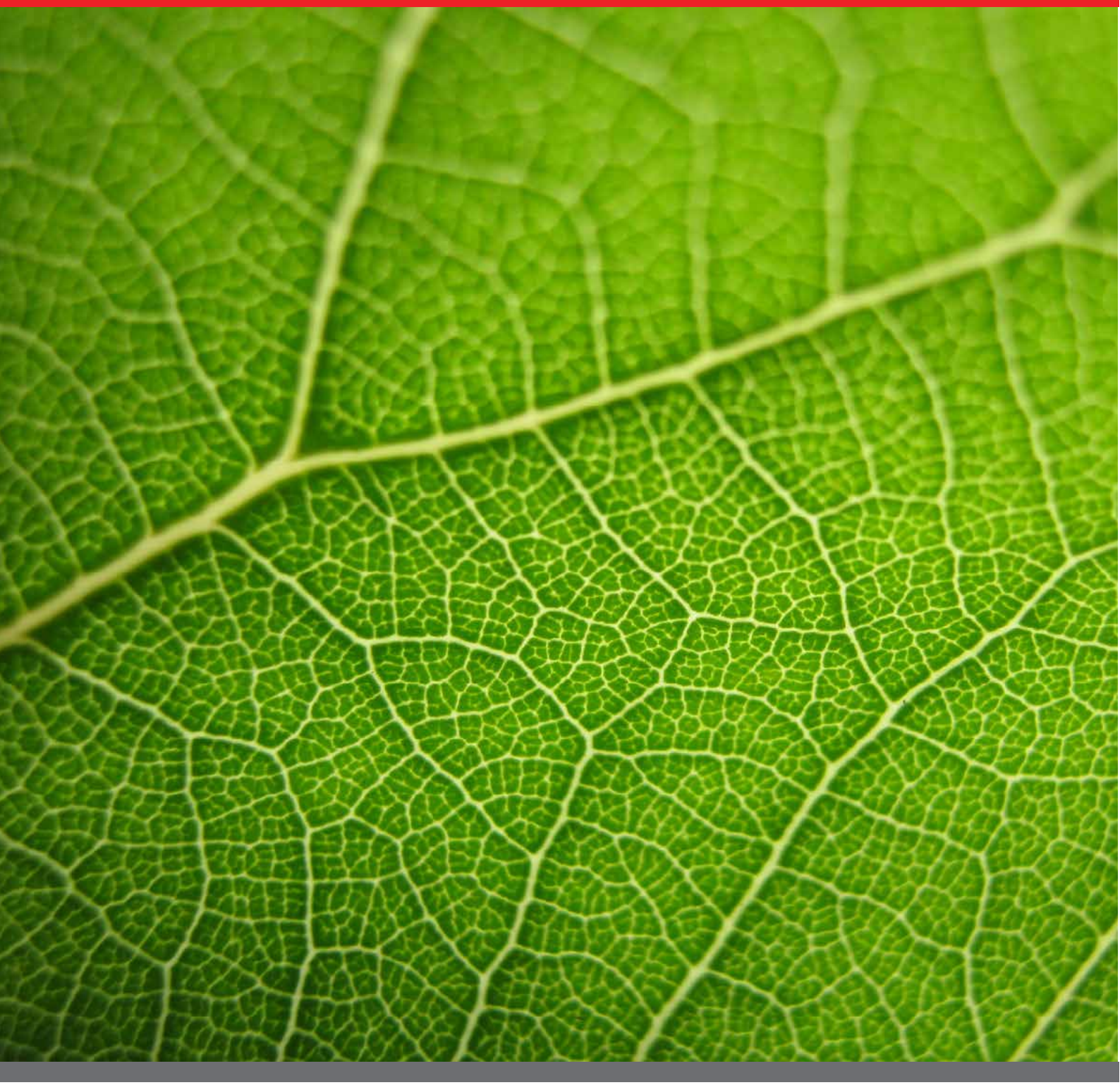
COSTING AND BUDGETARY CONTROL (TC9)

TECHNICIAN DIPLOMA IN ACCOUNTING



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IN MALAWI

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PREFACE

INTRODUCTION

The Institute noted a number of difficulties faced by students when preparing for the Institute's examinations. One of the difficulties has been the unavailability of study manuals specifically written for the Institute's examinations. In the past students have relied on text books which were not tailor-made for the Institute's examinations and the Malawian environment.

AIM OF THE MANUAL

The manual has been developed in order to provide resources that will help the Institute's students attain the needed skills. It is therefore recommended that each student should have their own copy.

HOW TO USE THE MANUAL

Students are being advised to read chapter by chapter since subsequent work often builds on topics covered earlier.

Students should also attempt questions at the end of the chapter to test their understanding. The manual will also be supported with a number of resources which students should keep checking on the ICAM website.

TC9: COSTING AND BUDGETARY CONTROL

AIM OF THE STUDY

To enable students understand principles of costing, their application in product costing, management information systems and preparation of budgets and budgetary control.

OBJECTIVES

By the end of the study students should be able to:

i. Ascertain costs for products and services using appropriate costing methods and use them to establish prices;
ii. Prepare budgets for various activities using appropriate budgeting approaches and methods:
iii. Analyse standards and budgets of various activities and compare with actual to explain differences;
iv. Use relevant cost theory to make simple and short term management decisions.

FORMAT AND STANDARD OF THE EXAMINATION PAPER

The paper will consist of 5 questions each carrying 20 marks. Candidates will be required to answer all questions.

SPECIFICATION GRID

This grid shows the relative weightings of topics within this course and should provide guidance regarding the time to be spent on each.

Syllabus Area	Weightings (%)
Cost Ascertainment	**40**
Planning, performance measurement and control	**30**
Decision	**30**
Total	**100**

Learning Outcomes

1 **. Cost ascertainment**

Students will be able to ascertain costs for products and services using appropriate costing methods and use them to establish prices.

Students should be able to:

a) Understand the basic concepts of cost accounting
b) Classify costs into fixed, variable and mixed and able to separate mixed costs into variable and fixed components.
c) Select the most suitable method of costing for different products and services
d) Understand basic concepts of overhead allocation, apportionment and absorption
e) Prepare management information using :
    - Marginal costing
    - Absorption costing and reconcile the differences in profits reported
f) Use non traditional costing methods in the provision of management information

2. Planning, performance measurement and control

Students will be able to identify and describe the purpose of standard costing system and the application in budgetary control. Select appropriate budgeting approaches and methods and prepare budgets.

Students should be able to:

a) Understand the concepts of standards and standard costing and how they are set.
b) Explain how budgeting fits into the overall planning and control framework
c) Identify and describe the various stages in the budgeting process
d) Prepare functional and master budgets using different techniques
e) Apply the principles of flexible budgeting in budgetary control
f) Calculate differences between actual performance and standards or budgets in terms of cost and volume effects and identify possible reasons for those differences.

3. Decision making

Students should be able to apply principles of marginal costing and relevant costs for use in management decision making.

Students should be able to:

a) Calculate the breakeven point, contribution and margin of safety for a given product or service.
b) Understand Cost-Volume-Profit (CVP) analysis, assumptions and limitations.
c) Distinguish between relevant and irrelevant costs and revenues for decision making.
d) Describe the key concept that should be applied for presenting information for product mix decisions when capacity constraints apply.
e) Describe how marginal costing can assist in short-term decision making.

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TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION TO COST ACCOUNTING

Learning objectives

By the end of this chapter students should be able to:

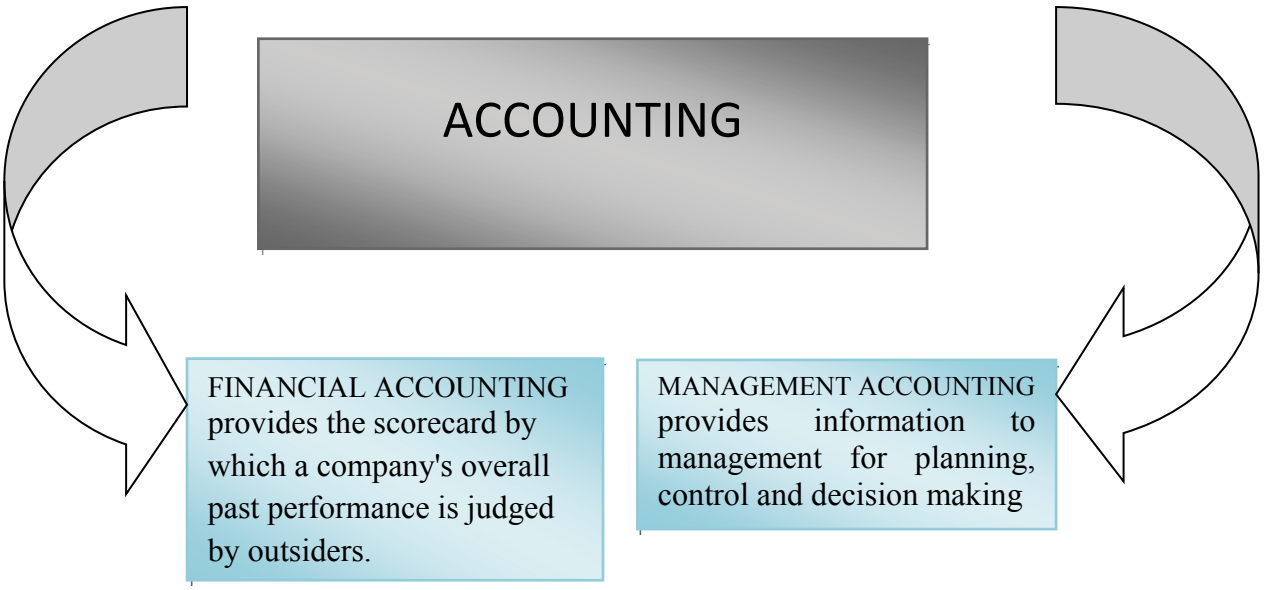
- Understand the differences between financial accounting and management accounting
- Understand the basic concepts of cost accounting
- Classify costs in various categories
- Separate mixed costs into fixed and variable components
- Apply cost behaviour in cost estimation

Introduction

Cost accounting is a part of accounting. Accounting is defined as:

> "the art of recording, classifying, and summarising in a significant manner and in terms of money, transactions and events which are, in part at least, of financial character, and interpreting the results thereof." (American Institute of Certified Public Accountants)

From the earlier studies students are introduced to accounting in general but at this point it is important to explain the various branches of accounting as follows:



Financial Accounting:

Financial accounting is concerned with provision of information to external parties outside the organization

Cost and Management Accounting

Cost Accounting is the establishment of budgets; standard costs (benchmark for comparison with actual); and actual costs of operations, processes, activities or products; and the analysis of variances, profitability or the social use of funds.
(CIMA's official terminology)

Functions of Cost Accounting

- Determination and analysis of costs and revenue of a business enterprise. Cost procedures have been developed to record costs and income by departments, processes, operations, lines of products, sales territories, etc so that comparisons by division and periods of time can be made in order to assess the operating efficiency of each business area.
- Cost control. Costs are accumulated and analysed to obtain value for money. The objective is to maintain costs at the lowest point consistent with the most efficient operating conditions in the light of the service or benefit obtained.
- Determining costs and profit for an accounting period
- Creating inventory values for costing and pricing purposes
- Providing management with information in connection with the problems that involve choice from among two or more alternative courses of action
- Aiding and participating in the creation and execution of plans and budgets.

The main objective of cost accounting, therefore, is the creation of underlying data for use in management accounting.

Management Accounting:

"The process of identification, measurement, accumulation, analysis, preparation, interpretation and communication of information used by management to plan, evaluate and control within an entity and to assure appropriate use of and accountability for its resources. Management accounting also comprises the preparation of financial reports for non-management groups such as shareholders, creditors, regulatory agencies and tax authorities" (CIMA Official Terminology).

It is " a profession that involves partnering in management decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy." Institute of Management Accountants (IMA)

Roles of cost and management accounting

- accurate ascertainment of the costs of goods and services, cost of a responsibility centre of the organization, revenue of the organization, profitability etc.
- analysis of actual versus budget (expected or planned) costs.
- any other information management feels it needs in its decision making process

Cost accounting and management accounting provide managerial information therefore, they form part of a management information system (MIS).
Management information system: is a system that provides data and information to the managers in the form of reports, including exception reports of matters requiring action; analysis; and other information to support the functions of planning, decision-making and control and its various aspects such as analysis and modeling.

Differences between Financial accounting and Management accounting:
Management accounting differs from financial accounting in a number of ways that are briefly discussed below.

Financial Accounting	Management Accounting
► Reports to those outside the organization owners, lenders, tax authorities and regulators.	► Reports to those inside the organization for planning, directing and motivating, controlling and performance evaluation.
► Emphasis is on summaries of financial consequences of past activities.	► Emphasis is on decisions affecting the future.
► Objectivity and verifiability of data are emphasised.	► Relevance of items relating to decision making is emphasised.
► Precision of information is required.	► Timeliness of information is required.
► Only summarized data for the entire organization is prepared.	► Detailed segment reports about departments, products, customers, and employees are prepared.
► Must follow International Accounting Standards (IAS) and International Financial Reporting Standards (IFRS).	► Need not follow IAS and IFRS
► Mandatory for external reporting.	► Not mandatory.

Cost Object

A cost represents the consumption of a resource or an expense. A cost of object is any activity for which a separate measurement of cost is desired. Businesses operate on a cost recovery principle. Unless a business is subsidised it will not sustain its operations if the cost of its resources spent when rendering a service or making a product available to a customer is not recovered. Therefore cost collection is important for different purposes

Cost Unit and Cost Centre

Before explaining how costs are classified, it is important to distinguish between a cost unit and a cost centre.

Cost unit:

A unit of product or service in relation to which costs are ascertained. CIMA Official Terminology

Cost Centre

A production or service location, a function, an activity or an item of equipment for which costs are accumulated. It is used as a collection place for costs and the cost of operating the cost centre is determined for the period and then this total cost is related to the cost units which have passed through the cost centre.

If a cost cannot be easily attributed to a cost unit, it should be charged to a cost centre. Therefore every cost accounting system should clearly identify cost units and cost centres. Cost units are regarded as building blocks of a cost accounting system.

Examples of cost unit and cost centres: A hospital: cost unit – outpatient day and cost centre – theatre, kitchen A firm of accountants: cost unit - charge hours and cost centre – audit department and accounting department A college: cost unit - student and cost centre - library A sugar manufacturer: cost unit – kg of sugar and cost centre - production department

Elements of Cost

There are three main elements of cost namely;

- materials – things that go into producing an object
- labour – human effort put into production of a product provision of a service
- expenses – anything used in production other than materials and labour

Cost Classification

This is the grouping of costs for easy collection. Cost classification is defined as the arrangement of items in logical groups by nature, purpose or responsibility - CIMA Terminology

Methods of Classifying Costs

1. Classification by nature

This is the classification of costs by state or form such as material, labour and expenses

2. Classification by Purpose

This is cost classification method that is associated with cost units and cost centres; for example *direct* and *indirect* costs

Costs are regarded as direct or indirect depending on how they can be associated with cost units and cost centres. If a cost is directly identifiable with a cost unit, it is regarded as a direct cost whereas if the cost cannot be directly attributed to a cost unit it is regarded as an indirect cost.

A direct cost is charged to a cost unit while an indirect cost is charged to a cost centre. Therefore, a cost centre is a collection point for all indirect costs

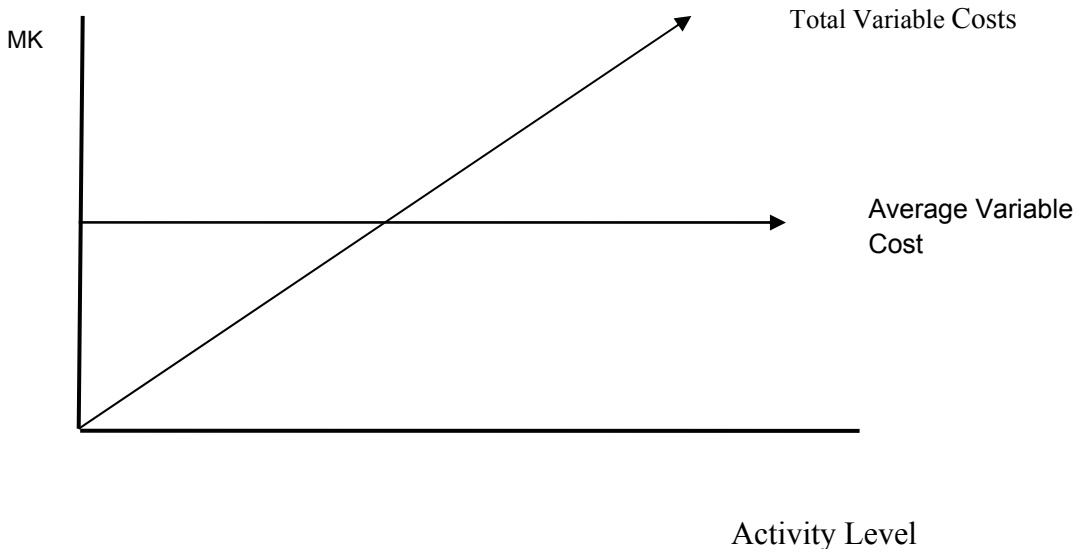
3. **Classification by behaviour**

Cost behaviour is the responsiveness of a cost to changes in activity level. According to this classification there are a number of cost behaviour patterns identified.

Variable costs
These are costs which change proportionately as volume or activity level changes. For instance, fuel costs for a vehicle increase with the distance or mileage covered. Direct material costs are considered to be totally variable.

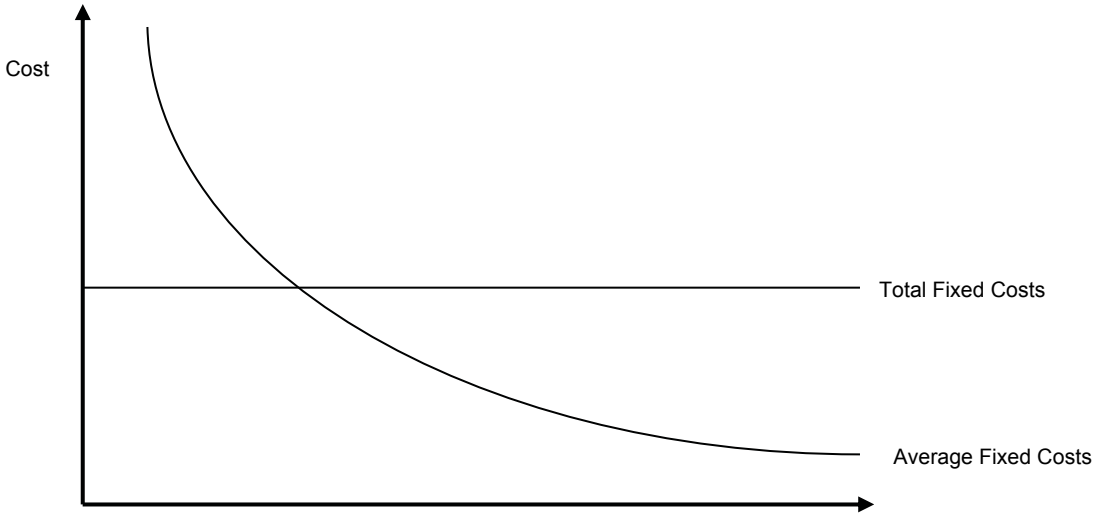
Linearity assumption

In cost accounting the linearity assumption is important because it emphasises the fact that the increase in costs is at a constant rate. This is regarded as the accountants' view which is in sharp contrast with the economists' view. The latter considers the effect of economies of scale which states that as efficiency improves or the activity level rises the increase in variable cost is at a decreasing rate thereby forming a curvilinear relationship with the level of activity.

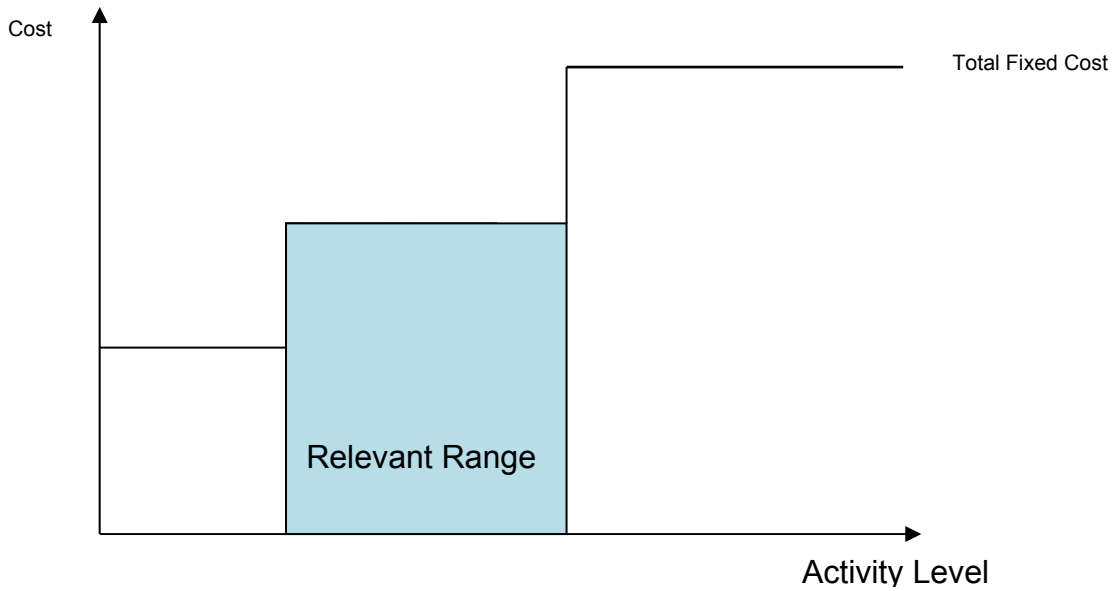


Fixed costs

These are costs which do not respond to any fluctuations in activity level or volume. In other words, fixed costs are those costs which remain unchanged when the activity level or volume changes. This is likely going to be the case at least in the short term when significant shifts are not expected in the activity level



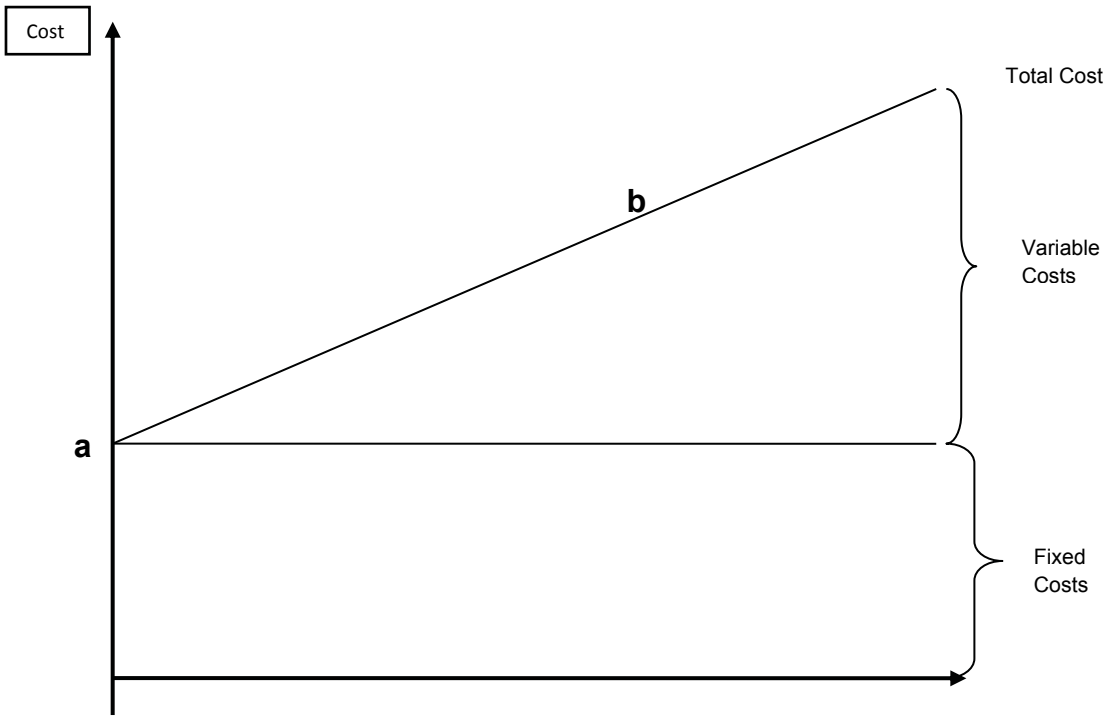
In the long run, fixed costs change due to significant shifts in activity level hence behave as **Step Costs** as illustrated in the following diagram:



A relevant range is the level of activity or volume over which the fixed costs remain constant without changing.

Mixed Costs

These are costs which do not go down to zero when the activity level is zero. Mixed costs show characteristics of both variable and fixed costs. They are therefore called *semi-variable or semi-fixed costs.*



From the diagram above, **a** is a y-intercept on the y - axis representing the level of fixed costs whereas **b** is a gradient or slope of the total cost (TC) line, also representing the variable cost.

This relationship is very important as it can be used in cost accounting in predicting cost of activities where there is a correlation between activity level and cost behaviour.

Separating Variable and Fixed Elements of Mixed Costs

Mixed costs are separated into individual elements of variable and fixed costs using the following methods:

1. *Scatter graph Method*

   This method involves plotting on a graph a collection of data relating to total cost and level of activity. A line of best fit is drawn by inspection and reading on this line. A fixed cost is determined from the y-intercept and the variable element is established from the gradient of the line. This method is not reliable because the line of best fit is drawn by inspection and the accuracy cannot be objectively established.

2. *Regression Analysis*

   This is a statistical method which involves the determination of the least squares regression line.

3. *High- Low Method*

   This is a method that is mostly used in cost accounting. It is based on an assumption that total costs consist of both fixed and variable costs. When the activity level increases only the variable cost element in the total cost increases. Therefore the variable cost can be estimated by the change in total costs between the highest and the lowest activity levels or volume.

Example

The following data was collected for a company over a period of five months as follows:

Month	Volume (units)	Total cost (MK)
July	13,000	109,000
August	15,000	120,000
September	11,000	99,000
October	11,200	98,800
November	16,000	124,000

Required:
Estimate the variable and fixed cost elements in the total cost.

Solution:

	Volume	Total costs MK
High	16,000	124,000
Low	11,000	99,000
Range	5,000	25,000

Variable cost 25,000÷5,000 units = MK5.00 per unit

Fixed cost can be calculated by substituting into the high or low but for illustration purposes the high will be used.

Total cost = Fixed cost + variable cost
Therefore, Fixed cost = Total cost – variable cost
= MK 124,000 – (16,000 x 5)
= MK 44,000

Noting that a linear equation is expressed as y = a + bx;
where y = total cost, a = total fixed costs, b = unit variable cost and x = volume then

$$y = 44{,}000 + 5x$$

The above equation can then be used in predicting the future total costs given the activity level or volume by substituting the independent variable - x.

Application of Cost Behaviour

- *Cost Control*

Cost behaviour provides a benchmark to which the actual costs incurred can be compared. Costs can be controlled by having a prior knowledge of the level of costs to be incurred as a result of an organisation's activities.

- *Budgeting*

Awareness of cost behaviour patterns helps to draw up a realistic budget. Expected costs can be estimated at each activity level.

- *Decision Making*

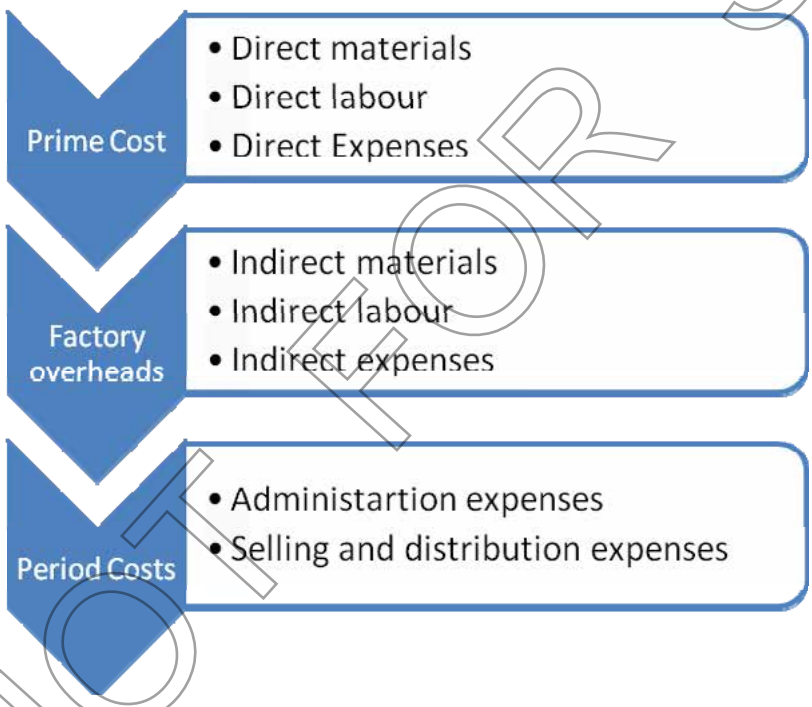
  An understanding of cost behaviour is vital for facilitating an evaluation of different courses of action open to an organisation. Management may require estimates of costs at different levels of activity for evaluation alternative courses of action. Management therefore needs to understand, for example, that fixed costs do not change in general as a result of a decision.

Product and Period Cost

One of the cost objectives is inventory valuation. Costs are collected in order to value inventory either for inclusion in the Balance sheet (statement of financial position) or purely for costing purposes.

Where costs are used for inventory valuation, cost accounting is said to be subservient to financial accounting because it serves the interests of external reporting.

Product Cost



A *Product Cost* is a cost which consists of the prime cost and the factory overheads. In order to value a finished product, it is important to include all costs incurred in converting the input raw materials or components into a finished product. In financial accounting inventory should be valued at the lower of cost or resale value. The cost includes all costs incurred in bringing the inventory to its present location and

condition. In this regard, a finished product should be valued at its product cost by adding the following:

- Cost of input material including carriage inwards
- Cost of conversion i.e. labour and overheads

If a finished product is sold the product cost is said to be expired and becomes cost of sales. But if the product remains unsold at the end of a reporting period, the product cost is carried forward to the next period. Hence the product cost is used for valuation only when it is unexpired.

A *Period Cost* on the other hand is a cost which is written-off to the operating statement during the same period it was incurred. In this regard, a period cost is not carried forward in the inventory value hence expired. It is important to remember that a period cost is not necessarily a fixed cost.

4. Classification by Function

According to this classification, costs are identified by the *function* of the business responsible for incurring them e.g. production, Sales, Administration and Research.

- **Production Costs**: Costs incurred by the sequence of operations beginning with the supply of raw materials through to completion as a finished product.

- **Administrative Costs**: Costs of managing an organisation in planning and controlling its operations so long as they do not relate to other functions

- **Selling and Distribution Costs**: Costs relating to creation of demand and securing firm orders from customers as well as availing the goods to consumers.

- **Research and Development Costs**: Research Costs relate to costs of searching for new or improved products. Development Costs are the costs incurred prior to commencement of manufacturing a new product or improving existing products.

- **Financing Costs**: Costs incurred to finance the business such as loan interest.

END OF CHAPTER QUESTION

Madalitso Medical Clinic offers a number of specialised medical services. The clinic recently added a 20-bed maternity wing. Since the clinic has no experience with in-patient maternity services, it decided to operate the wing for two months before determining how much to charge per patient-day on an ongoing basis. As a temporary measure, it adopted a patient-day charge of MK10,000, an amount equal to the fees charged by a hospital specialised in maternity care in the city.

This initial per-day charge was quoted to patients entering the wing during the first two months with assurances that if the actual operating costs justified it, the charge could be reduced. The maternity wing opened on 1 January 20X9. During the month of January, the wing had 2,100 patient-days of activity. During the month of February the activity was 2,250 patient-days. Costs for the two levels of activity output are as follows:

	2,100 Patient-Days	2,250 Patient-Days
Salaries, nurses	600,000	600,000
Assistants	120,000	120,000
Laboratory	11,000,000	11,750,000
Pharmacy	3,100,000	3,250,000
Depreciation	1,180,000	1,180,000
Laundry	1,680,000	1,800,000
Administration	1,200,000	1,200,000
Equipment hire	3,000,000	3,000,000

Required:

(a) Classify each cost as fixed, variable or mixed using patient-days as the activity driver. 4 marks

(b) Use the high-low method to separate the mixed costs into fixed and variable. 6 marks

(c) The administrator of the maternity wing has estimated that the centre will average 2,000 patient-days per month. If the wing is to be operated as a non-profit organisation, how much will it need to charge per patient-day? 6 marks

(d) Assume the wing averages 2,500 patient-days per month. How much would need to be charged per patient=day for the wing to cover its costs? 2 marks

(e) Explain why the charge per patient-day decreased as the activity output increased. 2 marks

(Total: 20 marks)

CHAPTER 2

ACCOUNTING FOR AND CONTROL OF MATERIALS

Learning objectives

By the end of this chapter students should be able to:

- Understand material procurement processes
- Maintain inventory records
- Prepare inventory valuation sheets
- Understand principles and techniques of material control

Introduction

Materials are categorised into raw materials, work in progress, finished goods for resale and consumable suppliers.

Procurement Procedures

If materials are available at stores the user department will request from stores and if materials are not available then the stores will arrange purchase from suppliers

1. Materials Requisition Note (MRN): this is a document which is issued by a User Department requesting Stores to issue inventory. The MRN is the authority for materials to leave stores. It carries with it costing information so that the user department can be charged for the use of the materials or else the user department charges to the jobs being carried out the cost of the materials

2. Purchase Requisition Note (PRN): this document is prepared by the stores or user department which initiates the procurement process when the item of inventory is not in stock. It is the authority on the buyer to source quotations from potential suppliers or issue tender documents for inviting bids from potential suppliers. The following are the steps to be followed in procurement

    - **Information gathering**: If the potential customer does not already have an established relationship with sales/ marketing functions of suppliers of required products it is necessary to search for suppliers who can satisfy the requirements.
    - **Supplier contact**: When one or more suitable suppliers have been identified, *requests for quotation, requests for information or requests for tender* may be advertised, or direct contact may be made with the suppliers.
    - **Background review**: References for product quality are consulted and any requirements for follow-up including installation, maintenance and warranty are

investigated. Samples of the products being considered may be examined or trials undertaken.

- **Negotiation**: Negotiations are undertaken and price, availability and customization possibilities are established. Delivery schedules are negotiated and a contract to acquire the product is completed.
- **Fulfilment**: Supplier preparation, expediting, shipment, delivery and payment for the products are completed based on contract terms. Installation and training may also be included.
- **Consumption, maintenance, and disposal**: During this phase, the company evaluates the performance of the products and any accompanying service support, as they are consumed.
- **Renewal**: When the product has been consumed and/or disposed of, the contract expires, or the product or service is to be re-ordered, company experience with the product is reviewed. If the product is to be re-ordered, the company determines whether to consider other suppliers or to continue with the same supplier.

3. Local Purchase Order (LPO): this is a document which is issued to a selected supplier for delivery of the materials according to delivery terms. It is a commitment for the organisation to pay for all goods procured on credit. A copy is supposed to accompany all invoices issued by the supplier asking for payment.

   When the supplier delivers the consignment is accompanied by a Delivery Note detailing the quantity and packaging of the goods delivered.

4. Goods Received Note (GRN): this is a very important document because it acknowledges receipt of inventory and is the authority for goods to enter stores.

Based on the consumption purposes of the acquired goods, procurement activities are often split into two distinct categories; the first category being direct, production-related procurement and the second being indirect, non-production-related procurement.

Direct procurement and indirect procurement				
		TYPES		
		Direct procurement	Indirect procurement	
		Raw material and production goods	Maintenance, repair, and operating supplies	Capital goods
FEATURES	Quantity	Large	Low	Low
	Frequency	High	Relatively high	Low
	Value	Industry specific	Low	High
	Nature	Operational	Tactical	Strategic
	Examples	Crude oil in petroleum industry	Lubricants, spare parts	Machinery, computers

Material Coding

A material code is a system of symbols designed to be applied to a classified set of items to give a brief accurate reference. It uses a combination of numbers and letters in alpha-numeric format in describing different types of materials.

Inventory is coded according to the characteristics of materials hence careful analysis is required in order to ensure that the method is satisfactory in avoiding duplication as well as assisting in structuring storekeeping to aid memory.

When designing a coding system the following principles should be borne in mind:
- Simplicity: to ensure the code is easy to use and minimise the likelihood of errors
- Flexibility: it should be possible to add further categories in future
- Unambiguity: each code should only refer to one item
- Brevity: codes should be kept short for ease of use and to reduce the chance of errors

Advantages

(a) Clerical effort is reduced because the writing out of precise descriptions becomes unnecessary
(b) Ambiguity is avoided because everyone knows what material is being referred to. For example, nails 6" and 6"nails would mean one thing but a computer would treat them separately. A code could avoid describing the same item differently
(c) It becomes easier to refer to items and categorise them
(d) It is normally essential when handling inventory data in mechanical or electronic processing systems

Record Keeping

The following documents are used for keeping inventory records:

1. Bin Card:

   This is a document which is identified with the inventory where stacked. It is found in a physical location where inventory is kept and is used for recording inventory movement for both receipts and issues in quantity only.

2. Stores Ledger Card:

   This document is used for recording the inventory movement in both quantity and value. In addition, it contains inventory control information. Instead of keeping it in the bin, stores ledger cards are centrally kept.

Inventory Accounting Systems and Inventory Counts

The two most widely used inventory accounting systems are the periodic and the perpetual.

- *Perpetual:* The perpetual inventory system requires accounting records to show the amount of inventory on hand at all times. It maintains a separate account in the subsidiary ledger for each good in stock, and the account is updated each time a quantity is added or taken out.
- *Periodic:* In the periodic inventory system, sales are recorded as they occur but the inventory is not updated. A physical inventory must be taken at the end of the year to determine the cost of goods sold.

Regardless of what inventory accounting system is used, it is good practice to perform a physical inventory count at least once a year.

Inventory Valuation Methods

Inventory valuation involves two major aspects:

- The cost of the purchased or manufactured inventory has to be determined and
- Such cost is retained in the inventory accounts of the company until the product is sold.

The following methods are the most commonly used for inventory valuation by companies:

- *First-in First-Out (FIFO):* the first goods to be sold (cost of sales) are the first goods that were purchased or consumed (cost of production). The ending inventory is formed by the last goods that were purchased and came in at the end to the inventory.
- *Last-in First-out (LIFO):* the first goods to be sold (cost of sales) are the last goods that were purchased or consumed (cost of production). The ending inventory is formed by the first goods that were purchased and came in at the beginning to the inventory.
- *Weighted Average Cost:* this method requires calculation of average unit cost of the goods in the beginning inventory plus the purchases made in the period. Based on this

average unit cost the cost of sales (production) and the ending inventory of the period are determined.

Formula:

$$\text{Weighted Average cost} = \frac{\text{Cost of Quantity in Stock + Cost of Receipts}}{\text{Quantity in Stock + Quantity Received}}$$

Each article sold and each unit that remains in the inventory are individually identified in the first two methods above but the last method does not require keeping batches separately.

Example

On 1 January20X1, Mr G started a business buying and selling a special yarn. He invested MK400,000 in the business and during the next six months the following transactions occurred:

Yarn purchases

Date of receipt	Quantity Boxes	Total Cost MK
13 Jan	200	72,000
8 Feb	400	152,000
11 March	600	240,000
12 April	400	140,000
15 June	500	140,000

Yarn sales

Date of dispatch	Quantity Boxes	Total Value MK
10 Feb	500	250,000
20 April	600	270,000
25 June	400	152,000

The yarn is stored in rented premises and the closing inventory of yarn counted on June 30 was 500 boxes. Other expenses incurred and paid in cash during the six months amounted to MK 23,000.

Required

(a) Prepare a stores ledger card showing the value of issues during the six-month period and the value of closing inventory at the end of June using three different methods of pricing (LIFO, FIFO and weighted average cost). State any advantages and disadvantages of each method.

(b) Calculate the effect each of the three methods of pricing inventory will have on the reported profit of the business and examine the performance of the business during the six-month period.

FIFO METHOD

Date	Receipts			Issues			Balance		
20X1	Qty	Unit price	Value	Qty	Unit price	Value	Qty	Unit price	Value
13-Jan	200	360	72,000				200	360	72,000
08-Feb	400	380	152,000				200	360	72,000
							400	380	152,000
							600		224,000
10-Feb				200	360	72,000			
				300	380	114,000			
				500		186,000	100	380	38,000
11-Mar	600	400	240,000				100	380	38,000
							600	400	240,000
							700		278,000
12-Apr	400	350	140,000				100	380	38,000
							600	400	240,000
							400	350	140,000
							1100		418,000
20-Apr				100	380	38,000	100	400	40,000
				500	400	200,000	400	350	140,000
				600		238,000	500		180,000
15-Jun	500	280	140,000				100	400	40,000
							400	350	140,000
							500	280	140,000
							1000		320,000
25-Jun				100	400	40,000			
				300	350	105,000	100	350	35,000
				400		145,000	500	280	140,000
							600		175,000
30-Jun				100	350	35,000	500	280	140,000

Note:

There is a stock difference of 100 boxes according to the stock count on 30June. This should be treated as a stock loss properly valued according to the valuation method used

Advantages

- FIFO produces realistic inventory values. Closing stock approximates to current market values
- Recommended for external reporting according to *IAS 2 Inventories*

Disadvantages

- Produces outdated production costs and therefore potentially overstates profits

- Complicates inventory records as inventory must be analysed by delivery

20X1	Qty	Unit price	Value	Qty	Unit price	Value	Qty	Unit price	Value
13-Jan	200	360	72,000				200	360	72,000
08-Feb	400	380	152,000				200	360	72,000
							400	380	152,000
							600		224,000
10-Feb				400	380	152,000			
				100	360	36,000			
				500		188,000	100	360	36,000
							100	360	36,000
11-Mar	600	400	240,000				600	400	240,000
							700		276,000
							100	360	36,000
							600	400	240,000
12-Apr	400	350	140,000				400	350	140,000
							1100		416,000
20-Apr				400	350	140,000	100	360	36,000
				200	400	80,000	400	400	160,000
				600		220,000	500	760	196000
							100	360	36,000
							400	400	160,000
15-Jun	500	280	140,000				500	280	140,000
							1000		336000
25-Jun				400	280	112,000	100	360	36,000
							400	400	160,000
							100	280	28,000
							600		224000
30-Jun				100	280	28,000	100	360	36,000
							400	400	160,000
							500		196000

Advantages

- LIFO produces realistic production costs and therefore more realistic or prudent profit figures
- Ideal under hyper inflation

Disadvantages

- Produces unrealistically low inventory values

- Also complicates inventory records as stock must be identified by delivery

WEIGHTED AVERAGE METHOD									
Date	Receipts			Issues			Balance		
20X1	Qty	Unit price	Value	Qty	Unit price	Value	Qty	Unit price	Value
13-Jan	200	360	72,000				200	360.00	72,000.00
08-Feb	400	380	152,000				600	373.33	224,000.00
10-Feb				500	373.33	186,666.67	100		37,333.33
11-Mar	600	400	240,000				700	396.19	277,333.33
12-Apr	400	350	140,000				1100	379.39	417,333.33
20-Apr				600	379.39	227,636.36	500		189,696.97
15-Jun	500	280	140,000				1000	329.70	329,696.97
25-Jun				400	329.70	131,878.79	600		197,818.18
30-Jun				100	329.70	32,969.70			
							500		164,848.48

Advantage

- Simple to operate since calculations within inventory records are minimised
- No need to analyse inventory by delivery

Disadvantage

- Both inventory values and production costs are far from current market values

Operating Statements Under Each Basis

	FIFO			LIFO		WEIGHTED AVERAGE	
Sales		672,000			672,000		672,000
Less: cost of sales							
opening stock	-		-			-	
Purchases	744,000		744,000			744,000	
	744,000		744,000			744,000	
less Closing stock	175,000		224,000			197,818	
		569,000			520,000		546,182
Gross profit		103,000			152,000		125,818
Less:							
Stock loss	35,000		28,000			32,970	
Expenses	23,000		23,000			23,000	
		58,000			51,000		55,970
Net profit		45,000			101,000		69,848

Other inventory valuation methods include:

- NIFO: Next In First Out
  - Involves the estimation of the next order prices for each issue. It produces realistic production costs and inventory values. However, the estimation of replacement costs is more complex because it requires the matching values of issues and receipts continuously.
- Standard Cost:
  - A standard cost rather than the actual cost is used in inventory valuation in which case the difference between the standard cost and the actual cost is treated as a price variance at the end of a reporting period.
  - Inventory records are simplified but the standard cost may not reflect current values since the standard cost is only revised when changes permanent in nature occur.

Inventory Control

The materials purchased by a concern may be classified as inventory items which are taken into store and held until required or as direct deliveries to the point of consumption. The control of those materials which are inventory items is known as inventory control.

The function of inventory control is to obtain the maximum inventory turnover consistent with the maintenance of sufficient stocks to meet all requirements. Inventory turnover is the ratio which the cost of the materials used per annum bears to the average inventory of raw materials. Discussions with regard to the quantity of materials stocked are reached after many considerations including:

- The availability of working capital for the procurement of inventories
- The storage space available
- The cost of storage
- Risk of loss due to a fall in prices, deterioration, obsolescence, pilferage etc.
- Economic order quantities
- Delivery delays

Need For Materials Control

One of the first steps in the installation of a **cost and management accounting system** is planning the proper control of materials and supplies from the time orders are placed with supplier until they have been consumed in the plant and office operation or have been sold as merchandise.
Materials represent an important asset and are the largest single item of cost in almost every business; accordingly the success or failure of a concern may depend largely upon efficient material purchasing, storage, accounting, utilization and control.

Where materials are not properly controlled, excess inventory of some items are likely to occur resulting into unnecessary tying up of capital and loss through deterioration and

obsolescence. Shortages of other materials may arise at the time when they are urgently needed and production will then be delayed.

The purchasing of materials is a highly specialized function. By ordering the right quantity and quality of materials at the most favourable price, and by ensuring that it arrives at the right time, the efficient buyer is able to make a valuable contribution to the success of a business. The **efficient material control** reduces losses and forms of waste that otherwise tend to pass unnoticed. Theft, misappropriation, deterioration, breakage and additional storage costs can be reduced to a minimum by proper controls and avoid idle time in the factory will be cut out if materials are available to meet the demands of the production staff. Finally and most important to the cost accountant, it is impossible to produce reliable costing information if the records of materials issue are unsatisfactory, because a cost statement cannot be more accurate than the information on which it is based.

