loss	1,000	Creditors	1,000
	1,000		1,000

COST PROFIT AND LOSS ACCOUNT (MEMORANDUM ONLY)

20..	RWF	20..	RWF
Cost of Sales	20,000	Sales	25,000
Profit	5,000		
	25,000		25,000

FINANCIAL PROFIT AND LOSS ACCOUNT

20..	RWF	20..	RWF
Cost of Sales	20,000	Sales	25,000
Discounts Allowed	1,500	Discounts Received	1,000
Profit c/f	4,500		
	26,000		26,000

TRIAL BALANCE AS AT 31 JANUARY

	Dr	Cr
	RWF	RWF
Capital		100,000
Profit		4,500
Fixed Assets	30,000	
Provision for Depreciation		300
Stores	10,000	
Debtors	13,500	
Work-in-Progress	30,300	
Finished Goods	50,000	
Creditors		24,000
Bank		5,000
	133,800	133,800

Make sure that you understand all the entries used in this answer; **once you have** studied it carefully, you should attempt the exercise of posting the entries given in the question.

Advantages of Integrated Accounting Systems

Provided that integrated accounting can be fitted conveniently into the organisation, there are five distinct advantages:

(a) Savings in accounting costs can be made.

(b) There is no need for reconciliation of cost and financial accounts.

(c) Better use can be made of accounting information, since all the facts are known. Together with this is the better co-operation which should ensue from the cost and financial accounting staff also being “integrated”.

(d) Single data capture greatly simplifies automated linkages between the process control systems, accounting systems and the overall management information systems.

(e) When introducing computerised systems, it is not sensible to use two separate ledgers, with all the attendant control problems. Computer systems are best at handling large volumes of data and exercising overall control, but problems often arise when control level interfaces are necessary such as when two or more ledgers are maintained. To overcome these problems the purchase and sales ledger areas of a computerised accounting system are usually kept apart from the nominal ledger and are physically defined as separate modules by the software supplier

If the accounts are not computerised, the work has to be sub-divided and, historically, this was why separate ledgers evolved for the cost and financial accounts.

GLOSSARY OF

MANAGEMENT ACCOUNTING

TERMS

A-Z

KEY MANAGEMENT ACCOUNTING TERMS

This glossary contains a number of Management Accounting terms which you might encounter. It is not intended to be comprehensive; for further explanations of these terms and of terms not included here, you should refer to the main body of this book.

Abnormal Gains The gain resulting when actual loss is less than the normal or expected loss.

Abnormal Loss The loss resulting when actual loss is greater than the normal or expected loss.

Absorption Overhead Overhead charged to products or services by means of absorption rates. (CIMA Official Terminology)

Absorption Costing The procedure which charges fixed as well as variable overhead to cost units. (CIMA Official Terminology)

Absorption Rate A rate charged to a cost unit intended to account for the overhead at a predetermined level of activity. (CIMA Official Terminology)

Account Classification Method A simple cost estimation technique involving the classification of costs as fixed, variable or semi variable.

Activity Based Costing (ABC) Cost attribution to cost units on the basis of benefit received from indirect activities e.g. ordering, setting-up, assuring quality. (CIMA Official Terminology)

Administrative Expenses Cost of management, and of secretarial, accounting and administrative services, which cannot be related to the separate production, marketing or research and development functions. (CIMA Official Terminology)

Attainable Standard A standard which can be attained if a standard unit of work is carried out efficiently, a machine properly operated or a material properly used. Allowances are made for normal losses, waste and machine downtime. (CIMA) Official Terminology)

Avoidable Costs The specific costs of an activity or sector of a business which would be avoided if that activity or sector did not exist. (CIMA Official Terminology)

Basic Standard A long term standard which remains unchanged over the years and is used to show trends.