The important requirements or essentials of a satisfactory system of materials control are as follows:

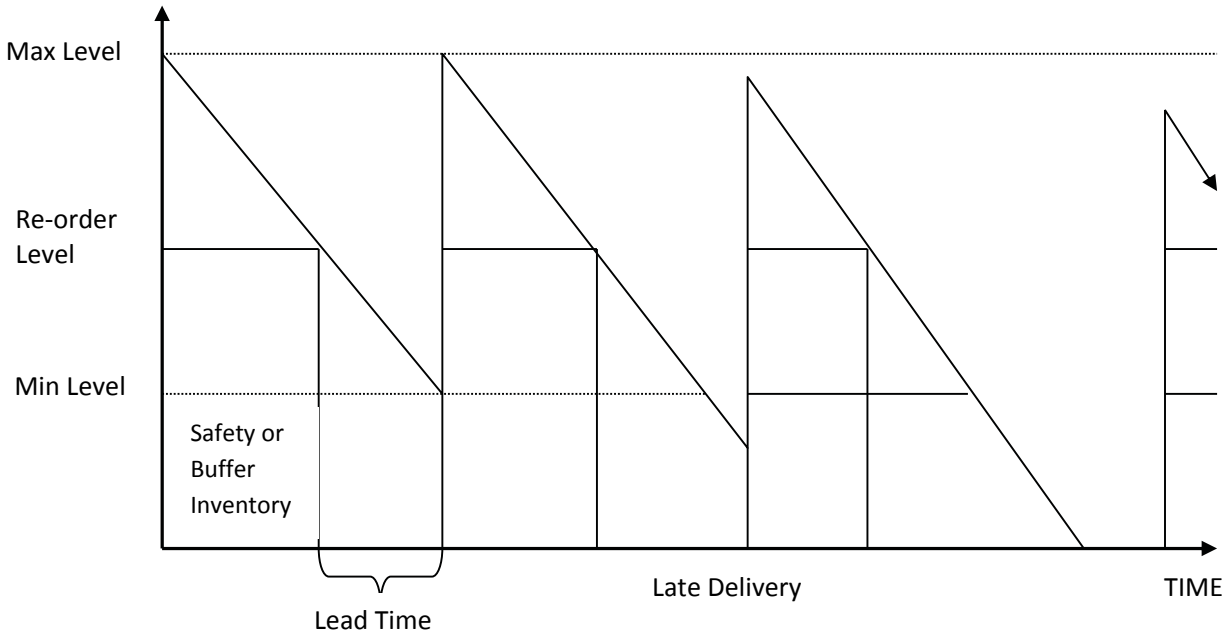
- Proper coordination
- Competent purchasing agent
- Use of standard forms
- Control by budgeting materials and equipment
- Storage location
- Operation of perpetual inventory
- Standards or level to be fixed
- Storage control and issue
- Internal check
- Development of controlling accounts and subsidiary records
- Regular reports

Inventory Control Systems

(a) Re-Order Level System

For effective control of materials, it is important to decide upon different levels of materials. These levels are maximum limit or level, minimum limit or level and re-order level or ordering point or ordering level. Maximum, minimum and re-order levels are not static. They must be varied to suit the changing circumstances. Thus, alteration will take place if the usage of certain materials is increased or decreased.

Sawtooth Diagram: Instant Replenishment



Minimum Limit or Minimum Level of Inventory:
The **minimum level or minimum inventory** is that level of inventory below which inventory should not be allowed to fall. In case of any item falling below this level, there is danger of disrupting production and, therefore, the management should give priority to the acquisition of new supplies.

Formula:
Minimum level or minimum limit can be calculated by the following formula:
Minimum limit or level = Re-order level or ordering point – Average usage × Average lead time
Or the formula can be written as:
Minimum limit or level = Re-order level or ordering point – Average usage for Normal period

Example

Normal usage	100 units per day
Maximum usage	130 units per day
Minimum usage	70 units per day
Re-order period or lead time	25 to 30 days

Required

Calculate the minimum limit or level

Solution

To calculate minimum limit of materials we must calculate re-order point or re-order level first.
Calculation:
Ordering point or re-order level = Maximum daily or weekly or monthly usage × Maximum re-order period

= 130 × 30
= 3,900 units

Minimum limit or level = Re-order level or ordering point – Average or normal usage × Normal re-order period

= 3900 – (100 × 27.5*)
= 1150 units
*(25 + 30) / 2

Maximum Level or Maximum Limit of Inventory:

The **maximum inventory limit** is upper level of the inventory and the quantity that must not be exceeded without specific authority from management. In other words, the maximum inventory level is that quantity of material above which the inventory of any item should not normally be allowed to go. This level is fixed after taking into account such factors as capital, rate of consumption of materials, storage space available, insurance cost, risk of deterioration and obsolescence and economic order quantity.

Formula:
Maximum level or maximum limit can be calculated by the help of following formula:

[Maximum limit or level = Re-order level or ordering point – Minimum usage × Minimum re-order period + Economic order quantity]

Example:

Normal usage	100 units per day
Maximum usage	130 units per day
Minimum usage	70 units per day
Re-order period or lead time	25 to 30 days
Economic order quantity	5,000 units

Required

Calculate the maximum limit or level.

In order to calculate maximum limit of inventory we must calculate re-order point or re-order level first.

Ordering point or re-order level = Maximum daily or weekly or monthly usage × Maximum re-order period = 130 × 30
= 3,900 units

Calculation

Maximum limit or level = Re-order level or ordering point – Minimum quantity used in re-order period usage + Economic order quantity
= 3900 – (70 × 25) + 5,000
= 7150 units

Re-order Level or Ordering Point or Ordering Level:

This is that level of materials at which a new order for replenishment of materials is to be placed. In other words, at this level a purchase requisition is made out. This level is fixed somewhere between maximum and minimum levels. Order points are based on usage during time necessary to requisition order, and receive materials, plus an allowance for protection against stock outs.

The **order point** is reached when inventory on hand and quantities due in are equal to the lead time usage quantity plus the safety inventory quantity.

Formula of Re-order Level or Ordering Point:
The following two formulas are used for the calculation of **reorder level or point**.

Ordering point or re-order level = Maximum daily or weekly or monthly usage × Lead time
The above formula is used when usage and lead time are known with certainty; therefore, no safety inventory is provided. When safety inventory is provided then the following formula will be applicable:
Ordering point or re-order level = Maximum daily or weekly or monthly usage × Lead time + Safety inventory

Example 1

Minimum daily requirement	800 units
Time required to receive emergency supplies	4 days
Average daily requirement	700 units
Minimum daily requirement	600 units
Time required for refresh supplies	One month (30 days)

Required

Calculate ordering point or re-order level

Solution

Ordering point = Ordering point or re-order level = Maximum daily or weekly or monthly usage × Lead time = 800 × 30
= 24,000 units

Example 2

Two types of materials are used as follows: Minimum usage	 20 units per week each
Maximum usage	40 units per week each
Normal usage	60 units per week each
Re-order period or Lead time Material A: Material B	 3 to 5 weeks 2 to 4 weeks

Required

Calculate re order point for two types of materials

Calculation:
Ordering point or re-order level = Maximum daily or weekly or monthly usage × Maximum re-order period
A: 60 × 5 = 300 units
B: 60 × 4 = 240 units
Average inventory level:

Formula:
Minimum inventory level + ½ Reorder Quantity

(b) Periodic Review System

This is another control system in which variable quantities are ordered at fixed intervals. An internal procurement committee (IPC) may meet every three months, for example, to review inventory levels. At each meeting a decision is made regarding the quantity to order to replenish the inventory in stores.

(c) Two Bin System

In this system, two bin cards are used for monitoring inventory movement. One card is for operations and the other is for reserve. When the operational card is empty, procurement procedures are initiated.

(d) Economic Order Quantity (EOQ)

Economic order quantity (EOQ) is that size of the order which gives maximum economy in purchasing any material and ultimately contributes towards maintaining the materials at the optimum level and at the minimum cost.
In other words, the ***economic order quantity (EOQ)*** is the amount of inventory to be ordered at one time for purposes of minimizing annual inventory cost.
The quantity to order at a given time must be determined by balancing two factors: (1) the cost of possessing or carrying materials and (2) the cost of acquiring or ordering materials. Purchasing larger quantities may decrease the unit cost of acquisition, but this saving may not be more than offset by the cost of carrying materials in inventory for a longer period of time.
The carrying cost of inventory may include:

- Interest on investment of working capital
- Property tax and insurance
- Storage cost, handling cost
- Deterioration and shrinkage of inventory
- Obsolescence of inventory.
-

Formula of Economic Order Quantity (EOQ):

Different formulas have been developed for the calculation of economic order quantity (EOQ). The following formula is usually used for the calculation of EOQ.

$$\sqrt{\frac{2 * A * Cp}{Ch}}$$

A = Demand for the year
Cp = Cost to place a single order
Ch = Cost to hold one unit inventory for a year
* = X

Example

Pam runs a mail-order business for gym equipment. Annual demand for the TricoFlexers is 16,000. The annual holding cost per unit is MK2.50 and the cost to place an order is MK50.

Required

Calculate economic order quantity (EOQ)

Solution

$$\sqrt{\frac{2*16{,}000*\$50}{\$2.50}} = 800 \text{ units per order}$$

Underlying Assumptions of Economic Order Quantity:

- The ordering cost is constant.
- The rate of demand is constant
- The lead time is fixed
- The purchase price of the item is constant i.e. no discount is available
- The replenishment is made instantaneously; the whole batch is delivered at once.

Exercise

The ordering of material KL has caused concern in the past according to the Chief accountant. There have been occasions when an excessive amount of stock has been carried forward beyond any possible demand and when the problem has been addressed and the stock level cut, orders have been unfulfilled and sales lost because the company has run out of material KL. The chief accountant has now said he wants a policy that achieves the following aims

- Adequate stock of material KL, thus minimizing the risk of shortage and production disruption
- This should be balanced with the avoidance of excessive stock levels of material KL and the consequent tying up of scarce funds

You are given the following information

- Budgeted average demand for material KL is 400 kilos per week and production is maintained for 50 weeks in the year
- The ordering cost is MK150 per order
- The standard material cost of material KL is MK6 per kilo and carrying costs are $33^{1}/_{3}\%$ of that figure per annum for each kilo
- The maximum usage in any one week is 600 kilos and the minimum is 400
- On average the orders take anything from one to three weeks to be delivered after they have been placed

Required

In order to meet the chief accountant's objectives determine the following

(a) the reorder level of material KL
(b) the optimum order quantity that should be placed
(c) the minimum level of stock that should be held
(d) the maximum level of stock that should be held
(e) the total costs per annum associated with material KL
(f) If the supplier offers you a discount of 2% on the price for orders of 2400 or above what advice would you give management?

Solution:

Check if you can find the following answers:

(a) Reorder Level = 1,800 kilos
(b) Optimum order Quantity(EOQ) = 1,732 kilos
(c) Minimum inventory level = 800 kilos
(d) Maximum inventory level = 3,132 kilos
(e) Total inventory associated costs = S123,464.10 (purchase + ordering + holding costs)
(f) With discount, cost is MK 121,202 hence yielding a cost saving of MK2,262.10. Therefore the discount is advantageous for management to adopt and abandon the EOQ.

(g) Just In Time System

a philosophy of manufacturing based on planned elimination of all waste and on continuous improvement of productivity". APICS dictionary (APICS- The Association for Operations Management)

It also has been described as an approach with the objective of producing the right part in the right place at the right time (in other words, "just in time"). Waste results from any activity that adds cost without adding value, such as the unnecessary moving of materials, the accumulation of excess inventory, or the use of faulty production methods that create products requiring subsequent rework. JIT (also known as *lean production* or *stockless production*) should improve profits and return on investment by reducing inventory levels (increasing the inventory turnover rate), reducing variability, improving product quality, reducing production and delivery lead times, and reducing other costs (such as those associated with machine setup and equipment breakdown). In a JIT system, underutilized (excess) capacity is used instead of buffer inventories to hedge against problems that may arise.

requires a complete and reliable logistics system as any disruption in the flow of materials can bring the whole production process to a devastating stop. Such systems are usually dependent upon a strong information system that often links the manufacturer directly to the supplier with automated procurement procedures. A Japanese term that is associated with JIT is "Kanban," which means some form of signal that a particular inventory is ready for replenishment.

A popular modification of the JIT system is for suppliers to "store" their inventory at the manufacturer's physical location. This enables the manufacturer to "buy" raw materials directly from the supplier's stock located within the same physical location. Finally, look carefully as you travel through industrial areas, and notice that "compatible" businesses are located in close proximity. For example, a beverage bottler's neighbour is apt to be an aluminium can manufacturer.

Just in time is a 'pull' system of production, so actual orders provide a signal for when a product should be manufactured. Demand-pull enables a firm to produce only what is required, in the correct quantity and at the correct time.

This means that stock levels of raw materials, components, work in progress and finished goods can be kept to a minimum. This requires a carefully planned scheduling and flow of resources through the production process. Modern manufacturing firms use sophisticated production scheduling software to plan production for each period of time, which includes ordering the correct stock. Information is exchanged with suppliers and customers through **EDI** (**Electronic Data Interchange**) to help ensure that every detail is correct.

Supplies are delivered right to the production line only when they are needed. For example, a car manufacturing plant might receive exactly the right number and type of tyres for one day's production, and the supplier would be expected to deliver them to the correct loading bay on the production line within a very narrow time slot.

Advantages of JIT

- Lower stock holding means a reduction in storage space which saves rent and insurance costs
- As stock is only obtained when it is needed, less working capital is tied up in stock
- There is less likelihood of stock becoming obsolete or out of date
- Avoids the build-up of unsold finished product that can occur with sudden changes in demand
- Less time is spent on checking and re-working the product of others as the emphasis is on getting the work **right first time**

Disadvantages of JIT

- There is little room for mistakes as minimal stock is kept for re-working faulty product
- Production is very reliant on suppliers and if stock is not delivered on time, the whole production schedule can be delayed
- There is no spare finished product available to meet unexpected orders, because all product is made to meet actual orders – however, JIT is a very responsive method of production

END OF CHAPTER QUESTION

Matabwa Limited trade in a single product and maintain a perpetual inventory system. The company has valued its stock on the LIFO basis, but is now considering a change to the FIFO method

Their records disclose that 2,000 units were in the inventory at the beginning of the current period. They have been valued on the basis of a receipt of 5,000 units priced at MK25.00 of which 4,000 had been sold before the end of the period, plus 500 from a delivery in October 20X8 when the cost was MK20.00 per unit, plus 500 purchased in July 20X7 when the cost was S5.00 per unit.

The following transactions took place in the period January to June 20X9:

	Purchases	Sales
January		1,500 units @ MK40.00 each
February	10,000 units @ MK25.00 each	
March		8,000 units @ MK40.00 each
April	15,000 units @ MK26.00 each	
May	6,500 units @ MK27.00 each	
June		22,000 units @ MK40.00 each

Required

(a) Calculate the inventory valuation at 30 June 20X9 using:

(i) the LIFO Method 6 marks
(ii) the FIFO Method 6 marks

(b) Calculate the trading profit for the period January to June 20X9 using both methods of valuation for opening and closing inventories. 6 marks

(c) Explain the possible reasoning behind the company's decision to change to the FIFO method at the present time. 2 marks

Total: 20 marks

CHAPTER 3

ACCOUNTING FOR AND CONTROL OF LABOUR

Learning objectives

By the end of this chapter students should be able to:

- Understand the categories of labour cost
- Maintain labour records
- Calculate labour costs
- Properly account for overtime costs and incentive schemes

Introduction

Labour cost is the second important cost element for any company after the raw materials. A rise in labour cost will directly drag profit down significantly and the right approach on the labour cost management contributes directly to the value added a company can generate. Therefore, labour cost is second major concern of the management. A cost accountant of a manufacturing company devotes her/his energy watching at the labour cost after the raw material consumption.

Labour is mostly engaged by a personnel department. All other departments submit their requirements for labour to the personnel department. This department is then responsible for recruitment and selection, induction and retention of the best employees. In other words the personnel department takes care of the employees' welfare through the conditions of service.

For every employee, the personnel department maintains a record of personal details, qualifications, grade or position in the organisation's structure and personal emoluments.

Definition

Labour is the physical or mental effort expended in manufacturing a product or service. Labour cost is the price paid for using human resources. The compensation paid to employees who engage in production-related activities represents factory labour cost.

Costs Included in Labour

The principal labour cost is wages paid to production workers. **Wages** are payments made on an hourly, daily, or piecework basis. **Salaries** are fixed payments made regularly for managerial or clerical services. However, in practice, the terms "wages" and "salaries" are often incorrectly used interchangeably.

Total labour costs have been increasing rapidly in recent years, particularly in areas such as holiday pay (or leave grants), pensions, hospitality, life insurance, and other fringe benefit costs. In some cases these supplementary costs represent nearly 30% of regular earnings.

Direct and Indirect Labour Costs

Direct labourers are those who work on a product directly, either manually or by using machines. Direct labour is all labour that is directly involved in the production of a finished product, that can be easily traced to the product, and that represents a major labour cost of producing that product. Examples are assembly-line workers in an automobile factory or knitting machine operators in a sweater factory. Direct labour is considered both a part of **prime cost** and the **conversion cost**.

Indirect labour is factory labour not directly traceable to a product; also, it is not considered worthwhile to try to relate the cost of the indirect labour to production. Labourers whose services are indirectly related to production include product designers, supervisors, and product inspectors. Indirect labour is considered part of **factory overhead cost.**

Accounting for Labour

Accounting for labour by a manufacturer usually involves three activities:
(1) timekeeping;
(2) computation of total payroll; and
(3) allocation of payroll costs.

These activities must be performed before the payroll is recorded in the accounting records.

Timekeeping

Most large-scale manufacturers have a separate timekeeping section within a personnel department whose function is to collect the hours worked by employees. Two source documents commonly used in timekeeping are the "**time card**" and the "**labour job ticket**".

A time card (clock card) is inserted in a time clock by the employee several times each day: upon arrival, going to lunch, taking a break, and when leaving for the day. By

mechanically keeping a record of total hours worked each day by employees, this procedure provides a reliable source for computing and recording total payroll costs.
As a control procedure no single employee is supposed to insert two cards in the time clock. On one hand, a computer system cannot tell that one employee has inserted two cards-one for himself and the other for a friend who will report late. On the other hand, a manual system can falsify the time one is reporting for work.

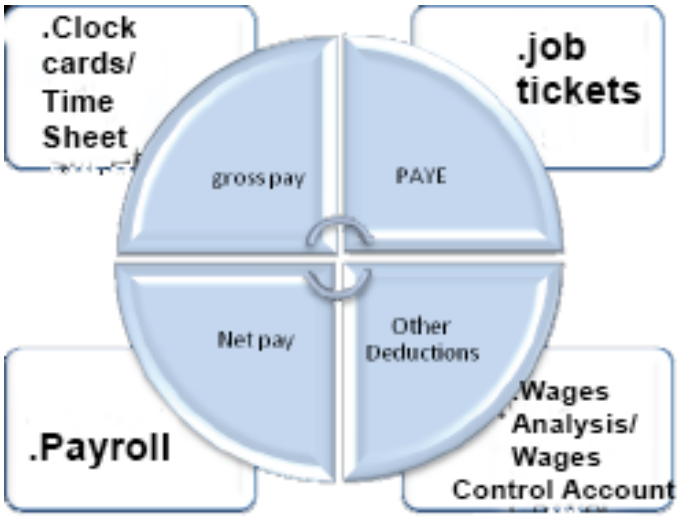
Labour job tickets are prepared daily by employees for each job worked on. Labour job tickets indicate the number of hours worked, a description of the work performed, and the employee's wage rate (inserted by the payroll department). The sum of the labour cost and hours for different jobs (as shown on labour job tickets) should be equal to the total labour cost and labour hours for the period (as shown on time cards).

Computation of Total Payroll

The payroll department's primary function is to compute the total payroll, including gross amount earned and the net amount payable to employees after deductions (Pay As You Earn, medical and pension contributions, and advances or staff loans). The payroll department distributes the payroll and maintains records of employees' earnings, wage rate, and job classification.

Allocation of Payroll Costs

Using time cards and labour job tickets as a guide, the cost accounting department must allocate the total payroll costs including the employer's portion of taxes like fringe benefit costs to individual jobs, departments, or products.
Some companies have the payroll department prepare the allocation and send it to the cost accounting department where the appropriate journal entries are prepared. The total payroll cost for any one period must equal the sum of the labour costs allocated to the individual jobs, departments, or products. The figure below depicts the cycle for labour costs.



Accounting for Elements of Labour Cost

1. Employee Taxes

   Employers are required by law to withhold, from their employees' earnings, state, income taxes (hereafter referred to as collectively as PAYE- and pension contributions which are designed to offer employees some measure of income upon retirement. Employers remit to the government, on a monthly basis, the employees' income taxes withheld as well as the employers' share of payroll taxes e.g. fringe benefit tax.

2. Employer Taxes and Fringe Benefit Costs

   Total payroll costs generally exceed the cost of gross wages or salaries. Employers are required to make provisions for severance pay. The purpose is to provide funds that can be used to pay employees in the event of terminated employment. In addition the government charges fringe benefit tax on other benefits given to employees such as motor vehicles.
   The government also requires that employers bear the cost of worker's compensation insurance to provide funds to employees who are injured on the job. Other optional fringe benefits are contributions to health, life or other insurance. Today, because of the skyrocketing costs of medical insurance, it is common to have the cost of health care paid jointly by the employer and employee.

3. Shift Premiums

   It is an accepted practice to pay shift premiums, or higher hourly rates, for the less desirable evening shift (3 P.M. to 11 P.M.) or night shift (11 PM to 7 AM). This shift premium, or shift differential, should be charged to factory overhead control rather than work-in-process, and spread over all units produced.

Note: Charging factory overhead control for shift premiums (instead of work-in-process) is especially important when a job order cost system is used because the unit cost of individual jobs produced when shift premiums are paid will not be distorted. Shift premiums are not caused by specific jobs and therefore should be spread over all the jobs produced during the period.

Overtime Premium

Regular earnings represent the total hours worked, including overtime hours, multiplied by the regular pay rate. Overtime premium represents the overtime hours multiplied by the premium rate. The premium rate for overtime is usually some fraction of the regular rate. Overtime is commonly referred to as time-and-a-half because most overtime hours worked are paid at the regular rate plus a premium of one-half the regular rate.

Three accounting treatments that are commonly used are based on the underlying cause of overtime:

- Treatment 1: Most overtime results from the random scheduling of jobs and should be treated like a shift premium and charged to factory overhead control.
- Treatment 2: When overtime results from the requirements of a specific job and not from random scheduling, the overtime premium should be charged to the specific job that caused the overtime.
- Treatment 3: If overtime resulted from negligence or poor workmanship on the part of a worker, then the overtime premium should be charged as a loss.

The type of accounting treatment accorded to overtime is important in that it determines what actions, if any, should be taken by management in the planning and control of labour costs. For example, the recording of a loss might call for closer supervision or better on-the-job training.

4. Idle Time

Idle time results when employees have no work to perform but are still paid for their time. For example, when a new job is being set up for production, some workers may temporarily have nothing to do. If their idleness is normal for the production process and cannot be avoided, the cost of idle time should be charged to factory overhead control. If the cost of idle time was due to negligence or inefficiency, it should be charged to a loss account.

Remuneration Methods

Remuneration methods depend on the nature of the qualifications of the operatives. The following are the most common remuneration methods

1. Time Based Pay

This remuneration method is suitable where there is no tangible output which can act as the basis for measuring the performance of each employee. The only basis for remuneration therefore will be the time each employee has actually worked. It will also be ideal for this remuneration method to be applicable especially where quality is emphasised. It is likely that in their quest to increase their take-home pay, employees might ignore quality.

Earnings = Clock hours worked x rate per hour

The clock hours worked will be collected using the clock cards as already noted earlier. The employee therefore will be paid at the end of a week, fortnight or a month. The rate of pay is normally fixed based on normal working conditions. During overtime, the rate is increased to time and half or double rate.

Fixed time
Employees are required to report for work at specific/defined times for instance from 7.30 am to 5.00 pm

Flexitime
The employee is required to work for a fixed duration (eg 8 hours per day) without indicating the start and finish times

2. Output Based Pay

This method is based on the output achieved by each employee where it is easily measurable. This means administrative arrangement will involve keeping records of output for each employee. If there are many employees, this may be cumbersome to maintain.

Earnings = Good output x rate per unit

The rate per unit can be a straight piecework rate where the rate per unit is constant, or a differential rate, where the rate per unit increases as output increases above certain limits as illustrated below:

001-100 units	MK20 per unit
101- 200 units	MK45 per unit
201- 300 units	MK60 per unit

This remuneration system benefits old employees because they can increase their output due to their improved efficiency or experience. New employees cannot benefit because, as they are learning, they are likely to be slow and make many mistakes. It should also be noted that only the output meeting quality standards should be paid

3. Guaranteed Wage and Incentive Plans

When payments to an employee are based solely on the number of units produced, the employee is said to be paid at a piecework rate. Many employers pay employees a minimum wage but employees can earn more if they produce more. This labour payment system benefits new employees because it guarantees them a minimum salary while they are learning their new job during which time they usually do not produce enough units to trigger the piecework rate.

Experienced employees also benefit from this system because they are provided an opportunity to earn more money as they become more efficient. If the output multiplied by the piece rate results in an amount less than the guaranteed wage, the difference is charged to factory overhead control. If the output multiplied by the piece rate results in an amount greater than the guaranteed wage, it should theoretically be charged to work-in-process [WIP] inventory. Under this type of compensation system, an average employee working on a job is expected to earn not only the minimum wage but a bonus as well. Had another type of compensation system been used, the employer would probably have paid workers an amount equivalent to the minimum wage plus the average bonus.

Incentive or Bonus Schemes

Individual bonus or incentive scheme

This is a remuneration method that recognises individual employee's effort to maximise output e.g. piecework rate. It requires maintaining records for each employee and does not encourage employees to work in teams. As a result the rate of absenteeism as well as accidents at the work place will be high. In addition the standard of performance is set highly.

Group Bonus Schemes

This incentive scheme encourages employees to work in teams hence not cumbersome in record- keeping. The problems associated with the individual incentive scheme are solved but the standard of performance is not high. However, the benefits are shared equally to all employees in the team. This creates a further problem because some members of the group who are hard workers tend to be discouraged from putting maximum effort.

Profit sharing scheme

This scheme allows employees to participate in the profits of the company when some targets (e.g. budgeted profit) have been achieved. The company's policy will determine the bonus to be given to employees either based on monthly or annual salary, or percentage of profit above the target.

Worked Examples

Example 1

The following information gives details of the gross pay calculated for a production worker:

	MK
Basic pay for normal hours worked 40 hours at MK50 per hour	2000
Overtime: 5 hours at time and half	375
Group bonus payment	40
	2415

Although paid for 40 hours in normal time the worker was in fact unable to work six hours due to machine breakdown.

Required

Analyse the total costs into direct and indirect costs.

SOLUTION						
Particulars	Total		Direct labour		Indirect labour	
Basic pay	2,000.00	34hrs X K50	1,700.00	6 X K50	300.00	Idle time
Overtime pay	375.00	5hrs X K50	250.00	5hrs X K25	125.00	O/T Premium
Group Bonus	40.00		-		40.00	
TOTALS	2,415.00		1,950.00		465.00	

Example 2

The following information is available

Normal working day	8 hours
Guaranteed rate of pay	MK55.00/hr
Standard time allowed to produce one unit	3 minutes
Piecework price	MK1/std time
Premium bonus*	75%

*The bonus is based on time saved in addition to hourly pay.

Required

For the daily production levels of 80, 120 and 210.Calculate earnings based on the following remuneration methods:

(a) piecework, where earnings are guaranteed at 80% of time based pay

(b) Premium bonus scheme

	SOLUTION				
(a)	Piecework	Output	80	120	210
	Tme based pay	clock hrs	8	8	8
		rate per hour	55.00	55.00	55.00
		Total pay	440.00	440.00	440.00
		Guaranteed minimum (80%)	352.00	352.00	352.00
		Standard time (min)	240	360	630
		Rate per min	1.00	1.00	1.00
		Total pay	240.00	360.00	630.00
		Earnings*	352.00	360.00	630.00
	* An employee is paid the piecework rate if it is higher than the guaranteed minimum				
(b)	Bonus pay		80	120	210
		Tme allowed (i)	4	6	10.5
		Time taken (ii)	8	8	8
		Time saved (i) - (ii)	0	0	2.5
		Bonus hours (75%)	0	0	1.875
		Total pay hours	8	8	9.875
		rate per hour	55.00	55.00	55.00
		Earnings	440.00	440.00	543.13

Labour Turnover

The rate at which employees are leaving and being replaced in a company over a period of one year expressed as a percentage of all employees i.e.

$$\frac{\text{Replacements}}{\text{Average employees}} \times 100$$

Causes of labour turnover

1. Lack of employee welfare
2. poor working relationship between members of staff and their supervisors
3. transfer of a key family member
4. lack of promotions and training opportunities
5. unsafe and stressful working conditions

Costs associated with labour turnover

1. Preventive costs
   - Job enrichment
   - Training and promotions
   - Social clubs
   - Pension schemes

2. Replacement costs
   - Advertisements for vacancies
   - Interviews and relocations
   - Loss of productive time due to on-the-job training
   - Increased accidents at the work place due to learning

END OF CHAPTER QUESTION

Zindikirani Limited manufactures a single product, Phunziro. Production operatives are paid a basic wage rate of MK30 per hour worked, but an additional 50% premium is paid for any overtime hours. The basic working week is 38 hours.

During the month ended 30 April 20X6, there were 4 weeks of production and the company employed 30 production operatives. No overtime was worked during the month and all 30 operatives worked for the full 38 hours each of the four weeks of production. During the month 456 units of Phunziro were made.

Required

(a) Calculate the labour cost for a single unit of Phunziro made in the month of April 20X6. **(4 marks)**

(b) The information below relates to the hours worked by three production operatives during the month ended 31 May 20X6:

Tadala:	140 basic hours and 17 hours overtime
Tawina:	150 basic hours and 22 hours overtime
Siphiwe:	120 basic hours and 20 hours overtime

Calculate separately the total wages earned by each of the operatives Tadala, Tawina and Siphiwe during the month ended 31 May 20X6. **(6 marks)**

(c) The company is considering introducing a bonus scheme for next year. The details are as follows:
In order to calculate the bonus a standard production time of 10 hours is to be allowed for each good unit of Phunziro. Rejected units do not qualify for a bonus. The bonus will be calculated using the following formula:

Bonus = time saved x 50% basic rate per hour

Assume that the scheme is introduced and that in the month of July 20X6, the production staff worked for a total of 4,200 basic hours. During the month, assume that 500 units of Phunziro were made, of which 50 units were rejected as faulty. The basic rate of pay will remain at MK30 per hour.

Required

i. Calculate the total basic wages that would be payable to the production operatives for July 20X6 **(2 marks)**

ii. Calculate the total bonus that would be payable to the production staff for July 20X6 **(6 marks)**

iii. Explain why a company might have to increase the inspection of finished goods if a bonus scheme is introduced. **(2 marks)**

(Total: 20 marks)

CHAPTER 4

ACCOUNTING FOR AND CONTROL OF OVERHEADS

Learning objectives

By the end of this chapter students should be able to:

- Understand the difference between production and non production overheads
- Understand the basic concepts of overheads allocation, apportionment and absorption
- Prepare overheads analysis schedules
- Identify appropriate bases and calculate absorption rates
- Determine under and over absorption of overheads and their treatment
- Explain causes of over and under absorption

Introduction

Overheads comprise of indirect materials, indirect labour costs and indirect expenses which are not directly identifiable or allocable to a cost object in an economically feasible way.

Overheads may be classified on the basis of functions to which the overheads are related:

- Production overheads
- Administrative overheads
- Selling overheads
- Distribution overheads

Overheads may also be classified on the basis of behaviour such as variable overheads, semi-variable overheads and fixed overheads.

- Variable overheads comprise of expenses which vary in proportion to the change of level of activity. For example, cost of utilities etc.
- Fixed overheads comprise of expenses whose total value does not change with the change in level of activities over a relevant period such as salaries, rent etc.
- Semi-variable overheads are partly affected by change in the level of activity. They are further split into variable overheads and fixed overheads

Dealing with overheads

In dealing with overheads, there are two schools of thoughts, namely:

(a) *Absorption Costing*: a system in which all production overhead costs, both variable and fixed, are charged to product/services using an allocation base (a measure of activity or volume such as labor hours, machine hours, or the number of units produced etc.). One of the limitations to absorption costing is that the allocation bases used in absorption costing are often arbitrary.

(b) *Marginal Costing*: a costing technique where only variable cost or direct cost will be charged to the cost unit produced. Marginal costing also shows the effect on profit of changes in volume/level of output by differentiating between fixed and variable costs. Both production and nonproduction fixed overheads are treated as periodic costs.

Absorption Costing

Absorption costing is a traditional costing system which does not distinguish between variable and fixed production overheads. It includes production overheads in the valuation of inventories and therefore complies with the requirements for external reporting..

Uses of absorption costing

The information from absorption costing is used in the following circumstances:

- *(a) Inventory valuation*: all costs incurred in the conversion process should be included in the product cost. Absorption costing helps to attribute indirect costs to cost units.
- *(b) Pricing*: where the total product cost is used as the basis for pricing as cost recovery basis, the selling price is established by adding a profit mark up to the total cost. This is called cost-plus pricing.
- *(b) Profitability measurement*: it is possible to assess profitability of a range of products by charging all common costs to products or services

Steps in Accounting for Overheads

(a) Allocation

Allocation of overheads is assigning a whole item of cost directly to a cost centre. An item of expense which can be directly related to a cost centre is to be allocated to the cost centre. For example, depreciation of a particular machine should be allocated to a particular cost centre if the machine is directly attached to that cost centre.

(b) Apportionment

This is a distribution of overheads to more than one cost centre on some equitable basis. When fixed overheads are common to different cost centres, these are to be apportioned to the cost centres on an equitable basis.

Overheads should be apportioned to different cost centres based on the following two principles:

- (i) *Cause and Effect* - Cause is the process or operation or activity and effect is the incurrence of cost. Apportionment of overheads based on this criterion ensures better rationality as it is guided by the relationship between cost object and cost.

- (ii) *Benefits received* – overheads should be apportioned to the various cost centres in proportion to the benefits received by them.

. Once the base for apportionment of fixed overheads is selected, it must be followed consistently and uniformly. However, change in basis for apportionment can be adopted only when it is considered necessary due to change in circumstances like change in technology, degree of mechanisation, product mix, etc. In case of such changes, proper disclosure in cost records is essential.

Examples of basis of primary distribution of some items of production overheads

Item of Cost	*Basis of Apportionment*
Power/ Fuel	Horse Power rating of Machines *
Equipment depreciation and Insurance	Machine value Floor or Space area
Telephone charges	Number of employees
Supervisors' salary & fringe benefits	Floor or Space area
Labour welfare cost	Number of employees
Rent & rates, building insurance	Floor or Space area
Depreciation	

Primary and Secondary Distribution of Overheads:
In case of multi-product environment, there are common **service cost centres** which are providing services to the various **production cost centres** and other service cost centres. The costs of services are required to be apportioned to the relevant cost centres. First step to be followed is to apportion the overheads to different cost centres and then second step is to reapportion the costs of service cost centres to production cost centres on an equitable basis. The first step is termed as primary distribution and the second step is termed as secondary distribution of overheads.

Reapportionment

The services rendered by some service cost centres are also utilised by other service cost centres and should be reapportioned.

Service cost centre	*Basis of reapportionment*
Canteen	Number of employees
Personnel services	Number of employees
Stores	Number of requisitions
Maintenance	Service or machine hours

(i) Reapportionment with no reciprocal services

In non-reciprocal secondary distribution, the costs of service cost centres are apportioned to the production cost centres. Steps involved are:

1. The cost of first service cost centre is apportioned on a suitable basis to production cost centres.
2. The next step is to apportion the cost of second service centre to the production cost centres as indicated in stage (i). The process is to be continued till the costs of all service cost centres are apportioned.

(ii) Reapportionment with reciprocal services

There may be support cost centres which render assistance to each other. In reciprocal secondary distribution, the cost of service cost centres are apportioned to production cost centres as well as other service cost centres. In such case, any one of the following three methods may be followed:

Repeated Distribution or Continuous Allotment Method

Steps to be followed under this method are:

i) The proportion at which the costs of service cost centres are to be distributed to production cost centres and other service cost centres are determined.
ii) Costs of first service cost centres are to be apportioned to production cost centres and service cost centres in the proportion as determined in step (i).
iii) Similarly, the costs of other service cost centres are to be apportioned.
iv) This processes as stated in (ii) and (iii) are to be continued till the figures remaining undistributed in the service cost centres are negligibly small. The negligible small amount left with service centre may be distributed to production cost centres.

Algebraic or Simultaneous Equation Method

The simultaneous equation method is to be adopted to take care of secondary distribution of cost of service cost centres to production cost centres with the help of mathematical formulation and solution. Steps to be followed:

i) Proportion of service benefits received by different cost centres from a cost centre are assessed on the basis of records
ii) The same ratios are used as coefficients in the equations framed for apportionment of cost of service cost centres to production cost centres.
iii) Solution of the equations gives the cost of service cost centres.
iv) Cost of service cost centres to be distributed to production cost centres

Example

Monitor Ltd is preparing its overhead budgets for a forthcoming period. The company has three production departments A, B and C, and two service departments X and Y.
The following figures have been produced:

	A	B	C	X	Y
Overhead cost Mk	40,000	42,000	45,000	40,000	42,000
Machine hours	15,000	12,000	13,000		

Overhead is absorbed on a machine hour basis. It has been estimated that service department usage is as follows:

	A	B	C	X	Y
Department X	20%	30%	10%	-	40%
Department Y	30%	30%	20%	20%	-

Required:

(a) Define
  (i) Overhead allocation
  (ii) Overhead apportionment.

(b) Prepare a schedule of the overhead costs to be charged to departments A, B and C, using the two methods to apportion the service department costs to the production departments
  (work to the nearest MK).

(c) Calculate the overhead absorption rates for the period for departments A, B and C (work to the nearest MK).

(d) State why hourly rates are generally accepted to be the most appropriate method of overhead absorption, and comment upon other methods of absorption that may be used.

Solution

(a) Definitions:
  (i) Overhead allocation is the charging, in total of discrete, identifiable items of cost to cost centres or cost units.
  (ii) Overhead apportionment is the division of costs among two or more cost centres in proportion to the estimated benefit received using an equitable basis of apportionment, e.g. area in square metres, number of employees etc.

(b) Repeated Distribution method

ITEM	Basis of apportionment	TOTAL	A	B	C	X	Y
		Mwk	Mwk	Mwk	Mwk	Mwk	Mwk
Allotted Overhead		209,000	40,000	42,000	45,000	40,000	42,000
Reapportionment	Percentages						
Department X	1st Phase	-	8,000	12,000	4,000	(40,000)	16,000
Department Y	1st phase	-	17,400	17,400	11,600	11,600	(58,000)
Department X	2nd Phase	-	2,320	3,480	1,160	(11,600)	4,640
Department Y	2nd Phase	-	1,392	1,392	928	928	(4,640)
Department X	3rd Phase	-	186	278	93	(928)	371
Department Y	3rd Phase	-	111	111	74	74	(371)
Department X	4th Phase	-	15	22	7	(74)	30
Department Y	4th Phase	-	9	9	6	6	(30)
Department X	5th Phase	-	1	2	1	(6)	2
Department Y	Final	-	1	1	0	-	(2)
TOTAL		**209,000**	**69,435**	**76,696**	**62,869**	**-**	**-**

Algebraic Method

Step 1: Define variables

Let ***x*** be the total cost of Department X plus reapportionment of Department Y

Let ***y*** be the total cost of Department Y plus reapportionment of Department X

Step 2: set the simultaneous equations

x = 40,000 + 0.2y.....(i)

y = 42000 + 0.4x.....(ii)

Step 3: solve for x and y using either elimination or substitution method. The results are:

x = 52,609

y = 63,044

Step 4 overheads distribution summary:

ITEM	**Basis of**	**TOTAL**	**A**	**B**	**C**	**X**	**Y**
Allotted Overhead		209,000	40,000	42,000	45,000	40,000	42,000
Reapportionment of	Percentage						
Department X	1st Phase	-	10,522	15,783	5,261	(52,609)	21,044
Department Y	1st phase	-	18,913	18,913	12,609	12,609	(63,044)
TOTAL		**209,000**	**69,435**	**76,696**	**62,870**	**(0)**	**(0)**

(c) Absorption rates

	A	B	C
Overhead	MK 69,435	MK76,696	MK62,870
Machine Hours	15,000	12,000	13,000
Rate/machine hour	MK4.63	MK6.39	MK4.84

(d) There is a general acceptance that hourly rates are more likely to reflect the load on a cost centre and hence the incidence of overheads. Overheads can also be absorbed on a percentage basis, as a percentage of direct material, of direct labour, or of prime cost. However, as there is little or no relationship between these elements of cost and the ways in which overhead is incurred, they are seldom used.

c) Absorption

Absorption of overheads is charging of overheads from cost centres to products or services by means of absorption rates for each cost centre which is calculated as follows:

$$\text{Total overhead absorption Rate} = \frac{\text{Total overheads of the cost centre}}{\text{Budgeted Activity Level}}$$

The base (denominator) is selected on the basis of type of the cost centre and its contribution to the products or services, for example, machine hours, labour hours, quantity produced etc based on normal capacity.
A *pre-determined rate* is used on a provisional basis for internal management decision making such as cost estimates for quotation, fixation of selling price etc. Budgeted overheads for the respective cost centres for the period concerned are to be taken as numerator and budgeted normal base for the period as denominator for determining the rate.

Overhead absorbed = Overhead absorption rate **x** units of base in product or service

Normal Capacity is the production achieved or achievable on an average over a period or season under normal circumstances taking into account the loss of capacity resulting from planned maintenance.

The amount of total overheads absorbed by a product, service or activity will be the sum total of the overheads absorbed from individual cost centres on pre-determined basis. The difference between overheads absorbed on pre-determined basis and the actual overheads incurred is the ***under- or over-absorption*** *of overheads.*

Treatment for Over- or Under- Absorption

Over-absorption occurs when the actual overheads incurred are less than the overheads absorbed. The effect is that the cost of sales will be overstated whereas the gross profit will be understated because more overheads have been charged to cost of sales than the actual overheads that have been incurred. Since overheads are charged before the actual cost is known, it is as if the customer was overcharged. Because it may not be possible to refund a customer for overcharging, the difference is credited to the income statement or added to gross profit thereby improving operating results.

Under-absorption occurs when the actual overheads incurred are more than the overheads that have been charged to cost of sales using predetermined absorption rates. It results into under-recovery of overheads when charging to cost units. The effect is to understate the cost of sales thereby overstating the gross profit because lower figure of overheads has been included in cost of sales. Since the cost of sales cannot be adjusted, the difference is subtracted from the gross profit or debited to the income statement.

Causes of over or under absorption:

- Budgeted overheads differ from actual overheads
- Actual activity level is different from budgeted
- Both actual overheads and activity level differ from budget.

Example

A company is preparing its production overhead budgets and determining the apportionment of these overheads to products. Cost centre expenses and related information have been budgeted as follows:

	Total	Machine Shop A	Machine Shop B	Assembly	Canteen	Mainten-ance
Indirect labour	78,560	8,586	9,190	15.674	29,650	15,460
Consumable materials	16,900	6,400	8,700	1,200	600	-
Rent and rates	16,700					
Building insurance	2,400					
Power	8,600					
Heat and light	3,400					
Depreciation of machinery	40,200					
Additional information						
Area (m^2)	45,000	10,000	12,000	15,000	6,000	2,000
Value of machinery	402,000	201,000	179,000	22,000	-	-
Power usage- technical estimates		55%	40%	3%	-	2%
Direct labour hours	35,000	8,000	6,200	20,800	-	-
Machine usage (hrs)	25,200	7,200	18,000	-	-	-

Required:

(a) Determine the budgeted overhead absorption rates for each of the production departments, using bases of apportionment and absorption which you consider most appropriate from the information provided.

(b) On assumption that actual activity was:

	Machine shop A	Machine Shop B	Assembly
Direct labour hours	8,200	6,500	21,900
Machine usage hours	7,300	18,700	-

And the total production overhead expenditure was MK 176,533 calculate the over- or under absorption.

SOLUTION

	Basi of Apportionment	Total	Machine Shop A	Machine Shop B	Assembly	Canteen	Maintenance
Indirect labour	Allocated	78,560	8,586	9,190	15,674	29,650	15,460
Consumable materials	Allocated	16,900	6,400	8,700	1,200	600	-
Rent and rates	Floor area	16,700	3,711	4,453	5,567	2,227	742
Building insurance	floor area	2,400	533	640	800	320	107
Power	Power usage	8,600	4,730	3,440	258	-	172
Heat and light	Floor area	3,400	756	907	1,133	453	151
Depreciation of machinery	Machine Value	40,200	20,100	17,900	2,200	-	-
Sub-totals		166,760	44,816	45,230	26,832	33,250	16,632
Reapportionment							
Canteen	Direct labour hours	(0)	7,600	5,890	19,760	(33,250)	-
Maintenance	Machine hours	-	4,752	11,880	-	-	(16,632)
TOTALS		166,760	57,168	63,000	46,592	-	-

Absorption basis	Labour hrs	Machine hrs	Labour hrs
Volume	8000	18000	20800
OAR	7.15	3.50	2.24

	Over-/Under-absorption		
			$
Actual overheads incurred			176,533.00
Overheads absorbed:			
Machine Shop A	8,200 hrs X K7.15	58,630	
Machine Shop B	18,700 mach hrs X K3.50	65,450	
Assembly	21,900 hrs X K2.24	49,056	173,136.00
(Over-)/Under-absorption			3,397

This shows that there was an underabsorption of $3,397

END OF CHAPTER QUESTION

A company reapportions the costs incurred by its two service cost centres, Canteen and Stores, to the four production cost centres.

The following are the overhead costs allocated and apportioned to the six cost centres:

	K
Production Department A	200,000
Production Department B	500,000
Production Department C	300,000
Production Department D	400,000
Canteen	50,000
Stores	100,000

Estimates of the benefits received by each cost centre are as follows:

	A	B	C	D	Canteen	Stores
	%	%	%	%	%	%
Canteen	10	30	20	30	-	10
Stores	20	10	30	20	20	-

Required

(a) Calculate the charge for overheads to **each** of the production cost centres, including the amounts reapportioned from the two service cost centres, using:

(i) the continuous allotment (repeated distribution) method; **8 Marks**

(ii) the algebraic method. **7 Marks**

(b) State whether the reapportionment of costs for service cost centres is worthwhile and suggest an alternative treatment of such costs. **5 Marks**

(TOTAL: 20 MARKS)

CHAPTER 5

MARGINAL COSTING

Learning Objectives

By the end of this chapter students should be able to:

- Appreciate the role of marginal and absorption costing in decision making and external reporting
- Understand the concept of contribution
- Prepare income statement using marginal and absorption costing
- Reconcile the marginal and absorption costing profits

Introduction

As earlier learned, some costs will vary with level of activity. These costs are called either direct costs or variable costs. Because of this, such costs are always included in decision analysis. However costs referred to as fixed because they relatively remain unchanged over a relevant period are not included in many decisions that involve relatively small variations from existing practice and/or are for relatively limited periods of time, fixed costs are not relevant to the decision. This is because either fixed costs tend to be impossible to alter in the short term or managers are reluctant to alter them in the short term.

Marginal costing - Defined

Marginal costing distinguishes between fixed costs and variable costs as conventionally classified. The marginal cost of a product is it's "variable cost". This is normally taken to be; the sum of unit direct labour cost, unit direct material cost, unit direct expense and unit variable overhead cost.

Marginal costing is formally defined as: 'the accounting system in which variable costs are charged to cost units and the fixed costs of the period are written-off in full against the aggregate contribution. Its special value is in decision making'. Unit contribution is the difference between unit sales value and marginal cost

Marginal cost = variable cost (direct labour+ direct materials+ direct expenses+ variable overheads

Contribution Concept

Marginal costing technique has given rise to a very useful concept of contribution where contribution is given by: sales revenue less variable cost (marginal cost)

Contribution may be defined as the profit before the recovery or charge of fixed costs. Thus, contribution goes toward the recovery of fixed cost and profit, and is equal to fixed cost plus profit (C = F + P).
In case a firm neither makes profit nor suffers loss, contribution will be just equal to fixed cost (C = F). This is known as breakeven point.

Contribution. has a fixed relation with sales. The proportion of contribution to sales is known as profit volume ratio (P/V ratio) which remains the same under given conditions of production and sales.

The Principles of Marginal Costing

1. For any given period of time, fixed costs will be the same, for any volume of sales and production within the relevant range of activity. Therefore, by selling an extra item of product or service the following will happen.
- Total revenue will increase by the sales value of the item sold.
- Total costs will increase by the variable cost per unit.
- Total profit will increase by the amount of contribution earned from the extra item.

2. Similarly, if the volume of sales falls by one item, the total profit will fall by the amount of contribution earned from the item.

3. Profit measurement should therefore be based on an analysis of total contribution. Since fixed costs relate to a period of time, and do not change with increases or decreases in sales volume, it is misleading to charge units of sale with a share of fixed costs.

4. When a unit of product is made, the extra costs incurred in its manufacture are the variable production costs. Fixed costs or overheads are unaffected, and no extra fixed costs are incurred when output is increased.

Features of Marginal Costing

The main features of marginal costing are as follows:

1. *Cost Classification*: the marginal costing technique makes a sharp distinction between variable costs and fixed costs. It is the variable cost on the basis of which production and sales policies are designed by a firm following the marginal costing technique.
2. *Inventory/Inventory Valuation*: Under marginal costing, inventory/inventory for profit measurement is valued at marginal cost. It is in sharp contrast to the total unit cost under absorption costing method.

3. *Marginal Contribution*: Marginal costing technique makes use of marginal contribution for marking various decisions. Marginal contribution is the difference between unit sales value and marginal cost. It forms the basis for evaluating the profitability of different products or departments.

Advantages and Disadvantages of Marginal Costing Technique

Advantages

- Marginal costing is simple to understand.
- By not charging fixed overhead to cost of production, the effect of varying charges per unit is avoided.
- It prevents the illogical carry forward in inventory valuation of some proportion of current year's fixed overhead.
- The effects of alternative sales or production policies can be more readily available and assessed, and decisions taken would yield the maximum return to business.
- It eliminates large balances left in overhead control accounts which indicate the difficulty of ascertaining an accurate overhead recovery rate.
- Practical cost control is greatly facilitated. By avoiding arbitrary allocation of fixed overhead, efforts can be concentrated on maintaining a uniform and consistent marginal cost. It is useful at various levels of management.
- It helps in short-term profit planning by breakeven and profitability analysis, both in terms of quantity and graphs. Comparative profitability and performance between two or more products and divisions can easily be assessed and brought to the notice of management for decision making.

Disadvantages

- The separation of costs into fixed and variable is difficult and sometimes gives misleading results
- Normal costing systems also apply overhead under normal operating volume and this shows that no advantage is gained by marginal costing.
- Under marginal costing, inventory and work in progress are understated. The exclusion of fixed costs from inventories affect profit and true and fair view of financial affairs of an organisation may not be clearly shown.
- Volume variance in standard costing also discloses the effect of fluctuating output on fixed overhead. Marginal cost data becomes unrealistic in case of highly fluctuating levels of production, e.g., in case of seasonal factories.
- Application of fixed overhead depends on estimates and not on the actuals and as such there may be under or over absorption of the same.
- Control affected by means of budgetary control is also accepted by many. In order to know the net profit, we should not be satisfied with contribution and hence, fixed overhead is also a valuable item. A system which ignores fixed costs is less effective since a major portion of fixed cost is not taken care of under marginal costing.

- In practice, sales price, fixed cost and variable cost per unit may vary. Thus, the assumptions underlying the theory of marginal costing sometimes becomes unrealistic. For long term profit planning, absorption costing is the only answer.

Presentation of Cost Data under Marginal Costing and Absorption Costing

Marginal costing is not a method of costing but a technique of presentation of sales and cost data with a view to guide management in decision-making. The traditional technique popularly known as total cost or absorption costing technique does not make any difference between variable and fixed cost in the calculation of profits. But marginal cost statement very clearly indicates this difference in arriving at the net operational results of a firm.

The following presentation of two Performa shows the difference between the presentation of information according to absorption and marginal costing techniques:

MARGINAL COSTING PRO-FORMA

	MK	MK
Sales Revenue		xxxxx
Less Marginal Cost of Sales		
Opening Inventory (Valued @ marginal cost)	xxxx	
Add Production Cost (Valued @ marginal cost)	xxxx	
Total Production Cost	xxxx	
Less Closing Inventory (Valued @ marginal cost)	(xxx)	
Marginal Cost of Production	xxxx	
Add Selling, Admin & Distribution Cost	xxxx	
Marginal Cost of Sales		(xxxx)
Contribution		xxxxx
Less Fixed Cost		(xxxx)
Marginal Costing Profit		xxxxx

ABSORPTION COSTING PRO-FORMA

	MK	MK
Sales Revenue		xxxxx
Less Absorption Cost of Sales		
Opening Inventory (Valued @ absorption cost)	xxxx	
Add Production Cost (Valued @ absorption cost)	xxxx	
Total Production Cost	xxxx	
Less Closing Inventory (Valued @ absorption cost)	(xxx)	
Absorption Cost of Sales		(xxxx)
Un-Adjusted Profit		xxxxx
(Under)/Over Absorption		xxxxx
Adjusted Profit		xxxxx
LESS Period costs		

Selling, Admin & Distribution Cost	xxxx
Absorption Costing Profit	xxxx

Reconciliation Statement for Marginal Costing and Absorption Costing Profit

Marginal Costing Profit	xx
Add	
(Closing inventory – opening Inventory) x OAR	xx
= Absorption Costing Profit	xx

Where OAR (overhead absorption rate) = $\frac{\text{Budgeted fixed production overhead}}{\text{Budgeted levels of activities}}$

Marginal Costing versus Absorption Costing

After knowing the two techniques of marginal costing and absorption costing, we have seen that the net profits are not the same because of the following reasons:

1. Over and Under Absorbed Overheads
   In absorption costing, fixed overheads can never be absorbed exactly because of difficulty in forecasting costs and volume of output. If these balances of under or over absorbed/recovery are not written off to costing profit and loss account, the actual amount incurred is not shown in it. In marginal costing, however, the actual fixed overhead incurred is wholly charged against contribution and hence, there will be some difference in net profits.

2. Difference in Inventory Valuation
   In marginal costing, work in progress and finished goods inventories are valued at marginal cost, but in absorption costing, they are valued at total production cost. Hence, profit will differ as different amounts of fixed overheads are considered in two accounts.

Profit Reporting

The profit difference due to difference in inventory valuation is summarized as follows:

- When there is no opening and closing inventories, profit based on marginal costing and absorption costing will be the same
- When opening and closing inventories are same, there will be no difference in profit, provided the fixed cost element in opening and closing inventories of absorption costing are of the same amount.
- When closing inventory is more than opening inventory, the profit under absorption costing will be higher as comparatively a greater portion of fixed cost is included in closing inventory and carried over to next period.

- When closing inventory is less than opening inventory, the profit under absorption costing will be less as comparatively a higher amount of fixed cost contained in opening inventory is debited during the current period.

Features distinguishing the two Methods

The features which distinguish marginal costing from absorption costing are as follows.

(a) In absorption costing, items of inventory are cost to include a 'fair share' of fixed production overhead, whereas in marginal costing, inventories are valued at variable production cost only. The value of closing inventory will be higher in absorption costing than in marginal costing.

(b) As a consequence of carrying forward an element of fixed production overheads in closing inventory values, the cost of sales used to determine profit in absorption costing will:

(i) include some fixed production overhead costs incurred in a previous period but carried forward into opening inventory values of the current period;

(ii) carrying forward some fixed production overhead costs incurred in the current period by including them in closing inventory values.

In contrast marginal costing charges the actual fixed costs of a period in full into the income statement of the period. Because of this, marginal costing is sometimes referred to as period costing.

(c) In absorption costing, 'actual' fully absorbed unit costs are reduced by producing in greater quantities, whereas in marginal costing, unit variable costs are unaffected by the volume of production, provided that variable costs per unit remain unaltered at the changed level of production activity. Profit per unit in any period can be affected by the actual volume of production in absorption costing; this is not the case in marginal costing.

(d) In marginal costing, the identification of variable costs and of contribution enables management to use cost information more easily for decision-making purposes (such as in budget decision making). It is easy to decide by how much contribution, and therefore profit, will be affected by changes in sales volume. Profit would be unaffected by changes in production volume.

In absorption costing, however, the effect on profit in a period of changes in both:

(i) production volume; and

(ii) sales volume;

is not easily seen, because behaviour is not analysed and marginal or extra or additional costs are not used in the calculation of actual profit.

Limitations of Absorption Costing

The following are the criticisms against absorption costing:

1. You might have observed that in absorption costing, a portion of fixed cost is carried over to the subsequent accounting period as part of closing inventory. This is an unsound practice because costs pertaining to a period should not be allowed to be vitiated by the inclusion of costs pertaining to the previous period and vice versa.
2. Further, absorption costing is dependent on the levels of output which may vary from period to period, and consequently cost per unit changes due to the existence of fixed overhead. Unless fixed overhead rate is based on normal capacity, such changed costs are not helpful for the purposes of comparison and control.

The cost to produce an extra unit is variable production cost. It is realistic to the value of closing inventory items as this is a directly attributable cost. The size of total contribution varies directly with sales volume at a constant rate per unit. For the decision-making purpose of management, better information about expected profit is obtained from the use of variable costs and contribution approach in the accounting system.

Marginal cost is the cost management technique for the analysis of cost and revenue information and for the guidance of management in decision making. The presentation of information through marginal costing statement can easily be understood by all mangers, even those who do not have preliminary knowledge and implications of the subjects of cost and
management accounting.

Absorption costing and marginal costing are two different techniques of cost accounting. Absorption costing is widely used for cost control purpose whereas marginal costing is used for managerial decision-making and control.

Example

The results for the first and second quarters for Nango Ltd prepared under absorption costing assumptions are as follows:

Income Statements

	First quarter		Second quarter	
	MK	MK	MK	MK
Sales		480,000		600,000
Cost of sales				
Opening stock	80,000		140,000	
Factory costs	300,000		180,000	
Closing stock	(140,000)		(20,000)	
		(240,000)		(300,000)
Gross profit		240,000		300,000
Selling and administration expenses		200,000		215,000
Under applied overhead		-		(72,000)
Net profit		40,000		13,000

Budgeted production and sales for the year together with actual production and sales for the first two quarters are given below:

	Quarterly figures in Units				
			First	Second	Third	Fourth
Budgeted Production			15,000	15,000	15,000	15,000
Actual production	15,000	9,000				
Budgeted sales			12,000	15,000	15,000	15,000
Actual sales			12,000	15,000		

Factory fixed overheads amount to MK 180,000 each quarter. Factory variable costs are MK8.00 per unit. The company had 4,000 units in inventory at the beginning of the first quarter and uses FIFO method of stock valuation.

There has been an argument between the Accounts department and management. Management is asking why, despite having made more sales in the second quarter than in the first quarter the profit is lower.

Required:

(a) Redo the profit statements for each quarter using marginal costing. **(14 marks)**

(b) Reconcile the profit figures in the question to the figures that you have obtained in (a) above and comment on what management are worried about. **(6 marks)**

(Total: 20 marks)

Solution

Workings						
Inventory movement:						
	First Quarter	Second Quarter				
Opening stock	4,000	7,000				
Production	15,000	9,000				
Total available for sale	19,000	16,000				
Sales	(12,000)	(15,000)				
Closing stock*	7,000	1,000				
*closing stock of Q1 is opening stock of Q2						
Determine unit costs						
		Cost per unit				
		$				
Variable production cost	given	8.00				
Fixed production cost	18,0000/15,000	12.00				
Unit product cost		20.00				
Selling price	48,0000/12,000	40.00				
Marginal costing values inventory at the variable product cost only						

MARGINAL COSTING INCOME STATEMENT						
		First Quarter			Second Quarter	
		$	$		$	$
Sales			480,000			600,000
Less: marginal cost of sales						
Opening stock	4,000 x $8.00	32,000		7,000 x $8.0	56,000	
Add: Production	15,000 x $8.00	120,000		9,000 x $8.0	72,000	
		152,000			128,000	
Less: Closing stock	7,000 x $8.00	56,000		1,000 x $8.0	8,000	
		96,000			120,000	
Add: Variable period costs		-	96,000		-	120,000
CONTRIBUTION			384,000			480,000
LESS: Fixed Costs						
Factory overheads		180,000			180,000	
selling and Administration		200,000	380,000		215,000	395,000
PROFIT/LOSS			4,000			85,000

RECONCILIATION		First Quarter		Second Quarter
		$		$
Marginal Costing profit/ (loss)		4,000.00		85,000.00
Adjust for fixed costs in inventory value				
ADD: closing stock difference	7,000 x $12.00	84,000.00	,000 x $12.00	12,000.00
LESS: opening stock difference	4,000 x $12.00	(48,000.00)	,000 x $12.00	(84,000.00)
ABROPTION COSTYING PROFIT		40,000.00		13,000.00

END CHAPTER QUESTION

The Sales Director of Howa Limited has received the following profit statement for May 2007. The statement has been prepared on a marginal costing basis, which the firm has just adopted for internal reporting purposes.

Howa Limited
Profit Statement for May 2007

	K'000	K'000
Sales		2,400
Less variable costs		1,200
Contribution		1,200
Less: Fixed manufacturing costs	580	
Fixed selling and administration costs	400	
		980
Net profit		220

The accountant attached the following notes to the statement:

(1) The unit sales price for May averaged K24.

(2) Production for May was 45,000 units in excess of sales.

(3) The closing stock at May 31 consisted of 80,000 units.

(4) Production costs in April were substantially the same as those incurred in May.

(5) Howa values its stocks using the FIFO method.

The Sales Director is not comfortable with the marginal costing basis and wonders what profit would be under the absorption costing basis.

Required:

(a) Present the profit statement for May on an absorption costing basis.
10 Marks

(b) Reconcile the difference between the marginal costing and absorption costing profit figures. **4 Marks**

(c) Explain the features which should make marginal costing attractive to the Sales Director. **6 Marks**

(TOTAL : 20 MARKS)

CHAPTER 6

ACTIVITY BASED COSTING

Learning Objectives

By the end of the chapter students should be able to:

- Understand the limitations of traditional absorption costing systems in the modern manufacturing environment
- Describe the differences between Activity Based System (ABC) and traditional absorption costing systems
- Appreciate the concept of cost drivers and cost pools
- Calculate product costs and prepare income statements using ABC
- Compare product costs and profit using ABC and traditional absorption costing including marginal costing

Introduction

So far two schools of thought in dealing with overheads have been introduced; absorption costing and marginal costing. Activity based costing is an alternative costing system which tries to resolve the problems associated with absorption costing.

It is argued that absorption costing is suitable under the following situations:

- Where a single product is made
- Where the level of overheads is insignificant as a proportion of prime cost in the total product cost
- Where the production or operation system is not complex.

However the modern business environment has changed tremendously rendering traditional systems unsatisfactory. Some of the changes are the following:

(a) Automated systems: from the design to the marketing of a product or service technology is adopted at every step rendering such systems complex and consuming more resources.
(b) Wide product range: diversification has led organisations spread their risk by offering more products rather than putting 'all their eggs in one basket'.
(c) Short product life cycles: when products are introduced and withdrawn from the market within a short time, it becomes necessary to continually invest in research and development for new products or services
(d) High competition: in a competitive market pricing becomes more important as a survival strategy. Therefore what goes into the selling price also depends on the accuracy of information from the costing system.

The level of overheads in a modern business environment is significantly high such that it is no longer possible to charge overheads arbitrarily without paying attention to the cause and effect relationship. Both preparers and users of cost accounting information were not happy with absorption costing. Activity-Based Costing (ABC) arose in the 1980s from the increasing lack of relevance of traditional cost accounting methods. The traditional cost accounting methods were designed around 1870 - 1920 and in those days industry was labour intensive, there was no

automation, the product variety was small and the overhead costs in companies were generally very low compared to today. However, from the 1960s - particularly 1980s - this changed rapidly.

Problems with Traditional Costing Systems

1. Manufacturing costs that do not actually arise because of a particular product are still assigned to that product as part of the plant-wide overhead rate, e.g. depreciation on equipment not used to make a particular product

2. Non-manufacturing costs that are caused by a particular product are not assigned as a cost of that product, e.g., sales commissions on the sale of the product.

3. Since all manufacturing costs must be assigned to products via the overhead rate, the costs of idle capacity must be assigned to all products. This is because the overhead rate will be higher if fewer units than plant capacity are expected to be produced and this higher rate will therefore include a component strictly due to idle capacity. Therefore, products will be charged for the costs of idle resources (rather than only the costs of resources actually used in making the product).

4. Overhead costs are usually allocated to products using a single measure of activity such as direct labour hours even though some manufacturing costs may not be affected by the number of direct labour hours.

These problems may cause product costs to be distorted or to be incomplete under the traditional costing approach.

So what is really the difference between ABC and traditional cost accounting methods? Despite the enormous difference in performance, there are three major differences:

1. In traditional cost accounting it is assumed that cost objects consume resources whereas in ABC it is assumed that cost objects consume activities.
2. Traditional cost accounting mostly utilizes volume related allocation bases while ABC uses drivers at various levels.
3. Traditional cost accounting is structure-oriented whereas ABC is process-oriented.

Definition of ABC

Activity based costing (ABC) is an accounting technique that aims to clarify exactly how and where a company makes its profit. ABC assigns costs to all the resources needed to carry out a particular business activity. It also accounts for indirect ("soft") operating costs. The result is a fuller financial picture than is usually produced with other costing accounting methods, for example, standard costing, and a useful distinction between activities that add value and those that do not. Advocates of ABC use it to form strategy about issues as diverse as organisational change, pricing, product mix, and capital investment. They also use it to help pinpoint and control costs, increase efficiency, and grow profits. Used in the right way, ABC can be such a powerful tool for assessing an organisation's whole operation.

ABC Justification

Products or services do not consume resources or incur costs. They rather exert demand on activities which then incur costs or consume resources. Therefore ABC acknowledges that **you cannot manage costs**, you can only managed what is being done and then costs will change as a consequence. In traditional cost accounting, however, the underlying assumption is that costs can be managed, but as most managers have found out the hard way - managing costs is almost impossible.

The benefit of the ABC mindset is that it opens up for a much wider array of measures when it comes to improving productivity. By investigating systematically what is being done, i.e. the activities, one will not only be able to identify surplus capacity if it occurs, but also lack of capacity and misallocation of capacity. A result of this might be that costs are cut the traditional way, but it might as well lead to a reallocation of capacity to where it is most needed which will yield high productivity more effectively than the traditional way.

ABC Methodology

Step 1: Identify and classify the activities related to the company's products

Alternative methods for identifying activities are

- Top-Down – Senior Management identifies what is done
- Participative Approach – the "doers" identify what is done
- Recycling Approach – using what is already documented
- Time/Motion studies – outside consultants observe what is done

Classification of Activities

1. *Unit Level Activities*: these are ***performed each time a unit is produced***. For example: testing a completed unit

2. *Batch Level Activities*: these are ***performed each time a batch is handled*** or processed. For example: setting up equipment for a production run. These activities occur regardless of the number of units in the batch.

3. *Product Level Activities*: these are ***required in order to have a product*** and must be performed regardless of how many units or batches are produced. For example the cost of maintaining an up to date parts list for each product.

4. *Customer Level Activities*: these ***relate to specific customers*** and include activities such as sales calls and catalogue mailings that are tied to a customer rather than to a specific product.

5. *Organization Sustaining Activities*: these activities are carried out regardless of which customers are served, which products are involved, how many batches are run, or how many units are produced. These costs should not be allocated to products or customers for purposes of making decisions. For examples: cost of providing a computer network for the business; cost of preparing financial statements.

Note that as we move away from unit level we begin to take in non-manufacturing costs. This shows that ABC incorporates both manufacturing and non manufacturing costs in the product as opposed to Absorption costing which is concerned with production overheads only.

Another classification of activities involves Value Added versus Non-Value Added Activities (JIT Processing)

Step 2: Determine the estimated cost of each activity identified in step 1.
This step assigns/allocates total costs incurred during a particular observation period to the activities incurred during that observation period.

Step 3: Identify a cost driver for each activity. Activities with a common driver are grouped into a COST POOL which means that organisations are not looked at in terms of departments or cost centres:

Definitions:
COST DRIVER: any factor which causes a change in the cost of an activity or the unit of an activity that causes the change in activity's cost
COST POOL: Activity cost pool is an aggregate of all the costs required to perform a task for instance production.

Step 4: Calculate a Cost-Driver Rate for the Activity

- Total cost of activity (from step 2)
- Divided by the number of Cost Driver occurrences
- Equals the cost per occurrence or Cost-Drive Rate

Step 5: Assign Activity Costs to Cost Targets (jobs, products, customers)

- Actual number of activity occurrencesmultipled by the Cost Driver Rate (from step 3)
- Equals Assigned (Traceable) Costs

Note that in this step the "costing systems" requires input, actual activities and target, and has an output, assigned or traceable cost of cost target.

How ABC solves the problems of Traditional Costing system

1. A cost is assigned to a product only if that cost arose because of the use of that activity by the product. Costs not caused by the product are not assigned to a product.

2. Non-manufacturing costs that are involved in the design, development, selling, distributing, or servicing of a product, are assigned as a cost of the product.

3. In traditional cost systems, the master budget volume is the most common denominator level used for determining the overhead absorption rate. This is usually less than plant capacity. Therefore, the production overhead rate is typically higher and includes a component for idle capacity. These idle capacity costs are charged to the product even though they in no way enhance the value of the product. However, under ABC, *some measure of capacity* is usually used as the denominator measure for calculating activity rates. Therefore, the activity rates are lower and include no component for idle capacity. Any cost for unused capacity will be written off and will not be assigned to the product itself.

4. By assigning cost to products on the basis of activities, using multiple activity cost pools with different activity bases, there can be a more accurate assignment of costs to products that reflect cause and effect rather than under the traditional system where either a single factory-wide absorption rate of multiple departmental overhead rates are used. This is a particular problem for traditional cost systems when batch sizes differ or the degree of complexity varies widely from one product to another.

Difference in the Meaning of Product Cost under Traditional and ABC systems.

Under traditional costing, only manufacturing costs are assigned to products including idle capacity costs and organization sustaining costs that relate to the factory.

Under ABC, both manufacturing. and non-manufacturing costs are included but idle capacity costs and organization-sustaining costs are excluded. Hence, product cost has a different meaning.

Who uses ABC?

A wide range of businesses and professions find ABC useful, although it can be particularly suitable for those relying on people-based resources, which can be much harder to cost using other accounting methodologies.

Problems often encountered when ABC concepts are used in service-type businesses.

While ABC systems are used in service businesses, for instance., railroads, hospitals, banks, data service companies, two problems often make implementation more of a challenge.

A larger proportion of costs tend to be organisation-sustaining costs that cannot be traced to any billable services provided by the firm

It is more difficult to capture ***activity*** data since many activities involve non-repetitive human tasks that cannot be easily recorded.

What are the pitfalls?

In order for ABC to succeed, everyone involved needs to be really committed. A test run on a smaller project is a good idea before attempting anything too ambitious. Also, the organization should have a clear grasp of all its activities and resources, what's involved in each, how much information they're going to need, and how much it's going to cost to collect it all. They also need agreement about how much detail and precision they're aiming for.

Activity-Based Management (ABM)

An ABC system is often used to make improvements in a process.When used in this way to manage activities in order to reduce waste, delays, or defects, it is called ABM.
Steps involved:
(i) Assuming an ABC system is already in place, determine what processes or activities have the greatest potential for improvement. This is done by using the Theory of Constraints,

and Benchmarking (compare the activity rate for the company with an industry standard or a world class company)

(ii) Apply Total Quality Management (TQM) or process re-engineering to improve the process and determine a revised activity rate after implementing the changes.

Example

The following information provides details of the costs, volume and transaction cost drivers for a period in respect of XYZ Ltd:

	Products			
	A	B	C	Total
Sales and production (units)	90,000	30,000	15,000	135,000
Raw materials usage (units)	10	7	14	1,320,000
Direct materials cost (MK)	30.00	40.00	15.00	4,125,000
Direct labour hours	2.5	3	1.5	337,500
Machine hours	5	3	7.5	652,500
Direct labour cost (MK)	20.00	30.00	10.00	2,850,000
Number of production runs	5	10	50	65
Number of deliveries	18	7	50	75
Number of receipts	50	70	700	820
Number of production orders	45	25	60	130

Overhead costs	MK
Set up	75,000
Machines	1,000,000
Receiving	900,000
Packing	650,000
Engineering	750,000
Total	3,375,000

You are required to:

(a) calculate the total costs for each product if all overhead costs are absorbed on a labour hour basis;

(b) calculate the total costs for each product, using activity based costing;

(c) calculate and list the unit product costs from your figures in (a) and (b) above to show the differences between them and to comment briefly on any conclusions which may be drawn which could have pricing and profit implications.

Solution

Traditional direct labour hour basis

The direct labour hour rate is MK10, calculated by dividing the total overheads by the total number of direct labour hours:

$$= \frac{\text{Total overheads}}{\text{Total number of direct labour hours}}$$

$$= \frac{3,375,000}{337,500}$$

= MK10 per direct labour hour

Since we are using the direct labour hour rate method for the absorption of all overheads, the product costs per unit must be:

	A	B	C
Direct Materials	30	40	15
Direct Labour	20	30	10
Overheads	30	15	15
Total Product Cost	25	30	40

The overheads recovered are, of course:
direct labour hour rate x number of direct labour hours per product
For product A, for example, the calculation is:

MK10/ direct labour hour x 2.5 direct labour hours = MK25

ABC method

As we said above, to apply the ABC method, we need to identify cost drivers for two stages:

1. cost drivers tracing the costs of inputs into cost pools; and
2. cost drivers tracing the cost pools into product costs

The workings that follow illustrate clearly how such cost drivers work through the ABC system in these two stages: an initial overhead rate or amount being further subdivided according the needs of the situation.

Workings:

The calculations for each of the rates to be used are:
The machine hour rate is the only rate that is what we might call a traditional rate. All of the other rates we are about to use involve a two stage process. We will see the elements of these two stages as we get to them.

Machine hour overhead rate

$$\frac{\text{MK1,000,000}}{\text{652,500 machine hours}} = \text{MK1.5326}$$

This rate is used as normal.
For the set up costs, we first devise a rate to tell us the cost per set up: total set up overheads divided by the number of set ups: in this case, this is

$$\frac{\text{MK75,000}}{\text{65 production runs}} = \text{MK1,153.85}$$

We will return to this rate shortly.

All of the other rates are calculated similarly. Hence they will be presented now without further comment.

Receiving rate	MK900,000 / 820 receipts	= MK1,097.56
Packing rate	MK650,000 / 75 deliveries	= MK8,666.67
Engineering rate	MK750,000 / 130 production orders	= MK5,769.23

All of this information can now be put together into a cost per unit statement as follows.
The final stage in the whole ABC procedure, as far as product cost determination is concerned is to find out the costs per unit. The cost per unit statement follows, and then we will work through the calculations.

Unit costs	A	B	C
	MK	MK	MK
Direct materials	30.0000	40.0000	15.000
Direct labour	20.000	30.000	10.000
Machine overheads	7.6628	4.5977	11.4943
Set up costs	0.0641	0.3846	3.8462
Receiving costs	0.6098	2.5610	51.2195
Packing costs	1.7333	2.0222	28.8889
Engineering costs	2.8846	4.8077	23.0769
Total Costs	MK62.9546	MK84.3732	MK143.5257

Workings

Machine overheads are found by multiplying the machine hour rate by the number of machine hours per product per unit:
machine hour rate MK1.5326 x

	A	B	C
Machine hours	5	3	7.5
gives	MK7.6628	4.5977	11.4943

The set up costs rate we have already is the rate per machine set up, the cost per unit is calculated by multiplying the rate per set up by the number of set up per product and then dividing the results by the total number of units per product:
Set up cost per set up MK1153.85 x

	A	B	C
No of set ups	5	10	50
gives	MK0.0010	0.0059	0.0592

Set up cost per set up MK1,153.85

	A	B	C
No of set ups	5	10	50
gives	MK5,769.25	11,538.50	57,692.50

these values are then divided by the number of units per product to give us the cost per unit:

A	B	C
MK0.0641	0.3846	3.8462

The receiving, packing and engineering costs are all calculated in the same way as the set up costs. There is no need to repeat these calculations, but check that they are understood. Summarising each of these methods now we can see the impact of the different methods on product costs. Assuming that the ABC method is really more effective than the traditional approach, product A shows a cost difference of MK42.1085 per unit.

Summary 1: Total costs per unit using each of the three methods

	Product		
	A	B	C
DLH	75.0000	100.0000	40.0000
ABC	62.9546	84.3732	143.5257

Summary 2: Overheads per unit using each of the three methods

	Product		
	A	B	C
DLH	25.0000	30.0000	15.0000
ABC	12.9546	14.3732	118.5257

Summary 3: Overheads as a percentage of total costs

	Product		
	A	B	C
DLH	33.33%	30.00%	37.50%
ABC	20.58%	17.04%	82.58%

END OF CHAPTER QUESTION

The following budgeted information relates to Trade Mark plc for the forthcoming period:

	Products		
	X	Y	Z
Sales and production("000 units)	50	40	30
Selling price per unit (K)	45	95	73
Prime cost per unit (K)	32	84	65

	Hours	Hours	Hours
Machine department(machine hours per unit)	2	5	4
Assembly department(direct labour hours per unit)	7	3	2

Overheads allocated and apportioned to production departments (including service cost center costs) were to be recovered in product costs as follows:

Machine department	K1.20 per machine hour
Assembly department	K0.825 per direct labour hour

You ascertain that the above overheads could be re-analysed into cost pools as follows:

Cost pool	K'000	Cost driver	Quantity
Machine services	357	Machine hours	420,000
Assembly services	318	Direct labour hours	530,000
Set-up costs	26	Set-ups	520
Order processing	156	Customer orders	32,000
Purchasing	84	Supplier orders	11,200
	941		

You have also been provided with the following estimates for the period:

	Products		
	X	Y	Z
Number of set-ups	120	200	200
Customer orders	8,000	8,000	16,000
Suppliers' orders	3,000	4,000	4,200

Required:

(a) Describe the differences between activity-based and traditional costing systems.

2 Marks

(b) Prepare and present profit statements using

(i) Conventional absorption costing **4 Marks**

(ii) Activity based costing **14 Marks**

(TOTAL : 20 MARKS)

CHAPTER 7

COSTING METHODS

Learning Objectives

By the end of this chapter students should be able to:

- Explain features various costing methods
- Calculate costs for products and services using appropriate costing methods
- Explain the significance of retention fees in contract costing

Introduction

There is a distinction between costing systems and costing methods. So far we have looked at costing systems and now we turn to costing methods.

Costing systems

A costing system is a system of collecting costs using principles that are generally applicable to all industries regardless of whether the cost unit is a product or service.

Examples include absorption costing, marginal costing and activity based costing.

Costing methods

A costing method is a specific application of the costing principles which is designed to suit the way cost units are produced or services rendered.

Examples of costing methods include job, batch, contract, process and service costing

Costing methods are classified into:

1. specific order costing
2. operational costing

Specific Order Costing

This is a costing system which is applicable where work is undertaken to customer order or specification. Each work is different from the rest. The following are forms of specific order costing:

(a) Job costing
(b) Batch costing
(c) Contract costing

Job Costing

A job is a cost unit which consists of a single order or contract. Job costing is applicable where work is undertaken to customer specification for a short duration such as in property repairs, engineering works and others.

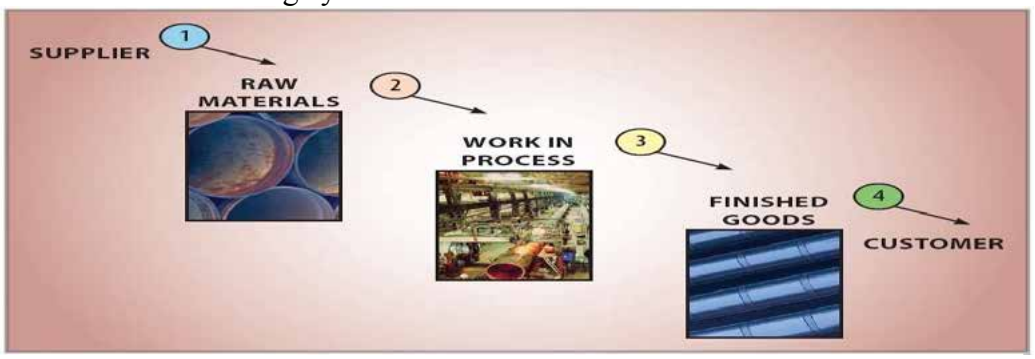
Characteristics of job costing

- Products are one-off items, non-standard and made to order
- Production systems are complex requiring technical or specialist skills with a variety of tasks
- Plant and equipment is general purpose in nature because the products are non standard
- Materials and components are ordered on JIT basis because procurement is demand-driven
- Pricing is based on cost –plus i.e. the selling price is total cost plus a profit mark-up.

Collection of Job Costs

A Job Card is opened when a job is agreed with a customer. This document or job cost sheet is used for recording all the job costs in respect of:

Direct Material Costs:
Materials flow in the following cycle:



The movement of materials from stores to the user department is by means of a *materials requisition note*. Therefore, the materials charged to each job will also be traced through the requisitions.

The requisition note is an essential documentation to safeguard and track inventory. At the time inventory is acquired, *Raw Materials Inventory account* is increased by a debit entry.

The second step will result in a reduction in the *Raw Materials Inventory* and a corresponding increase in the *Work in Progress Inventory*. Upon completion, the cost is transferred from *Work in Progress Inventory* to *Finished Goods Inventory*. When the product is sold, the cost moves out of Finished Goods Inventory to cost of sales.

Direct Labour Costs

To track the direct labour costs to specific jobs, fill out a time report documenting time spent on each job, as well as the time spent on tasks that cannot be traced to a specific job using time sheets or job tickets.

Technology is also used to track and log time to specific jobs via various forms of "login clocks." This is the same information collected via time sheets and clock cards but with added efficiency, accuracy, and control. In addition to monitoring job cost, a manager must also safeguard corporate resources. Here, technology can play a key role. Newer systems require biometric validation like finger print IDs and logging of employees working on a job. These tools are used to make sure thatemployees who claim time working on a job are in fact present and working on the job. Such systems can also be used to limit access to direct material inventory.

Overheads
A predetermined overhead absorption rate is used provided it fairly charges overheads to jobs.

Job Cost Sheet
The preceding information can then be logically transferred to a job cost sheet as already noted above, that is, a compilation of cost data for a specific job. A job costing system can be manual or computerized whereby a database is used.

Example

The following information is available for Job 4321, which is being produced at the request of a customer

	Departments		
	A	B	C
Materials consumed (MK)	4,000	1,000	1,500
Direct labour			
Wage rate per hour (Mk)	3	4	5
Direct labour hours (Mk)	300	200	400

In accordance with company policy the following are chargeable to jobs:

Fixed production overheads	MK5 per direct labour hour
Fixed administration overhead	80% of total production cost
Profit margin	20% margin on selling price

Required:
Calculate the total cost and selling price of Job 4321

Solution

			MK		MK
Inventory cost	Dept A		4,000.00		
	Dept B		1,000.00		
	Dept C		1,500.00		6,500.00
Labour Cost	Dept A	300 x MK3	900.00		
	Dept B	200 x MK4	800.00		
	Dept C	400 x MK5	2,000.00		3,700.00
Prime cost					10,200.00
Fixed production overheads (blanket rate)				900 x MK5	4,500.00

Total production cost		14,700.00
Add: Administration overheads	MK14700 x 80%	11,760.00
Total cost		26,460.00
Add: Profit mark-up	MK 26,460 x 20/80	6,615.00
Selling Price		33,075.00

Job costing in service, not-for-profit, and governmental environments

The job costing model presented in this chapter is generally suggestive of the idea that a "job" can be identified as some tangible product. But, that is not necessarily the case. The cost of services, whether provided in the private sector, not-for-profit, or governmental arenas, must be determined with some reasonable degree of accuracy. The growth, indeed dominance, of these sectors of the economy underscores the need to extend costing methods beyond the traditional manufacturing setting.

Batch Costing

Batch costing 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 only that the cost per unit manufactured in a batch is the total batch costs divided by the number of units in the batch.

Businesses which manufacture a variety of products, for instance, household electrical goods, to be held in stock prior to sale, will operate batch costing. Other industries where batch costing is applicable include printing works, such as newspaper printing and book publishing

Jobbing methods are still used and the costing system is practically the same as for job costing. The only difference is that instead of charging costs to each separate cost unit, they are charged to the one production order which covers a quantity of cost units. When the order is completed the unit cost is found by dividing the quantity into the total batch cost.

Economic Batch Quantity (EBQ)

Where products are made in batches for stock to await sale or use in assemblies, the quantity to be produced in any one batch is a recurring and major problem, which involves consideration of:

(a) Rate of consumption
(b) Storage costs and availability
(c) Time required setting up and taking down production facilities
(d) Capacity available in terms of machines, labour and services in relation to requirements for other products.

$$EBQ = \sqrt{\frac{2\,DB}{H}}$$

- Contracts are undertaken to special requirements or specifications of the customer
- Work is done on a site rather than the contractor's premises or factory
- Work mainly consists of construction activities
- Duration of the assignments is relatively for a long duration relative to job costing

Differences between Job and Contract costing

item	Basis	Job costing	Contract costing
1	Cost unit	A single unit, batch or order	A contract
2	Place	Work is carried out in the premises of the customer	Work is carried on site
3	Duration	Short duration	Contracts may take at least a year or more
4	Pricing	Prices fixed basing on nature of costs and policy of the firm using cost-plus pricing	Pricing is through bidding and external forces have major influences in fixing the offer price
5	Allocation of cost	Cost is first allocated to cost centres before charging to individual jobs	Most expenses are directly charged to contract accounts but general overheads and head office expenses are apportioned to individual contracts
6	value	Value of work done is less	Contract works have higher value

Accounting Procedures

In contract costing each contract is a separately identifiable **cost unit**, so that costs will be accumulated in a separate ledger account for each contract. The various elements of cost are dealt with as follows:

(a) *Direct materials*

Materials charged to the contract may include both material purchased specially and materials issued from the contractor's store. The appropriate costs are debited to the *contract account*. Control of materials at the site can be impaired by the difficulty of organising effective procedures for recording receipts and for returns from site to store of materials surplus to contract requirements.

(b) *Direct wages*

Labour charges to the contract may include design and drawing office work. involving a time-booking procedure for salaried staff, manufacturing operations in the factory, and work on the site. All labour employed at the site of a contract will be direct. Time sheets may be necessary to disclose the time spent by workers at different sites. All such labour costs are debited to the contract account.

(c) *Direct expenses*

Direct contract costs other than materials and labour are often very significant. The two major items falling within this category are *plant* and *sub-contracted work*.

(1) Plant

Plant or equipment may be purchased specifically for a contract, in which case the contract account is debited with the cost. Alternatively, plant may be transferred from another contract, in which case it is the written down value that is debited to this contract and credited to the contract from which it has been moved. At the end of each financial period the book value of any plant owned is shown as a credit entry in the contract account , as a balance carried down on the account to the next period.) The net effect of the book keeping entries is that depreciation on the plant is automatically debited to the contract. Plant may be hired for use on a particular contract. As the business does not own such plant, the only ledger entries are the hire charges which are debited to the contract account. It is also possible to charge the contract account with a notional hire charge for plant owned by the business, thus treating the plant hire department as a separate entity.

(2) Sub-contracted work

In the case of a large contract or one involving specialist activities, the business may engage sub-contractors in certain aspects of the work. The cost of any sub-contracted work is a direct expense of a contract and is debited to the contract account.

(d) *Indirect costs*

Many contractors do not attempt to apportion such costs to specific contracts as they are often negligible compared with direct costs. However, if such apportionment of indirect costs is carried out, the resultant amount is debited to the contract account.

Architects' certificate and retention monies

For each contract a price is agreed between the business and the client. This is known as the contract price. In the case of large contracts, where the work involved may spread over many months or even years, the contractor will expect interim payments from the client in respect of

the contract price. Such payments will be related to the work done so far on the contract. The procedure involved is as follows:

(a) *Architects' certificates*
As the work on a contract proceeds, the client's architects will issue certificates indicating that so much of the contract price is now due to the contractor in respect of the work completed. In most cases at this stage the contractor will invoice the contractee with a progress payment.

(b) *Retention monies*
The contractor normally receives only a proportion of the value shown on the architect's certificates while the contract is still in progress. The amounts held back by the client are known as retention monies. Such retention monies would only be paid over to the contractor some time after the completion of the contract when any faulty work has been rectified.

Attributable profit on uncompleted contracts
Where a contract extends over a long period IAS 11 (Construction contracts) allows the contractor to take credit for part of the profit attributable to the contract in each year's accounts using percentage of completion method to avoid the inconsistency of having a number of years with no profit from a particular contract and then suddenly making a profit in the year when it is completed. Before any interim profit is taken the successful outcome of the contract should be assessed with reasonable certainty;
Profit should only be taken in proportion to the work completed to date on the contract; and any anticipated overall loss on the contract should be provided for as soon as it is recognised.

Calculation of interim profit
The calculation of the profit to be taken on an uncompleted contract involves five steps:
Step 1 Determine the total sales value of the contract' for a fixed price contract this will be the contract price. Call this (a)

Step 2 Compute the total expected costs to complete the contract. Call this (b); it consists of two elements:

(i) the actual costs incurred to date on the contract; plus
(ii) the estimated future costs necessary to complete the contract.

Step 3 The expected overall profit on the contract is given by (a) minus (b).

Step 4 The attributable profit to date on the contract should reflect the amount of work that has been completed so far. It is calculated as follows:

$$\text{Attributable Profit to date} = \frac{\text{Value of work certified to date}}{\text{Contract Price}} \times \text{Expected overall profit}$$

It is important to realise that the attributable profit thus calculated is the *cumulative figure* to date and check that it does not exceed profit to date adjusted for any allowance for rectification.

Step 5 The profit to be taken this year, debited to the contract account in current year is the cumulative attributable profit calculated at step 4 less the profit on the contract already recognised on previous years.

Unfortunately, some examination questions do not provide sufficient information to use this approach. If you are not told the estimated future costs, it is necessary to use the following procedure:

	MK	*MK*
Profit to date:		
Value of work certified		X
Less: Cost to date	X	
Less: Cost of work not yet certified	X	
		X
Profit to date		X

Sometimes this figure is reduced by an arbitrary amount for instance, one- third, to allow for the fact that the contract is incomplete and therefore the outcome is not certain.

Notes:

1. It is always necessary to calculate profit to ensure that losses are identified and provided for.

2. Attention must be paid to the cost of work not yet certified. This arises where some work has been done but not checked/certified by the architects. Hence the costs will be included in the ledger but the selling price of this work is excluded from the value of work certified. The idea is, therefore, to calculate only profit on work that has been certified.

Example

RD Ltd is a construction company with accounting year ending 31 August. The following information relates to a contract to build a cafeteria for Mangani College of Accountancy.