Batch A group of similar articles which maintains its identity throughout one or more stages of production and is treated as a cost unit. (CIMA Official Terminology)

Batch Costing A form of specific order costing; the attribution of costs to batches. (CIMA Official Terminology)

Bill of Materials A specification of the materials and parts required to make a product. (CIMA Official Terminology)

Breakeven Chart A chart which indicates approximate profit or loss at different levels of sales volume within a limited range. (CIMA Official Terminology)

Breakeven Point The level of activity at which there is neither profit nor loss. (CIMA Official Terminology)

Breakeven (cost-volume profit (CVP)) analysis The study of the interrelationships between costs, volume and profit at various levels of activity.

Budget A plan expressed in money. It is prepared and approved prior to the budget period and may show income, expenditure, and the capital to be employed. May be drawn up showing incremental effects on former budgeted or actual figures, or be complied by zero-based budgeting. (CIMA Official Terminology)

Budget Committee Ideally comprises representatives from every part of the organisation and oversees the budgeting process by co-ordinating and allocating responsibility for budget preparation, timetabling, providing information to assist in budget preparation and monitoring the budgeting and planning process by comparing actual and budgeted results.

Budget Manual A detailed set of documents that provide information and guidelines about the budgetary process.

Budget Period The period for which a budget is prepared and used, which may then be sub-divided into control periods. (CIMA Official Terminology)

Budgeted Capacity Standard Hours planned for the period, taking into account budgeted sales, supplies, workforce availability and efficiency expected.

By-product Output of some value produced incidentally in manufacturing something else (main product). See joint products. (CIMA Official Terminology)

Cash Buget A statement in which estimated future cash receipts and payments are tabulated in such a way as to show the forecast cash balance of a business at defined intervals.

Classification The arrangement of items in logical groups having regard to their nature (subjective classification) or purpose (objective classification). (CIMA Official Terminology)

Code A system of symbols designed to be applied to a classified set of items to give a brief accurate reference, facilitating entry, collation and analysis. (CIMA Official Terminology)

Committed Cost The future cash outflow that will be incurred regardless of whatever decision is taken now about alternative opportunities.

Computer-aided design/computer aided manufacturing (CAD CAM) system
Computer based techniques which allow interactive design and testing of a manufacturing component on a visual display unit and permits the programming and control of production equipment in the manufacturing task.

Continuous Operation Costing See process costing.

Contract Costing A form of specific order costing; attribution of costs to individual contracts. (CIMA Official Terminology)

Contribution/profit volume (P/V) chart Chart showing the impact on profit of changes in turnover. (CIMA Official Terminology)

Controllable Cost A cost which can be influenced by its budget holder. (CIMA Official Terminology)

Cost Accounting The establishment of budgets, standard costs and actual costs of operations, processes, activities or products; and the analysis of variances, profitability or the social use of funds. (CIMA Official Terminology)

Cost Accumulation The collection of cost data in some organised way through an accounting system.

Cost behaviour The way in which costs of output are affected by fluctuations in the level of activity. (CIMA Official Terminology)

Cost Centre A production or service location, function, activity or item of equipment whose costs may be attributed to cost units. (CIMA Official Terminology)

Cost Department The department responsible for keeping cost accounting records.

Cost Driver An activity which generates cost. (Particularly related to activity based costing). (CIMA Official Terminology)

Cost Pool A group of costs that are associated with the same activity or cost driver.

Cost Unit A unit of product or service in relation to which costs are ascertained. (CIMA Official Terminology)

Cost-volume-profit (CVP) analysis See breakeven analysis.

Current Standard A standard based on current working conditions (current wastage, current inefficiencies).

Database Frequently a much-abused term. In its strict sense a database is a file of data structured in such a way that it may serve a number of applications without its structure being dictated by any one of those applications, the concept being that programs are written around the database rather than files being structured to meet the needs of specific programs. The term is also rather loosely applied to simple file management software. (CIMA Official Terminology)

Differential/Incremental Cost The difference in total cost between alternatives; calculated to assist decision-making. (CIMA Official Terminology)

Direct Cost Expenditure which can be economically identified with a specific saleable cost unit. (CIMA Official Terminology)

Dual Value See shadow price.