Start date: 1st March 20X8. Estimated completion date: 30th June 20X9

	MK
Contract price	4,800,000
Book value of plant sent to site on 1st March 20X8	500,000
Book value of plant at 31st August 20X8	425,000
Direct materials:	
Sent to site	620,000
On site at 31st August 20X8	146,000
Direct wages and salaries:	
Paid up to 31st August 20X8	444,000
Accrued at 31st August 20X8	5,000
Subcontractors fees	260,000
Plant hire costs	125,000

Head office costs	210,000
Cost of work not certified	480,000
Value of work certified to 31 August 20X8	2,160,000
Estimated costs to complete the contract	1,780,000

Required:
Prepare the contract account for the cafeteria for the year ending 31 august 20X8

(12 marks)

Determine the amount of profit if any to be recognised on the contract for the year ended 31 August 20X8, providing the supporting calculations and explanation. **(8 marks)**

Total: 20 marks

Solution

(a) CONTRACT ACCOUNT FOR RD CONSTRUCTION LTD

	(MK)	(MK)		(MK)
Direct wages and salaries	444,000			
Add: Accrued c/f	5,000	449,000	Materials on site	146,000
Direct materials sent to site		620,000	Plant on site c/d	425,000
Sub Contractor's fees		260,000	Cost of work not certified	480,000
Plant hire costs		125,000		
Head Office costs		210,000		
Book value of plant		...500,000	Cost of work certified	1,113,000
		2,164,000		**2,164,000**

(b) Attributable profit:
Since costs to completion are given estimate the total profit first as follows:

	MK'000	MK'000
Contract price		4,800
Less: total contract costs:		
Cost of work certified	1,113	
Cost of work not certified	480	
Costs to completion	1,780	3,373
Estimated total profit		1,427

Attributable profit: = value of work certified x estimated total profit
Contract price

= 2,160,000 X 1,427,000
4,800,000

= MK642,150

Note: the contract is only 45% (2160/4800) complete

CHAPTER 8

PROCESS COSTING

Learning objectives

By the end of this chapter students should be able to:

- Understand basic concepts and principles of process costing
- Calculate and account for normal losses, abnormal losses and abnormal gains
- Understand notional concept of equivalent units for valuation of working in progress
- Prepare process accounts
- Allocate process costs to joint products using various methods
- Describe accounting treatment of by products

Introduction

Process costing method is applicable where products result from continuous flow of operations or repetitive processing and products are identical and cannot be segregated.

Process Costing enables the ascertainment of cost of the product at each process or stage of manufacture. Some of the industries which apply process costing include Oil refining,Sugar production, Manufacturers of textiles, paint, soap, cement, timber, etc.

Characteristics of Process costing

1. The output consists of products which are homogenous.
2. Production is carried on in different stages, each of which is called a process, having a continuous flow.
3. Production takes place continuously except in cases where the plant and machinery are shut down for maintenance etc. Output is uniform and all units are identical during each process. It would not be possible to trace the identity of any particular lot of output to any lot of input. Therefore work in progress in a common feature.
4. The input will pass through two or more processes before it takes the shape of the output. The output of each process becomes the input for the next process until the final product is obtained, with the last process giving the final product.
5. The output of a process is transferred to the next process generally at cost to the process. It may also be transferred at market price to enable checking efficiency of operations in comparison to the market conditions.
6. Normal losses, abnormal losses and abnormal gains may arise in the processes
7. The output of any processing stage may also be saleable in which case the process may generate some profit.
8. The input of any process may be acquired from the outside sources or from a preceding processing stage

Components of Costs in Process costing

For the purpose of cost accounting, the process industry is divided into separate departments with each department representing a specific process. The direct material and direct labour costs are collected for each department separately and the overheads which are collected over all the departments/processes are apportioned over the various departments/processes on some rational basis.

The following are the main elements/components of costs involved in the manufacturing process where process costing method is adopted.

(a) Direct Materials

There are two types of materials in process costing.

- *Primary Material (or Input)*
  Materials which are introduced in the initial processing stage and passed on to the next processing stage which becomes a part of output after completion of processing. In subsequent processes, the material is regarded to be 100% complete because it is introduced at the start of the process
- *Secondary Material (or added material)*
  These materials which are introduced in the first or subsequent processing stages in addition to the main material introduced in the initial processing stage. This gets mixed up with the main material and is passed on to the subsequent processes as a part of the output.

(b) Direct Labour

The direct labour cost is generally incurred at every processing stage. Identification of direct labour cost is also relatively easy in process costing industry

(c) Direct Expenses

Expenses in addition to direct material and labour expenses which can be directly attributable to a particular process. These are costs relevant to specific processing stages.

(d) Production Overheads

The overhead expenses are generally spread over all the processes involved in production. These are to be apportioned over the various processes.

Methodology of Recording Costs

Financial Accounting Methodology is adopted for recording costs involved.

Process Accounts- A nominal account for each process is used to record all the costs relevant to a process.

Each process account is

(a) Debited with
(i) The Primary Direct Material Cost
(ii) Secondary Direct Material Cost
(iii)Direct Labour Cost
(iv)Direct Expenses and
(v) Production Overheads allocated and/or apportioned to the process.

(b) Credited with
- The value of output transferred to the subsequent process or finished stocks.

Process Losses

Losses occur in process costing because the output is not always equal to the input. The main causes of such losses could be evaporation, contamination or spillage.

1. *Normal loss*
   This is the loss of input whose occurrence is inevitable and occurs on account of normal reasons. It is expected or standard loss in any process. It is usually expressed as a percentage of input. It can therefore not be easily controlled and its magnitude depends on the production process in consideration.

2. *Abnormal loss*
   This is a loss of input whose occurrence can be avoided because it occurs on account of abnormal reasons. The abnormal losses may be caused by low quality materials, unskilled labour or inefficient machinery. It can be interpreted as the magnitude of actual loss that is incurred in excess of normal loss. In other words it is the difference between actual loss and expected or standard loss.

   Abnormal loss is given by the following relationship:

Abnormal loss units	= Actual loss – Normal loss, or = Expected output – Actual output
where expected output	= Input – normal loss

3. Abnormal gain
   This is the extent to which actual loss is less than the expected or normal loss and can be given by the following relationship:

Abnormal Gain units	= Normal loss – Actual loss, or = Actual output –Expected output
where expected output	= Input – normal loss

Forms of loss

Losses can also be classified based on their physical appearance or form:

(a) *Loss without physical presence*: loss resulting in the reduction of output due to evaporation

(b) *Loss with physical presence*: loss available in a physical form either in the same form as the input or transformed on processing. This loss can have a resale, scrap value or a disposal cost.

Valuation of losses

(i) Normal loss is valued at its market price or the *net realisable value.* Since this loss is expected the scrap value is included in budgeting information. Its effect is to reduce the cost of input rather than treating it as a separate source of revenue. The scrap value therefore reduces the impact of the loss suffered by crediting the process account.

If the loss is a toxic waste which has a disposal cost, the disposal cost is debited to the process account.

(ii) Abnormal loss is valued at cost or its full value which is the cost of normal output. The cost represents the additional cost incurred for scrapping more units than expected. This loss should not be absorbed by the good stock or output but rather should be treated separately. Before taking the cost to the income statement, the cost is reduced by any scrap value of the physical loss. The scrap value could relate to sale of damaged stock, insurance realisation, sale by repairing the damaged stock or sale by converting the loss to some saleable form.
The cost of abnormal loss is credited to the Process Account and debited into a separate abnormal loss account

(iii)Abnormal gain represents a reduction in normal loss whereby the actual output is higher than expected. The value of abnormal gain represents a cost saving which has an effect of improving the profit. Abnormal gain is therefore valued at the normal cost of expected output
Abnormal gain is debited to the process account and credited into a separate abnormal gain account

Valuation of Output
Where there is no work in progress the calculation of cost per unit is required for the valuation of finished units or transfers. The following formula is used:

$$\text{Cost per unit} = \frac{\text{total process costs – scrap value of normal loss}}{\text{Expected Output}}$$

Where expected output = Input – normal loss

Example
A product passes through three distinct processes and the following information is available

	Process I	Process II	Process III
Materials (1000 units @ MK6)	6,000		
Direct wages (MK)	4,000	6,000	4,000
Production overheads	4,450	6,160	2,048
Normal loss (as % of input)	5%	10%	15%
Scrap value per unit (MK)	4	8	10
Output	950	840	750

Required

Prepare all ledger accounts to record costs for output

Solution

Process I

	Units	MK		Units		MK
Materials input	1,000	6,000	Process II	950	(x15)	14,250
Direct wages		4,000	Normal loss	50	(x4)	200
Production overheads		4,450				----------
		1000	14,450			1000
	14,450					

Cost per unit = (14,450 – 200)/ (1000-50)
= 14,250/ 950
= MK15.00

Calculation of abnormal losses and gains

To establish whether there are abnormal losses or gains in the process compare expected output and actual output

(i) If actual output is less than expected output or expected loss is greater than actual loss, the difference between actual output and expected output or actual loss and expected loss is the abnormal loss. The production has been inefficient

(ii) If actual output is greater than expected output or expected loss is less than actual loss, the difference between actual output and expected output or actual loss and expected loss is the abnormal gain. Production has been efficient

Process II

	Units	MK		Units		MK
Process I	950	14,250	Process II	840	(x30)	25,200
Direct wages		6,000	Normal loss	95	(x8)	760
Production overheads		6,160	Abnormal loss	15(x30)		450
		950	26,410			950
	26,410					

Expected output is (100%-10%) of input 950 units = 855 units
Actual output = 840 units

Actual output is lower than expected output, therefore, there is an abnormal loss equal to the difference of 855 and 840 units – 15 units

Cost per unit = (26,410 – 760)/ (950-95)
= 25,650/ 855
= MK30.00

Process III

	Units	MK		Units		MK
Process I	840	25,200	Finished goods	750	(x42)	31,500
Direct wages		4,000	Normal loss	126	(x10)	1,260
Production overheads		2,048				

Abnormal gain	36	(x42)	1,512		
	876		32,760	876	32,760

Expected output is (100%-15%) of input 840 units = 714 units
Actual output = 750 units
Actual output is greater than expected output, therefore, there is an abnormal gain equal to the difference of 750 and 714 units – 36 units

Cost per unit = (31,248 – 1,260)/ (840-126)
= 29,988/ 714
= MK42.00

Abnormal loss account

	Units	MK		Units		MK
Process II	15	450	Scrap	15	(x8)	120
			Costing P&L			390

Abnormal Gain Account

	Units	MK		Units	MK
Scrap	36	(x10) 360	Process III	36	1,512
Costing P&L		1,152			

Normal Loss Account

	Units	MK		Units	MK
Process I	50	200	Cash	50	200
Process II	95	760	Cash	110	880
Abnormal loss	15	120			
Process III	126	1,260	Cash	90	900
			Abnormal gain	36	360
	286	2,340		286	2,340

Departmental transfers

Process costing is ordinarily used when products require a number of different production operations which are performed in two or more departments or cost centres. For example, the first operation may be performed in Department A, such as a machining or mixing process. After completion the units are transferred to Department B for an assembly or refining process. When this is completed, the units are transferred to finished goods inventory.

Flow of units
The flow of units (in terms of quantity) through a process cost system can be summarized by the following equation:

Units in process at beginning + Units started in process or transferred in (Units to account for) = Units transferred out + Units completed and on hand + Units still in process (Units accounted for)

When any four terms in the equation are known, the missing component can be computed from the equation. Note that all the components are not necessarily present in each situation (i.e., there may not always be units in process at the beginning of the period or units completed and still on hand at the end of the period).

Work in Progress and Equivalent Units of Production

Rarely are all units placed in production during the month completed and sent to the next department or processing stage by the end of the month. In most cases there will be beginning and ending inventories of work in process at different stages of completion each month.

To allocate costs when inventories of partially finished goods exist, all units,(beginning work-in-process inventory and ending work-in-process inventory, must be expressed in terms of completed units. This is done by means of a common denominator, known as *equivalent units of production* or *equivalent production.* By using the equivalent production figure, the unit cost for the month would include the cost of completing any work in process at the beginning of the month and the cost to date of work in process at the end of the month.

Separate equivalent production computations are usually needed for each cost element such as. direct materials, added materials and direct labour and factory overhead, collectively known as conversion costs.

Equivalent units of production are notional output assuming partly completed units are completed based on their degree of completion. The volume is multiplied by the degrees of completion to arrive at equivalent units. This figure for partially completed units is then added to units actually completed in order to arrive at the equivalent total production figure for the period. This figure is used to divide into period costs to arrive at the cost per equivalent unit for each cost element

Opening Work in Process

There are two principal methods used in valuation of work-in-process inventories: *weighted average costing* and *first-in, first-out* (FIFO) *costing.* There are minor differences in cost report format or procedure; the major difference relates to the way in which the work-in-process inventories are treated.

(i) Weighted Average Cost.

Under this method, also known as average costing, the opening work-in-process inventory costs are *merged* with the costs of the new period and a new average cost is obtained. Thus, there is only one average cost for goods completed.

Equivalent units under average costing may be computed as follows:

Units Completed (Transferred out plus Closing output) + [Closing Work in Process x Degree of Completion (%)]

This method is based on the assumption that *all* units in beginning work-in-process inventory were completed during the current period.

Information Required

FIFO METHOD	*WEIGHTED AVERAGE METHOD*
Degrees of completion for each cost element of opening work in progress	Total cost of opening work in progress should be shown separately for each cost element so that it can be added to period costs.
Total cost of opening work in progress	

Process costing is a topic which is viewed by many candidates with trepidation and, quite often, they despair as they plough their way through numerous calculations in the hope that their final process accounts will balance. Terms such as "abnormal losses", "work in progress" and "equivalent units" frequently bemuse candidates, resulting in panic and a reluctance to even attempt any question set on this topic.

The following example illustrates how to approach a Process Costing question, paying particular attention to presentation and calculation. Candidates should always strive to present their solutions as neatly and methodically as possible, not only to help the marker follow the calculations, but also to allow themselves to check that they have not missed out a vital step.

Example 1
Jammy Ltd is a manufacturing organisation with two processes. Information for the period ended 31 July 20X1 is as follows:

	Process 1	Process 2
Opening WIP	Nil	200kg
Costs for the period:		
Material 1000 kg costing	MK25,650	Nil
Labour	MK12,750	MK6,950
Overheads	MK5,950	MK3,475
Transferred to Process 2	700kg	—
Transferred to Finished Goods	—	800kg
Closing WIP	200kg	150kg

Normal losses are expected to be 5% of input for each process. Losses in Process 1 have no scrap value, whilst losses in Process 2 can be sold for MK10 per kg. Losses are deemed to arise at the end of the process.

Opening WIP is 60% complete with regard to Labour and Overheads. Closing WIP in Process 1 is 100% complete with regard to Material and 50% complete for Labour and Overheads. Closing WIP in Process 2 is 50% complete with regard to Labour and Overheads.

Required:

Prepare the Process Accounts for each process.

Solution

Step 1

The best way to approach this question is to concentrate on Process 1 first, as Process 2 cannot be completed until we know the value of the items transferred into this process from Process 1. The first step is to draw up a process account in typical 'T' account fashion. Each side of the account should have a column for 'Units' and a column for 'MK'. You should then enter all the information given in the question. This will make it clear as to which items have to be calculated — these items are numbered in this example for illustrative purposes.

Process 1 Account

	Units	MK		Units	MK
Current costs:					
			Transferred to Process 2	700	(1)
Material	1,000	25,650	Normal Loss	50	NIL
Labour	—	12,750	Closing WIP	200	(2)
Overheads	—	5,950	Abnormal Loss	50	(3)
	1,000	44,350		1,000	**(4)**

The Normal Loss figure is 5% of the 1000kg input. No cost is assigned to Normal Loss as the cost is absorbed into the "good" units. Abnormal Loss is the difference between the total units on the debit side and the total units on the credit side.

Step 2

The next step is to draw up an Equivalent Units Statement to determine the cost per unit of the equivalent "whole" units produced.

Equivalent Units Statement

	Units	Material	Labour	Overhead
Units transferred to Process 2	700	700	700	700
Normal loss	50	-	-	-
Closing WIP	200	200	100	100
Abnormal Loss	50	50	50	50
Equivalent units (a)	950	950	850	850

Period Costs (b)	MK25,650	MK12,750	MK5,950
Cost per unit (b)/(a)	MK27	MK15	MK7

Closing WIP is 50% complete for Labour and Overheads, which is equivalent to 200 x 50% = 100 "complete" units. Abnormal loss is assumed to arise at the end of the process hence 100% complete for each cost element. To arrive at equivalent units abnormal loss is *added* and abnormal gain is *subtracted.*

Step 3

The information calculated in the Equivalent Units Statement is then used to construct a Cost Allocation Statement or Statement of Evaluation. The layout of this statement is exactly the same as the Equivalent Units Statement.

	Material	Labour	Overhead	Total	
Units transferred to Process 2	18,900	10,500	4,900	34,300	(1)
Closing WIP	5,400	1,500	700	7,600	(2)
Abnormal Loss	1,350	750	750	2,450	(3)
	25,650	12,750	5,950	44,350	

Each entry in the above statement is calculated using the cost per unit calculated in the Equivalent Units Statement and the relevant equivalent units. For example, the Material Cost of Units transferred to Process 2 (MK18,900) is calculated by multiplying the Material Unit Cost (MK27) by the equivalent units transferred to Process 2 in respect of Material (700). This gives us MK18,900. The Labour Cost of Abnormal Loss is calculated by multiplying the Labour Unit Cost (MK15) by the equivalent units of Abnormal Loss in respect of Labour (50). This gives us MK750, and so on.

You will notice that the total of each column (Material, Labour and Overhead) is the same as the figures appearing in the Process Account for each of these costs.

Step 4

The final step is to complete the Process Account by using the figures calculated in the 'Total' column of the Cost Allocation Statement. Those figures labelled (1) – (3) are the figures to be slotted into the spaces similarly numbered in the Process Account in Step 1. Your final Process Account should now look thus:

Process 1 Account

	Units	MK		Units	MK
Current costs:					
			Transferred to Process 2	700	34,300
Material	1,000	25,650	Normal Loss	50	NIL
Labour	—	12,750	Closing WIP	200	7,600
Overheads	—	5,950	Abnormal Loss	50	2,450
	1,000	44,350		1,000	44,350

Step 5

We are now in the position to go through the whole "process" again for Process 2. The main differences between the two processes are the existence of Opening WIP and scrap value of losses in Process 2. Explanations for the figures in Process 2 are only given where the concepts have not been explained already in Process 1.

Construct Process Account:

Process 2 Account

	Units	MK		Units	MK
Opening WIP	300	13,000	Transferred to		
Transferred from			Finished Goods	800	(4)
Process 1	700	34,300	Normal Loss	50	500
Labour	—	6,950			
Overheads	—	3,475	Closing WIP	150	(5)
	1,000	57,725		1,000	(6)

Losses can be sold at MK10 per kg, therefore Normal Loss is assigned a monetary value of 50 x MK10 = MK500.

Step 6

Construct Equivalent Units Statement

Equivalent Units Statement

	Transferred Costs from Process 1	Labour	Overhead
Opening WIP	NIL	120	120
Units started and Completed	500	500	500
Closing WIP	150	75	75
Total Equiv Units	650	695	695
Period Costs	MK33,800	MK6,950	MK3,475
Cost per unit	MK52	MK10	MK5

Opening WIP is already 60% complete with regard to Labour and Overheads, therefore only 40% remains to be completed in this period. Equivalent units completed in this period are therefore 300 x 40% = 120kg.

Opening WIP in respect of "Transferred Costs from Process 1" are always NIL as they were transferred in a previous period and therefore do not form part of the cost of the units transferred from Process 1 in this period.

Units started and completed during the period is the difference between the units transferred to finished goods (shown in the Process Account as 800) and the units already started at the beginning of the period (Opening WIP of 300).

The period cost given for "Transferred Costs from Process 1" has been calculated by deducting the scrap value of Normal Loss (MK500) from the total transferred cost (MK34,300).

Step 7 Construct Statement of Evaluation:

Statement of Evaluation

	Transferred Costs from Process 1	Labour	Overhead	Total	
Opening WIP	NIL	1,200	600	1,800	(*)
Units started and Completed	26,000	5,000	2,500	33,500	(*)
Closing WIP	7,800	750	375	8,925	(5)
	33,800	6,950	3,475	44,225	

(*) The calculation of the cost of units transferred to Finished Goods is slightly different when there is Opening WIP. The cost of units transferred includes 3 elements: the cost of Opening WIP brought forward from the previous period (MK13,000), the cost to complete the Opening WIP in this period (MK1,800) and the cost of the units started and completed in this period (MK33,500). This gives us a total of MK48300 to be slotted into the Process Account.

Step 8 Complete the Process Account:

Process 2 Account

	Units	MK		Units	MK
Opening WIP	300	13,000	Transferred to		
Transferred from			Finished Goods	800	48,300
Process 1	700	34,300	Normal Loss	50	500
Labour	—	6,950			
Overheads	—	3,475	Closing WIP	150	8,925
	1,000	57,725		1,000	57,725

Summary

Process Costing is best tackled with a methodical approach. Given the number of calculations involved, it will help if workings are presented neatly. Try to get into the habit of following a particular approach and layout, rather than trying to confuse yourself with different methods of presentation and calculation. The approach given above is by no means the only way of tackling process costing, but is very useful in the respect that it tackles all the calculations in a logical order. Work through the example again without looking at the solution — it is the best way of testing whether you understand the concepts.

Weighted Average Method

The example above did not state whether FIFO or Weighted Average method was used especially in Process 2. In fact the information provided necessitated the application of FIFO method and students are required to state the method used during examinations.

The following example will apply the second method and it is important to note the information required and the steps to be followed. However, you can use the question to assess yourselves if you have understood the FIFO method before proceeding with the application of the Weighted Average method.

Example 2

The following information relates to Chidyaonga Ltd. Data relating to process Y for accounting period 2 is as follows:
At the beginning of period 2 there were 800 units partly completed which had the following values:

	Value (MK)	**Complete (%)**
Input material from Process X	8,200	100
Material introduced	5,600	55
Labour	3,200	65
Overheads	2,400	45

During the period 4300 units were transferred from Process X at a value of MK46,500 and other costs were as follows:

	MK
Materials introduced	24,000
Labour	19,500
Overheads	18,200

At the end of the period, the closing work in progress was 600 units which were at the following stages of completion:

	Complete (%)
Input material	100
Materials introduced	50
Labour	50
Overhead	40

Output from Process Y is transferred to finished goods

Required
Calculate the value of the units transferred to finished goods and the value of closing work in progress and prepare the Process Y account using:

(i) the FIFO method
(ii) the weighted average costs method

Solution

	Process Y Account				
	Units	$		Units	$
Opening WIP	800	19,400	Finished goods	4,500	116,853
Process X materials	4,300	46,500	Closing WIP	600	10,747
Added materials		24,000			
Labour		19,500			
Overheads		18,200			
	5,100	127,600		5,100	127,600

Output	=	o/s+ input -c/s
	=	800+4300-600
	=	4500

	Statement of Equivalent Units of Production				
	units	Process X Materials	Added Materials	Labour	Overheads
Finished goods	4500	4500	4500	4500	4500
closing wip	600	600	300	300	240
	5100	5100	4800	4800	4740

	Statement of Cost per Equivalent unit				
	o/wip	period cost	Total cost	Equivalent units	Cost/ Eq unit
Process X Materials	8,200	46,500	54,700	5,100	10.725
Added Materials	5,600	24,000	29,600	4,800	6.167
Labour	3,200	19,500	22,700	4,800	4.729
Overheads	2,400	18,200	20,600	4,740	4.346
					25.967

	Statement of Evaluation				
	Process X Materials	Added Materials	Labour	Overheads	Total
Finished goods					116,853
Closing WIP	6,435	1,850	1,419	1,043	10,747

Joint and by- products

In some production processes, particularly in agriculture and natural resources, two or more products undergo the same process up to a **split-off point**, after which one or more of the products may undergo additional processing. An oil company drills for oil and obtains both crude oil and natural gas. A second-growth forest is harvested and timber of various grades is milled. A farmer maintains a herd of dairy cows, and after the cows are milked, the milk is sold to a dairy company that processes it into various products such as cream, yoghurt and others.

Some of these products then constitute raw materials in the manufacture of other products such as butter and cheese.

Following are some important terms:

Common costs: These costs cannot be identified with a particular joint product. By definition, joint products incur common costs until they reach the split-off point.

Split-off point: At this stage, the joint products acquire separate identities. Costs incurred prior to this point are common costs, and any costs incurred after this point are separable costs.

Separable costs: These costs can be identified with a particular joint product. These costs are incurred for a specific product, after the split-off point.

The characteristic feature of joint products is that all costs incurred prior to the split-off point are common costs, and cannot be identified with individual products that are derived at split-off. Furthermore, the costs incurred by the dairy farmer to feed and care for the cows do not significantly affect the relative amounts of cream and skim obtained, and the costs incurred by the lumber company to maintain and harvest the second-growth timber do not significantly affect the relative quantities of lumber of various grades that are obtained.

Joint Products: two or more products originating from the same input or common process having sufficiently high saleable value By Product: a product which is produced incidentally alongside a main product having some saleable value

Reasons for Allocating Common Costs

Given the lack of a cause-and-effect relationship between the incurrence of common costs and the relative quantities of joint products obtained, any allocation of these common costs to the joint products is arbitrary. Consequently, there is no management accounting purpose served by the allocation of these common costs. Literally, there is no managerial decision that becomes better informed by such an allocation. Consider the possibilities:

1. Can the allocation of common costs prompt the manager to favour some joint products over other joint products and to therefore change the production process, and hence the quantities of joint products obtained?

   No. By definition, the relative quantities obtained from the joint process are inherent in the production process itself, and cannot be managed. In fact, the manager probably does have strong preferences for some joint products over others (high-grade lumber over low-grade lumber; cream over skim milk), but the manager's preferences are irrelevant.

2. Can the allocation of common costs prompt the manager to change the sales prices for the joint products, or to change decisions about whether to incur separable costs to process one or more of the joint products further?

   No. The decision to sell a joint product at split-off or to process it further depends only on the *incremental* costs and revenues of the additional processing, not on the common

costs. In fact, the common costs can be considered sunk at the time the additional processing decision is made. As for pricing, most joint products are commodities, and producers are generally price-takers. To the extent that the producer faces a downward sloping demand curve, determining the optimal combination of price and production level depends on the variable cost of production, but this calculation would have to be done simultaneously for all joint products, in which case no allocation of common costs would be necessary.

3. Can the allocation of common costs inform the manager that the entire production process is unprofitable and should be terminated? For example, does this allocation tell the dairy farmer whether the farmer should sell the herd and get out of the dairy business?

   No. Such an allocation is unnecessary for the decision of whether to terminate the joint production process. For this decision, the producer can look at the operation in its entirety (total revenues from all joint products less total common costs and total separable costs).

Yet despite the fact that allocating common costs to joint products serves no decision-making purpose, it is required for external financial reporting. It is necessary for product costing if we wish to honour the matching principle for common costs, because these common costs are manufacturing costs. For example, if the dairy sells low fat milk shortly after split-off, but processes high milk fat product into cheese that requires an aging process, the allocation of common costs is necessary for the valuation of ending inventory (work-in-process for cheese) and the determination of cost-of-goods sold (low fat milk).

Bases for Sharing Common Costs to Joint Products

Joint products, as noted above, share common costs using different methods as outline below.

1. **Physical measurement or units' basis:** Using this method, some common physical measure is identified to describe the quantity of each product obtained at split-off. For example, the weight of the joint products, or the volume. Common costs are then allocated in proportion to this physical measure. This method presumes that the quantities of all joint products can be expressed using a common measure, which is not always the case. For example, crude oil is a liquid, while natural gas is, naturally, a gas, and volumes of liquids and gasses are not normally measured in the same units.

2. **Sales value at split-off:** If a market price can be established for the products that are obtained at split-off, common costs can be allocated in proportion to the sales value of the products at split-off. The sales value of each joint product is derived by multiplying the price per unit by the number of units obtained. For example, if the dairy farmer obtains 20 gallons of cream, and if cream can be sold for MK3 per gallon, then the sales value for cream is MK60. If the farmer also obtains 40 gallons of skim milk that sells for MK2 per gallon, then the sales value of skim milk is MK80. The total value of both products is MK140, and 43% (MK60 ÷ MK140) of common costs would be allocated to all 20 gallons of cream. This method can be used whether or not one or more of the joint products are actually processed further, as long as a market price exists for the product obtained at split-off. In other words, even if the farmer does not sell any cream, but processes all of the cream into butter, the fact

that there is a market price for cream is sufficient for the farmer to be able to apply this method of common cost allocation.

1. **Final Sales Value less further processing costs:** The net realisable value of a joint product at split-off is the sales price of the final product after additional processing, minus the separable costs incurred during the additional processing. If the joint product is going to be sold at split-off without further processing, the net realizable value is simply the sales value at split-off, as in the previous method. Under the net realisable value method of common cost allocation, common costs are allocated in proportion to their net realisable values. As with the previous method, the allocation is based on the total value of all quantities of each joint product obtained (the net realisable value per unit, multiplied by the number of units of each joint product).
2. **Constant gross profit percentage method allocates joint costs so that overall gross profit percentage is identical for each individual product. This is so because all products arise from single productive process and should therefore earn identical gross profit percentage**

Accounting Treatment for By Product

By product is not allocated any cost because it is incidental to production of a main product(s). If a by product has any commercial value, then proceeds from the sale of it will be treated as follows:

a. by product net revenues, the sales proceeds less packing or any further processing costs, should be deducted from the joint costs
b. net revenues from by-product could be shown on a separate line
c. by product net revenues, the sales proceeds less packing or any further processing costs, should be deducted from cost of sales

Example

Marsh Ltd produces three products X, Y and Z in a single process. There is a normal loss in the process of 10% of input, and the products emerge in the ratio of X 5: Y 3: Z 2. For a typical month, the following budgeted figures are available:

Material input	100,000 kilos	MK3 per kilo
Labour	5,000 hours	MK8 per hour
Variable overhead	5,000 hours	MK4 per hour

Fixed overhead is absorbed at 50% of labour cost.

There is no abnormal loss. The normal loss is sold for scrap at MK2 per kilo, this being credited to the process account. There was no opening or closing work-in-progress.

The products sell for	X	MK6 per kilo
	Y	MK5 per kilo
	Z	MK7.5 per kilo

You are required to:

(a) Calculate separately the cost of each of X, Y and Z, using the following methods to apportion the joint processing costs, working to the nearest MK:
   (i) Relative weight of output
   (ii) Sales value of output **(10 marks)**

(b) Each of X, Y and Z can be converted by a further process into XX, YY and ZZ respectively. The selling prices would be XX MK7 per kilo, YY MK7 per kilo and ZZ MK8.2 per kilo. The further processing would cost MK0.5 per kilo input. There would be a normal loss in the further processing of 10% of material input, which would have no sales value. State with supporting figures which (if any) of the products X, Y and Z should be converted into XX, YY and ZZ.

(10 marks)
(Total 20 marks)

Solution

(a) Costs		MK
Material	100,000 × MK3	300,000
Labour	5,000 × MK8	40,000
V Overhead	5,000 × MK4	20,000
F Overhead		20,000
		380,000
Scrap	10,000 × MK2	20,000
		360,000

Weight

X	45,000 kilos	MK180,000
Y	27,000 kilos	MK108,000
Z	18,000 kilos	MK72,000

Sales Value

X	45,000 × 6	MK270,000
Y	27,000 × 5	MK135,000
Z	18,000 × 7.5	MK135,000
		540,000

Cost apportionment

X	MK180,000
Y	90,000
Z	90,000
	360,000

(b) Output

X	45,000 * 90% = 40,500
Y	27,000 * 90% = 24,300
Z	18,000 * 90% = 16,200

		XX		YY		ZZ
Sales	MK7	283,500	MK7	170,100	MK8.2	132,840
Loss of sales		270,000		135,000		135,000
Increase/(decrease)		13,500		35,100		(2,160)
Further costs	MK0.5	2,500		13,500		9,000
Profit/(Loss)		(9,000)		21,600		(11,160)

On the basis of the above, Y should be converted.

END OF CHAPTER QUESTION

Ngondo & Co. manufactures three products, M, N and O after subjecting raw material to a continuous process. The three products could be sold in their raw state after this initial process, alternatively they could be further refined and sold for a higher price after the further refining process.

Cost details:

Input to initial process

Raw material X	10,000 kilos at MK2 per kilo
Conversion costs	MK 22,000
Expected loss	1,000 kilos

Expected output	Product M	4,000 kilos
	Product N	3,000 kilos
	Product O	2,000 kilos

If sold at this stage the selling price per kilo would be as follows:

Product M	MK6 per kilo
Product N	MK7 per kilo
Product O	MK9 per kilo

If M, N and O are further refined they could be sold for the following prices:

Product M	MK9 per kilo
Product N	MK12 per kilo
Product O	MK12 per kilo

There are, however, further processing costs to be incurred which would be as follows:

Fixed cost of the further refining operation MK9,000

Variable costs	Product M	MK2 per kilo
	Product N	MK3 per kilo
	Product O	MK3.20 per kilo

Required:

(a) Prepare a statement which gives product unit costs at point of separation explaining any assumptions made; **(7 marks)**

(b) Prepare a statement detailing information about the advisability of processing the three products further. **(6 marks)**

(c) Advise management about the further refining process that it appears they should adopt. **(7 marks)**

(TOTAL: 20 Marks)

CHAPTER 9

STANDARD COSTING

Learning objectives

By the end of this chapter students should be able to:

- Understand the concepts of standard and standard costing
- Understand different types of standards
- Understand how standards are set and recorded
- Calculate and explain various ratios in standard costing

Introduction

Management accounting is managing a business through accounting information. In this process, management accounting is facilitating managerial control. These measures should be applied correctly so that performance takes place according to plans. Planning is the first tool for making the control effective. The vital aspect of managerial control is cost control. Hence, it is very important to plan and control costs. Standard costing is a technique which helps to control costs and business operations. It aims at eliminating wastes and increasing efficiency in performance through setting up standards or formulating cost plans.

Meaning of Standard

The word standard means a benchmark or yardstick. The standard cost is a predetermined cost which determines in advance what each product or service should cost under given circumstances.

In the words of Backer and Jacobsen, "Standard cost is the amount the firm thinks a product or the operation of the process for a period of time should cost, based upon certain assumed conditions of efficiency, economic conditions and other factors."

Definition: Standard Cost

> 'The planned unit cost of the product, component or service produced in a period. The standard cost may be determined on a number of bases. The main use of standard costs is in performance measurement, control, stock valuation and in the establishment of selling prices.' *CIMA Official Terminology, 2005*

A standard cost is "a predetermined cost which is calculated from management's standards of efficient operations and the relevant necessary expenditure." They are the predetermined costs on technical estimate of material, labour and overhead for a selected period of time and for a

prescribed set of working conditions. In other words, a standard cost is a planned cost for a unit of product or service rendered.

The technique of using standard costs for the purposes of cost control is known as standard costing. It is a system of cost accounting which is designed to find out how much should be the cost of a product under the existing conditions. The actual cost can be ascertained only when production is undertaken. The predetermined cost is compared to the actual cost and a variance between the two enables the management to take necessary corrective measures.

A standard costing system consists of the following four elements:

1. Setting standards for each operation.
2. Comparing actual with standard performance.
3. Analysing and reporting variances arising from the difference between actual and standard performance.
4. Investigating significant variances and taking appropriate corrective action.

Standard costing application

This is generally best suited to organisations with repetitive activities. It is probably most relevant to manufacturing organisations with repetitive production processes. Standard costing cannot be applied easily to non-repetitive activities because there is no clear basis for observing and recording operations. It is difficult to determine a clear standard.
Two commonly used approaches are used to set standard costs.

1. Past historical records can be used to estimate labour and material usage.
2. Engineering studies can be used. This may involve a detailed study or observation of operations in terms of material, labour and equipment usage.

The most effective control is achieved by identifying standards for quantities of material, labour and services to be used in an operation, rather than an overall total product cost. Variances from standard on all component parts of cost should be reported to identify the cause – and ultimate responsibility – for the variance from standard.

Uses of Standard Costs

- *Value inventory*. It is time-consuming to accumulate actual inventory costs at the end of each accounting period, so companies instead create standard costs for valuation purposes. This is especially effective for companies having large inventories.
- *Budgeting*. A budget is essentially a baseline against which actual results are compared, and standard costs are also a baseline for comparison against actual costs - thus, standard costs and budgets are a perfect match, and standard costs should always be included in budgets.
- *Product pricing*. When customers ask for a price estimate on a unique product configuration, it is much easier to create a price based on a database of standard costs than to research actual costs.
- *Forecasting*. Standards are used in a manufacturing resources planning system (MRP II), which creates forecasts for production and purchasing based on standard amounts of labour and materials.

- *Management by exception*. Variance analysis identifies which actual costs were different from their planned costs, which allows you to manage by exception; if an actual cost matches the expected (standard) cost, then there is no need to investigate it. Only costs causing large variances are worthy of investigation, so management can focus its attention on a small number of items each month.

Setting Standards

Normally, setting up standards is based on the past experience. The total standard cost includes direct materials, direct labour and overheads. Normally, all these are fixed to some extent. The standards should be set up in a systematic way so that they are used as a tool for cost control.

A standard cost consists of two elements:

- Volume or quantity
- Price or rate

A summary of standard costs for a unit of product or service is shown in a standard cost card:

	MK
Direct material: 5kg @ MK4/kg	20.00
Direct labour: 2hours @ MK10/hr	20.00
Variable overheads: 2hours @ MK4/hr	8.00
Fixed overheads: 2hours @MK6/hr	12.00
Standard Product Cost	60.00
Standard Profit	40.00
Standard selling price	100.00

Note that responsibility for standard setting rests with managers who are able to estimate the usage of various cost elements and their costs

Types of Standards

1. *Ideal Standard*

   This is the standard which represents a high level of efficiency. Ideal standard is fixed on the assumption that favourable conditions will prevail and management will be at its best. The price paid for materials will be lowest and wastes etc. will be minimum possible. The labour time for making the production will be minimum and rates of wages will also be low. The overheads expenses are also set with maximum efficiency in mind. All the conditions, both internal and external, should be favourable and only then ideal standard will be achieved.

   Ideal standard is fixed on the assumption of those conditions which may rarely exist. This standard is not practicable and may not be achieved. Though this standard may not be achieved, even then an effort is made. The deviation between targets and actual performance is ignorable. In practice, ideal standard has an adverse effect on the employees. They do not try to reach the standard because the standards are not considered realistic.

2. *Attainable Standards*

   It is defined as 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. If well-set, they provide a useful

psychological incentive by giving employees a realistic, but challenging target of efficiency. The consent and co-operation of employees involved in improving the standard are required.

3. *Current Standards*
   A current standard is a standard which is established for use over a short period of time and is related to current condition. It reflects the performance that should be attained during the current period. The period for current standard is normally one year. It is presumed that conditions of production will remain unchanged. In case there is any change in price or manufacturing condition, the standards are also revised.

4. *Basic Standards*
   A basic standard may be defined as a standard which is established for use for an indefinite period. It is established for a long period and is not adjusted to the preset conditions. The same standard remains in force for a long period. These standards are revised only on the changes in specification of material and technology productions. It is indeed just like a number against which subsequent process changes can be measured. Basic standard enables the measurement of changes in costs. The changes in manufacturing costs can be measured by taking basic standard, as a base standard but cannot serve as a tool for cost control purpose because the standard is not revised for a long time. The deviation between standard cost and actual cost cannot be used as a yardstick for measuring efficiency.

Elements which Influence the Setting of Standards

1. *Setting Standards for Direct Materials*
   There are several basic principles which ought to be appreciated in setting standards for direct materials. Consider two things:
   - Quantity (and Quality) of material
   - Price of the material

   To purchase material, the quality and size should be determined. The standard quality to be maintained should be decided. The quantity is determined by the production department. This department makes use of historical records, and an allowance for changing conditions will also be given for setting standards. A number of test runs may be undertaken on different days and under different situations, and an average of these results should be used for setting material quantity standards.

   The second step in determining direct material cost will be a decision about the standard price. Material's cost will be decided in consultation with the purchase department. The cost of purchasing and store keeping of materials should also be taken into consideration. The procedure for purchase of materials, minimum and maximum levels for various materials, discount policy and means of transport are the other factors which have bearing on the materials cost price. It includes the following:
   - Cost of materials
   - Ordering cost
   - Carrying cost

   The purpose should be to increase efficiency in procuring and store keeping of materials. The type of standard used also affects the choice of standard price.

2. *Setting Direct Labour Cost*

The second largest amount of cost is of labour. The benefit derived from the workers can be assigned to a particular product or a process. If the wages paid to workers cannot be directly assigned to a particular product, these will be known as indirect wages. The time required for producing a product would be ascertained and labour should be properly graded. Different grades of workers will be paid different rates of wages. The times spent by different grades of workers for manufacturing a product should also be studied for deciding upon direct labour cost. The setting of standard for direct labour will be done basically on the following:

- Standard labour time for producing
- Labour rate per hour

Standard labour time indicates the time taken by different categories of labour force which are as under:

- Skilled labour
- Semi-skilled labour
- Unskilled labour

For setting a standard time for labour force, we normally take into account previous experience, past performance records, test run result, work-study etc. The labour rate standard refers to the expected wage rates to be paid for different categories of workers. Past wage rates and demand and supply principle may not be a safe guide for determining standard labour rates. The anticipation of expected changes in labour rates will be an essential factor. In case there is an agreement with workers for payment of wages in the coming period, these rates should be used. If a premium or bonus scheme is in operation, then anticipated extra payments should also be included. Where a piece rate system is used, standard cost will be fixed per piece. The object of fixed standard labour time and labour rate is to device maximum efficiency in the use of labour.

3. *Setting Standards for Overheads*

The next important element comes under overheads. The very purpose of setting standard for overheads is to minimize the total cost. Standard overhead rates are computed by dividing overhead expenses by direct labour hours or units produced. The standard overhead cost is obtained by multiplying standard overhead rate by the labour hours spent or number of units produced.

The determination of overhead rate involves three things:

a) Determination of overheads
b) Determination of labour hours or units manufactured
c) Calculating overheads rate by dividing a by b

The overheads are classified into fixed overheads, variable overheads and semi-variable overheads. The fixed overheads remain the same irrespective of level of production, while variable overheads change in the proportion of production. The expenses increase or decrease with the increase or decrease in output. Semi-variable overheads are neither fixed nor variable. These overheads increase with the increase in production but the rate of increase will be less than the rate of increase in production. The division of overheads into fixed, variable and semi-variable categories will help in determining overheads.

The standard absorption rate per hour is the same as the pre-determined absorption rate as calculated for absorption costing system and will depend on the planned production volume for a period.

a) Production Capacity or volume capacity measured perhaps in standard hours of output which in turn reflects production direct labour hours.
b) Efficiency in working, by labour or machines, allowing for rest time and contingency allowances.

Capacity levels are needed to establish a standard absorption rate for production overhead, when standard absorption costing is used.

The following are capacity levels which might be used in budgeting:

(a) *Full Capacity*
This is the theoretical capacity, assuming continuous production without any stoppage due to factors such as machine breakdown, supply shortages or labour shortages. Full capacity can be associated with *ideal standards*.

(b) *Practical Capacity*
This is full capacity less an allowance for known unavoidable volume losses. Some stoppages are unavoidable, such as maintenance time for machines, and resetting time between jobs, some machine breakdown etc.
Practical capacity is below full capacity and would be associated with *attainable standards.*

(c) Budgeted Capacity
This is standard hours planned for the period taking into account, budgeted sales, supplies, workforce availability and efficiency expected.
It is the capacity needed to produce the budgeted output and would be associated with current standards which relate to current conditions but may not be representative of normal practical capacity over a longer period of time.

(d) *Idle Capacity*
This is the practical capacity less the budgeted capacity measured in standard hours of output. It represents unused capacity that ought to be available, but which is not needed because the budgeted volume is lower than the practicable volume that could be achieved.

Capacity ratio can be calculated which provide similar information to variances:

(i) Idle capacity ratio
(ii) Production volume ratio
(iii) Efficiency ratio

Example*:*
Given the following information, calculate, idle capacity ratio, production volume ratio and efficiency ratios and explain their meanings:

Full Capacity	10,000	standard hours
Practical Capacity	8,000	standard hours
Budgeted capacity	7,500	standard hours
Standard hours worked	6,500	
Actual hours worked	7,000	

Solution:

(i) *Idle Capacity Ratio* = $\frac{\text{Practical Capacity - Budgeted Capacity}}{\text{Practical Capacity}} \times 100\%$

$$\frac{8,000 - 7,500}{8,000} \times 100\% = 6.25\%$$

This means that 6.25% of practical capacity will be unused because budgeted volume is lower than the achievable volume.

(ii) Production Volume Ratio = $\frac{\text{Standard hours Produced}}{\text{Budgeted capacity}} \times 100\%$

$$\frac{6,500}{7,500} \times 100\% = 86\ ^{2}/_{3}\%$$

This means actual output was only $86^{2}/_{3}\%$ of budgeted output.

(iii) Efficiency Ratio: $\frac{\text{Standard hours Produced}}{\text{Actual hours worked}} \times 100\%$

$$\frac{6,500}{7,000} \times 100\% = 92.86\%$$

This means that the labour force was working at 92.86% efficiency.

Organization for Standard Costing

The success of standard costing system will depend upon the setting up of proper standards. For the purpose of setting standards, a person or a committee should be given this job. In a big concern, a standard costing committee is formed for this purpose. The committee includes production manager, purchase manager, sales manager, personnel manager, chief engineer and cost accountant. The cost accountant acts as a co-coordinator of this committee.

Accounting System

Classification of accounts is necessary to meet the required purpose, i.e. function, asset or revenue item. Codes can be used to have a speedy collection of accounts. A standard is a pre-determined measure of material, labour and overheads. It may be expressed in quality and its monetary measurements in standard costs.

Revision of Standards

For effective use of this technique, sometimes we need to revise the standards which follow for better control. Even standards are also subjected to change like the production method, environment, raw material, and technology.

Standards may need to be changed to accommodate changes in the organization or its environment. When there is a sudden change in economic circumstances, technology or production methods, the standard cost will no longer be accurate. Standards that are out of date will not act as effective feed forward or feedback control tools. They will not help us to predict the inputs required nor help us to evaluate the efficiency of a particular department. If standards are continually not being achieved and large deviations or variances from the standard are reported, they should be carefully reviewed. Also, changes in the physical productive capacity of the organization or in material prices and wage rates may indicate that standards need to be revised. In practice, changing standards frequently is an expensive operation and can cause confusion. For this reason, standard cost revisions are usually made only when changes permanent in nature occur but not in response to temporary blips. In times of rapid price

inflation, many managers have felt that the high level of inflation forced them to change price and wage rate standards continually. This, however, leads to reduction in value of the standard as a yardstick. At the other extreme is the adoption of basic standard which will remain unchanged for many years. They provide a constant base for comparison, but this is hardly satisfactory when there is technological change in working procedures and conditions.

Advantages

Standard costing is a management control technique for every activity. It is not only useful for cost control purposes but is also helpful in production planning and policy formulation. It allows management by exception. In the light of various objectives of this system, some of the advantages of this tool are given below:

1. ***Efficiency measurement***-- The comparison of actual costs with standard costs enables the management to evaluate performance of various cost centres. In the absence of standard costing system, actual costs of different period may be compared to measure efficiency. It is not proper to compare costs of different period because circumstance of both the periods may be different. Still, a decision about base period can be made with which actual performance can be compared.
2. ***Finding of variance***-- The performance variances are determined by comparing actual costs with standard costs. Management is able to spot out the place of inefficiencies. It can assign responsibility for deviation in performance. It is possible to take corrective measures at the earliest. A regular check on various expenditures is also ensured by standard cost system.
3. ***Management by exception***-- The targets of different individuals are fixed if the performance is according to predetermined standards. In this case, there is nothing to worry. The attention of the management is drawn only when actual performance is less than the budgeted performance. Management by exception means that everybody is given a target to be achieved and management need not supervise each and everything. The responsibilities are fixed and everybody tries to achieve his/her targets.
4. ***Cost control***-- Every costing system aims at cost control and cost reduction. The standards are being constantly analyzed and an effort is made to improve efficiency. Whenever a variance occurs, the reasons are studied and immediate corrective measures are undertaken. The action taken in spotting weak points enables cost control system.
5. ***Right decisions***-- It enables and provides useful information to the management in taking important decisions. For example, the problem created by inflating, rising prices. It can also be used to provide incentive plans for employees etc.
6. ***Eliminating inefficiencies***-- The setting of standards for different elements of cost requires a detailed study of different aspects. The standards are set differently for manufacturing, administrative and selling expenses. Improved methods are used for setting these standards. The determination of manufacturing expenses will require time and motion study for labour and effective material control devices for materials. Similar studies will be needed for finding other expenses. All these studies will make it possible to eliminate inefficiencies at different steps.

Limitations of Standard Costing

1. It cannot be used in those organizations where non-standard products are produced. If the production is undertaken according to the customer specifications, then each job will involve different amount of expenditures.
2. The process of setting standard is a difficult task, as it requires technical skills. The time and motion study is required to be undertaken for this purpose. These studies require a lot of time and money.
3. There are no inset circumstances to be considered for fixing standards. The conditions under which standards are fixed do not remain static. With the change in circumstances, if the standards are not revised the same become impracticable.
4. The assigning of responsibility is not an easy task. The variances are to be classified into controllable and uncontrollable variances. Standard costing is applicable only for controllable variances.

For instance, if the industry changed the technology then the system will not be suitable. In that case, we will have to change or revise the standards. A frequent revision of standards will become costly.

Basically, standard costing is a management tool for control. In the process, we have taken standards as parameters for measuring the performance. Cost analysis and cost control is essential for any activity. Cost includes material labour and overheads. Sometimes, we need to revise the standards due to change in uses, raw material, technology, method of production etc. For a proper organization, it is required to implement this under a committee for the activity. It is a continued activity for the optimum utilization of resources.

CHAPTER 10

BUDGETING

Learning objectives

By the end of this chapter students should be able:

- Explain how budgeting fits into the overall planning and control framework
- Identify and describe the purposes of budgeting
- Identify and describe the various stages in the budgeting process
- Prepare functional and master budgets
- Describe the limitations of incremental budgeting
- Describe activity-based , zero-based and rolling budgets
- Describe the criticisms relating to traditional budgeting

Introduction

A budget is a quantified plan of action for a forthcoming accounting period. A budget is a document that translates plans into money, money that will need to be spent to get your planned activities done (expenditure) and money that will need to be generated to cover the costs of getting the work done (income). It is an estimate, or informed guess, about what you will need in monetary terms to do your work.

A budget is not:

- "Written in stone" – where necessary, a budget can be changed, so long as you take steps to deal with the implications of the changes. For example, if you have budgeted for ten new computers but discover that you really need a generator, you could buy fewer computers and purchase the generator.
- Simply a record of last year's expenditure, with an extra 15% added on to cover inflation. Every year is different. Organisations need to use the budgeting process to explore what is really needed to implement their plans.
- Just an administrative and financial requirement of donors. The budget should not be prepared as part of a funding proposal and then taken out and dusted when it is time to do a financial report for the donor. It is a living tool that must be consulted in day to day work, checked monthly, monitored constantly and used creatively.
- An optimistic and unrealistic picture of what things actually cost – don't underestimate what things really cost in the hopes that this will help you raise the money you need. It is better to return unspent money to donors than to beg for a "bit more" so you can complete the work. **Budgeting Toolkit** *by Janet Shapiro*

Short-termism or free wheeling

It has been argued that a budget is a waste of management's time and resources because it reinforces bad practice and stifles initiative. Therefore it should not be encouraged as a management tool. Instead managers should focus on their short term targets and mobilise resources required to achieve them. However the budget has stood the test of time as a powerful weapon in the hands of a manager.

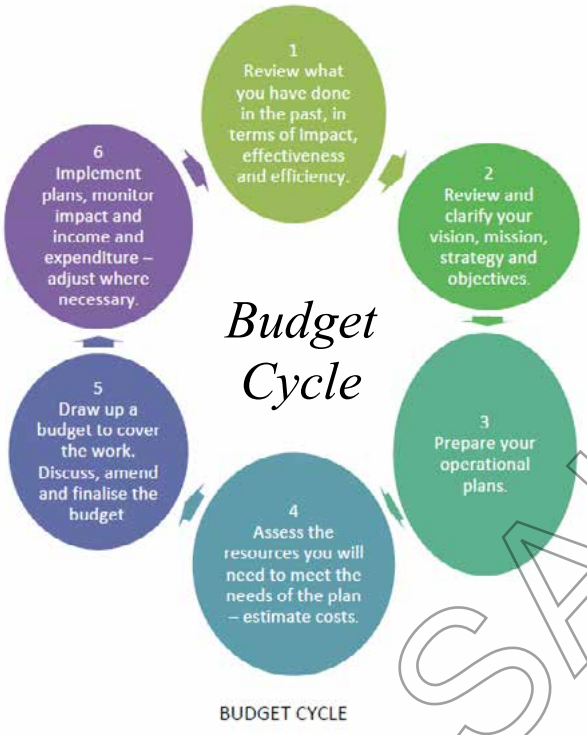
Functions of a budget

1. Planning: a budget compels planning whereby managers take time to reflect on anticipated changes affecting their future operations. This necessitates consideration for responses to changed conditions or anticipated problems rather than making hasty decisions that are made on the spur of the moment based on expediency rather than reasoned judgement

Planning can be both long term and short term and the following are the stages to be considered:

- Establish objectives: every organization has a mission or its reason for existence i.e *raison d'être* from which it derives its objectives. The reason for existence identifies the nature of business and the customers the organization seeks to serve and satisfy. Objectives are broad aims which show where the organization is going.
- Identify potential strategies: a strategy is a course of action which includes the specification of resources required to enable the company achieve its stated objectives. This may require an understanding of the company's present position, its strengths and weaknesses, opportunities and risks or threats
- Evaluate strategic options: alternative strategies are evaluated using three criteria: suitability, feasibility and acceptability. Only those strategies with the greatest potential for achieving objectives should be chosen.
- Select the course of action: a long term plan also called a strategic plan is formulated covering several years.
- Implementation of the long term plan: a budget is an implementation tool for a long term plan because t takes one year at a time. By shortening the planning horizon, budgets tend to be more precise and detailed.
- Monitor and review actual results: departures from plan are investigated for possible corrective action

Planning is a continuous process such that a budgetary planning and control cycle is formed as follows:



BUDGET CYCLE

2. Coordination: activities of different parts of the company can be brought together and reconciled into a common plan. In order for managers to achieve goal congruence, they need to assess the impact of their actions on other parts of the company. Therefore a budget compels managers to examine the relationship between their operations and those of other departments. Any conflicts are resolved before hand because the budget creates a holistic picture.
3. Communication: an organization is a collection of departments and sections which collectively forms a structural pyramid. In order to pull in the same direction all parts of the organization should be fully aware of the plans and policies. Every employee should clearly understand the role they are to play. Therefore, a budget is a tool which facilitates communication so that each employee is made accountable for implementing the budget.
   Communication is done in both ways- management communicates to lower levels its expectations, policies and targets whereas lower levels of management give feedback to top management on actual performance.

4. Motivation: a budget can be used as a tool for rewarding managers whose performance is higher than expected especially where the targets are realistic and challenging. As such it can be used to influence managerial behavior. At the same time, a budget can be used as a fault-finding tool where the targets are just imposed on the managers and penalties are likely to follow wherever targets are not achieved.

5. Control: a key aspect of managerial responsibility is to ensure that actual results are in line with expectation. When the actual results differ from budget an investigation should be carried out in order to establish the cause of the departure from plan before taking corrective action.
6. Performance evaluation: promotion or bonuses may partly be attached to an employee's budget record. Therefore a budget is used as a method of assessing performance

of individual managers. Since each manager is given his /her own area of responsibility, a budget should form part of a framework for responsibility accounting.

When the goals have been set for the organisation the management uses the budgetary system to control the running of the business and to evaluate the extent to which those goals are achieved. By a continuous comparison of actual performance with planned results, deviations or variances are quickly identified and appropriate action initiated. This is a fundamental aspect of the whole process: if targets were set but little or no attempt were made to measure the extent to which they were achieved, then the advantages of budgeting would be severely curtailed.

Top Down and Bottom up Approaches

Where employees have knowledge about budgeting, they are all encouraged to participate in the budgeting process. Much as it is time- consuming, acceptability of the budget is enhanced as well as its implementation. Where the budgeting process is participatory, it is regarded as a bottom up approach.

If the budget is prepared by top management and communicated to lower levels, then the budget is imposed. The top-down approach may be necessary where employees do not know how to go about budgeting.

For purposes of this manual, the focus is on the bottom-up approach because it encourages participation.

Administrative Procedures

Managers responsible for preparing budgets should ideally be the managers and their subordinates who are responsible for carrying out the budget.eg

(a) The sales manager should draft the sales budget and selling overhead cost centre budgets.
(c) The purchasing manager should draft the material purchases budget.
(d) the production manager should draft the direct production cost budgets.
(e) the various cost centre managers should prepare the individual cost centre budgets for their own cost centres.
(f) the cost accountant will analyse the budgeted overheads to determine the overhead absorption rates for the next budget period.

Budget Committee

The committee consists of heads of departments or major segments of the company. The staff work of the budget committee is delegated to a budget officer, usually an accountant who will coordinate the functional budgets into a master budget. Every part of the organisation should be represented on the committee.

Functions of the budget

(a) Co-ordination of the preparation of budgets, which includes the issue of the budget manual.
(b) Issuing of timetables for the preparation of functional budgets
(c) Allocation of responsibilities for the preparation of functional budgets.
(d) Provision of information to assist in the preparation of budgets.
(e) Communication of final budgets to the appropriate managers
(f) Comparison of actual results with budget and the investigation of variances.
(g) Continuous assessment of the budgeting and planning process, in order to improve the planning and control function.

Before the master budget is finally agreed, the budget committee may meet several times. Functional budgets and cost centre budgets prepared in draft may need to be amended many times over as a consequence of discussions between departments, changes in market conditions, reversals of decisions by management, during the course of budget preparation. In practice, functional budgets are negotiated before approval.

The Budget Manual

It is a collection of instructions governing the responsibilities of persons and the procedures, forms and records relating to the preparation and use of budgetary data.

Contents of a Budget Manual

(a) *An explanation of the objectives of the budgetary process:*
  (i) the purpose of budgetary planning and control
  (ii) the objectives of the various stages of the budgetary process
  (iii) the importance of budgets in the long-term planning and administration of the enterprise.

(b) *Organisational structures*
  (i) an organisational chart
  (ii) a list of individual responsibility officers

(c) An outline of the principal budgets and the relationship between them

(d) *Administrative details of budget preparation*
  (i) Membership and terms of reference of the budget committee
  (ii) The sequence in which budgets are to be prepared
  (iii) A time table.

(e) *Procedural matters*
  (i) Specimen forms and instructions for completing them
  (ii) Specimen reports
  (iii) Account codes (or a chart of accounts)
  (iv) The name of the budget officer to whom inquiries must be sent.

The Budget and Control Periods

Budget period is the period to which the budget relates. Except for capital expenditure budgets, the budget period is commonly the accounting year sub-divided into 12 or 13 control periods. A

control period is the period under performance review. If performance is reviewed every quarter, then there will be four control periods in a budget period.

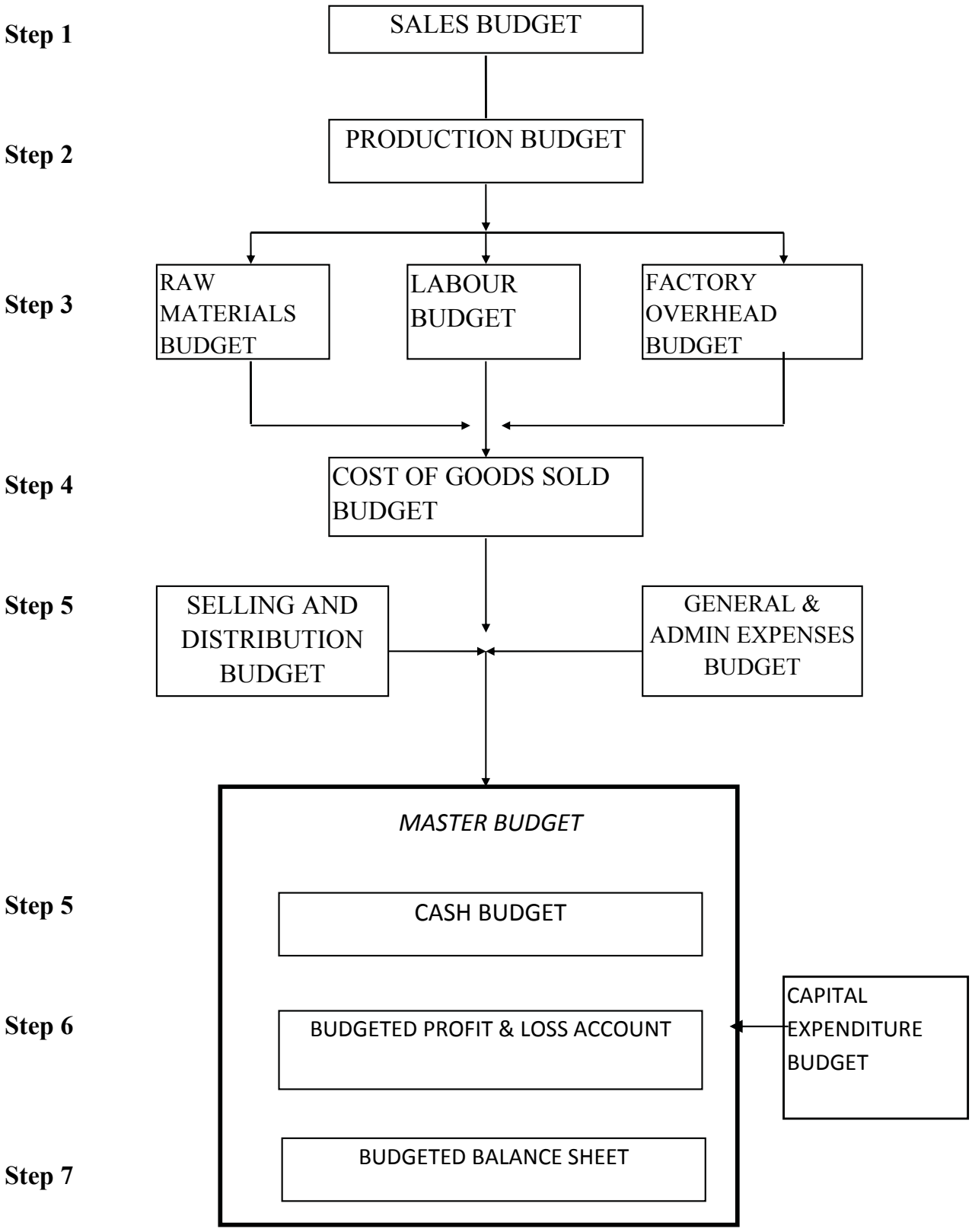
The Principal Budget Factor

The first task is to identify the principal budget factor, also known as *key budget factor* or *limiting budget factor* and is the factor which will limit the activities of an undertaking and which is therefore taken into account when preparing budgets. The principal budget factor is usually sales demand: a company will be restricted from making and selling more of its products because there would be no sales demand for the increased output, at a price which would be acceptable or profitable to the company. It may also be the machine capacity, distribution and selling resources, the availability of key resources like skilled labour, raw materials or the availability of cash.

Once this factor is defined then the rest of the budget can be prepared. For instance, if sales are the principal budget factor then the production manager can only prepare his budget after the sales budget is complete.

Sequence of Preparation

Although some functional budgets and cost centre budgets can be prepared at the same time as others, there is a rough sequence of preparation summarised on the following diagram.


Step 1
SALES BUDGET
Step 2
PRODUCTION BUDGET
Step 3
RAW MATERIALS BUDGET
LABOUR BUDGET
FACTORY OVERHEAD BUDGET
Step 4
COST OF GOODS SOLD BUDGET
Step 5
SELLING AND DISTRIBUTION BUDGET
GENERAL & ADMIN EXPENSES BUDGET
MASTER BUDGET
Step 5
CASH BUDGET
Step 6
BUDGETED PROFIT & LOSS ACCOUNT
CAPITAL EXPENDITURE BUDGET
Step 7
BUDGETED BALANCE SHEET

Example

XYZ Company produces three products X, Y, and Z. For the coming accounting period, budgets are to be prepared based on the following information:

Budgeted sales

Product X	2,000 at MK100 each
Product Y	4,000 at MK130 each
Product Z	3,000 at MK150 each

Standard usage of raw material

	RM 11	RM 22	RM 33
Product X	5	2	0
Product Y	3	2	2
Product Z	2	1	3
Standard cost per unit of material	MK5	MK3	MK4

Finished stocks budget

Product	X	Y	Z
Beginning	500	800	700
End	600	1,000	800
Raw materials stock	RM 11	RM 22	RM 33
Beginning	21,000	10,000	16,000
End	18,000	9,000	12,000

Product	X	Y	Z
Standard hours per unit	4	6	8
Standard hourly rate labour	MK3	MK3	MK3
Standard hourly rate variable overhead	MK2	MK2	MK2

Fixed production overheads are budgeted at MK 292,000 absorbed on the basis of direct labour hours

Required:

Prepare the following budgets

(i) Sales budget- quantity and sales volume
(ii) Production budget
(iii) Material usage budget
(iv) Material purchases budget
(v) Labour cost budget
(vi) Production cost budget, detailing standard cost per unit

Solution

1. Sales Budget

	Product X	Product Y	Product Z
Sales units	2,000	4,000	3,000
Budgeted selling price (MK)	100.00	130.00	150.00
Sales Value	200,000.00	520,000.00	450,000.00

2. Production Budget

	Product X	Product Y	Product Z
Sales units	2,000	4,000	3,000
Add: closing inventory	600	1,000	800
	2,600	5,000	3,800
Less: Opening inventory	500	800	700
Production	2,100	4,200	3,100

Alternative Format

Production budget	Product X	Product Y	Product Z
Sales units	2,100	4,200	3,100
Add: closing inventory	600	1,000	800
Less: Opening inventory	500	800	700
Increase/(decrease)	100	200	100
Production	2,200	4,400	3,200

3. Material Usage Budget

	RM11	RM 22	RM 33
Produc tion requirements			
Product X	10,500	12,600	6,200
Product Y	4,200	8,400	3,100
Product Z	-	8,400	9,300
Material Usage	14,700	29,400	18,600

4. Material Purchase Budget

	RM11	RM 22	RM 33
Materials Usage	14,700	29,400	18,600
Add: closing inventory	18,000	9,000	12,000
Less:opening inventory	21,000	10,000	16,000
Increase/ (Decrease)	(3,000)	(1,000)	(4,000)
Purchases	11,700	28,400	14,600
Unit price $	5.00	3.00	4.00
Parchase cost	58,500	85,200	58,400

5. Labour Cost Budget

Production requirements		Total Hours
Product X	2,100 x 4hrs/unit	8,400
Product Y	4,200 x 6hrs/unit	25,200
Product Z	3,100 x 8hrs/unit	24,800
Standard hours		58,400
Standard cost per hour /MK		3.00
Total Labour Cost -MK		175,200

6. Production Budget

		Product X	Product Y	Product Z
Materials:		MK	MK	MK
RM 11	5 units @MK5.00	25.00	15.00	10.00
RM 22	2 units @MK3.00	6.00	6.00	3.00
RM 33	0 units @ MK4.00	-	8.00	12.00
Labour cost	4 hrs @ MK3.00	12.00	18.00	24.00
Variable overheads	4 hrs @ MK2.00	8.00	12.00	16.00
Fixed overheads(w1)	6 hrs @ MK3.00	20.00	30.00	40.00
standard product unit		71.00	89.00	105.00
Production		2,100	4,200	3,100
Product Cost		149,100	373,800	325,500

Overhead Absorption Rate per labour hour		292000
		58400
	=	5.00

The standard hour

A useful concept in budgeting for labour requirements is the standard hour (or standard minute) which is defined as:

> the quantity of work achievable at standard performance, expressed in terms of a standard unit of work done in a standard period of time.

For example, budgeted output of various different products or jobs in a period could be converted into standards hours of production, and a labour budget constructed accordingly.

Standard hours are particularly useful when management wants to monitor the production levels of a variety of dissimilar units. For example product A may take five hours to produce and product B, seven hours. If four units of each product are produced, instead of saying that total output is eight units, production level could be stated as (4 x 5) + (4 x 7) standard hours = 48 standard hours.

The concept of the standard hour is used in standard costing, which is described in a later chapter. You might also come across it in a situation where standard costing is not used. Study the following example.

Example

Tithokoze Ltd manufactures a single product, Q, with a single grade of labour. Its sales budget and finished goods stock budget for period 3 of 20X6 are as follows.

Sales	700 units
Opening stocks, finished goods	50 units
Closing stock, finished goods	70 units

The goods are inspected only when production work is completed, and it is budgeted that 10% of finished work will be scrapped.

The standard direct labour hour content of product Q is three hours. The budgeted productivity ratio for direct labour is only 80%.

The company employs 18 direct operatives, who are expected to average 144 working hours each in period 3.

Required

(a) Prepare a production budget.
(b) Prepare a direct labour budget.
(c) Comment on the problem that your direct labour budget reveals, and suggest how this problem might be overcome.

Solution

Production budget	
	Units
Sales	700
Add closing stock	70
	770
Less opening stock	50
Production required of 'good' output	720

Direct labour budget		
Standard hours per unit		3
Total standard hours required	800 units (W1) x 3 hours	2,400
Productivity ratio		80%
Actual hours required	2,400 x 100/80	3,000

Wastage rate 10%
(assumed to be 100% of total production, not 10% of good production)

(W 1) Total production required: $720 \times \frac{100*}{90} = 800$ units

(* Note that the required adjustment is 100/90, not 110/100)

Problem

Budgeted hours available	18 operatives x 144 hours =	2,592 hours
Actual hours required		3,000 hours
Shortfall in labour hours below amount required		408 hours

The (draft) budget indicates that there will not be enough direct labour hours to meet the production requirements. This problem might be overcome in one, or a combination, of the following ways.

(a) Reduce the closing stock requirement below 70 units. This would reduce the number of production units required.
(b) Persuade the workforce to do some overtime working.
(c) Perhaps, recruit more direct labour, if long-term prospects are for higher production volumes.
(d) Discuss with the workforce (or their union representatives) the possibility of improving the productivity ratio, and so reducing the number of hours required to produce the output and/or, if possible, reducing the wastage rate below 10%.

Materials Purchases Budget
Where losses are expected, the quantity purchased should be increased by the amount of the loss.

Example
Chivomezi Ltd manufactures two products, S, and T, which use the same raw materials, D and E. One unit of S uses 3 litres of D and 4 kilograms of E. One unit of T uses 5 litres of D and 2 kilograms of E. A litre of D is expected to cost MK3 and a kilogram of E MK7.

Budgeted sales for 20X2 are 8,000 units of S and 6,000 units of T; finished goods in stock at 1 January 20X2 are 1,500 units of S and 300 units of T, and the company plans to hold stocks of 600 units of each product at 31 December 20X2.

Stocks of raw material are 6,000 litres of D and 2,800 kilograms of E at 1 January, and the company plans to hold 5,000 litres and 3,500 kilograms respectively at 31 December 20X2.
The warehouse and stores managers have suggested that a provision should be made for damages and deterioration of items held in store, as follows.

Product S: loss of 50 units
Product T: loss of 100 units
Product D: loss of 500 litres
Product E: loss of 200 kilograms

Required

Prepare a material purchases budget for the year 20X2.

Solution
To calculate material purchase requirements, it is first of all necessary to calculate the budgeted production volumes and material usage requirements.

	Product S		*Product T*	
	Units	*Units*	*Units*	*Units*
Sales		8,000		6,000
Provision for losses		50		100
Closing stock	600		600	
Opening stock	1,500		300	
Increase/(decrease) in stock		(900)		300
Production budget		7,150		6,400

	Material D		*Material E*	
Usage requirements	*Litres*	*Litres*	*kg*	*kg*
To produce 7,150 units of S	21,450		28,600	
To produce 6,400 units of T	32,000		12,800	
Usage budget		53,450		41,400
Provision for losses		500		200
		53,950		41,600
Closing stock	5,000		3,500	
Opening stock	6,000		2,800	
Increase/(decrease) in stock		(1,000)		700
Material purchases budget		52,950		42,300
Cost per unit		MK3 per litre		MK7 per kg
Cost of material purchases		MK158,850		MK296,100
Total purchases cost				MK454,950

Master Budget
A final outcome of budgeting is a master budget which consists of

(a) A Forecast Income Statement
(b) A forecast Statement of Financial Position
(c) A Cash Budget or Forecast Statement of Cash flow

The master budget is a summary of company's plans that sets specific targets for sales, production, distribution and financing activities. In short, this budget represents a comprehensive expression of management's plans for future and how these plans are to be accomplished.

Cash Budget

A cash budget is prepared to show the expected receipts of cash and payments of cash during the next year. The annual cash budget will be divided into smaller time periods (or control periods), commonly of one month or four weeks. Receipts of cash may be from cash sales, payments of receivables, the sale of non-current assets, the issue of new shares or loan stock, the receipt of interest and dividend from investments outside the business.

The objective of a cash budget is to ensure that sufficient cash is available at all times to meet the level of operations that are outlined in the various budgets

Not all of these are income statement items.

a. The issue of new shares or loan account items.
b. The cash received from selling an asset affects the Forecast Statement of Financial Position; the profit or loss on the sale or disposal of the assets, which appears in the forecast income statement, is not the cash received but the difference between the cash received and the written-down value of the asset.

Payments of cash may be for purchase of stock, payment of wages or other expenses, the purchase of capital items, the payment of interest, dividends, or taxation. Not all payments are income statement items for example the purchases of capital equipment.
It may be seen from this brief description that receipts and payments are not the same as sales and cost of sales for the following reasons.

(a) Not all receipts affect the income statement.
(b) Not all payments affect the income statement.
(c) Some costs in the income statement such as loss or profit on sale of assets and depreciation are not cash items but are 'costs' derived from accounting conventions.
(d) The timing of receipts and payments does not coincide with the income statement accounting period.

The following example will be used to explain how a master budget is prepared:

Example

Freewheel is in the process of preparing its master budget for the six months ending December 20X2. The forecast statement of financial position for the year ended 30 June 20X2 is estimated to be as follows:

	Cost	Depreciation Provision	Net book Value
	MK	MK	MK
Non-current assets	140,000	14,000	126,000
Current assets			
Inventory	25,000		
Trade receivables	24,600		
Bank	3,000		52,600
Total Assets			178,600

Capital and reserves

Share capital		100,000
Retained earnings		44,600
		144,600
Current Liabilities		
Trade payables	25,000	
Other payables	9,000	34,000
Total funds and liabilities		178,600

The budget committee have derived the following trading forecasts for the six months ended 31 December 20X2. (Figures in MK)

	May	June	July	August	September	October	November	December
Sales-units	4,000	4,200	4,500	4,600	4,800	5,000	3,800	3,000
Purchases	12,000	13,000	14,000	18,000	16,000	14,000	12000	12,000
Wages/salaries	8,000	8,000	8,000	10,000	10,000	10,000	12,000	12,000
Overheads*	7,000	7,000	7,000	7,000	7,000	8,000	8,000	8,000
CAPEX							30,000	
New MK1 shares					20,000			
Dividends						10,000		

*overheads excluding depreciation

You are given the following information:

(a) The selling price in May 20X2 was MK6 per unit and this is to be increased to MK8 per unit in October. 50% of sales are for cash and 50% on credit to be paid two months later.
(b) Purchases are to be paid for two months after purchase.
(c) Wages and salaries are to be paid 75% in the month incurred and 25% in the following month.
(d) Overheads are to be paid in the month after they are incurred.
(e) The non-current assets in the CAPEX are to be paid for in three equal instalments in the three months following purchase.
(f) Dividends are to be paid three months after they are declared and the receipts from the share issue are budgeted to be received in the month of issue
(g) Non-current assets are depreciated at 10% per annum on a straight line basis on those assets owned at 31 December 20X2
(h) Closing inventory at the beginning of the period under review was equal to the previous two months purchases. At 31 December 20X2, it was equal to three months purchases.

Required:

Prepare the following budgets for the six months ending 31 December 20X2:

(i) Cash budget
(ii) Forecast income statement
(iii) Forecast statement of financial position.

Solution

CASH BUDGET FOR SIX MONTHS ENDING DECEMBER 20X2								
		July	**August**	**Sept**	**Oct**	**Nov**	**Dec**	**TOTAL**
RECEIPTS	Note	$	$	$	$	$	$	$
Cash sales	1	13,500	13,800	14,400	20,000	15,200	12,000	88,900
Receivables	2	12,000	12,600	13,500	13,800	14,400	20,000	86,300
New share issue				20,000				20,000
TOTAL- (A)		**25,500**	**26,400**	**47,900**	**33,800**	**29,600**	**32,000**	**195,200**
PAYMENTS								
Purchases	3	12,000	13,000	14,000	18,000	16,000	14,000	87,000
Wages	4	8,000	9,500	10,000	10,000	11,500	12,000	61,000
Overheads	5	7,000	7,000	7,000	7,000	8,000	8,000	44,000
CAPEX	6						10,000	10,000
TOTAL- (B)		**27,000**	**29,500**	**31,000**	**35,000**	**35,500**	**44,000**	**202,000**
Net Cash flow	7	(1,500)	(3,100)	16,900	(1,200)	(5,900)	(12,000)	(6,800)
Balance b/f	8	3,000	1,500	(1,600)	15,300	14,100	8,200	3,000
Balance C/f		**1,500**	**(1,600)**	**15,300**	**14,100**	**8,200**	**(3,800)**	**(3,800)**

Notes

1. Cash sales: July :- 4,500 units X MK6 X50%
2. Receivables: July:- After 2 months- May sales: 4000units*MK6*50%
3. Purchases: July :- After 2 months – May purchases
4. Wages: July:- 75%*8,000(July)+ 25%*8,000(June)
5. Overheads: July:- MK7,000 incurred in June
6. CAPEX: non-current assets will be paid in three equal instalments of MK10,000 from December 20X2
7. Net cash flow= Total receipts (A) less Total Payments (B)
8. Balance b/f is the opening cash balance which is the previous month's closing balance

FORECAST INCOME STATEMENT		
Revenue		177,800
less: Cost of Sales		
Opening Inventory	25,000	
Purchases	86,000	
	111,000	
Less Closing inventory	34,000	77,000
		100,800
Less Expenses		
wages & salaries	62,000	
overheads	45,000	
Depreciation*	8,500	115,500
profit / (loss)		(14,700)
Retention b/f		44,600
		29,900
Dividend		(10,000)
Retention c/f		**19,900**

Depreciation = (MK140000+MK30000) 10% * $^{6}/_{12}$

Note: the income statement is prepared on accruals basis i.e revenue is recognised even before cash is collected. Therefore the timing of the cash flow is ignored.

FORECAST STATEMENT OF FINANCIAL POSITION			
Non current assets		MK	MK
	Cost	170,000	
	less:Acc. Depreciation	22,500	147,500
Current Assets			
	Inventory	34,000	
	Trade receivables	27,200	61,200
TOTAL ASSETS			208,700
Funds and liabilities			
	Share capital		120,000
	Retaines earnings		19,900
Current liabilities			
	Trade payables	24,000	
	other payables	41,000	
	bank overdraft	3,800	68,800
TOTAL FUNDS AND LIABILITIES			208,700

Profit and Cash flow

Profit and cash flows during a period need not be the same amount and indeed, will not usually be the same. The reasons for the difference between profit and cash flow might be familiar to you if you have already studied cash flow statements in financial accounting. The differences are as follows.

(a) There are some items in the income statement which are not cash flow items. For example, depreciation is a charge against profit, but is not a cash flow. The same applies to discounts allowed or received.

(b) There are some sources of cash income which are not fully reported, or not reported at all, in the income statement. These include funds from a new issue of shares or a loan, or the cash earned from the sale of non- current assets.

(c) There are some payments which are not reported fully, or at all, in the P & L account, such as the payment for new capital equipment (fixed assets) the payment of dividend and taxation, and the repayment of loans.

(d) Increases in the volume of working capital tie up funds and reduce the cash inflow. For example an increase in debtors represents sales on credit (and so profit) without cash income yet having been received.

Example

You are presented with the following budgeted data for your organisation for the period November 20X1 to June 20X2. It has been extracted from functional budgets that have already been prepared.

	NovX1	*DecX1*	*Jan X2*	*Feb X2*	*MarX2*	*AprX2*	*MayX2*	*June X2*
	MK	MK	MK	MK	MK	MK	MK	MK
Sales	80,000	100,000	110,000	130,000	140,000	150,000	160,000	180,000
Purchases	40,000	60,000	80,000	90,000	110,000	130,000	140,000	150,000
Wages	10,000	12,000	16,000	20,000	24,000	28,000	32,000	36,000
Overheads	10,000	10,000	15,000	15,000	15,000	20,000	20,000	20,000
Dividends				20,000				40,000
Capital expenditure			30,000			40,000		

You are also told the following.

(a) Sales are 40% cash 60% credit. Credit sales are paid two months after the month of sale.
(b) Purchases are paid the month following purchase.
(c) 75% of wages are paid in the current month and 25% the following month.
(d) Overheads are paid the month after they are incurred.
(e) Dividends are paid three months after they are declared.
(f) Capital expenditure is paid two months after it is incurred.
(g) The opening cash balance is MK 15,000.

The managing director is pleased with the above figures as they show sales will have increased by more than 100% in the period under review. In order to achieve this he has arranged a bank overdraft with a ceiling of MK 50,000 to accommodate the increased stock levels and wage bill for overtime worked.

Required

(a) Prepare a cash budget for the six month period January to June 20X2.

(c) Comment upon your results in the light of your managing director's comments and offer advice.

Solution

	January	February	March	April	May	June	TOTAL
Receipts	MK'000	MK'000	MK'000		MK'000	MK'000	MK'000
Sales revenue							
Cash	44	52	56	60	64	72	348
Credit	48	60	66	78	84	90	426
TOTAL	92	112	122	138	148	162	774
Payments							
Purchases	60	80	90	110	130	140	610
Wages							
75%	12	15	18	21	24	27	117
25%	3	4	5	6	7	8	33
Overheads	10	15	15	15	20	20	95
Dividends					20		20
Capital expenditure			30			40	70
TOTAL	85	114	158	152	201	235	945
Net cash flow	7	(2)	(36)	(14)	(53)	(73)	(171)
b/f	15	22	20	(16)	(30)	(83)	15
c/f	22	20	(16)	(30)	(83)	(156)	(156)

The overdraft arrangements are quite inadequate over the six-month period. If the figures are realistic to avoid difficulties in the near future,

(i) Activities could be curtailed.
(ii) Other sources of cash could be explored, e.g. a long-term loan to finance the capital expenditure and a factoring arrangement to provide cash due from receivables more quickly.
(iii) Efforts to increase the speed of debt collection could be made.
(iv) Payments to suppliers could be delayed.
(v) The dividend payments could be postponed (the figures indicate that this is a small company, possibly owner-managed).
(vi) Staff might be persuaded to work at a lower rate in return for, say an annual bonus or a profit-sharing agreement.
(vii) Extra staff might be taken on to reduce the amount of overtime paid.
(viii) The stockholding policy should be reviewed; it may be possible to review current production and minimise cash tied up in inventory.

Note: Some examination questions are not straight forward. A student needs to understand the question fully before writing the answer.

Example

Thauni Co values, advertises and sells residential property on behalf of its customers. The company has been in business for only a short time and is preparing a cash budget for the first four months of 2006. Expected sales of residential properties are as follows.

	20X5	20X6	20X6	20X6	20X6
Month	Dec	Jan	Feb	Mar	Apr
Units sold	10	10	15	25	30

The average price of each property is MK1.80 million and Thauni Co charges a fee of 3% of the value of each property sold. Thauni Co receives 1% in the month of sale and the remaining 2% in the month after sale. The company has nine employees who are paid on a monthly basis. The average salary per employee is MK 350,000 per year. If more than 20 properties are sold in a given month, each employee is paid in that month a bonus of MK 1,400 for each additional property sold.

Variable expenses are incurred at the rate of 0·5% of the value of each property sold and these expenses are paid in the month of sale. Fixed overheads of MK43,000 per month are paid in the month in which they arise. Thauni Co pays interest every three months on a loan of MK2.0million at a rate of 6% per year. The last interest payment in each year is paid in December.

An outstanding tax liability of MK958,000 is due to be paid in April. In the same month Thauni Co intends to dispose of surplus vehicles, with a net book value of MK150,000, for MK200,000. The cash balance at the start of January 20X6 is expected to be a deficit of MK400,000.

Required:

(a) Prepare a monthly cash budget for the period from January to April 20X6. Your budget must clearly indicate each item of income and expenditure, and the opening and closing monthly cash balances. (15 marks)

(b) Discuss the advantages and disadvantages to Thauni Co of using overdraft finance to fund any cash shortages forecast by its cash budgets. (5 marks)

Solution

(a) Cash Budget for Thauni Co:

	January	February	March	April
Receipts	MK	MK	MK	MK
Cash fees	180,000	270,000	450,000	540,000
Credit fees	360,000	360,000	540,000	900,000
Sale of assets				200,000
Total receipts	540,000	630,000	990,000	1,640,000
Payments				
Salaries	262,500	262,500	262,500	262,500
Bonus			63,000	126,000
Expenses	90,000	135,000	225,000	270,000
Fixed overheads	43,000	43,000	43,000	43,000
Taxation				958,000
Interest			30,000	
Total payments	395,500	440,500	623,500	1,659,500

Net cash flow	144,500	189,500	36,650	(1,950)
Opening balance	(400,000)	(255,500)	(66,000)	300,500
Closing balance	(255,500)	(66,000)	300,500	281,000

Workings

Month	December	January	February	March	April
Units sold	10	10	15	25	30
Sales value (MK'm)	18.00	18.00	27.00	45.00	54.00
Cash fees at 1% (MK)	180,000	180,000	270,000	450,000	540,000
Credit fees at 2% (MK)	360,000	360,000	540,000	900,000	1,080,000
Variable costs at 0·5% (MK)		90,000	135,000	225,000	270,000

Monthly salary cost = (350,000 x 9)/12 = MK262,500
Bonus for March = (25 – 20) x 1,400 x 9 = MK63,000
Bonus for April = (30 – 20) x 1,400 x 9 = MK126,000

(b) In two of the four months of the cash budget Thauni Co has a cash deficit, with the highest cash deficit being the opening balance of MK 400,000. This cash deficit, which has occurred even though the company has a loan of MK200,000, is likely to be financed by an overdraft. An advantage of an overdraft is that it is a flexible source of finance, since it can be used as and when required, provided that the overdraft limit is not exceeded. In addition, Thauni Co will only have to pay interest on the amount of the overdraft facility used, with the interest being charged at a variable rate linked to bank base rate. In contrast, interest is paid on the full MK200,000 of the company's bank loan whether the money is used or not. The interest rate on the overdraft is likely to be lower than that on long-term debt.

A disadvantage of an overdraft is that it is repayable on demand, although in practice notice is given of the intention to withdraw the facility. The interest payment may also increase, since the company is exposed to the risk of an interest rates increase. Banks usually ask for some form of security, such as a floating charge on the company's assets or a personal guarantee from a company's owners, in order to reduce the risk associated with their lending.

Budgeting Systems

1. *Incremental Budget*
   This is an approach to budgeting which is mainly concerned with the increments in costs and revenues which will occur in the forth coming period. Traditionally, current year's results act as the basis for preparing the annual budget and takes into account the estimated growth and inflation. It is usually reasonable if current operations are effective and economical

   Advantages:
   - Appropriate for costs such as staff salaries.
   - Administratively easy to prepare.

   Disadvantages
   - It is an inefficient form of budgeting as it encourages budget padding and wasteful spending to creep into budgets.

- Past inefficiencies are perpetuated because budgets are rarely subjected to close scrutiny.

2. *Activity Based Budgeting (ABB)*
   This budgeting system involves defining activities that underlie the financial figures in each function and using the level of activity to decide how much resource should be allocated, how well it is being managed and to explain variances from budget.

   Steps Involved In ABB
   1. Identification of activities to which resources may be committed
   2. Examination of the value of activities to the organizational objectives, leading to a prioritisation ranking for scarce resource provision during the budgetary process
   3. Assessment of the possible levels of service required for each activity including the zero option
   4. A meaningful match between areas of responsibility or "ownership" and costs
   5. Estimation of the cost implications of activities for cost- benefit analysis.

   ABB leads to the realisation of the fact that an organisation needs to be managed with far more reference to the behaviour of the activities and cost drivers identified. For instance, training costs will be driven by the number of new employees who need induction, rather than the personnel manager.

   The traditional budgetary process is seen as a burdensome and costly routine, reinforcing bad practice and constraining response in a rapidly changing environment.

3. *Zero Based Budgeting* (ZBB)
   It is a formalized system of budgeting for the activities of an organization as if each activity is being performed for the first time. Essentially, a number of alternative levels of provision for each activity are identified, cost and evaluated in terms of the benefits to be obtained from them.

   In practice managers can start from their current levels of expenditure, rather than from zero, and working downwards, asking what would happen if any particular aspect of the current operations and expenditure were removed from the budget.
   The questioning attitude may involve the following questions:
   - Does the activity need to be carried out?
   - What would be the consequences if the activity were no carried out?
   - Does the activity benefit the organization?
   - Is the current level of provision sufficient?
   - Are there alternative ways of providing the function?
   - Is the expenditure worth the benefits achieved?

   ZBB Approach
   Step 1: Specify decision units
   A decision unit is a programme of work or capital expenditure programme or area of activity, which can be evaluated individually.

Step 2: Define Decision Packages
Each decision unit is described in a decision package i.e. a document which identifies and describes the specific activity in such a way that management can evaluate and rank it in order of priority against other activities

There are TWO types of Decision Packages:
(a) Mutually exclusive packages: each package contains an alternative method of getting the job done. The best option is selected by cost benefit analysis and the other packages are discarded
(b) Incremental packages: one aspect of work is divided into different levels of effort. A base package will show the minimum level of activity and other packages describe what additional work could be done , at what cost, and for what benefits

Step 3: Evaluate and rank packages
Each decision package is evaluated and ranked on the basis of its benefit to the organization. The exercise act as the basis for allocating resources between different activities

Step 4: Drop unworthy activities.
Activities which would cost more than they are worth in qualitative or quantitative terms should be dropped

Step 5: Allocate resources
Resources are allocated according to the funds available and the evaluation and ranking of the competing packages.

4. *Rolling Budgets (continuous budget)*
Management needs the chance to revise their plans by introducing a system of rolling budgets especially when inflation is expected to rise or fall by a large percentage during the course of the year

Rolling budgets are an attempt to prepare targets and plans which are more realistic and certain, by shortening the period between preparing budgets
Suppose for instance a rolling budget is prepared every three months. Each budget would plan for twelve months with the first three months in detail and the rest in less detail, because of the uncertainty about the long term future. It is then extended by a further three months as the current period ends.
Advantages
- Reduction of uncertainty in budgeting
- Forcing managers to reassess the budget regularly thereby producing up to date budget in the light of current events and expectations
- There is always a budget extending twelve months ahead

Problems in Constructing Budgets

Most of the practical problems in budgeting are not so much the computations themselves, but rather the factors listed below.

(a) It might be difficult to forecast sales with any reliable accuracy. Likewise the availability of resources, especially skilled labour and cash, might be difficult to predict, and so it might be difficult to identify the principal budget factor. Because of inflation, it might be difficult to estimate future price levels for materials, expenses, wages and salaries.

(b) Managers might be reluctant to budget accurately.

(i) They may overstate their expected expenses, so that by having a larger-than-necessary budget, they will be unlikely to overspend their budget allowance. They will then not be held accountable in control reports for excess spending. Excess expenditure built into a budget is known as *slack* and zero base budgeting is an attempt to eliminate this.

(ii) They may compete with other departments for the available resources, by trying to expand their budgeted expenditure. Budget planning might well intensify inter-departmental rivalry and the problems of 'empire building'.

(c) Inter-departmental rivalries and self-interests might ruin the efforts towards co-ordination in a budget.

(d) Employees might resist budget plans either because the plans are not properly communicated to them, or because they feel that the budget puts them 'under pressure' from senior managers to achieve better results.

Other problems include:

- Budgets can be seen as pressure devices imposed by management, thus resulting in:
  (a) bad labour relations
  (b) inaccurate record-keeping.
- Departmental conflict arises due to:
  (a) disputes over resource allocation
  (b) b) departments blaming each other if targets are not attained.
- It is difficult to reconcile personal/individual and corporate goals.
- Waste may arise as managers adopt the view, "we had better spend it or we will lose it". This is often coupled with "empire building" in order to enhance the prestige of a department.
- Responsibility versus controlling, i.e. some costs are under the influence of more than one person, e.g. power costs.
- Managers may overestimate costs so that they will not be blamed in the future should they overspend.