Departmental/functional budget A budget of income and/or expenditure applicable to a particular function. A function may refer to a department or a process.

Exponential Smoothing A method of short term forecasting which involves the automatic weighting of past data with weights that decrease exponentially with time so that the most current values receive the greatest weighting and the older observations receive a decreasing weighting.

Equivalent Units Notional whole units representing uncompleted work. Used to apportion costs between work in progress and completed output. (CIMA Official Terminology)

Feasible Area/Region The area on a graphical model of a linear programming problem in which all of the constraints are satisfied.

Feedback A component of a control system which measures differences between planned and actual results and modifies subsequent actions to achieve the required results. (CIMA Official Terminology)

Feedforward Control Control based on comparing original targets or actual results with a forecast of future results.

First-in, First-out (FIFO) Process Costing Method A process costing method that sharply distinguishes between the work done on opening work in progress and the work done on work introduced into the process during the period.

Fixed Budget A budget which does not include any provision for the event that actual volumes of production may differ from those budgeted.

Fixed Cost/Fixed Overhead/Period Cost The cost which is incurred for a period, and which, within certain output and turnover limits, tends to be unaffected by fluctuations in the levels of activity (output or turnover). Examples are rent, rates, insurance and executive salaries. (CIMA Official Terminology)

Fixed Overhead See Fixed Cost

Flexible Budget A budget which be recognising different cost behaviour patterns, is designed to change as volume of output changes. (CIMA Official Terminology)

Flexible Manufacturing System An integrated production system that uses computer-controlled robots to produce immense varieties of a product at a low cost; flexibility is promoted through rapid changeover times.

Forecasting The identification of factors and quantification of their effect on an entity, as a basis for planning. (CIMA Official Terminology)

Full Capacity Output (expressed in standard hours) that could be achieved if sales order, supplies and workforce were available for all installed workplaces. (CIMA Official Terminology)

Full Cost Plus Pricing Method of determining the sales price by calculating the full cost of the product and adding a percentage mark-up for profit.

Function Costing See Service Costing

Functional Budget See Departmental Budget

Functional Classification of Costs A group of costs that were all incurred for the same basic purpose.

High-low Method A technique for determining the fixed and variable components of a total cost that uses actual observations of total cost at the highest and lowest levels of activity and calculates the change in both activity and cost.

Historical Cost The actual cost of acquiring assets, goods and services. (CIMA Official Terminology)

Ideal Standard A standard which can be attained under the most favourable conditions, with no allowance for normal losses, waste and machine downtime. Also known as potential standard. (CIMA Official Terminology)

Imputed Cost Cost recognised in a particular situation that is not regularly recognised bu usual accounting procedures.

Incremental Cost See Differential Cost

Industrial Engineering Approach Cost estimation approach which analyses the relationships between inputs and outputs in physical terms and then transforms the physical measures into standard or budgeted costs.

Integrated Accounts A set of accounting records which provides financial and cost accounts using a common input of data for all accounting purposes. (CIMA Official Terminology)

Interlocking Accounts/Non-Integrated Accounts A system in which the cost accounts using a common input of data for all accounting purposes. (CIMA Official Terminology)

Internal Opportunity Cost The shadow price of a scarce source.

Key Factor See Limiting Factor

Job A customer order or task of relatively short duration. (CIMA Official Terminology)

Job Costing A form of specific order costing; the attribution of cost to jobs. (CIMA Official Terminology)

Joint Products Two or more products separated in processing, each having sufficiently high saleable value to merit recognition as a main product. (CIMA Official Terminology)

Just-in-Time (JIT) A technique for the organisation of work flows, to allow rapid, high quality, flexible production whilst minimising manufacturing waste and stock levels. (CIMA Official Terminology)

Least Squares Method (of regression analysis) Method of finding the line of best fit.