In this chapter we have dealt with budgetary planning and control for manufacturing and trading organisations. You will appreciate that the same techniques for forecasting and control of costs are applicable to service organisations and to non profit-making organisations such as charities and local government. Planning and control of costs are important in all organisations. The most efficient method is to co-ordinate effort by preparing budget

A *budget* is a quantified plan of action for a forthcoming accounting period. The *budget committee* is the co-ordinating body in the preparation and administration of budgets. The *principal budget factor* should be identified at the beginning of the budgetary process, and the budget for this is prepared before all the others. *Cash budgets* are important in the planning

process because they give advanced warning of any cash surpluses or deficits. *Rolling budgets* are continuously updated so that managers always have a twelve-month plan available. *Zero base budgeting* is a technique used to eliminate slack or wasteful expenditure from budgets, by starting each budget from scratch, or from zero. Computational work is not the only consideration in budgeting. Attention must be give to the *behaviour* aspects, to discourage such activities as 'empire building'.

END OF CHAPTER QUESTION

Ndirande Fabricators, a medium-sized metal working firm, produces two types of tool boxes; Small and Large. In September 2006, the budget department of Ndirande Fabricators gathered the following data in order to project sales and budget requirements for 2007:

2007 Projected sales

Size	Units	Price K
Small	60,000	700
Large	40,000	1,000

2007 Stocks (in units)

Size	Expected stocks 01/01/07	Desired stocks 31/12/07
Small	20,000	25,000
Large	8,000	9,000

The materials used to produce one unit of either model and the projected data for 2007 with respect to materials are as follows:

	Amount used per unit		Anticipated purchase	Expected stocks	Desired stocks
	Small	Large	price (K)	Jan 1 2007	Dec 31 2007
Steel – Type I	4kg	5kg	80 per kg	32,000 kg	36,000 kg
Steel – Type II	2kg	3kg	50 per kg	29,000 kg	32,000 kg
Graphite	-	1lt	30 per lt	6,000 lt	7,000 lt

Projected direct labour requirements for 2007 and rates are as follows:

Size	Hours per unit	Rate per hour (K)
Small	2	30
Large	3	40

Required:

Prepare the following budgets for 2007:

(a) Sales budget (in Kwacha) **3 Marks**

(b) Production budget (in units) **3 Marks**

(c) Materials purchases budget (in quantities) **10 Marks**

(d) Materials purchases budget (in Kwacha) **2 Marks**

(e) Direct labour budget (in Kwacha) **2 Marks**

(TOTAL: 20 MARKS)

CHAPTER 11

FLEXIBLE BUDGETS AND BUDGETARY CONTROL

Learning Objectives

By the end of this chapter, students should be able to:

- Know the principles of flexible budgeting
- Understand the distinction between fixed and flexible budgets
- Prepare flexible budgets
- Apply the principles of flexible budgeting in budgetary control

Introduction

A flexible budget is a budget that is a function of one or more levels of activity. Thus, the budget depends on one or more measures of activity volume rather than being fixed in amount.

A fixed budget on the other hand is a financial plan that does not change through the budget period, irrespective of any changes from the plan in actual activity levels experienced.

Fixed Budget is mainly used in the planning stage to define the broad objectives of management. Flexible budget, on the other hand is prepared for the volume of activity actually achieved, in other words the controlling stage.

Purpose:--The purpose of a flexible budget is to develop an estimate or estimates of cost for one or more levels of activity. Activity levels are typically measured in terms of activity inputs, levels, or outputs. Such a budget is flexible in the sense that it depends upon a specified level of activity volume. Acquisition budgets focus on the costs to be incurred to acquire actual or planned levels of resources. Labour budgets, purchasing plans, and similar budgets are resource acquisition oriented. Activity budgets focus on the resources that should be required to maintain activities at specified levels based on expected or desired levels of efficiency. Production budgets focus on the resources that would be required to produce a specified set of products and services. Like activity budgets, production budgets are necessarily based on assumed levels of efficiency.

Temporal issues:--Flexible budgets can be used as ex-ante forecasts of total cost for various levels of activity volume. Or they can be used as ex-post standards of the costs that should have been incurred for various levels of activity volume (measured in terms of input, activity, or output levels).

Context:--Flexible budgets are used in a wide variety of circumstances. Such budgets are utilized in not-for-profit organizations as well as business firms, for a variety of activities including administrative and service tasks as well as production activities. Flexible budgets can be used even when there is no functional relationship between activity inputs and outputs. In such cases activity volume is measured in terms of input levels or other proxy measures of activity.

Approach:--A flexible budget requires an estimate of the relationship between total cost and activity volume. The form of that relationship depends on the structure of the process for which costs are being estimated. Some criteria for choosing a measure of volume include:

1. Causality -- an individual type of cost should be related whenever possible to that activity which causes the cost to vary.

2. Independence of activity measure -- to the extent possible, the activity measure should be independent of other influences. For example, labour or machine hours are independent of changes in prices.

3. Ease of understanding -- Activity measure units should be easily understandable and obtainable at reasonable expense. Complicated indices of activity volume are best avoided.

4. Functionality - Activity measures should be functional and thus contribute to organizational goals. For example, poor performance should not result in a more generous budget for performance evaluation and control purposes.

Practice: the cost behaviour assumption that underlies much of current accounting practice is that cost is a simple linear function of volume. Specifically, it is assumed that

Total cost C = F + *v*Q, where F represents total fixed cost, ***v*** represents the variable cost per unit of activity, and Q represents the level of activity for which the budget is to be constructed. When there are multiple cost drivers for an activity, then the linear equation is of the form

$$\text{Total cost } C = F + v_1Q_1 + v_2Q_2 + \cdots + v_nQ_n \quad (1)$$

In matrix form, we would write this as

$$\text{Total cost } C = F + \mathbf{vQ} \quad (2)$$

Flexible budgeting can be implemented whenever a reasonably strong relationship exists between total cost and some measure of activity volume. The relationship can be curvilinear or linear. The important concept is that the budget flexes, in a predetermined manner, with changes in volume.

Measures of Activity

1. Flexible budgets are sometimes based on measures of **activity inputs** (e.g., direct labour hours) that indicate the budgeted costs necessary to acquire a given level of resources at specified prices. These are acquisition budgets, such as might be used to budget for the purchase of raw materials for a specified period.

2. Flexible budgets are sometimes based on measures of **activity** (e.g., hours a production line is in operation) to forecast the cost of operating an activity, usually for a given level of input or output (e.g., standard hours allowed for the output achieved). In constructing such budgets, one must specify the rate at which resources will be consumed to maintain the activity.

3. Flexible budgets are sometimes based on measures of **activity output** (e.g., number of units produced during a period). In constructing such budgets, one must specify both the rate at

which resources will be consumed to maintain the activity and the rate at which the activity will produce units of output. Thus, a flexible budget based on output must be based on specified input/output ratios.

Common uses of flexible budgets include:

1. to estimate total indirect factory costs at different levels of activity to compute **budgeted** activity cost rates,
2. to budget total indirect factory costs at different levels of activity to compute **standard** activity cost rates,
3. to estimate **total** activity costs at different levels of activity to compute **budgeted** or **standard** activity cost rates.
4. to estimate total activity cost **for the level of activity achieved** for control and performance evaluation purposes,
5. to forecast total activity costs for **cash budgeting** purposes,
6. to forecast activity costs for **expense budgeting** purposes, and
7. to forecast total activity costs to **forecast earnings** under different scenarios.

When using flexible budgets for control and performance evaluation purposes, the flexible budget is compared to the original budget to find the difference. This difference is called variance.

Variances may be **favourable (F)** or **adverse (A)**. A favourable variance occurs when the actual outcome is better than planned while an adverse variance occurs when the actual outcome is worse than planned.

Steps in the preparation of the flexible budgets:
(a) Analyse all the cost into fixed and variable category
(b) Break up semi-variable cost into fixed and variable cost if necessary using **high-low** method.
(c) Flex the variable cost and **not the fixed cost.**
(d) Prepare the Flexible Budget also known as Performance Statement

Example

Secondline Ltd, aware of the uncertain nature of their market for the forthcoming year have prepared budgeted profit forecasts based on 90%, 100% and 105% activity as follows:

	90%	100%	105%
	MK	MK	MK
Revenue	1,350,000	1,500,000	1,575,000
Less:			
Material costs	337,500	375,000	393,500
Labour costs	440,000	485,000	507,500
Production overhead costs	217,500	235,000	243,750
Administration costs	120,000	130,000	135,000
Selling and distribution costs	70,000	75,000	77,500
Total costs	1,185,000	1,300,000	1,357,500
Net Profit	165,000	200,000	217,000

In fact actual activity has turned out far worse than expected and only 37,500 units have been sold with the following results:

	MK	MK
Revenue		1,075,000
Less:		
Material costs	311,750	
Labour costs	351,500	
Production overhead costs	171,250	
Administration costs	117,500	
Selling and distribution costs	66,500	
Total costs		1,018,500
Net Profit		56,500

You are also given the following information:
(i) The budgeted selling price is MK30 per unit
(ii) All production is sold hence no closing inventory
(iii) The fixed element of the budgeted costs will remain unchanged at all levels of production

Required:

(a) Prepare a statement for the year showing the flexed budget at the actual level of activity, the actual results and the variance for each item of revenue and cost.

(b) The company has seen that sales were likely to be depressed for the forthcoming year and its sales team has secured a potential order for all of the spare capacity from actual activity up to 100% activity. For this order, a special selling price of MK25 per unit had been agreed and budgeted variable administration costs would increase by 25%, budgeted variable production overheads by 20% and budgeted labour costs by MK1 per unit. All other costs would remain the same.

Required
Recommend whether Secondline should have maintained 100% activity for the year by accepting the order detailed above. Clearly state the reasons for your decision and show any workings.

Solution

Workings:

1. Budgeted volume :

At 95%		Total revenue of MK1,350,000 divided by selling price of K30
	=	45,000 units
At 100%		Total revenue of MK1,500,000 divided by selling price of K30
	=	50,000 units
At 105%		Total revenue of MK1,575,000 divided by selling price of K30
	=	52,500 units

2. Establish the cost behaviour of each cost element as follows:

	100%	95%	105%
	MK	MK	MK
Material costs	375,000	(375,000* 95%) 337,500	(375,000*105%) 393,750

Material costs are **totally variable** because they are changing proportionately with volume.
Cost per unit = MK375,000 ÷50,000 = MK7.50

Labour coats	485,000	(485,000*95%) 460,750	(485,000*105%) 509,250

Labour costs are **semi-variable** because they are not changing proportionately with volume. Such costs can be separated using High-Low method.

3. Complete the flexed budget by taking into account the cost behaviour patterns of the budget at the same level as the ACTUAL activity level.

FLEXED BUDGET

			Fixed Budget	Flexed Budget	Actual results	Variance	
Activity Level	Note		100%	75%	75%	0%	
Sales volume (units)			50,000	37,500	37,500	-	
			K	K	K	K	
Sales Revenue		30.00	1,500,000	**1,125,000**	1,075,000	50,000	A
Less:							
Material costs		7.50	375,000	**281,250**	311,750	30,500	A
Labour costs	1	9.00	485,000	**372,500**	351,500	21,000	F
Production overhead costs	2	3.50	235,000	**191,250**	171,250	20,000	F
Administartion costs	3	2.00	130,000	**105,000**	117,500	12,500	A
Selling and distribution costs	4	1.00	75,000	**62,500**	66,500	4,000	A
TOTAL COSTS			1,300,000	**1,012,500**	1,018,500	6,000	A
NET PROFIT			200,000	**112,500**	56,500	56,000	A

Workings

1	Labour costs		Voulme	Cost
			Units	K
	High		52,500	507,500
	Low		45,000	440,000
	Range		7,500	67,500
	Variable cost		(67,500/7,50	9.00
	Fixed cost		Total Cost - Variable cost	
	At 100% =		485,000 - (50,000*K9.00)	
			35,000	
	At 37,500 (75%)			
	Total cost = Fixed Cost + Variable cost)			
	=		35,000+ (37,500*K9.00)	
			372,500	

2	Production overheads	Semi- variable
	Vaiable Cost	(243,750- 217,500)/ 7,500
		3.50
	Fixed Costs	(235,000 - 50,000* 3.50)
		60,000.00
	Total cost	(60,000 + 37,500* 3.50)
		191,250
3	Administration Costs	Semi-variable
	Vaiable Cost	(135,000- 120,000)/ 7,500
		2.00
	Fixed Costs	(130,000 - 50,000* 2.00)
		30,000.00
	Total cost	(30,000 + 37,500* 2.00)
		105,000
4	Selling and Distribution costs	
	Vaiable Cost	(77,500- 70,000)/ 7,500
		1.00
	Fixed Costs	(75,000 - 50,000* 1.00)
		25,000.00
	Total cost	(25,000 + 37,500* 3.50)
		62,500

Part (b) involves decision making (order acceptance). It is important to note that an order should be accepted if its contribution is positive. There is a spare capacity of 12,500 units (50,000 - 37,500)

		MK
Selling price		25.00
Less: Variable costs		
Material costs		7.50
Labour costs	9.00 (+ MK1.00)	10.00
Production overhead costs	3.50 (+20%)	4.20
Administration costs	2.00 (+25%)	2.50
Selling and distribution costs		1.00
Total variable Costs		(25.20)
CONTRIBUTION		(0.20)
Sales volume		12,500
Decrease in profit		..2,500

Conclusion: Reject the offer because it would reduce overall profit by MK2,500 so it is better to operate below capacity

Contribution approach

In order to prepare a flexible budget it is necessary to first determine the cost behaviour patterns. Variable costs must be separately identified from fixed costs so that it is possible to

determine which costs will change as the activity level changes and which costs will remain fixed.

Flexible budgets are often prepared on a marginal costing basis, which means that the contribution is highlighted. The flexing of budgets is simplified if they are prepared in this format because the fixed costs will be clearly segregated from the variable costs

Example

The following information relates to budget period 1 for Lezala Co:

	Budget	Budget	Actual for period
	(60,000 units)	(90,000 units)	
Sales	MK900,000	MK1,350,000	MK1,240,000
Raw materials	MK450,000	MK675,000	MK632,400
Labour	MK155,000	MK207,500	MK165,200
Production o/h	MK190,000	MK235,000	MK238,000

Actual production and sales in budget period 1 were 80,000 units. Actual labour costs for the period included MK50,000 of fixed labour costs. Actual production overheads for the period included MK110,000 of fixed production overheads.

Required:

(a) Using a marginal costing approach, prepare a flexed budget for the period and calculate appropriate variances in as much detail as allowed by the information provided above. (**8 marks**)

(b) In budget period 2, Lezala Co planned to absorb fixed production overheads of MK112,500 on a standard labour hour basis. A total of 22,500 standard labour hours were budgeted but only 16,000 labour hours were actually worked in the period. Standard labour hours for actual production were 22,000 hours.

Required:

Calculate the fixed production overhead efficiency variance for period 2 and explain its meaning. **(4 marks)**

(c) Explain how budgeting can help organisations to achieve their objectives. (**8 marks**)

(Total: 20 marks)

Solution

	Flexed Budget (80,000 units) MK000	Actual for period (80,000 units) MK000	Variances for period MK000
Sales	1,200	1,240·0	40·0 (F)
Variable costs			
Raw materials	600	632·4	32·4 (A)
Labour	140	115·2	24·8 (F)
Production overheads	120	128·0	8·0 (A)
	860	875·6	
Contribution	340	364·4	
Fixed costs			
Labour	50	50	nil
Production overheads	100	110	10·0 (A)
	150	160·0	
Gross profit	190	204·4	14·4 (F)

Workings

1. Sales:
   Selling price per unit = 1,350,000/90,000 = MK15·00 per unit
   Sales revenue at 80,000 units = 80,000 x 15·00 = MK1,200,000
2. Raw materials:
   Variable cost per unit = (675,000 – 450,000)/(90,000 – 60,000) = MK7·50 per unit
   Alternatively, 675,000/90,000 = MK7·50 per unit
   Raw material cost at 80,000 units = 80,000 x 7·50 = MK600,000
3. Labour:
   Variable cost per unit = (207,500 – 155,000)/(90,000 – 60,000) = MK1·75 per unit
   Fixed cost = 207,500 – (90,000 x 1·75) = 207,500 – 157,500 = MK50,000
   Variable labour cost at 80,000 units = 80,000 x 1·75 = MK140,000
4. Production overhead:
   Variable cost per unit = (235,000 – 190,000)/(90,000 – 60,000) = MK1·50 per unit
   Fixed cost = 235,000 – (90,000 x 1·50) = MK100,000
   Variable production overhead cost at 80,000 units = 80,000 x 1·50 = MK120,000

(a) Overhead absorption rate = 112,500/22,500 = MK5 per labour hour
Overhead efficiency variance = 5 x (16,000 – 22,000) = MK30,000 (F)
The fixed production overhead efficiency variance measures the difference between the standard fixed production overhead cost of the actual output and the fixed production overhead absorbed on the actual hours worked. It arises because of the efficiency or inefficiency of workers in producing the actual output, as measured by the difference between the standard labour hours and the actual labour hours for the actual output. Here, the efficiency of the workforce was higher than expected.

(b) Organisations formulate plans in order to achieve their objectives. Corporate or strategic planning is concerned with determining the direction in which the organisation is expected to move and with setting objectives to support this. Achievement of longer-term objectives

is supported in the shorter term by the budgetary planning process, which gives rise to the short-term financial plan known as a budget. Annual budgets, therefore, are the means by which organizations implement their long-term or strategic plan.

Budgetary planning requires the identification of the principal budget factor, which is the limiting factor as far as the organisation's activities are concerned. This limiting factor is usually sales volume in commercial organisations and so budget preparation would begin with formulating the sales budget. Where some other factor is limiting the organisation's activities, such as production capacity, achievement of strategic plans may call for financial investment in new machinery in order to remove this limiting factor.

Once the principal budget factor and its associated budget have been prepared, functional budgets and the master budget can be prepared. In a large organisation the preparation of these budgets will require planning and co-ordination between different aspects or areas of the business, since otherwise the budget might contain elements that are unrealistic or not achievable.

Budgetary Control

> "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". CIMA

Budgetary control is:

- A control technique whereby actual results are compared with budgets.
- Any differences (variances) are made the responsibility of key individuals who can either exercise control action or revise the original budgets.

Budgetary control and responsibility centres

These enable managers to monitor organisational functions. **A responsibility centre** can be defined as any functional unit headed by a manager who is responsible for the activities of that unit. There are four types of responsibility centres:

(a) *Revenue centres*
Organisational units in which outputs are measured in monetary terms but are not directly compared to input costs.

(b) *Expense centres*
Units where inputs are measured in monetary terms but outputs are not.

(c) *Profit centres*
Where performance is measured by the difference between revenues (outputs) and expenditure (inputs). Inter-departmental sales are often made using "transfer prices".

(d) *Investment centres*
Where outputs are compared with the assets employed in producing them, i.e. ROI.

Advantages of budgeting and budgetary control

There are a number of advantages to budgeting and budgetary control:

- Compels management to think about the future which is probably the most important feature of a budgetary planning and control system. Forces management to look ahead, to set out detailed plans for achieving the targets for each department, operation and (ideally) each manager, to anticipate and give the organisation purpose and direction.

- Promotes coordination and communication.
- Clearly defines areas of responsibility. Requires managers of budget centres to be made responsible for the achievement of budget targets for the operations under their personal control.
- Provides a basis for performance appraisal (variance analysis). A budget is basically a yardstick against which actual performance is measured and assessed. Control is provided by comparisons of actual results against budget plan. Departures from budget can then be investigated and the reasons for the differences can be divided into controllable and non-controllable factors.
- Enables remedial action to be taken as variances emerge.
- Motivates employees by participating in the setting of budgets.
- Improves the allocation of scarce resources.
- Economises management time by using the management by exception principle.

Management action and cost control

Producing information in management accounting form is expensive in terms of the time and effort involved. It will be very wasteful if the information once produced is not put into effective use.
There are five parts to an effective cost control system. These are:
(a) preparation of budgets
(b) communicating and agreeing budgets with all concerned
(c) having an accounting system that will record all actual costs
(d) preparing statements that will compare actual costs with budgets, showing any variances and disclosing the reasons for them, and
(e) taking any appropriate action based on the analysis of the variances in (d) above.

Action(s) that can be taken when a significant variance has been revealed will depend on the nature of the variance itself. Some variances can be identified to a specific department and it is within that department's control to take corrective action. Other variances might prove to be much more difficult, and sometimes impossible, to control.

Variances revealed are historic. They show what happened last month or last quarter and no amount of analysis and discussion can alter that. However, they can be used to influence managerial action in future periods.

Types of Control systems

There are two control systems: feedback and feed forward controls
(1) Feedback Control:
actual results are compared with planned outcomes at the end of a control period. Where the outcome of the comparison is not favourable, it is not possible to take corrective measures in the same period because it is too late for corrective action.
(2) Feed forward control
Planned outcomes are compared with projected outcomes based on actual performance so that it is known before the end of a control period whether the desired outcome will be achieved or not so that any corrective measures can be taken immediately. Therefore failure to achieve desired planned outcomes will be due to reasons beyond the control of managers or those responsible.

CHAPTER 12

VARIANCE ANALYSIS

Learning Objectives

By the end of this chapter, students should be able to:

- Know what is meant by variance and analysis and its purpose
- Understand the interdependence and relationship of variances
- Calculate labour, material, overhead and sales margin variance and reconcile actual profit with budgeted profit
- Identify the causes of labour, material, overhead and sales margin variances

Standard costing is a control system that enables any variances from standard cost or budget to be analysed in some detail. This allows for more effective cost control.

A variance is the difference between planned, budgeted or standard costs and actual cost; and similarly for revenue. The process by which the total difference between standard and actual results is determined is known as variance analysis.

> **Variance analysis**
> 'The evaluation of performance by means of variances, whose timely reporting should maximise the opportunity for managerial action.' *CIMA Official Terminology, 2005*

Variance analysis involves breaking down the total variance to explain:

1. How much of it is caused by the usage of resources differing from the standard

2. How much is caused by cost of resources differing from the standard

Together, variances can help to reconcile the total cost difference by comparing actual and standard cost. The main purpose of variances is to provide reasons for off-standard performance. In this way, management can improve operations, correct errors and deploy resources more effectively to reduce costs.

Direct material standards and variance analysis

Direct material standards are derived from the amount of material required for each product or operation. This should take into account the most suitable material for the product specification and design. It should also include any anticipated wastage or losses in the process.
Direct material standards should also consider the standard price of the material, based on the most suitable and competitive price as required by the most suitable quality of material. These prices should also include economic order quantity, discounts and credit terms offered by suppliers.

The standard material used and the standard cost of the material are combined to calculate the standard material cost. By comparing the actual material price and the actual material used with the standards calculated, the material price and the material usage variance can be determined.

In variance analysis, the problem is to decide whether the material price variance, should be based on the quantity of materials purchased or on the materials used. (Not all purchases may be used).

(a) If the closing stocks are valued at standard cost, the price variance is calculated on material purchases in the period.

(b) If the closing stocks are valued at actual cost (FIFO) the price variance is calculated on material used in production in the period.

A full standard costing system is usually in operation and therefore the price variance is calculated on purchases in the period. The variance on all purchases will be written off to the costing profit and loss account even though only part is included in the cost of production.

There are two main advantages in extracting the material price variance at the time of receipt

(a) If variances are extracted at the time of receipt they will be brought to the attention of managers earlier than if they are extracted as the material is used. If it is necessary to correct any variances then management action can be more timely.

(b) Since variances are extracted at the time of receipt, all stocks will be valued at standard price. This is administratively easier and it means that all issues from stocks can be made at standard price. If stocks are held at actual cost it is necessary to calculate a separate price variance on each batch as it is issued. Since issues are usually made in a separate in a number of small batches this can be a time consuming exercise, especially with a manual system.

Direct labour standards and variance analysis

Direct labour standards are derived from the analysis of activities required for different operations. Often a time and motion study is carried out to determine the most efficient production method, including operating conditions, equipment required and best practice.

Following this, the time is analysed to determine the standard hours required to complete an operation. Standard wage rates are identified using rates of pay for employees required to carry out the operation, which are normally set by the company. This standard time and standard wage rate are combined to calculate the standard labour rate.

Overhead standards – variable overheads

Where overheads vary with activities, a standard variable overhead rate is used. However, several different activity measures exist and it is important for the organisation to identify which measure influences overhead cost the most. For example, volume related variable overheads could vary with direct labour, machine hours, material quantities or number of units. In practice, the most frequently used are direct labour hours or machine hours.

The variable overhead rate per unit is applied to the standard labour or machine usage to calculate a standard variable cost per unit. The two variances calculated for variable overheads are:

1. The variable overhead expenditure variance, which is equal to the difference between the budgeted flexed variable overheads for the actual direct labour or machine hours of input, and the actual variable overheads incurred.

2. The variable overhead efficiency variance, which is the difference between the standard hours of input and the actual hours of input for the period, multiplied by the standard variable overhead rate.

Overhead standards – fixed overheads

These overheads are largely independent of changes in activity and remain unchanged in the short term over wide ranges of activity. The budgeted annual fixed overhead is divided by the budgeted level of activity to determine the standard fixed overhead rate per unit of activity.
Machine hours are normally used for machine-related overheads and direct labour hours are used for more labour-related overheads. This standard rate is applied to the standard labour or machine usage per unit to calculate the standard fixed overhead cost for a product.

The total fixed overhead variance is the difference between the standard fixed overhead charged to production and the actual fixed overhead incurred. An under- or over-recovery of overheads may occur because the fixed overhead rate is calculated by dividing budgeted fixed overheads by budgeted output. If actual output or fixed overhead expenditure differs from budget, then an under or over recovery will occur.

Therefore under- or over-recovery may be due to a fixed overhead expenditure variance arising from actual expenditure differing from budgeted expenditure. Alternatively, a fixed overhead volume variance may arise from actual production differing from budgeted production.

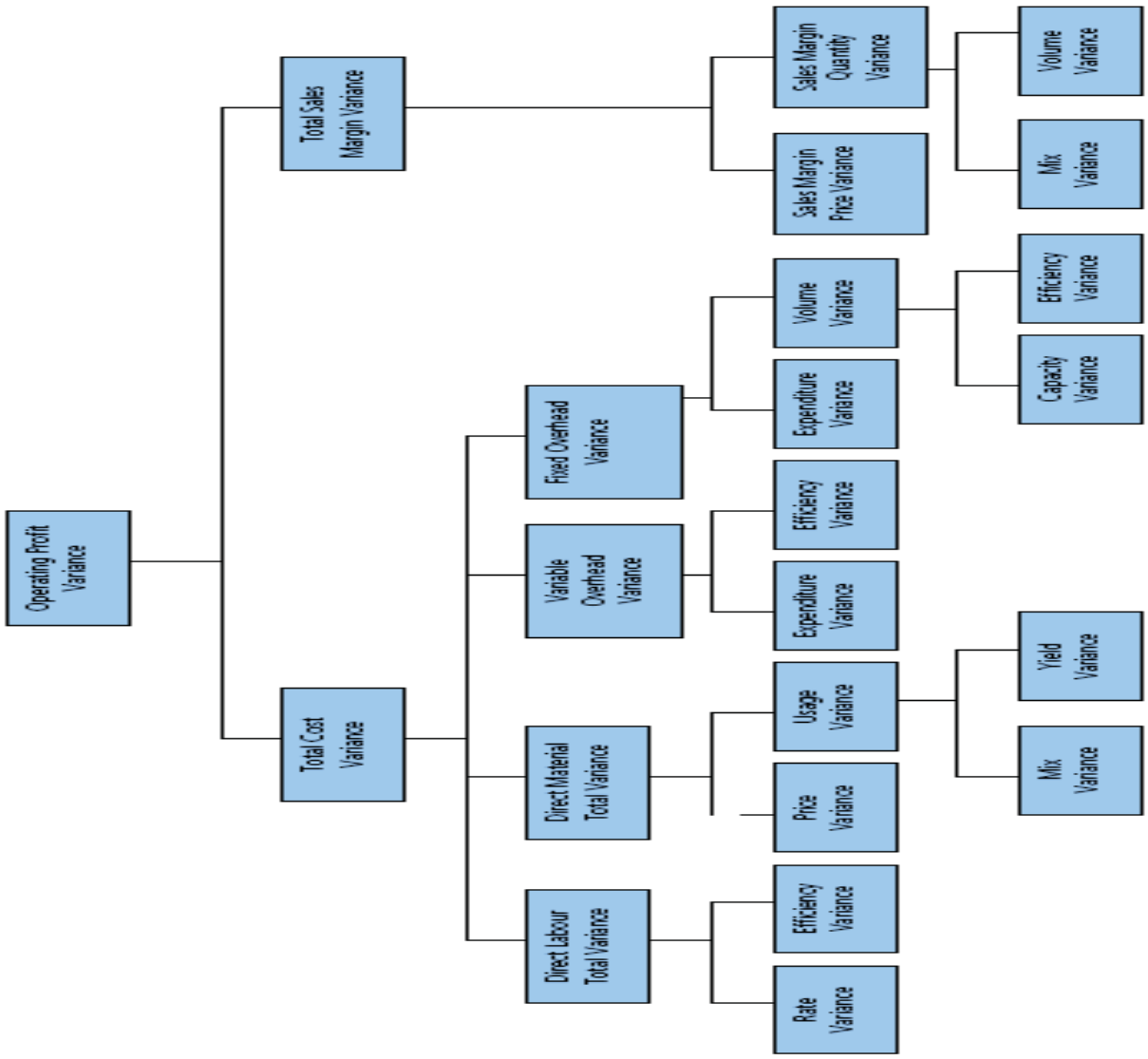


Chart of common variances: Adapted from Lucey, T. (1996). Costing, 5th ed. p. 432

The reasons for cost variances

There are many possible reasons for cost variances arising, including efficiencies of operations, errors in standard setting and changes in exchange rates. There now follows a list of a few possible causes of cost variances. This is not an exhaustive list and in an examination question you should review the information given and use your imagination and common sense to suggest possible reasons for variances.

Variance	Favourable	Adverse
Material price	Unforeseen discounts received Greater care taken in purchasing Changing in material standard	Price increase Careless purchasing

		Change in material standard
Material usage	Material used of higher quality than standard More effective use made of material Errors in allocating material to jobs	Defective material, Excessive waste Theft Stricter quality control Errors in allocating material to jobs
Labour rate of pay	Use of apprentices or other workers at a rate of pay lower than standard	Wage rate increase
Idle time		Machine breakdown Non-availability of material Illness or injury to worker
Labour efficiency	Output produced more quickly than expected, i.e. actual output in excess of standard output set for same number of hours because of work motivation, better quality of equipment or materials Errors in allocating time to jobs	Lost time in excess of standard allowed Output lower than standard set because of deliberate restriction, lack of training, or sub-standard material used Errors in allocating time to jobs
Overhead expenditure	Savings in costs incurred More economical use of services	Increase in cost of services used Excessive use of services Change in type of services used
Overhead efficiency	The same reasons as for the labour efficiency variance have caused overhead recovery to be different from standard	The same reasons as for the labour efficiency variance have caused overhead recovery to be different from standard
Overhead capacity	Excess of actual time worked over budget	Excessive idle time Shortage of plant capacity

Interdependence between variances

The cause of one variance may be wholly or partly explained by the cause of another variance. Examples could be as follows:

(a) If the purchasing department buys a cheaper material which is poorer in quality than the expected standard, the material price variance will be favourable, but this may cause material wastage and an adverse usage variance.

(b) Similarly, if employees used to do some work are highly experienced, they may be paid a higher rate than the standard wage per hour, but they should do the work more efficiently than employees of 'average' skill, i.e. an adverse rate variance may be compensated for by a favourable efficiency variance.

(c) An increase in sales price may result in a fall in sales volume below budgeted levels, i.e. a favourable sales price variance may result in an adverse sales volume variance.

Example 1

You have been asked to examine the performance of a subsidiary company for September 20X3.the subsidiary supplies kitchen units to the building industry. The standard cost of one unit is as follows:

		MK
Direct materials:	5kilos at MK4 per kilo	20.00
Direct labour	4 hours at MK6 per hour	24.00
Overheads:		
Variable	4 hours at MK1.50 per hour	6.00
Fixed	4 hours at MK2.50 per hour	10.00
Standard production cost		60.00

The standard selling price of one unit is MK100 and the budgeted sales were 1,200 units. The actual results were as follows:

- 1,300 units were made and sold for a total of MK134,500
- Direct material s used were 6,600 kilos at a total cost of MK25,080
- Direct labour was paid for 5,330 hours at a total cost of MK32,513 but actual operating hours were 5,300 due to a machine breakdown
- Actual variable overheads cost was MK8,400
- Actual fixed overheads were MK13,600

Required:

Prepare a variance report for management for September 20X3 reconciling the standard profit expected at actual production with the actual profit clearly showing sub-variances for each cost element and sales.

Solution

Working: from the standard cost card, standard profit = standard selling price less standard production cost i.e. MK100-MK60 = MK40 (based on standard absorption costing.)
Alternatively, a standard contribution can be calculated by subtracting variable costs from selling price or adding fixed overheads to standard profit i.e. MK100-MK50 = MK50 or MK40 + MK10 = MK50

A variance is either **Favourable (F)** or **Adverse (A)** depending on its effect on profit or contribution

Using Narrative approach

1 **Sales variances:**

			MK	
(a)	Price variance:			
	1300 units should sell for	(x MK100)	130,000	
	But did sell for		134,500	
	Sales price variance		**4,500**	**F**
(b)	Sales Volume variance:			
	Budgeted sales (units)		1,200	
	Actual sales		1,300	

Sales volume variance in units			100	F
Standard profit		x	40.00	
Sales Volume Profit variance	(100x MK40)		**4,000**	**F**

2 **Cost variances**

Direct materials

(a) Material price variance:			MK	
6,600 kilos should cost	(xMK4/kilo)		26,400	
But did cost			25,080	
Material price variance			**1,320**	**F**
(b) Material usage variance:				
1,300 units produced should use	(x5kilos)		6,500	
But did use			6,600	
Usage variance in kilos			100	A
Standard cost per kilo		x	MK4.00	
Material usage variance			**400**	**A**

(c) Total material cost variance:				
Actual materials cost			25,080	
Standard cost	(1,300units*MK20)		26,000	
Total material cost variance			**920**	**F**

{Check: Total material cost variance = Price + usage i.e. MK1,320 (F) - MK400(A) = MK920(F)}

Direct labour

(a) Labour Rate variance:			MK	
5,330 hour paid for should cost	(x MK6/ hr)		31,980	
But did cost			32,513	
Labour rate variance			**533**	**A**
(b) Labour Efficiency variance				
1,300 units should take	(x 4hrs/unit)		5,200	
But did take			5,300	
Labour efficiency variance in hours			100	A
Standard cost per labour hour		x	MK6.00	
Labour efficiency variance			**600**	**A**

(c) Idle time variance				
Actual hours paid for			5,330	
Actual hour worked (operating hours)			5,300	
Idle time in hours (due to machine breakdown)			30	A
Standard labour rate		x	MK6.00	
Idle time variance			**180**	**A**

(d) Total labour cost variance:			MK	
Actual labour cost			32,513	
Standard cost	(1,300 units x MK24)		31,200	
Total cost variance			**1,313**	**A**

Variable overheads

(a) Expenditure Variance			MK	
5,300 actual operating hour should cost	(xMK1.50)		7,950	

	But did cost		8,400	
	Variable overhead Expenditure variance		**450**	**A**
(b)	Efficiency variance			
	Labour efficiency in hours		100	A
	Standard variable overhead absorption rate	x	MK1.50	
	Variable overheads efficiency variance		**150**	**A**
	Fixed overheads			
(a)	Expenditure variance		MK	
	Budgeted expenditure	(1,200 units x MK10)	12,000	
	Actual expenditure		13,600	
	Fixed overheads expenditure variance		**1,600**	**A**
(b)	Volume variance			
	Units basis:			
	Budgeted volume		1,200	
	Actual volume		1,300	
	Volume variance		100	F
	Standard absorption rate per unit	x	MK10	
	Fixed overheads volume variance		**1,000**	**F**
	Labour hours basis:			
	Budgeted volume	(1,200 x 4hours)	4,800	
	Actual volume utilised	(1,300 x 4hours)	5,200	
	Volume variance		400	F
	Standard absorption rate per hour	x	MK2.50	
	Fixed overheads volume variance		**1,000**	**F**

Note:
Fixed overheads volume variance represents over or under-absorption under standard absorption costing but is not necessary under standard marginal costing.

It can also be analysed further into capacity and efficiency variances as follows:

Capacity variance				
Budgeted capacity in labour hours			4,800	
Actual capacity utilised			5,300	
Capacity variance in hours			500	F
Standard absorption rate per hour		x	MK2.50	
Capacity variance			**1,250**	**F**
Efficiency variance:				
Labour efficiency in hours			100	A
Standard absorption rate		x	MK2.50	
Efficiency variance			**250**	**A**

Check: Fixed overheads Volume Variance = Capacity + Efficiency Variances i.e.
1,250 (F) – 250 (A) = 1,000 (F)

Operating statements

Two approaches will be used to show the difference between standard absorption and standard marginal costing systems

1 **Standard absorption costing**

			MK	
Budgeted Profit		(1,200 x MK40)	48,000	
Sales volume profit variance			4,000	F
Standard profit on actual sales		(1300 x MK40)	52,000	
Sales price variance			4,500	F
Actual sales less standard cost of sales			56,500	
Cost variances	Favourable (F)	Adverse (A)		
Direct materials:				
Price	1,320			
Usage		400		
Direct labour:				
Rate		533		
Efficiency		600		
Idle time		180		
Variable overheads:				
Expenditure		450		
Efficiency		150		
Fixed overheads				
Expenditure		1,600		
Volume	1,000			
Totals	2,320	3,913	(1,593)	
Actual profit			**54,907**	

Check: **Actual operating statement**

	MK	MK
Sales		134,500
Less: Cost of Sales		
Direct Materials	25,080	
Direct labour	32,513	
Variable overheads	8,400	
Fixed overheads	13,600	79,593
Gross profit		**54,907**

Standard marginal costing

		MK	
Budgeted contribution	(1,200 x MK50)	60,000	
Sales volume contribution variance	(100 x MK50)	5,000	F
Standard contribution on actual sales	(1300 x MK50)	65,000	
Sales price variance		4,500	F

Actual sales less standard cost of sales			69,500	
Cost variances	Favourable (F)	Adverse (A)		
Direct materials:				
Price	1,320			
Usage		400		
Direct labour:				
Rate		533		
Efficiency		600		
Idle time		180		
Variable overheads:				
Expenditure		450		
Efficiency		150		
Totals	1,320	2,313	(993)	
Actual contribution			68,507	
Fixed overheads:				
Budgeted expenditure			12,000	
Expenditure variance			1,600	A
			(13,600)	
Actual profit			**54,907**	

Example 2

McDermott plc is a manufacturer of beds. It uses a standard absorption costing system to monitor performance of managers and departments. A standard absorption cost card for one of its models, the Dreamer, is given below.

		MK
Selling price		250·00
Production costs		
Direct material: 12 metres at MK1·50 per metre	18·00	
Direct labour: 4 hours at MK6·00 per hour	24·00	
Variable overhead: 4 hours at MK15·00 per hour	60·00	
Fixed overhead: 4 hours at MK10·00 per hour	40·00	
		142·00
Gross profit		MK108·00

Budgeted production and sales are 1,000 Dreamers per month.
Actual results for the manufacture and sale of Dreamers for the most recent month were as follows:
Sales: 1,200 beds at MK240 each.
Production: 1,300 beds
Direct material (purchased and used): 16,000 metres at MK1·40 per metre
Direct labour (worked and paid): 5,000 hours at MK6·00 per hour
Variable overhead MK75,500
Fixed overheads MK54,600.
There were no opening stocks of finished goods.

Required

(a) Prepare a variance report clearly showing all sub variances in order to reconcile budgeted and actual profit **(14 marks)**

(b) Explain the differences between standard absorption costing and standard marginal costing in the following areas:
(i) the sales volume variance;
(ii) the fixed overhead variances;
(iii)stock valuation and its effect upon profit.
(no further calculations are required) **(6 marks)**

(TOTAL:20 marks)

Solution

				MK	
Budgeted profit				108,000	
Sales volume profit variance				21,600	F
Standard profit				129,600	
Sales price variance				12,000	A
Actual sales less std cost of sales				117,600	
Cost Variances		F	A		
		MK	MK		
Direct materials	Price	1,600			
	Usage		600		
Direct labour	Rate	-	-		
	Efficiency	1,200			
Variable Overhead	Expenditure		500		
	Efficiency	3,000			
Fixed Overhead	Expenditure		14,600		
	Volume	12,000			
		17,800	15,700	2,100	F
Actual profit				119,700	
Actual Results				MK	
Sales				288,000	
Less Cost of sales					
Production	1300 beds	182,500			
Closing stock	100 beds	14,200			
				168,300	
Actual gross profit				119,700	

(b) Differences between standard absorption and standard marginal costing

Sales volume variance

This variance measures the effect on profit of selling more (or less) units than budgeted. Under absorption costing this is calculated at standard profit per unit. Note that in calculating standard profit per unit all costs, both fixed and variable, are charged against standard selling price. Under standard marginal costing the variance is calculated at standard contribution per unit. In calculating standard contribution per unit only standard variable costs are charged against standard selling price.

Fixed overhead variances

The expenditure variance (the difference between actual and budgeted expenditure) is the same under both approaches. Under absorption costing fixed overheads are charged to individual units of production via an overhead absorption rate. If production volume differs from that budgeted this can result in under or over absorption of overhead and resultant adverse or favourable volume variance. In turn this volume variance can be subdivided into capacity and efficiency variances.

Under marginal costing, fixed overheads are not charged to individual units of production and thus no under or over absorption, or volume variance, occurs.

Stock valuation and its effect upon profit

The profit figures under the two systems may be different due to the different costing principles involved. Under absorption costing finished goods stock is valued at full production cost, which includes both fixed and variable production cost. Under a marginal costing system finished goods stock is valued at variable production cost only. This will result in differences in stock valuations and possibly differences in cost of sales figures. In a period when production is greater than sales (as in the most recent month) absorption costing will show the higher profit figure as a proportion of the current period's fixed production costs will be absorbed into units included in closing stock and be carried forward into the next period. This will result in absorption costing showing a lower cost of sales and a higher profit than marginal costing.

Working backwards

Students should be prepared to tackle examination questions on working backwards. An examination type question will be used to illustrate the procedure:

The following information has been made available by the management accountant of Chifuniro Ltd.

Operating Income Statement for the month of November 20X8

		MK	MK	MK
Budgeted Profit				50,000
Variances		Favourable	Adverse	
Sales	Price	4,800		
	Volume		2,000	
Direct materials	Price		4,960	
	Usage		3,200	
Direct wages	Rate		3,600	
	Efficiency	1,800		
Fixed production	Expenditure	1,400		
Overheads	Efficiency	1,200		
	Capacity		2,000	
		9,200	15,760	(6,560)
Actual profit				43,440

Budgeted information for the period is as follows:

Output for the year is 60,000 units

Fixed production overhead for the year is MK240,000

Production and sales are expected to be evenly spread during the year

Standard cost of one unit of product:

Direct materials: 5 kg at MK4 per kg

Direct wages: 2 hours at MK3 per hour

Fixed production overheads are absorbed on direct labour hour basis

Profit is 25% of sales price

Required:

Reconstruct the actual profit and loss statement for the month of November. **(16 marks)**

Describe briefly two different types of standards which may be used as bases for a standard costing system. **(4 marks)**

(Total: 20 marks)

Solution

Prepare a Standard Cost Card as follows:

		MK
Direct materials	5kg @ MK4.00/kg	20.00
Direct labour	2hrs @ MK3.00/hr	6.00
Fixed production overheadsW1	2hrs @ MK2.00/hr	4.00
STANDARD PRODUCT COST		30.00
Standard profit W2		10.00
Standard selling price		40.00

W1 Overhead absorption rate-OAR = MK240,000 ÷ (2 x 60,000) hours
= MK2.00 per hour

W2 Profit margin = 25% of sales price
Given sales price = 100%
Standard product cost = 75%
Standard selling price = MK30.00 ÷ 75%
= MK40.00
Standard profit = $^{100}/_{75}$ x MK30.00
= MK10.00

Actual operating statement for November 20x8

	MK	MK
Sales W1		196,800
Less Cost of sales:		
Direct materials W2	104,160	
Direct labour W3	30,600	
Fixed factory overheads W4	18,600	
		153,360
Actual profit		43,440

Note that the actual profit is the same as the one given in the question which means that the answer is correct. You can as well check yourself during an examination before submitting your answer sheet

Workings

1. Actual sales:

Budgeted sales per month	(60,000 units/12)	5,000	
Sales volume variance	MK2,000/MK10(std profit)	200	A
Actual sales volume		4,800	
Standard selling price		X MK40.00	
Standard sales		192,000	
Sales price variance		4,800	F
Actual sales		**196,800**	

2. Direct materials cost

Standard quantity of materials	(4,800 x 5kg)	24,000kg	
Usage variance in kg	(MK3200/MK4/kg)	800kg	A
Actual quantity used		24,800kg	

		MK	
Standard cost of actual quantity	(24,800kg x MK4/kg)	99,200	
Material price variance		4,960	A
Actual cost of materials		**104,160**	

3. Direct labour cost

Standard usage of labour	(4,800 units x 2hrs/unit)	9,600hrs	
Efficiency variance in hours	(MK1,800/MK3/hr)	600hrs	F
Actual operating hours		9,000hrs	

		MK	
Standard cost of actual hours worked	9,000hrs x MK3/hr)	27,000	
Labour rate variance		3,600	A
Actual cost of labour		**30,600**	

4. Fixed production overheads

		MK	
Budgeted expenditure	(5,000 units x MK4/unit)	20,000	
Expenditure variance		1,400	F
Actual expenditure		**18,600**	

END OF CHAPTER QUESTION

The Makata plant of Chemicals Limited produces an industrial chemical. At the beginning of the year, the plant had the following standard cost card:

		K
Direct materials	(10kg @ K16.00 per kg)	160.00
Direct materials	(0.75hr @ K180.00 per hr)	135.00
Variable overhead	(0.75 hr @ K30.00 per hr)	22.50
Fixed overhead	(0.75 hr @ K40.00 per hr)	30.00
Standard cost per unit		347.50

The plant calculates its overhead rates using practical capacity which is 7,200 units. The actual results for the year are as follows:

(i) 7,000 units were produced.
(ii) 74,400 kg of direct materials were purchased at K15.00 per kg.
(iii) 73,600 kg of direct materials were used.
(iv) 5,600 hours of direct labour were worked at a rate of K179.00 per hour.
(v) Variable overhead amounted to K175,400.
(vi) Fixed overhead amounting to K214,000 was incurred.