Limiting Factor/Key Factor Anything which limits the activity of an entity. An entity seeks to optimise the benefit it obtains from the limiting factor. (CIMA Official Terminology)

Line of Best Fit Represents the best linear relationship between two variables.

Linear Programming The use of a series of linear equations to construct a mathematical model. The objective is to obtain an optimal solution to a complex operational problem, given a number of alternative values of stated variables and quantitative constraints as to their use. (CIMA Official Terminology)

Mark-up Pricing See Marginal Cost Plus Pricing

Marginal Cost Plus Pricing/Mark-up Pricing Method of determining the sales price by adding a profit margin onto either marginal cost of production or marginal cost of sales.

Marginal Costing The accounting system in which variable costs are charged to cost units and fixed costs of the period are written off in full against the aggregate contribution. Its special value is in decision-making. The objective is to obtain an optimal solution to a complex operational problem, given a number of alternative values of stated variables and quantitive constraints as to their use. (CIMA Official Terminology)

Master Budget The set of budgeted profit and loss account, budgeted balance sheet and cash budget.

Minimum Pricing Price charged that just covers both the incremental costs of production and selling an item and the opportunity costs of the resources consumed in making and selling it.

Mixed Cost See Semi-Variable Cost

Moving Averages A technique involving the calculation of consecutive averages over time to establish the trend of a time series.

Non-Integrated Accounts See Inter-Locking Accounts

Normal Loss The loss expected during the normal course of operations, for unavoidable reasons.

Notional Cost The value of a benefit where no actual cost incurred. (CIMA Official Terminology)

Objective Function The mathematical equation which states the maximisation or minimisation objective of a linear programming problem.

Operating Statement A regular report for management of actual cost, and revenue, as appropriate. Usually compares actual with budget and shows variances. (CIMA Official Terminology)

Opportunity Cost The value of a benefit sacrificed in favour of an alternative course of action. (CIMA Official Terminology)

Overhead Absorption Rate A means of attributing overhead to a product or service based, for example, on direct labour hours, direct hour cost or machine hours. (CIMA Official Terminology)

Overhead/Indirect Cost Expenditure o labour, materials or services which cannot be economically identified with a specific saleable cost unit. (CIMA Official Terminology)

Period Cost See Fixed Cost

Semi-Fixed Cost See Semi Variable Cost

Semi-Variable Cost/Semi-Fixed Cost/Mixed Cost A cost containing both fixed and variable components and which is thus partly affected by fluctuations in the level of activity. (CIMA Official Terminology)

Standard Costing A control technique which compares standard cost and revenues with actual results to obtain variances which are used to stimulate improved performance. (CIMA Official Terminology)

Step Cost A cost which is fixed in nature but only within certain levels of activity.

Time Series Analysis The analysis of a series of figures or values recorded over time.

Uncontrollable Cost A cost that cannot be affected by management within a given time period.

Under or Over-Absorbed overhead The difference between overhead incurred and overhead absorbed in a given period. In a standard costing system, it is the sum of variable production overhead total variance and fixed production overhead variance. (CIMA Official Terminology)

User Cost The incremental cost of using machinery.

Variable Cost Cost which tends to vary with the level of activity. (CIMA Official Terminology)

Variance Difference between planned, budgeted, or standard cost and actual cost; and similarly for revenue. Not to be confused with statistical variance which measures the dispersion of a statistical population.

Variance Analysis The analysis of performance by means of variances. Used to promote management action at the earliest possible stages.

Weighted Average Process Costing Method A process costing method that adds the cost of all work done in the current period to the cost of work done in the preceding period on the current period's opening work in process and divides the total by the equivalent units of work done to date.

Zero Based Budgeting A method of budgeting whereby all activities are re-evaluated each time a budget is set. Discrete levels of each activity are valued and a combination chosen to match funds available.