Required:

(a) Calculate the following variances:

(i) Price and usage variances for direct materials. **4 Marks**

(ii) Direct labour rate and direct labour efficiency variances. **4 Marks**

(iii) Variable overhead expenditure and efficiency variances. **4 Marks**

(iv) Fixed overhead expenditure and volume variance. **4 Marks**

(b) What does the fixed overhead volume variance mean? **4 Marks**

Total: 20 Marks

CHAPTER 13

COST-VOLUME-PROFIT ANALYSIS

Learning Objectives

By the end of this chapter, students should be able to:

- Understand Cost-Volume-Profit (CVP) analysis
- Know basic CVP Analysis formulas
- Be able to draw traditional and contribution break-even charts
- Understand profit graphs
- Know the assumptions and limitations of CVP analysis

Breakeven Analysis and Breakeven Point

Cost and management accounting is concerned not just with recording historical costs, and with budgetary control, but also with the provision of information which will help managers to make decisions for the future. To forecast costs, accountants must know about the cost behaviour of all cost items.

One way of providing information about expected future costs and revenues for management decision making is breakeven analysis.

Breakeven analysis is an application of marginal costing techniques and is sometimes called CVP or cost-volume-profit analysis, which is often used in budget planning, by marketing managers as well as by accountants.

Uses of breakeven analysis

(a) To provide information to management about cost behaviour, for routine planning and 'one-off' decision making

(b) To determine what volume of sales is needed at any given budgeted sales price in order to break even, and to identify the 'risk' in the budget by measuring the margin of safety

(c) To calculate the effects on profit of changes in variable costs, C/S ratios, sales price and volume, product mix, and so on

Assumptions of CVP Analysis

Before any formulas are given or graphs drawn, the major assumptions behind CVP analysis must be stated. These are:
(a) All costs can be resolved into fixed and variable elements.
(b) Fixed costs will remain constant and variable costs vary proportionately with activity.
(c) Over the activity range being considered costs and revenues behave in a linear fashion.
(d) That the only factor affecting costs and revenues is volume.
(e) That technology, production methods and efficiency remain unchanged.
(f) Particularly for graphical methods, that the analysis relates to one product only.
(g) There are no stock level changes or that stocks are valued at marginal cost only.

(h) There is assumed to be no uncertainty.

You should now understand that by using marginal costing techniques, it is possible to ascertain the contribution per unit. The total contribution from all sales during a period is then compared with the fixed costs for that period; any excess or deficiency of contribution over fixed costs represents the profit or loss respectively for the period.

The management of an organisation usually wishes to know not only the profit likely to be made if the aimed-for production and sales for the year are achieved, but also the point at which neither profit nor loss occurs (*the breakeven point*) and the amount by which actual sales can fall below anticipated sales without a loss being incurred.

The breakeven point can be calculated arithmetically. The number of units needed to be sold in order to break even will be the total fixed costs divided by the contribution per unit. This is because the contribution required to break even must be an amount which exactly equals the amount of fixed costs.

$$\text{Breakeven point (BEP)} = \frac{\text{Total fixed costs}}{\text{Contribution per unit}} = \frac{\text{Required contribution to breakeven}}{\text{Contribution per unit}}$$

= Number of units of sale required to break even.

Example:

Expected sales	10,000 units at MK8 = MK80,000
Variable cost	MK5 per unit
Fixed costs	MK21,000

Required
Compute the breakeven point.

Solution

The contribution per unit is MK(8-5)	=	MK3
Contribution required to break even	=	fixed costs = MK21,000
Breakeven point (BEP)	=	MK21,000 ÷ MK3
	=	7,000 units
In revenue, BEP	=	(7,000 x MK8)
	=	MK56,000

Sales above MK56,000 will result in profit of MK3 per unit of additional sales and sales below MK56,000 will mean a loss of MK3 per unit for each unit by which sales fall short of 7,000 units. i.e profit will improve or worsen by the amount of contribution per unit

	7,000 units		*7001 units*
	MK		*MK*
Revenue	56,000		56,008
Less variable costs	35,000		35,005
Contribution	21,000		21,003
Less fixed costs	21,000		21,000
Profit	0	(= breakeven)	3

Breakeven Analysis and the Contribution/Sales ratio (C/S)

An alternative way of calculating the breakeven point to give an answer in terms of sales revenue is as follows.

Sales revenue at breakeven point = $\frac{\text{Fixed costs}}{\text{C/S ratio}} = \frac{\text{Required contribution}}{\text{C/S ratio}}$

(The C/S ratio is also sometimes called a profit/volume or P/V ratio).

In the example given above the C/S ratio is MK3/ MK8 = 37.5%

Breakeven is where sales revenue equals MK21,000/ 37.5% = MK56,000

At a price of MK8 per unit, this represents 7,000 units of sales.

The contribution/sales ratio is a measure of how much contribution is earned from each MK1 of sales. The C/S ratio of 37.5% in the above example means that for every MK1 of sales, a contribution of MK0.375 is earned. Thus, in order to earn a total contribution of MK21,000 and if contribution increases by $37^1/_2$ tambala per MK1 of sale, sales must be:

$$\frac{\text{MK1}}{37^1/_2 \text{ tambala}} \times \text{MK21,000}$$

$$= \frac{\text{MK21,000}}{37^1/_2 \text{ tambala}} \text{ or } \text{MK56,000}$$

The margin of safety

In budgeting, the *margin of safety* is a measure by which the budgeted volume of sales is compared with the volume of sales required to breakeven. It is the difference in units between the budgeted sales volume and the breakeven sales volume and it is sometimes expressed as a percentage of the budgeted sales volume. (It may also be expressed as the difference between the budgeted sales revenue and breakeven sales revenue, expressed as a percentage of the budgeted sales revenue.)
In essence, the margin of safety assesses the vulnerability of a company to a fall in demand. If the margin of safety is narrow, a small decrease in sales may lead to the company making a loss.

Example

Mapundi Ltd makes and sells a product which has a variable cost of MK30 and which sells for MK40. Budgeted fixed costs are MK70,000 and budgeted sales are 8,000 units. What is the breakeven point and what is the margin of safety?

Solution

(a) Breakeven point = $\frac{\text{fixed costs (required contribution)}}{\text{contribution per unit}}$ = $\frac{\text{MK70,000}}{\text{MK(40-30)}}$

= 7,000 units

(b) Margin of safety = 8,000 - 7,000 units = 1,000 units

which may be expressed as $\frac{1{,}000 \text{ units}}{8{,}000 \text{ units}} \times 100\%$ = $12\frac{1}{2}$ % of budget

(c) The margin of safety indicates to management that actual sales can fall short of budgetary by 1,000 units or $12\frac{1}{2}$ % before the breakeven point is reached and no profit at all is made.

Breakeven arithmetic

(a) At the breakeven point, sales revenue equals total costs and there is no profit.

S = V + F

where:

S = Sales revenue

V = Total variable costs

F = Total fixed costs

(b) Subtracting V from each side of the equation, we get:

S - V = F, i.e. total contribution = fixed costs.

Example: breakeven arithmetic

Tsukwambe Ltd makes a product which has a variable cost of MK7 per unit. If fixed costs are MK63,000 per annum, what must the selling price per unit be if the company wishes to break even with a sales volume of 12,000 units?

Solution

Required contribution to break even (= Fixed costs)	MK63,000
Volume of sales	12,000 units
	MK
Required contribution per unit (S - V) i.e. MK63,000 ÷12,000	5.25
Variable cost per unit (V)	7.00
Required sales price per unit (S)	12.25

Target profits

A similar formula may be applied where a company wishes to achieve a certain profit during a period. To achieve this profit, i.e.

S = V + F + P, where

P = required profit

Subtracting V from each side of the equation, we get:

S - V = F + P, i.e.

Total contribution required = F + P

Example:

Nantani Ltd makes and sells a single product, for which variable costs are as follows.

	MK
Direct materials	10
Direct labour	8
Variable production overhead	4
Variable sales overhead	2
	24

The sales price is MK30 per unit, and fixed costs per annum are MK68,000. The company wishes to make a profit of MK16,000 per annum. What sales are required to achieve this profit?

Solution

Required contribution = fixed costs + profit
= MK68,000 + MK16,000
= MK84,000

Required sales can be calculated in one of two ways.

(a) $\frac{\text{Required contribution}}{\text{Contribution per unit}} = \frac{\text{MK84,000}}{\text{MK(30-24)}}$
= 14,000 units, (or MK420,000 in revenue)

(b) $\frac{\text{Required contribution}}{\text{C/S ratio}} = \frac{\text{MK84,000}}{20\%}$
= MK420,000 of revenue, (or 14,000 units)

Example: target profit (2)

Bonzo Ltd makes and sells three products, X, Y and Z. The selling price per unit and costs are as follows.

		X	*Y*	*Z*
Selling price per unit		MK80	MK50	MK70
Variable cost per unit		MK50	MK10	MK20
Fixed costs per month	MK160,000			

The maximum sales demand per month is 2,000 units of each product and the minimum sales demand is 1,000 of each.

Required

(a) Comment on the potential profitability of the company.
(b) Suppose that there is a fixed demand for X and Y of 1,500 units per month, which will not be exceeded, but for which firm orders have been received. Calculate the number of units of Z that would have to be sold to achieve a profit of at least MK25,000 per month.

Solution

(a) When there is no indication about whether marginal or absorption costing is in use, it is simpler (and more informative too) to assess profitability with contribution analysis and marginal costing. This is the requirement in part (a) of the problem. The obvious analysis to make is a calculation of the worst possible and best possible results.

	Best possible			Worst possible		
	Sales units	Cont'n per unit MK	Total contribution MK	Sales units	Cont'n per unit MK	Total contribution MK
X	2,000	30	60,000	1,000	30	30,000
Y	2,000	40	80,000	1,000	40	40,000
Z	2,000	50	100,000	1,000	50	50,000
Total contribution			240,000			120,000
Fixed costs			160,000			160,000
Profit/(loss)			80,000			(40,000)

The company's potential profitability ranges from a profit of MK80,000 to a loss of MK40,000 per month.

(b) The second part of the problem is a variation of a 'target profit' calculation.

		MK	MK
Required (minimum) profit per month			25,000
Fixed costs per month			160,000
Required contribution per moth			185,000
Contribution to be earned from:			
Product X	(1,500 x MK30)	45,000	
Product Y	(1,500 x MK40)	60,000	
			105,000
Contribution required from product Z			80,000
Contribution per unit of Z			MK50
Minimum required sales of Z per month			1,600 units

Decision to change sales price or costs

You may come across a problem in which you will be expected to offer advices as to the effect of altering the selling price, variable cost per unit or fixed cost.

These problems are slight variations on basic breakeven arithmetic, and some examples will be used to illustrate typical questions.

Example

Nabetha Ltd bakes and sells a single type of cake. The variable cost of production is MK0.15 and the current sales price is MK0.25. Fixed costs are MK6,000 per month, and the annual profit for the company at current sales volume is MK36,000. The volume of sales demand is constant throughout the year.

The sales manager, Pius Banda, wishes to raise the sales price to MK0.29 per cake, but considers that a price rise will result in some loss of sales.

Required

What is the minimum volume of sales required each month to justify a rise in price to MK0.29?

Solution

The minimum volume of demand which would justify a price of MK0.29 is one which would leave total profit at least the same as before, i.e. MK3,000 per month. Required profit should be converted into required contribution, as follows:

		MK
Monthly fixed costs		2,600
Monthly profit, minimum required		3,000
Current monthly contribution		5,600
Contribution per unit	(25t – 15t)	10t
Current monthly sales	(MK5,600/.01)	56,000 cakes

The minimum volume of sales required after the price rise will be an amount which earns a contribution of MK5,600 per month, i.e. no worse than at the moment. The contribution per cake at a sales price of 29 tambala would be 14 tambala.

Required sales = $\frac{\text{required contribution}}{\text{contribution per unit}}$

= $\frac{\text{MK5,600}}{\text{14 tambala}}$

= 40,000 cakes per month.

Example:

Mauni Ltd makes a product which has a variable production cost of MK8 and a variable selling cost of MK2 per unit. Fixed costs are MK40,000 per annum, the sales price per unit is MK18, and the current volume of output and sales is 6,000 units.

The company is considering whether to have an improved machine for production. Annual hire costs would be MK10,000 and it is expected that the variable cost of production would fall to MK6 per unit.

Required

(a) Calculate the number of units that must be produced and sold to achieve the same profit as is currently earned, if the machine is hired.

(b) Calculate the annual profit with the machine if output and sales remain at 6,000 units per annum.

Solution

The current unit contribution is MK(18 - (8 + 2)) = MK8

		MK
(a) Current contribution	(6,000 x MK8)	48,000
Less current fixed costs		40,000
Current profit		8,000

With the new machine fixed costs will go up by MK10,000 to MK50,000 per annum. The variable cost per unit will fall to MK(6 + 2) = MK8 and the contribution per unit will be MK10.

	MK
Required profit (as currently earned)	8,000
Fixed costs	50,000
Required contribution	58,000
Contribution per unit	MK10
Sales required to earn MK8,000 profit	5,800 units

(b) If sales are 6,000 units

		MK
Sales (6,000 X MK18)		108,000
Variable costs: production (6,000 x MK6)	36,000	
Variable selling costs (6,000 x MK2)	12,000	
		48,000
Contribution (6,000 x MK10)		60,000
Less fixed costs		50,000
Profit		10,000

Alternative calculation

	MK
Profit at 5,800 units of sale (see (a))	8,000
Contribution from sale of extra 200 units (x MK10)	2,000
Profit at 6,000 units of sale	10,000

Example

Lisbon Ltd achieved the following results in 20X1.

	MK'000	*MK'000*
Sales		2,000
Cost of sales		
Direct materials	800	
Direct labour	400	
Overheads	600	
		1,800
Profit		200

Throughout 20X1, the sales price was MK10 per unit, and variable overheads, which vary with the number of units produced, amount to MK1 per unit.

Required

Using CVP analysis, calculate the sales volume necessary to achieve a profit of MK330,000 in 20X2 if, at beginning of the year, the sales price is increased by MK0.50 per unit, but the increases in cost above 20X1 levels are expected to be as follows.

Direct materials	10%
Direct labour	15%
Variable overhead	10%
Fixed overheads	20%

Comment on the result obtained.

Solution

In 20X1 sales were 200,000 units. The variable cost per unit is therefore as follows.

	20X1 20X2	*prediction*
	MK	*MK*
Direct materials	4	(+10%)4.40
Direct labour	2	(+15%)2.30
Variable overheads	1	(+10%)1.10
		7
	7.80	

Fixed costs		*MK*
20X1 total overhead (fixed plus variable)	600,000	
Variable overhead in 20X1	(200,000)	
	200,000	
Fixed overhead in 20X1	400,000	
Add 20%	80,000	
Estimated fixed overhead in 20X2		480,000

In 20X2, a profit of MK330,000 is required.	*MK*
Required profit	330,000
Fixed costs	480,000
Required contribution	810,000

Contribution per unit in 20X2	(*MK*10.50 -*MK*7.80	*MK*2.70
Required sales	MK810,000/MK2.70 per unit	300,000 units

This is an increase of 50% on 20X1 volumes. It is first of all questionable whether such a large increase could be achieved in one year. Secondly, given such an increase, it is likely that output will be outside the *relevant range* of output, and the estimates of fixed costs and variable costs are unlikely to be reliable.

Sales price and sales volume

It may be clear by now that, given no change in fixed costs, total profit is maximised when the total contribution is at its maximum. Total contribution in turn depends on the unit contribution and on the sales volume.

An increase in the sales price will increase unit contribution, but sales volume is likely to fall because fewer customers will be prepared to pay the higher price. A decrease in sales price will reduce the unit contribution, but sales volume may increase because the goods on offer are now cheaper. The optimum combination of sales price and sales volume is arguably the one which maximises total contribution.

Example:

Lizaya Ltd has developed a new product which is about to be launched on to the market. The variable cost of selling the product is MK12 per unit. The marketing department has estimated that at a sales price of MK20, annual demand would be 10,000 units.

However, if the sales price is set above MK20, sales demand would fall by 500 units for each 50c increase above MK20. Similarly, if the price is set below MK20, demand would increase by 500 units for each 50c stepped reduction in price below MK20.

What is the price which would maximise Lizaya Ltd's profit in the next year?

Solution

At a price of MK20 per unit contribution would be MK(20-12) =MK8. Each 50 tambala increase (or decrease) in price would raise (or lower) the unit contribution by 50 tambala. The total contribution is calculated at each sales price by multiplying the unit contribution by the expected sales volume.

	Unit price	*Unit contribution*	*Sales volume*	*Total contribution*
	MK	MK	Units	MK
	20.00	8.00	10,000	80,000
(a)	*Reduce price*			
	19.50	7.50	10,500	78,750
	19.00	7.00	11,000	77,000
(b)	*Increase price*			
	20.50	8.50	9,500	80,750
	21.00	9.00	9,000	81,000
	21.50	9.50	8,500	80,750
	22.00	10.00	8,000	80,000
	22.50	10.50	7,500	78,750

The total contribution would be maximised, and therefore profit maximised, at a sales price of MK21 per unit, and sales demand of 9,000 units.

Applying the principles of breakeven analysis

If you think you understand the principles of breakeven analysis you should be able to work out your own solutions to the following exercise. Notice, by the way, that the questions deal with changes in selling prices, sales volumes, variable costs and fixed costs, hence the term cost-volume-profit analysis.

Exercise

(a) If a company reduces its selling prices by 20% to 80/100 of their former level, but increases its sales volumes by 20% as a consequence of the price reduction, then profits will be unchanged. True or false?

(b) If a company introduces automation into its work practices, so that unit variable costs fall, but fixed costs increases substantially, with the result that profitability at current sales volumes remains unchanged, then the decision to automate would have been irrelevant to the future profitability of the company. True or false?

Solution

(a) False. The problem should be considered in terms of contribution, and it is helpful to use algebra.

Let the current sales price be s
and the variable unit cost be v
and the sales quantity be q
Total contribution = contribution per unit x volume of sales
= (s - v)q
= qs - qv

With the reduction in sales price to 0.8s, and the increase in sales volume to 1.2q, total contribution would be:

(0.8s - v) 1.2q
= 0.96qs - 1.2qv

Total contribution would be less, because sales revenue would fall (qs to 0.96qs) and total variable costs would rise (qv to 1.2qv).

(b) False. Although total contribution and profits are unchanged at the current sales volume, the automation will have important consequences for any increase or fall in sales demand in the future, because the ratio of contribution to sales has increased. An increase in sales volume will now result in a faster rate of increase in profits (just as a fall in sales volume would reduce profitability at a faster rate).

Breakeven Charts and Profit/Volume Charts

The breakeven point can also be determined graphically. A breakeven chart is prepared showing on the horizontal axis the sales/output (in units or in value) and on the vertical axis values for sales revenue and costs. The following lines are then drawn.

a. The *sales line* which starts at the origin (zero sales volume = zero sales revenue) and ends at the point which signifies the expected sales.

b. The *fixed costs* line which runs above and parallel to the horizontal axis, at a point on the vertical axis denoting the total fixed costs.

c. The *total costs* line, which starts at the point where the fixed costs line meets the vertical axis (at zero output), and ends at the point which represents, on the horizontal axis, the anticipated sales in units, and on the vertical axis the sum of the total variable cost of those units plus the total fixed costs.

The break-even point is the intersection of the sales line and the total costs line. By projecting the lines horizontally and vertically from this point to the appropriate axes, it is possible to read off the break-even point in sales units and sales value.

The number of units represented on the chart by the distance between the break-even point and the expected (or budgeted) sales, in units, indicates the margin of safety.

Note. It is important that you should be able to draw all of the charts described in the following paragraphs.

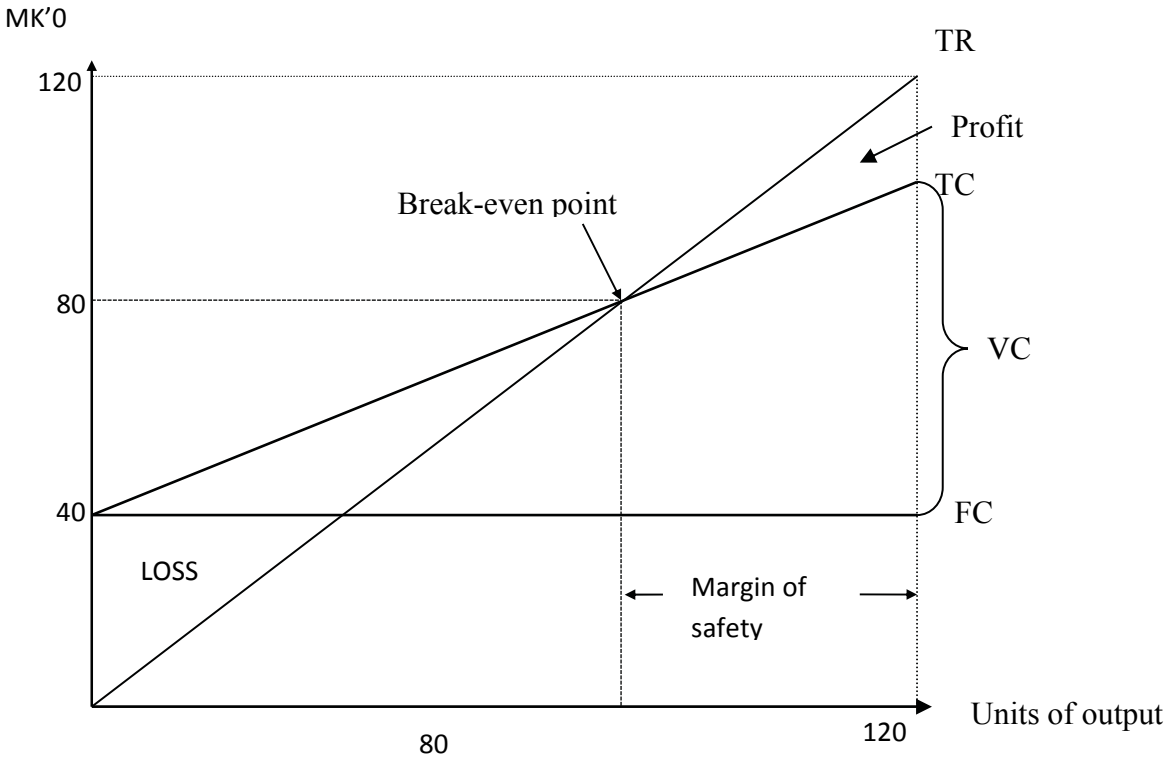
Example:

The budgeted annual output of a factory is 120,000 units. The fixed overhead amounts to MK40,000 and the variable costs are 50c per unit. The average sales price is MK1 per unit.

Construct a break-even chart showing the current break-even point and profit earned up to the present maximum capacity.

Solution

	MK
Sales (120,000 units)	120,000
Variable costs	60,000
Contribution	60,000
Fixed costs	40,000
Profit	20,000



The chart is drawn as follows.

(a) The y axis represents money (costs and revenue) and the x axis represents the level of activity (production and sales).
(b) The fixed costs are a straight line parallel to the x axis (in our example, at MK40,000).
(c) The variable costs are added 'on top' of fixed costs, to give total costs.

To draw the straight line of costs, only two points need to be plotted and joined up. Perhaps the two convenient points to plot are total costs at zero output, and total costs at the budgeted output and sales.

(i) At zero output, costs are equal to the amount of fixed costs only, MK40,000, since there are no variable costs.

(ii) At the budgeted output of 120,000 units, costs are MK100,000.

	MK
Fixed costs	40,000
Variable costs (120,000 x 50c)	60,000
Total costs	100,000

(d) The revenue 'line' is also drawn by plotting two points and joining them up.
(i) At zero sales, revenue is nil.
(ii) At the budgeted output and sales of 120,000 units, revenue is MK120,000.

The breakeven point is where total costs are matched exactly by total revenue. From the chart, this can be seen to occur at output and sales of 80,000 units, when revenue and costs are both MK80,000. This breakeven point can be proved mathematically as:

$$\text{required contribution} = \frac{\text{Fixed costs}}{\text{Contribution per unit}}$$

$$= \frac{\text{MK40,000}}{\text{50c per unit}}$$

$$= 80{,}000 \text{ units}$$

The margin of safety can be seen on the chart as the different between the budgeted level of activity and the breakeven level.

The value of breakeven charts

Breakeven charts may be helpful to management in planning the production and marketing of individual products, or the entire product range of their company. A chart gives a visual display of how much output needs to be sold to make a profit and what the likelihood would be of making a loss if actual sales fell short of the budgeted expectations.

However, it is important to realise the following.

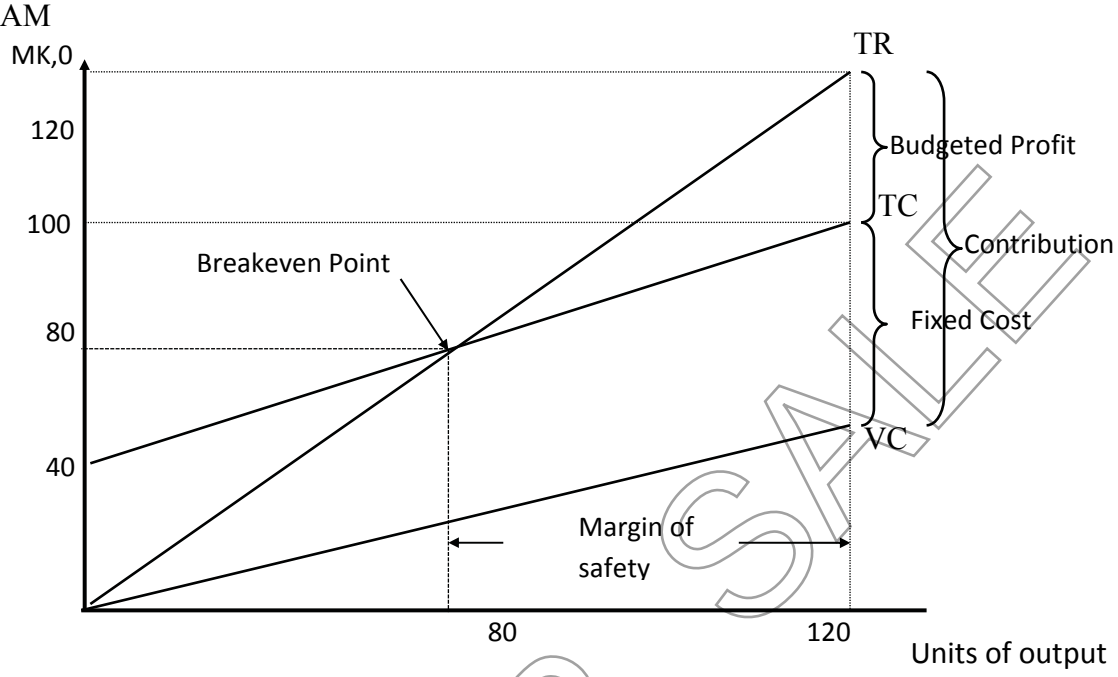
(a) A breakeven chart is a means of showing, in 'picture' form, the cost-volume-profit 'arithmetic' of sales revenues, fixed costs and variable costs. In practice, management is more likely to use the arithmetical techniques of CVP analysis without bothering to draw charts as a visual aid.

(b) Although the cost line starts at zero output and can be extended to costs at very high volumes of output and sales, cost accountants would claim that the estimates of fixed plus variable costs are not accurate over the entire range of output, but only within a 'relevant' or 'normal' range of output. It is generally assumed that this relevant range will include the breakeven point and the budgeted output, therefore for all practical purposes; the breakeven chart is accurate enough. This point has been discussed in the chapter on cost behaviour.

Alternative presentation: contribution breakeven charts

As an alternative to drawing the fixed cost line first, it is possible to start with that for variable costs. This is shown below using the graph from the last example.

DIAGRAM



One of the advantages of the contribution breakeven chart is that it shows clearly the contribution for different levels of production (indicated here at 120,000 units, the budgeted level of output) as the 'wedge' shape between the sales revenue line and the variable costs line. At the breakeven point, the contribution equals fixed costs exactly. At levels of output above the breakeven point, the contribution is larger, and not only covers fixed costs, but also leaves a profit. Below the breakeven point, the loss is the amount by which contribution fails to cover fixed costs.

Example: variations in the use of breakeven charts

Breakeven charts can be used to show variations in the possible sales price, variable costs or fixed costs. Suppose that a company sells a product which has a variable cost of MK2 per unit. Fixed costs are MK15,000. It has been estimated that if the sales price is set at MK4.40 per unit, the expected sales volume would be 7,500 units; whereas if the sales price is lower, at MK4 per unit, the expected sales volume would be 10,000 units.

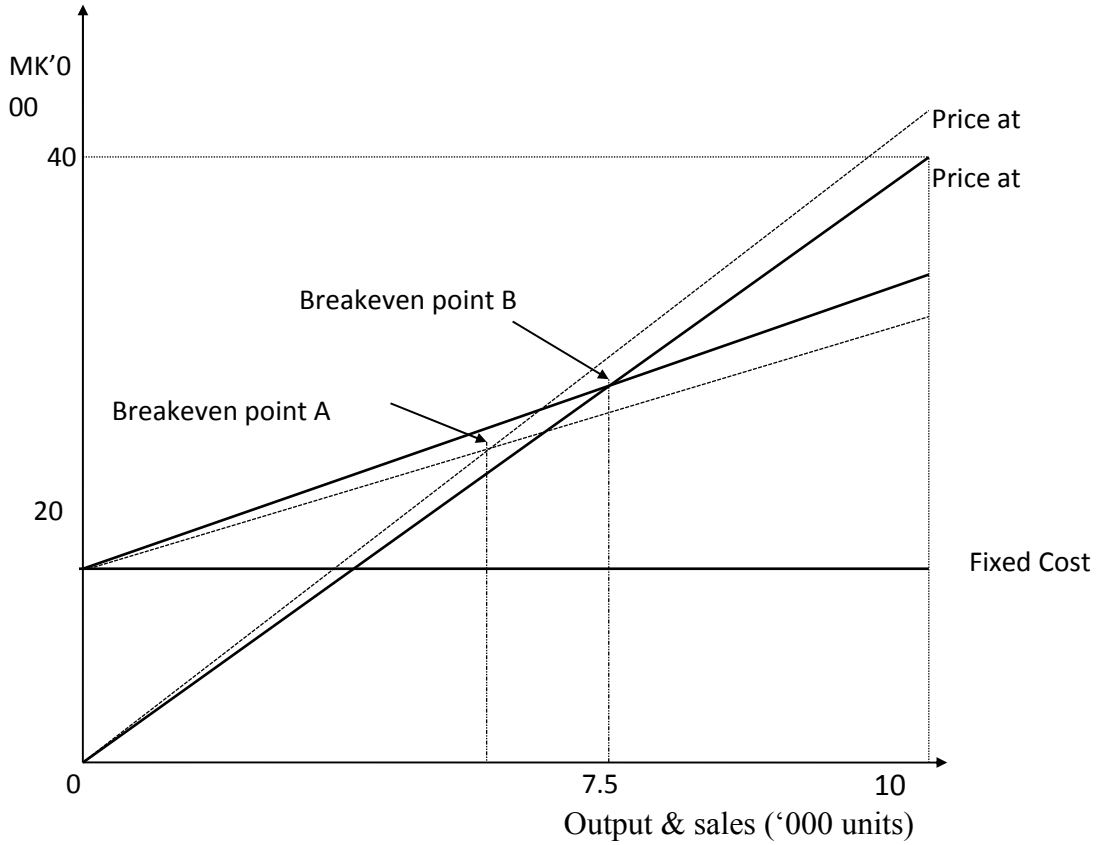
Required

Draw a breakeven chart to show the budgeted profit, the breakeven point and the margin of safety at each of the possible sales prices.

Solution

Workings

	Sales price MK4.40 per unit		Sales price MK4.00 per unit
	MK		MK
Fixed costs	15,000		15,000
Variable costs (7,500 x MK2)	15,000	(10,000 x MK2)	20,000
Total costs	30,000		35,000
Budgeted revenue (7,500 x MK4.40)	33,000	(10,000 x MK4)	40,000



(a) Breakeven point A is the breakeven point at a sales price of MK4.40 per unit, which is 6,250 units or MK27,500 in costs and revenues.

(check: $\frac{\text{required contribution to break even}}{\text{contribution per unit}} = \frac{\text{MK15.000}}{\text{MK2.40 per unit}} =$ 6,250 units)

The margin of safety (A) is 7,500 units - 6,250 units = 1,250 units or 16.7% of expected sales.

(b) Breakeven point B is the breakeven point at a sales price of MK4 per unit which is 7,500 units or MK30,000 in costs and revenues.

(check: $\frac{\text{required contribution to break even}}{\text{contribution per unit}} = \frac{\text{MK15,000}}{\text{MK2 per unit}} =$ 7,500 units)

The margin of safety (B) = 10,000 units - 7,500 units = 2,500 units or 25% of expected sales.

Since a price of MK4 per unit gives a higher expected profit and a wider margin of safety, this price will probably be preferred even though the breakeven point is higher than at a sales price of MK4.40 per unit.

The Profit/Volume (P/V) chart

The profit-volume (P/V) chart is a variation of the breakeven chart which provides a simple illustration of the relationship of costs and profit to sales, and of the margin of safety. A P/V chart is constructed as follows (look at the chart in the example that follows as you read the explanation).

(a) 'P' is on the y axis and actually comprises not only 'profit' but contribution to profit (in monetary value), extending above and below the axis with a zero point at the intersection of the two axes, and the negative section below the axis representing fixed costs. This means that at zero production, the firm is incurring a loss equal to the fixed costs.

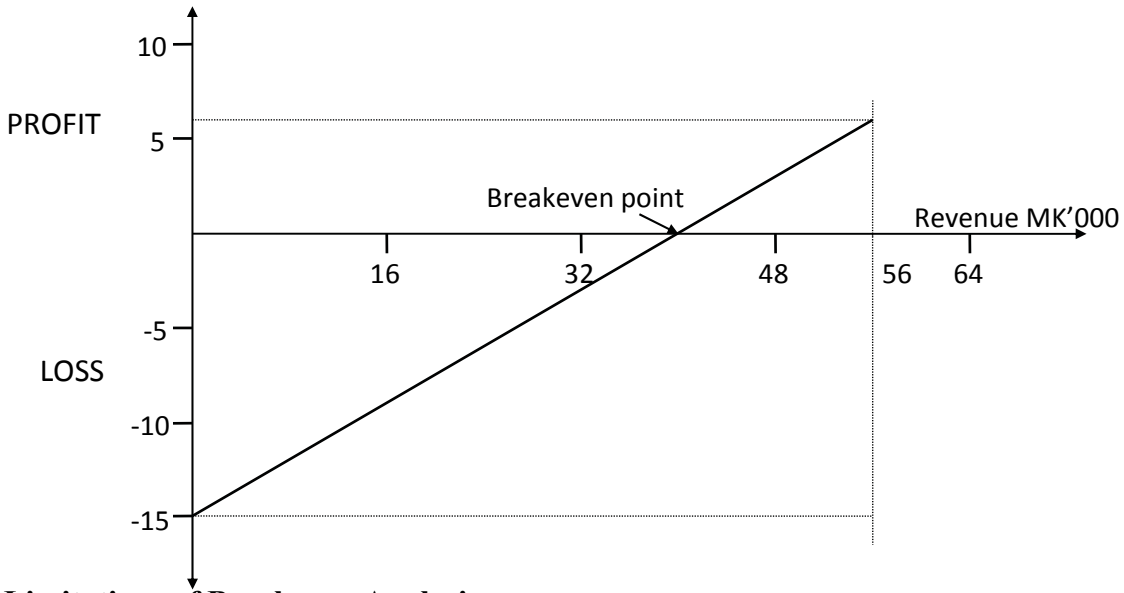
(b) 'V' is on the x axis and comprises either volume of sales or value of sales (revenue).

(c) The profit-volume line is a straight line drawn with its starting point (at zero production) at the intercept on the y axis representing the level of fixed costs, and with a gradient of contribution/unit (or the C/S ratio if sales value is used rather than units). The P/V line will cut the x axis at the breakeven point of sales volume. Any point on the P/V line above the x axis represents the profit to the firm (as measured on the vertical axis) for that particular level of sales.

Example:
Chikondi Ltd makes and sells a single product which has a variable cost of sale of MK5. Fixed costs are MK15,000 per annum. The company's management estimates that at a sales price of MK8 per unit, sales per annum would be 7,000 units. You are required to construct a P/V chart.

Solution
At sales of 7,000 units, total contribution will be 7,000 x MK(8-5) = MK21,000 and total profit will be MK6,000.

DIAGRAM



Limitations of Breakeven Analysis

Breakeven charts and breakeven arithmetic should be used carefully. The major limitations of breakeven analysis are as follows.

(a) A breakeven chart can only apply to one single product or a single mix (fixed proportions) of a group of products. This restricts its usefulness.
(b) It is assumed that fixed costs are the same in total and variable costs are the same per unit at all levels of output. This assumption is a real simplification.

(i) Fixed costs will change if output falls or increases substantially (most fixed costs are step costs).

(ii) The variable cost per unit will decrease where economies of scale are made at higher output volumes, and the variable cost per unit will also eventually rise where diseconomies of scale begin to appear at higher volumes of output (for example the extra cost of labour in overtime working).

It is important to remember that although a breakeven chart is drawn on the assumption that fixed costs and the variable cost per unit are constant, this is only correct within a normal range or relevant range of output. It is generally assumed that both the budgeted output and also the breakeven point of sales lie within this relevant range.

(c) It is assumed that sales prices will be constant at all levels of activity. This may not be true, especially at higher volumes of output, where the price may have to be reduced to win the extra sales.

(d) Production and sales are assumed to be the same, therefore the consequences of any increase in stock levels (when production volumes exceed sales) or 'de-stocking' (when sales volumes exceed production levels) are ignored.

(e) Uncertainty in the estimates of fixed costs and unit variable costs is often ignored in breakeven analysis, and some costs (for example mixed costs and step costs) are not always easily categorised or divided into fixed and 'variable'.

In spite of limitations, however, breakeven analysis is a useful technique for managers in planning sales prices, the desired sales mix, and profitability. (Breakeven charts are 'decorative' in the sense that they merely provide a graphical representation of CVP arithmetic).

CVP arithmetic should be used with a full awareness of its limitations, but can usefully be applied to provide simple and quick estimates of breakeven volumes or profitability given variations in sales price, sales mix, variable and fixed costs and sales volumes, within a 'relevant range' of output /sales volumes.

Additional Example

A friend of yours has come to you for financial advice. He is about to set up in business manufacturing and selling personal computers. He provides you with the following budgeted information concerning his total costs:

	MK
Material costs	2,800,000
Labour costs	3,000,000
Production overhead	1,500,000
Selling and distribution overhead	1,400,000
Administration overhead	600,000

The above figures are based upon budgeted production of 3,500 computers, although, although there is production capacity for 4,000 computers. The budgeted selling price is MK3,000 per computer.

You ascertain that MK1,250,000 of labour costs, 100% of administration overheads, 30% of production overheads and 50% of selling and distribution overheads are fixed in nature. All other costs are variable with the level of production.

Required

(a) Prepare a cost statement showing the contribution per computer and for the budgeted level of production. **(6 marks)**

(b) Calculate the profit at the budgeted level of production. **(2 marks)**

(c) Construct a breakeven chart in good format, clearly showing the breakeven point in units and sales revenue as well as the margin of safety in units at the budgeted level of production.

(8 marks)

(d) Your friend has had an offer to utilise his existing spare capacity by making 500 computers for a price of MK2,250 per computer. He intends to reject this offer as the price is well below his total cost for making a computer. Advise him upon this course of action giving reasons for your advice. **(4 marks)**

{TOTAL: 20 MARKS}

Solution

	MK	MK	MK
Material costs	2,800,000	2,800,000	-
Labour costs	3,000,000	1,750,000	1,250,000
Production overhead	1,500,000	1,050,000	450,000
Selling and distribution overhead	1,400,000	700,000	700,000
Administration overhead	600,000	0	600,000
TOTAL	9,300,000	6,300,000	3,000,000
sales volume		3500	
variable cost per computer		1,800.00	
Selling price		3,000.00	
Contribution per computer		1,200.00	
Profit at Budgeted level:			
Budgeted sales		3500	
contribution per computer		1,200.00	
Total contribution		4,200,000	
less: fixed costs(as in (a) above)		3,000,000	
Profit		1,200,000	

Reading from the graph, the break-even point is 2,500 computers or MK7.5million
Margin of safety (MOS):

Sales volume	=	3,500 – 2,500
	=	1,000 computers
Sales value	=	MK10.5m - MK7.5m
	=	MK3.0m

Special offer acceptance: You need to establish the contribution per computer. If positive, the offer is profitable hence accept.

		MK
Revised selling price		2,250.00
Less : variable costs		
Material costs	800.00	
Labour costs	500.00	
Production overhead	300.00	
Selling and distribution overhead	200.00	2,000.00
Contribution		250.00
Sales volume		500
Total increase in contribution/profit		MK125,000.00

END OF CHAPTER QUESTION

Galant Promotions Limited is planning to stage a concert. The following are the estimated costs which the company expects to incur in connection with the proposed concert:

	K
Rent of premises	130,000
Advertising	100,000

Printing of tickets	25,000
Ticket sellers, security	40,000
Wages of personnel employed at the concert	60,000
Fee to artist	100,000

There are no variable costs for staging the concert. The company is considering to sell tickets at either K400 or K500 each.

Required:

(a) (i) Calculate the number of tickets which must be sold at each price in order to break even. **2 Marks**

(ii) Calculate the number of tickets which must be sold at each price in order to break even, if the artist agrees to change from a fixed fee of K100,000 to a fee equal to 25% of the gross sales of tickets. **3 Marks**

(iii) Calculate the level of ticket sales, for each price, at which the company would be indifferent as between the fixed and percentage fee alternatives. **4 Marks**

(iv) Comment on the factors which you think the company might consider in choosing to pay the artist either a fixed fee or a percentage of the gross ticket sales. **4 Marks**

(b) Outline **three** positive aspects and **four** limitations of the cost-volume- profit model. **7 Marks**

(TOTAL : 20 MARKS)

CHAPTER 14

DECISION MAKING

Learning objectives

By the end of this chapter, students should be able to:

- Distinguish between relevant and irrelevant costs and revenues for decision making
- Know how marginal costing can assist short-term decision making
- Describe the opportunity cost concept
- Describe the key concept that should be applied for presenting information for product mix decisions when capacity constraints apply
- Make decisions using relevant costs and revenues

Introduction

Decision making uses principles learnt in the preceding chapter as well as marginal costing principles. It can be classified as short term and long term decision making because decisions faced by management may affect the future of a business in the long term, short term or both.

The following are areas requiring special attention:
(a) Special offer acceptance
(b) Temporary shut down
(c) Make or buy
(d) Further processing of joint products
(e) Limiting factor analysis
(f) Minimum pricing

Before tackling the areas outlined above, it is necessary to understand the terms used in decision making.
(a) Relevant cost
(b) Opportunity cost
(c) Marginal cost
(d) Incremental cost
(e) Avoidable cost
(f) Controllable cost
(g) Sunk cost
(h) Committed cost
(i) Real and notional cost

Relevant costs are defined as costs appropriate to a specific management decision. (*CIMA Official Terminology*).

A relevant cost is a future cash flow arising as a direct consequence of the decision under review. Only relevant costs should be considered in decision making, because it is assumed that in the long run future profits will be maximised if the 'cash profits' of the company, i.e. the cash earned from sales minus the cash expenditures on making and selling the goods, are also maximised.

Costs which are not relevant include the following.

(a) Past costs, or money already spent
(b) Future spending already committed by separate previous decisions
(c) Costs not of a cash nature, like depreciation, notional rent, notional interest etc.
(d) Absorbed overheads, since only cash overheads incurred are relevant to a decision

The relevant cost of a unit of production is usually the variable cost of that unit plus (or minus) any change in the total expenditure on fixed costs.

The assumption used is that in the end profits earn cash. Reported profits and cash flow are not the same in any period for various reasons, such as the timing differences caused by giving credit and the accounting treatment of depreciation. In the long run, however, a profit that is earned will eventually produce a net inflow of an equal amount of cash. Hence accounting for decision making looks at cash flow as means of measuring profits.

Avoidable costs are defined by the CIMA as 'the specific costs of an activity or business which would be avoided if that activity or sector did not exist'. We will see later in this chapter that one of the situations in which it is necessary to identify the avoidable costs is in deciding whether or not to discontinue a product. The only costs which would be saved are the avoidable costs, which are usually the variable costs and sometimes some specific fixed costs. Costs which would be incurred whether or not the product is discontinued are known as *unavoidable costs*.

A differential cost is 'the difference in total cost between alternatives'. If option A will cost an extra MK300 and option B will cost an extra MK360, the differential cost is MK60, with option B being more expensive. A differential cost is the difference between the *relevant costs* of each option.

A differential cost of extra unit of production is the extra cost required to make that unit it is the difference in cost between making the unit and not making it. This type of cost is also called an *incremental cost*. Incremental costs are relevant costs.

An opportunity cost is the benefit forgone by selecting one course of action in preference to the next best alternative. Suppose for example that there are three mutually exclusive options, A, B and C. The net profit from each would be MK80, MK100 and MK70 respectively.

Since only one option can be selected option B would be chosen because it offers the biggest benefit.

	MK
Profit from option B	100
Less opportunity cost (i.e. the benefit from the most profitable alternative, A)	80
Differential benefit of option B	20

The decision to choose option B would not be taken simply because it offers a profit of MK100, but because it offers a differential profit of MK20 in excess of the next best alternative.

The CIMA's Official Terminology defines an opportunity cost simply as 'the value of a benefit sacrificed in favour of an alternative course of action.'

The principle underlying decision accounting is that 'bygones are bygones'. What has happened in the past is done, and cannot be undone. Management decisions can only affect the future. In decision making, managers therefore require information about future costs and revenues which would be affected by the decision under review, and they must not be misled by events, costs

and revenues in the past, about which they can do nothing. Past expenditures, in decision making terms, are *sunk costs* which either:

(a) have been charged already as a cost of sales in a previous accounting period; or

(b) will be charged in a future accounting period, although the expenditure has already been incurred (or the expenditure decision irrevocably taken). An example of this type of cost is depreciation. If the fixed asset has been purchased, depreciation may be charged for several years but the cost is a sunk cost, about which nothing can now be done.

In contrast, relevant costs are future costs and benefits obtainable by carrying out a particular course of action, and they also include the benefits which could have been earned, but which have been given up, by choosing one option instead of another. Opportunity costs will never appear in a set of double entry cost accounts, but they often appear in decision accounting information reports. Relevant costs, differential costs and incremental costs, and opportunity costs, will all be illustrated in the examples which follow.

Sunk variable costs and directly attributable fixed costs

Relevant costs are often simply variable costs and/or opportunity costs of contribution from an alternative course of action.

There might, however, be occasions when a variable cost is in fact a sunk cost. For example, suppose that a company has some units of raw material in stock. They have been paid for already, and originally cost MK2,000. They are now obsolete and are no longer used in regular production, and they have no scrap value. However, they could be used in a special job which the company is trying to decide whether to undertake. The special job is a 'one-off' customer order, and would use up all these materials in stock.

In deciding whether the job should be undertaken, the relevant cost of the materials to the job would be nil. Their original cost of MK2,000 is a sunk cost, and should be ignored in the decision.

However, if the materials did have a scrap value of say, MK300, then their relevant cost to the job would be the opportunity cost of being unable to sell them for scrap, i.e. MK300.

There might be occasions when a fixed cost is a relevant cost, and you must be aware of the distinction between 'specific' or 'directly attributable' fixed costs, and general fixed overheads.

(a) Directly attributable fixed costs are those costs, which, although fixed within a relevant range of activity levels, or regarded as fixed because management has set a budgeted expenditure level (e.g. advertising costs are often treated as fixed) would in fact either increase if certain extra activities were undertaken or decrease/be eliminated entirely if a decision were taken to reduce the scale of operations or shut down entirely.

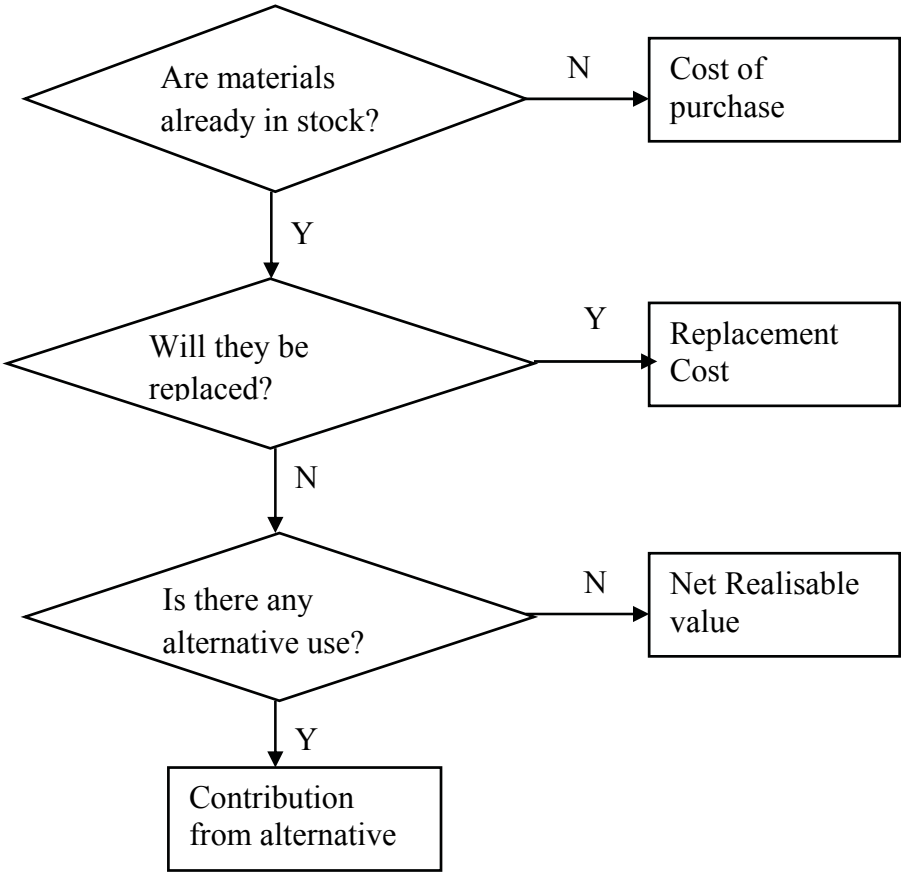
(b) General fixed overheads are those fixed overheads which will be unaffected by decisions to increase or decrease the scale of operations, perhaps because they are an apportioned share of the fixed costs of items which would be completely unaffected by the decisions. An apportioned share of head office charges is an example of general fixed overheads for a local office or department.

You should appreciate that whereas directly attributable fixed costs will be relevant to a decision in hand, general fixed overheads will not be.

Identifying Relevant Costs

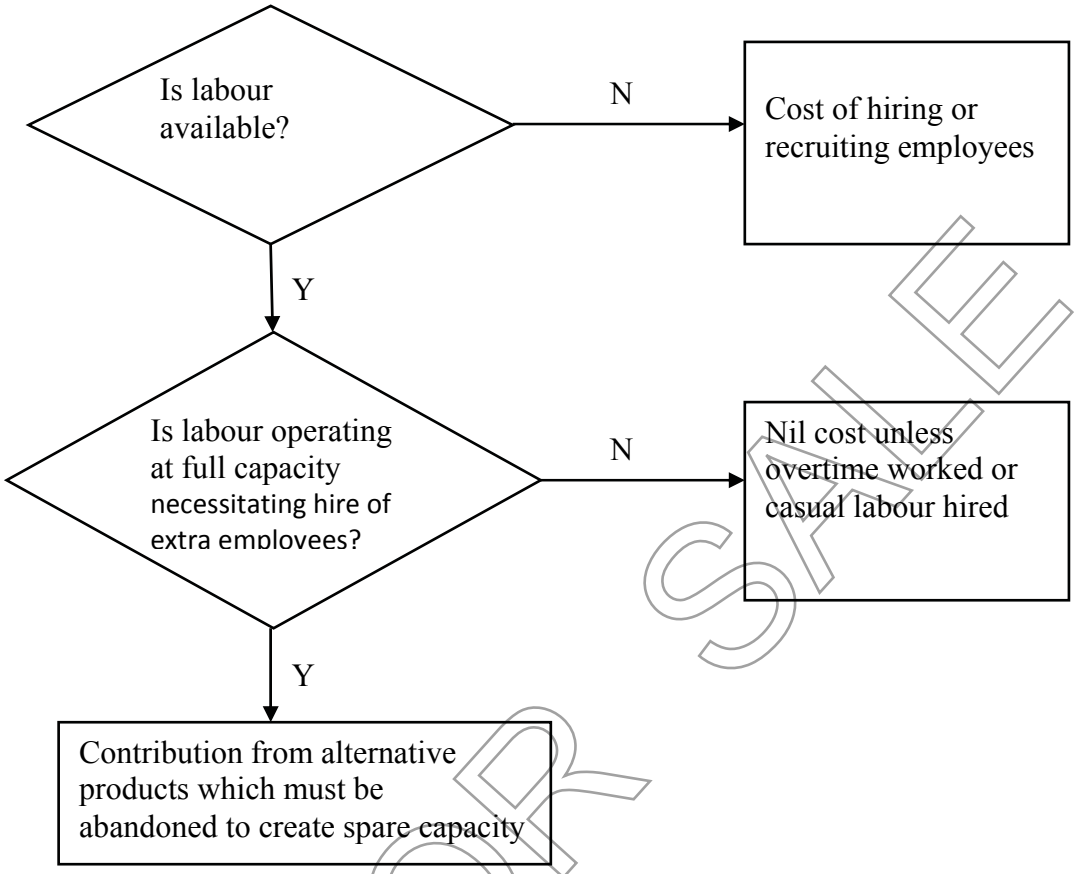
It is important that you should be able to identify the relevant costs which are appropriate to a decision. In many cases, this is a fairly straightforward problem, but there are cases where great care should be taken

Determining Relevant Costs of Materials



Identifying the relevant cost of labour

The key question is whether spare capacity exists in which case labour is not operating at full capacity. Where labour is operating at full capacity, work needs to be abandoned in order to create spare capacity and in the process contribution can be lost. Where labour is not operating at full capacity, then the relevant cost will be any incremental costs in respect t of overtime or shift allowance paid. Otherwise the salary is a committed cost which is irrelevant for decision making. The following flow chart illustrates the relevant cost of labour.



Example:

A company has been making a machine to order for a customer, but the customer has since gone into liquidation, and there is no prospect that any money will be obtained from the winding up of the company.

Costs incurred to date in manufacturing the machine are MK50,000 and progress payments of MK15,000 had been received from the customer prior to the liquidation.

The sales department has found another company willing to buy the machine for MK34,000 once it has been completed.

To complete the work, the following costs would be incurred.

(a) Materials have been bought at a cost of MK6,000. They have no other use, and if the machine is not finished, they would be sold for scrap for MK2,000.
(b) Further labour costs would be MK8,000. Labour is in short supply, and if the machine is not finished, the work force would be switched to another job, which would earn MK30,000 in revenue, and incur direct costs of MK12,000 and absorbed (fixed) overhead of MK8,000.

(c) Consultancy fees of MK4,000 would be incurred. If the work is not completed, the consultant's contract would be cancelled at a cost of MK1,500.

(d) General overheads of MK8,000 would be added to the cost of the additional work.

Required:
Should the new customer's offer be accepted?

Solution

(a) Costs incurred in the past, or revenues received in the past are not relevant costs because they cannot affect a decision about what is best for the future. Costs incurred to date of MK50,000 and revenue received of MK15,000 are 'water under the bridge' and should be ignored.

(b) Similarly, the price paid in the past for the materials is irrelevant. The only relevant cost of materials affecting the decision is the opportunity cost of the revenue from scrap which would be forgone - MK2,000.

(c) Labour cost

	MK
Labour costs required to complete work	8,000
Opportunity costs: contribution forgone by losing other work MK(30,000 - 12,000)	18,000
Relevant cost of labour	26,000

(d) The incremental cost of consultancy from completing the work is calculated as follows.

Cost of completing work	4,000
Cost of cancelling contract	1,500
Incremental cost of completing work	2,500

(e) Absorbed overhead is a notional accounting cost and should be ignored. Actual overhead incurred is the only overhead cost to consider. General overhead costs (and the absorbed overhead of the alternative work for the labour force) should be ignored.

(f) Relevant costs may be summarised as follows:

		MK	MK
Revenue from completing work			34,000
Relevant cost of:			
Materials:	opportunity cost	2,000	
Labour:	basic pay	8,000	
	opportunity cost	18,000	
	incremental cost of consultant	2,500	
			30,500
Extra profit to be earned by accepting the completion order			3,500

Exercise

Identify the relevant costs of labour and overheads in the following exercise.

Rodgers Ltd has been offered MK21,000 by a prospective customer to make some purpose-built equipment. The extra costs of the machine would be MK3,000 for materials. There would also be a requirement for 2,000 labour hours. Labour wages are MK4 per hour; variable overhead is MK2 per hour and fixed overhead is absorbed at the rate of MK4 per hour.

Labour, however, is in limited supply and, if the job is accepted, workers would have to be diverted from other work which is expected to earn a contribution of MK5 per hour towards fixed overheads and profit. Should the contract be undertaken?

Solution

Fixed costs are ignored because there is no incremental fixed cost expenditure.

	MK
Materials	3,000
Labour (2,000 hours x MK4)	8,000
Variable overhead (2,000 hours x MK2)	4,000
	15,000
Opportunity cost: Contribution forgone from other work (2,000 hours x MK5)	10,000
Total costs	25,000
Revenue	21,000
Net loss on contract	(4,000)

Decision: The contract should not be undertaken.

Accepting or Rejecting Orders

An order will probably be accepted if it increases contribution and profit, and rejected if it reduces profit

Example 1:

Blessings Ltd makes a single product which sells for MK20, and for which there is great demand. It has a variable cost of MK12, made up as follows.

	MK
Direct material	4
Direct labour (2 hours)	6
Variable overhead	2
	12

The labour force is currently working at full capacity and no extra time can be made available. A customer has approached the company with a request for the manufacture of a special order, for which he is willing to pay MK5,500.

The costs of the order would be MK2,000 for direct materials, and 500 labour hours will be required.

Required:

Should the order be accepted?

Solution

(a) Labour is a limiting factor. By accepting the order, work would have to be diverted away from the standard product, and contribution will be lost, i.e. there is an opportunity cost of accepting the new order, which is the contribution forgone by being unable to make the

standard product. The contribution from the standard product is MK4 per labour hour [(MK20 - MK12) ÷2 hrs]

(b) Direct labour pay costs MK3 per hour, but it is also usually assumed that variable production overhead varies with hours worked, and must therefore be spent in addition to the wages cost of the 500 hours.

	MK	MK
Value of order		5,500
Cost of order		
Direct materials	2,000	
Direct labour (500 hrs x 3)	1,500	
Variable overhead (500 hrs x 1)	500	
Opportunity cost (500 hrs x 4)	2,000	
(Contribution forgone)		
Relevant cost of the order		6,000
Loss incurred by accepting the order		(500)

(In other words, although accepting the order would earn a contribution of MK1,500 (MK5,500 - MK4,000). the lost production of the standard product would reduce contribution earned elsewhere by MK2,000.)

Example 2:

Bangula Ltd produces a range of products, and absorbs production overhead into cost at the rate of 120% of direct labour costs. This rate was calculated from the following budgeted costs:

	MK
Variable production overhead	144,000
Fixed production overhead	216,000
	360,000
Direct labour costs	120,000

One of the company's products, the Toto, has a normal selling price of MK35 and a unit production cost of:

	MK
Direct materials	12
Direct labour	4
Total production overhead	12
Factory cost	28

A customer has offered to buy 3,000 units of Toto at a price of MK22 each. If the order is accepted, normal sales would be unaffected, and the company has the existing capacity to make the extra units.

Required

Should the order be accepted?

Solution

We will assume that direct labour is a variable cost. The variable cost per unit of Toto is made up as follows.

	MK
Direct materials	12.00
Direct labour	4.00
Variable overhead (120% of labour cost)	4.80
	20.80

A contribution of MK(22-20.80) = MK1.20 per unit would be earned by accepting the order, to give a total extra contribution and profit of 3,000 x MK1.20 = MK3,600.

Conclusion: the order should be accepted unless a more profitable alternative use exists for the spare resources.

Shutdown Decisions

Shutdown decisions may relate to the problem of closing down a department or factory, or of ceasing to make and sell an item of product.

A shutdown decision can be made if the product or division is failing to cover its variable costs and its attributable fixed costs. Shared fixed costs or absorbed overheads are irrelevant for decision making in this context.

Example:

Angoni Ltd makes four products, A, B, C and D. The budget for the forthcoming year is as follows.

	A	*B*	*C*	*D*	*Total*
	MK	MK	MK	MK	MK
Direct materials	5,000	6,000	4,000	8,000	23,000
Direct labour	4,000	8,000	6,000	4,000	22,000
Variable overheads	1,000	2,000	1,500	1,000	5,500
	10,000	16,000	11,500	13,000	50,500
Sales	20,000	15,000	14,000	20,000	69,000
Contribution	10,000	(1,000)	2,500	7,000	18,500
Share of fixed costs	6,000	4,000	4,000	2,000	16,000
Profit/(loss)	4,000	(5,000)	(1,500)	5,000	2,500

Required:
Should production of any product cease?
Solution

(a) Manufacture of product B should cease, because revenue does not cover variable costs and the contribution is negative.

(b) Product C makes a positive contribution, but fails to cover its share of fixed costs.

(i) If fixed costs of MK2,500 or more (i.e. equal to or greater than the contribution earned) could be saved by ceasing to make product C, the product should be closed down.

(ii) If the saving in fixed costs from shutdown of product C is less than MK2,500 it will remain profitable to continue to make the product until a more profitable alternative use arises for the production resources.

If we suppose that fixed costs are not stepped costs, and will remain at MK16,000 if any products are closed down, then product B only should be abandoned. Profits will then increase by MK1,000 as follows.

	A	C	D	Total
	MK	MK	MK	MK
Direct materials	5,000	4,000	8,000	17,000
Direct labour	4,000	6,000	4,000	14,000
Variable overheads	1,000	1,500	1,000	3,500
	10,000	11,500	13,000	34,500
Sales	20,000	14,000	20,000	54,000
Contribution	10,000	2,500	7,000	19,500
Fixed costs (new apportionment unknown)				16,000
Profit/(loss)				3,500

Since the company now has spare capacity from the shutdown of product B, it would be recommended that management should look for an alternative use for the available resources which would earn a positive contribution, and thereby increase profit still further.

Extra Shift Decisions
The decision to work an extra shift should be taken on the basis of whether the costs of the shift are exceeded by the benefits to be obtained.

Example:

Shift Ltd currently operates a single production shift, which incurs the costs and earns the revenues stated below (per annum).

	MK	MK
Sales (10,000 units)		360,000
Direct materials	120,000	
Direct labour	100,000	
Variable overhead (MK2 per unit)	20,000	240,000
Contribution		120,000
Fixed overhead		90,000
Profit		30,000

Sales demand exists for an extra 6,000 units (at the existing sales price) which could be made in a second shift.

The labour costs in the second shift would be the same as in the first shift plus a second-shift premium. The second shift premium is paid at time-and-a-quarter. Additional fixed overheads of MK10,000 would be incurred, but a bulk purchase discount of 5% would be obtained on all quantities of material bought.

Required:
Should the second shift be opened up?

Solution

The extra costs and revenues of the second shift must be compared. The extra cost of materials must allow for the full savings from discounts.

	MK	MK
Extra revenue (6,000 x MK36)		216,000
Extra costs:		
Current cost of materials	120,000	
Total cost of materials with 2nd shift (16,000 x 95% of MK12)	182,400	
Incremental cost of materials	62,400	
Incremental cost of labour (MK100,000 x 1.25)	125,000	
Incremental cost of variable overhead (6,000 x MK2)	12,000	
Incremental cost of fixed overhead	10,000	
Total incremental costs		209,400
Increase in profit from second shift		6,600

Shift working versus overtime

When a business expands, the management is often faced with the following problems.

(a) Whether to acquire larger premises and more plant and machinery
(b) Whether to persuade existing personnel to work longer hours (on an overtime basis) or to engage extra staff who would use the existing equipment but at a different time (on a shift basis).

If the management decide to incur additional expenditure on premises and plant, that expenditure is a fixed cost. It will therefore be necessary to determine how much additional contribution will be required from the anticipated increased production to cover the extra fixed cost.

If it is decided to use the existing fixed assets, but for a longer period each day, the choice of shift working or overtime will also involve a marginal costing consideration. If overtime is selected, the direct wages cost per unit produced will be increased because the wages paid to workers on overtime are a basic rate plus an overtime bonus. If the management opt for shift working the shift premium may not be as expensive as the overtime premium so the direct wages cost may be relatively lower. On the other hand, there may be an increase in fixed (or semi-fixed) costs such as lighting and heating and canteen facilities.

Limiting Budget Factors and Opportunity Costs

One of the more common decision making problems is a budgeting decision in a situation where there are not enough resources to meet the potential sales demand, and so a decision has to be made about using what resources there are as effectively as possible.

The CIMA's *Official Terminology* defines a limiting factor or key factor as: 'anything which limits the activity of an entity. An entity seeks to optimise the benefit it obtains from the limiting factor'. The limiting factor may change from time to time for the same entity or product. Thus when raw materials are in short supply, performance or profit may be expressed as per kilo of material, or, in a restricted skilled labour market, as per skilled labour hour. Alternatively, the limiting factor may be one critical process in a chain.

A limiting factor, if there is one, ought to be identified when the annual budget is being prepared, and so limiting factor decisions are more in the nature of routine rather than *ad hoc*

decisions. Even so, the concept of opportunity costs comes into the decision making, and so limiting factor decisions are introduced in this chapter.

There might be just one limiting factor (other than maximum sales demand) but there might also be several scarce resources, with two or more of them putting an effective limit on the level of activity that can be achieved. In this chapter, however, we shall concentrate on single limiting factor problems and a technique for resolving these. Situations in which there are two or more limiting factors (other than sales demand) call for the application of an operational research technique known as linear programming, which is outside the scope of the syllabus.

Limiting factor decisions

Examples of limiting factors are as follows:

(a) Sales: there may be a limit to sales demand

(b) Labour (either of total quantity or of particular skills): there may be insufficient labour to produce enough to satisfy sales demand.

(c) Materials: there may be insufficient materials available to produce enough units to satisfy sales demand.

(d) Manufacturing capacity: there may not be sufficient machine capacity to produce enough.

(e) Financial resources: there may not be enough cash to pay for the production demanded.

If sales demand is the factor which restricts greater production output, profit will be maximised by making exactly the amount required for sales (and no more) provided that each product sold earns a positive contribution.

If labour supply, materials availability, machine capacity or cash availability limits production to less than the volume which could be sold, management is faced with the problem of deciding what to produce and what should not be produced because there are insufficient resources to make everything.

It is assumed in limiting factor accounting that management wishes to maximise profit and that profit will be maximised when contribution is maximised (given no change in fixed cost expenditure incurred). In other words, *marginal costing* ideas are applied.

(a) Contribution will be maximised by earning the biggest possible contribution per unit of scarce resource. Thus if Grade A labour is the limiting factor, contribution will be maximised by earning the biggest contribution per hour of Grade A labour worked. Similarly, if machine time is in short supply, profit will be maximised by earning the biggest contribution per machine hour worked.

(b) The limiting factor decision therefore involves the determination of the contribution earned by each different product per unit of scarce resource.

In limiting factor decisions, we generally assume that fixed costs are the same whatever production mix is selected, so that the only relevant costs are *variable costs*.

Example 1

Mabvuto Ltd makes two products, the Mapi and the Mawe. Unit variable costs are as follows.

	Mapi MK	Mawe MK
Direct materials	1	3
Direct labour (MK3 per hour)	6	3
Variable overhead	1	1
	8	7

The sales price per unit is MK14 per Mapi and MK11 per Mawe. During July 20X2 the available direct labour is limited to 8,000 hours. Sales demand in July is expected to be as follows.

Mapi	3,000 units
Mawe	5,000 units

Required:
What production budget will maximise profit, assuming that fixed costs per month are MK20,000, and that there are no opening stocks of finished goods or work in progress?

Solution

(a) The first step in the solution is to confirm that the limiting factor is something other than sales demand.

	Mapi	Mawe	Total
Labour hours per unit	2 hrs	1 hr	
Sales demand	3,000 units	5,000 units	
Labour hours needed	6,000 hrs	5,000 hrs	11,000 hrs
Labour hours available			8,000 hrs
Shortfall			3,000 hrs

Labour is the limiting factor on production.

(b) The second step is to identify the contribution earned by each product per unit of scarce resource, i.e. per labour hour worked.

	Mapi MK	Mawe MK
Sales price	14	11
Variable cost	8	7
Unit contribution	6	4
Labour hours per unit	2 hrs	1 hr
Contribution per labour hour (= unit of limiting factor)	MK3	MK4

Although Mapi have a higher unit contribution than Mawe, two Mawe can be made in the time it takes to make one Mapi. Because labour is in short supply, it is more profitable to make Mawe than Mapi.

(c) The final stage in the solution is to work out the budgeted production and sales. Sufficient Mawe will be made to meet the full sales demand, and the remaining labour hours available will then be used to make Mapi.

(i)

Product	*Priority for Demand*	*Hours required*	*Hours available*	*Hours manufacture*
Mawe	5,000	5,000	5,000	1st
Mapi	3,000	6,000	3,000 (bal)	2nd
		11,000	8,000	

(ii) Optimum Production Plan

Product	Unit	*Hours needed*	*Contribution per unit* MK	*Total* MK
Mawe	5,000	5,000	4	20,000
Mapi (balance)	1,500 (bal)	3,000	6	9,000
		8,000		29,000
Less fixed costs				20,000
Profit				9,000

(d) Note that it is not more profitable to begin by making as many units as possible with the bigger unit contribution. We could make 3,000 units of Mapi in 6,000 hours and 2,000 units of Mawe (MK4 per unit) in the remaining 2,000 hours. However, contribution would be MK(3,000 x MK6) plus MK(2,000 x MK4) = MK26,000, and profit would be only MK6,000. Unit contribution is not the correct way to decide priorities, because it takes two hours to earn MK6 from a Mapi and one hour to earn MK4 from a Mawe. Mawe makes profitable use of the scarce resources, labour hours.

Opportunity costs with limiting factor

When there is a limiting factor, an organisation has to make a choice about what it is going to do with the scarce resources. There are alternative courses of action, and each alternative means that the benefit of another option must be sacrificed. The opportunity costs in this situation are the contribution per unit of limiting factor for each product. In the previous example, the contribution per labour hour was MK3 per hour per unit of Mapi and MK4 per hour per unit of Mawe.

If the oragnisation chooses to make Mawe in preference to making Mapi it will make MK4 contribution per hour from Mawe, but it will also forgo making some Mapi, at MK3 contribution per hour. This MK3 per hour forgone is an opportunity cost of not making Mapi.

	MK
Contribution from Mapi	4
Contribution forgone from Mawe*	3 (opportunity cost)
Differential contribution	1 (differential benefit)

* In the example, the budget includes the manufacture of some Mawe, but not as many as could be sold; therefore some potential contribution from Mawe is forgone and there is an opportunity cost.

Example

Sparrow Ltd makes four products, P, Q, R and S from the same materials. The sales price and variable costs per unit are as follows.

		P	Q	R	S
		MK	MK	MK	MK
Materials:	A	6	4	3	8
	B	4	8	10	2
Direct labour		5	10	10	2
Variable overhead		2	2	3	2
Sales price		25	23	31	32
Sales demand (units)		4,000	5,000	8,000	6,000

Most production resources are in sufficient supply, but there will only be 6,500 kg of material A available in the period. Material A costs MK12 per kilogram.

Required:
You are required to calculate the production quantities of each product which will maximise profit in the period.

Solution
(a) There is a shortage of material A

Product	*Demand* Units	*Demand* kg of A
P	4,000	2,000
Q	5,000	1,667
R	8,000	2,000
S	6,000	4,000
		9,667
Available		6,500
Shortfall		3.167

(b) We now calculate the contribution earned by each product per kilogram of material A consumed.

	MK	MK	MK	MK
Sales price per unit	25	23	31	32
Variable cost per unit	17	24	26	20
Contribution per unit	8	(1)	5	12
Quantity of material A per unit	1/2 kg	1/3 kg	1/4 kg	2/3 kg
Contribution per kg of material A	MK16	-	MK20	MK18
Priority for manufacture	3rd	-	1st	2nd

Because product Q does not earn a positive contribution (its marginal cost exceed its sales value), it should not be made at all.

(c) Even so, there is still a shortfall in the quantities of material A by 1,500 kilograms.

Products in order of priority	*Demand units*		*Material A Required* kg	*Cumulative Requirements* kg
R	8,000 units	(x 1/4)	2,000	2,000
S	6,000 units	(x 2/3)	4,000	6,000
P	4,000 units	(x 1/2)	2,000	8,000

Since only 6,500 kg of material A is available it may be seen that there is sufficient material to satisfy demand for R and S in full, leaving 500 kg left over to make some P.

Product	*Material A needs kg*	*Units produced*	*Contribution per unit MK*	*Total contribution MK*
R	2,000	8,000	5	40,000
S	4,000	6,000	12	72,000
P (balance)	500	1,000	8	8,000
	6,500			120,000

Management may wish to consider other factors before finalising the budget.

(a) Are the estimates of sales demand reliable?
(b) Can any production work be sub-contracted to make up the shortfall?
(c) What will be the effect on customer goodwill of failing to supply enough units of P?
(d) Is sales demand for R and S dependent on sales of P?

Recognising a limiting factor situation

An examination problem might present you with a situation in which there is a limiting factor, without specifically stating that this is so, and you will have the task of recognising what the situation is. You may be given a hint with the wording of the question as below:

(a) 'It is possible that the main raw material used in manufacturing the products will be difficult to obtain in the next year.'

(b) The company employs a fixed number of employees who work a maximum overtime of eight hours on top of their basic 36 hour week. The company has also agreed that no more staff will be recruited next year.

In (a) there is a hint that raw materials might be a limiting factor. In (b), perhaps less obviously, a maximum limit is placed on the available labour hours, and so the possibility should occur to you that perhaps labour is a limiting factor.

If you suspect the existence of a limiting factor, some quick computations should confirm your suspicions.

(a) Calculate the amount of the scarce resource (material quantities, labour hours, machine hours etc.) needed to meet the potential sales demand.

(b) Calculate the amount of the scarce resource available (e.g. number of employees multiplied by maximum working hours per employee.)

(c) Compare the two figures. Obviously, if the resources needed exceed the resources available, there is a limiting factor on output and sales.

Make-or-buy decisions

Businesses may be faced with the decision whether to make components for their own products themselves or to concentrate their resources on assembling the products, obtaining the components from outside suppliers instead of making them 'in house'.

If the components are bought in, their purchase cost is wholly marginal (i.e. direct). However, if it is decided to manufacture the components internally, the comparative costs of doing so will be the direct materials and wages costs, plus the variable factory overhead. If the total variable cost of internally manufactured components is seen to be greater than the cost of obtaining similar components elsewhere, it is obviously uneconomic to produce these items internally.

Example:

Suppose for example that Tsankho Ltd makes four components, W, X, Y and Z, for which costs in the forthcoming year are expected to be as follows.

	W	*X*	*Y*	*Z*
Production (units)	1,000	2,000	4,000	3,000
Unit marginal costs	MK	MK	MK	MK
Direct materials	4	5	2	4
Direct labour	8	9	4	6
Variable production overheads	2	3	1	2
	14	17	7	12

Total fixed costs per annum are expected to be as follows.

	MK
Incurred as a direct consequence of making W	1,000
Incurred as a direct consequence of making X	5,000
Incurred as a direct consequence of making Y	6,000
Incurred as a direct consequence of making Z	8,000
Other fixed costs	30,000
	50,000

A sub-contractor has offered to supply units of W, X, Y and Z for MK12, MK21, MK10 and MK14 respectively.

Required

Should Tsankho Ltd make or buy the components?

Solution

(a)

	Z	W	X	Y
	MK	MK	MK	MK
Unit variable cost of making	14	17	7	12
Unit variable cost of buying	12	21	10	14
Extra variable cost of buying per unit	(2)	4	3	2
Annual requirements (units)	1,000	2,000	4,000	3,000
	MK	MK	MK	MK
Extra variable cost of buying (per annum)	(2,000)	8,000	12,000	6,000
Fixed costs saved by buying	1,000	5,000	6,000	8,000
Extra total cost of buying	(3,000)	3,000	6,000	(2,000)

(b) The company would save MK3,000 pa by sub-contracting component W (where the purchase cost would be less than the marginal cost per unit to make internally) and would save MK2,000 pa by sub-contracting component Z (because of the saving in fixed costs of MK8,000).

(c) In this example, relevant costs are the variable costs of in-house manufacture, the variable costs of sub-contracted units, and the saving indirectly attributable fixed costs.

(d) Other matters would need to be considered.

(i) If components W and Z are sub-contracted, the company will have spare capacity. How should that spare capacity be profitably used, i.e. are there hidden benefits to be obtained from sub-contracting?

(ii) Would the sub-contractor be reliable with delivery times, and would he supply components of the same quality as those manufactured internally?

(iii) Does the company wish to be flexible and maintain better control over operations by making everything itself?

Make-or-buy decisions and limiting factors

Where there are limiting factors on production other than sales (such as materials or labour) one way of overcoming the limiting factor on production is to sub-contract work.

Where this problem arises, profit is maximised by producing or buying all the components or products at the cheapest cost. The cost of bought in components supplied by sub-contractors normally exceeds the marginal cost of making products internally, because the supplier's cost includes a contribution/profit margin on his costs. A company would then prefer to make all its own products, but the limiting factor makes this impossible.

In a situation where a company must sub-contract work to make up a shortfall in its own production capability, its total costs would be minimised where the extra marginal cost of buying from a sub-contractor is least for each unit of limiting factor saved by buying in. This may be made clearer with an example.

Example:

Alinafe Ltd manufactures three components, A, B and C using the same machines for each. The budget for the next year calls for the production and assembly of 4,000 of each component.

The variable production cost per unit of the final product, is as follows.

	Machine hours	*Variable cost*
		MK
1 unit of A	3	20
1 unit of B	2	36
1 unit of C	4	24
Assembly		20
		100

Required:

Only 24,000 hours of machine time will be available during the year, and a sub-contractor has quoted the following unit prices for supplying components: A MK29; B MK40 and C MK34.

Required:

Advise Alinafe Ltd.

Solution

(a) There is a shortfall in machine hours available, and some products must be sub-contractor

	Product	*Units*	*Machine hours*
	A	4,000	12,000
	B	4,000	8,000
	C	4,000	16,000
Required			36,000
Available			24,000
Shortfall			12,000

(b) The assembly costs are not relevant costs because they are unaffected by the make-or-buy decisions. The units sub-contracted should be those which will add least to the costs of Alinafe Ltd. Since 12,000 hours of work must be sub-contracted, the cheapest policy is to sub-contract work which adds the least extra costs (i.e. the least extra variable costs) per hour of own-time saved.

(c)

	A	*B*	*C*
	MK	*MK*	*MK*
Variable cost of making	20	36	24
Variable cost of buying	29	36	24
Extra variable cost of buying	9	4	10
Machine hours saved by buying	3 hrs	2 hrs	4 hrs
Extra variable cost of buying, per hour saved	MK3	MK2	MK2.5

It is cheaper to buy B than to buy C and it is most expensive to buy A. The priority for making the components in-house will be in the reverse order to the preference for buying them from a sub-contractor.

Make	1st	A
	2nd	C
	3rd	B

(d)

Cumulative Component	*Hrs per unit to make in-house*	*Hrs in total*	*required hours*
A	3 hrs	12,000	12,000
C (balance)	4 hrs	16,000	28,000
B	2 hrs	8,000	36,000
Hours available			24,000
Shortfall			12,000

There are enough machine hours to make all 4,000 units of A and 3,000 units of C. 8,000 hours' production of B and 4,000 hours of C must be sub-contracted.

(e)

	Total Make	*Machine hrs used/saved*	*Unit cost*	*variable Variable cost*
A	12,000	4,000	20	80,000
C (balance)	12,000	3,000	24	72,000
	24,000			152,000
	Buy			
C (balance)	4,000	1,000	34	34,000
B	8,000	4,000	40	160,000
Total variable costs of components				346,000
Assembly costs (4,000 x MK20)				80,000
Total variable costs				426,000

This is the cheapest production policy available.

Minimum Pricing

This involves the establishment of a minimum price which covers all the relevant costs such that no profit or loss is made. It is expected that the transaction will not lead to repeat business because it is a one-off transaction.

An examination question will require proper presentation such that reasons should be given for the treatment of each item.

Example

John Robertson, a self employed builder, has been asked to provide a fixed price quotation for some building work required by a customer. Robertson's accountant has compiled the following figures, together with some notes as a basis for a quotation.

		MK	
Direct materials:			
	Bricks 200,000 at MK100 per thousand	20,000	note 1
	200,000 at MK120 per thousand	24,000	
Other materials		5,000	note 2
Direct labour:			
	Skilled 3,200 hours at MK12 per hour	38,400	note 3
	Unskilled 2,000 hours at MK6 per hour	12,000	note 4
Other costs:			
	Scaffolding hire	3,500	note 5
	Depreciation of general purpose machinery	2,000	note 6
	General overheads 5,200 hours at MK1 per hour	5,200	note 7
	Plans	2,000	note 8
Total cost		112,100	
Profit		22,420	note 9
Suggested price		134,520	

Notes

1. The contract requires 400,000 bricks, 200,000 are already in stock and 200,000 will have to be bought in. This is a standard type of brick regularly used by Robertson. The 200,000 in stock were purchased earlier in the year at MK100 per 1,000. The current replacement cost of this type of brick is MK120 per 1,000. If the bricks in stock are not used on this job John is confident that he will be able to use them later in the year.

2. Other materials will be bought in as required; this figure represents the purchase price.

3. Robertson will need to be on site whilst the building work is performed. He therefore intends to do 800 hours of the skilled work himself. The remainder will be hired on an hourly basis. The current cost of skilled workers is MK12 per hour. If John Robertson does not undertake the building work for this customer he can either work as a skilled worker for other builders at a rate of MK12 per hour or spend the 800 hours completing urgently needed repairs to his own house. He has recently had a quotation of MK12,000 for labour to repair his home.

4. John employs four unskilled workers on contracts guaranteeing them a 40 hour week at MK6 per hour. These unskilled labourers are currently idle and would have sufficient spare time to complete the proposal under consideration.

5. This is the estimated cost of hiring scaffolding.

6. John estimates that the project will take 20 weeks to complete. This represents 20 weeks' straight line depreciation on equipment used. If the equipment is not used on this job it will stand idle for the 20 week period.

In either case its value at the end of the 20 week period will be identical.

7. This represents the rental cost of John's storage yard. If he does not undertake the above job he can rent his yard out to a competitor who will pay him rent of MK500 per week for the 20 week period.

8. This is the cost of the plans that John has already had drawn for the project.

9. John attempts to earn a mark-up of 20% on cost on all work undertaken.

John is surprised at the suggested price and considers it rather high. He knows that there will be a lot of competition for the work.

Required:

Using relevant costing principles, calculate the lowest price that John could quote for the customer's building work. Explain your treatment of each item in the accountant's estimate.

(20 marks)

Solution

Minimum price to be quoted

		MK
Direct materials		
Bricks	note 1	48,000
Other materials	note 2	5,000
Direct labour		
Skilled 2,400 hours at MK12 per hour + MK12,000	note 3	40,800
Unskilled	note 4	–
Scaffolding hire	note 5	3,500
Depreciation of general purpose machinery	note 6	–
General overheads	note 7	10,000
Plans	note 8	–
Total cost		107,300
Profit	note 9	–
Minimum price		107,300

Notes

1. All bricks are charged at replacement cost as they are regularly used in the business and those in stock will need to be replaced at MK120 per 1,000.

2. Charged at their incremental purchase price.

3. John's labour is charged at its value in its best alternative use (its opportunity cost). If not working on the project he could earn 800 hours x MK12 = MK9,600 working for other builders or save MK12,000 by repairing his own house. The latter is the best alternative use of his time. The remainder of the skilled labour is charged at its incremental cost of MK12 per hour.

4. There is no incremental cost of using the unskilled labour on this project.

5. This is the incremental hire cost.

6. Depreciation is not an incremental cash flow. The value of the asset is not affected by the project, therefore there is no cost attached to using it.

7. The value of the yard in its best alternative use is MK500 x 20 weeks = MK10,000.

8. This work has already been done and its cost is sunk, therefore irrelevant.

9. As we are considering the minimum price John can quote, no profit figure is included.

END OF CHAPTER QUESTIONS

Dziwawekha Ltd manufactures three products L M and N. The company that supplies the two raw materials that are used in the manufacture of all the three products has informed Dziwawekha that their employees are refusing to work overtime. This means that the supply of raw materials is limited to the following quantities in 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 Dziwawekha Ltd is as follows:

	L	M	N
Quantity of material used per unit manufactured			
Material A (kg)	2	1	4
Material B (kg)	5	3	7
Maximum sales demand	120	160	110
Contribution per unit sold	MK15	MK12	MK17.50

Owing to the perishable nature of the products, no stocks of finished goods are held.

Required

(a) Recommend a production mix that will maximise the profits of Dziwawekha Ltd for the forthcoming period **15 marks**

(b) Dziwawekha Ltd has a valued customer to whom they wish to guarantee the supply of 50 units of each product next year. Would this alter your recommended production plan? **5 marks**

(Total: 20marks)

SUGGESTED SOLUTIONS TO END OF CHAPTER QUESTIONS

Chapter 1

Madalitso Medical Clinic

(a) **Cost classification**

Fixed	Variable	Mixed
Salaries, nurses	Laundry	Laboratory
Assistants		Pharmacy
Depreciation		
Administration		
Equipment hire		

(b) Separating mixed laboratory and pharmacy costs into their fixed and variable components.

(i) **Laboratory**

	Output	Cost
		K
High	2,250	11,750,000
Low	2,100	11,000,000
Difference	150	750,000

Variable laboratory cost per patient – day = K750,000/150 patient days
= K5,000 per patient-day

	K
Total laboratory cost	11,750,000
Total variable laboratory cost K5,000 x 25,0 patient – days	11,250,000
Fixed laboratory cost	500,000

(ii) **Pharmacy**

	Output	Cost
		K
High	2,250	3,250,000
Low	2,100	3,100,000
Difference	150	150,000

Variable pharmacy cost per patient – day = K150,000/150 patient days

= K1,000 per patient per day

	K
Total pharmacy cost	3,250,000
Total variable pharmacy cost K10 x 2,250 patient – days	2,250,000
Fixed pharmacy cost	1,000,000

(c) Total charge per patient – day for an average of 2,000 patient – days per month.

Variable cost per patient day

	K
Laboratory	5,000
Pharmacy	1,000
Laundry	800
Total	6,800

Fixed costs for 2,000 patient days

	K
Salaries	600,000
Assistants	120,000
Laboratory	500,000
Pharmacy	1,000,000
Depreciation	1,180,000
Administration	1,200,000
Equipment hire	3,000,000
Total	7,600,000

Fixed cost per patient – day = K7,600,000/2,000 patient days
= K3,800 per patient-day

Total cost per patient-day = Variable cost per patient-day + Fixed cost per patient-day
= K6,800 + K3,800
= K10,600

(d) Total charge per patient-day for an average of 2,500 patient-days per month

Fixed cost per patient – day = K7,600,000/2,500 patient days
= K3,040 per patient-day

Total cost per patient-day = K6,800 + K3,040
= K9,840

(e) The charge per patient-day decreased as the same amount of fixed costs are now being spread over an increased number of patient-days.

Chapter 2

Matabwa Limited

(a) (i) **Inventory valuation – LIFO method**

Date	Receipts		Sales	Balance		
	Qty	Value	Qty	Qty	Value	
1 January				2,000	500 x K5.00	= 2,500
					500 x K20.00	= 10,000
					1,000 x K25.00	25,000
						37,500
January			1,500	500	500 x K5.00	2,500
February	10,000	250,000		10,500	500 x K5.00	2,500
					10,000 x K25.00	250,000
						252,500
March			8,000		500 x K5.00	2,500
					2,000 x K25.00	50,000
						52,500
April	15,000	390,000		17,500	500 x K5.00	2,500
					2,000 x K25.00	50,000
				15,000	15,000 x K26.00	390,000
						442,500
May	6,500	175,000		24,000	500 x K5.00	2,500
					2,000 x K25.00	50,000
					15,000 x K26.00 = 390,000	
					6,500 x K27.00 = 175,500	
						618,000
June				22,000	500 x K5.00	2,500
					1,500 x K25.00	37,500
						40,000

(ii) **Inventory valuation – FIFO method**

Date	Receipts		Sales	Balance		
	Qty	Value	Qty	Qty	Value	
1 January				2,000	2,000 x K25.00	= 50,000
January			1,500	500	500 x K25.00	12,500
February	10,000	250,000		10,500	500 x K25.00	12,500
					10,000 x K25.00	250,000
						262,500
March			8,000	2,500	2,500 x K25.00	62,500
April	15,000	390,000		17,500	2,500 x K25.00	62,500
					15,000 x K26.00	390,000
				15,000		452,500
May	6,500	175,000		24,000	2,500 x K25.00	62,500
					15,000 x K26.00	390,000
					6,500 x K27.00	175,500
						628,000
June			22,000	2,000	2,000 x K27.00	54,000

(b) (i) **Trading profit – LIFO method**

	K	K
Sales (1,500 + 8,000 + 22,000) x K40		1,260,000
Cost of sales:		
Opening inventory	37,500	
Purchases (250,000 + 390,000 + 175,500)	815,500	
Closing inventory	(40,000)	
Gross profit		(813,000)
		447,000

(ii) **Trading profit – FIFO method**

	K	K
Sales (1,500 + 8,000 + 22,000) x K40		1,260,000
Cost of sales:		
Opening inventory 50,000		
Purchases (K250,000 + 390,000 + 175,500)	815,500	
Closing inventory	(54,000)	(811,000)
Gross profit		448,500

(c) The company might have decided to change from LIFO inventory valuation to FIFO inventory valuation because during inflationary periods FIFO values closing inventories at the latest prices which are realistic as compared to the LIFO method that values inventories using old outdated prices.

Chapter 3

Zindikirani Limited

(a) Total labour cost = 30 employees x 38 hrs per week x 4 weeks x K30 per hr
= K136,800

Labour cost per unit = K136,800/456 units
= K300/unit

(b) Operative	Tadala K	Tawina K	Siphiwe K
Basic pay	4,710 (157xK30)	5,160 (172xK30)	4,200 (140xK30)
Overtime	255 (17xK30x50%)	330 (22xK30x50%)	300 (20xK30x50%)
Total	4,965	5,490	4,500

(c)

(i) Basic wages = 4,200 hrs x K30/hr = K126,000

(ii) Bonus

Time allowed (450 units x 10hrs/unit)	4,500 hours
Time taken	4,200 hours
Time saved	300 Hours

Bonus =300 hours x 50% x K30 per hour
= K4,500

(iii) A bonus scheme is usually introduced to encourage increased production but it is also possible that in attempting to produce goods more quickly, carelessness can occur resulting in an increase in faulty products being produced. The company may have to introduce additional inspection to combat these problems.

Chapter 4

(a) (i) Repeated distribution method

	A	B	C	D	Canteen	Stores
	K	K	K	K	K	K
Initial cost	200,000	500,000	300,000	400,000	50,000	100,000
Reapportion:						
Canteen 10:30:20:30:10	5,000	15,000	10,000	15,000	(50,000)	5,000
	205,000	515,000	310,000	415,000	-	105,000
Stores 20:10:30:20:20	21,000	10,500	31,500	21,000	21,000	(105,000)
	226,000	525,500	341,500	436,000	21,000	-
Canteen	2,100	6,300	4,200	6,300	(21,000)	2,100
	228,100	531,800	345,700	442,300	-	2,100
Stores	420	210	630	420	420	(2,100)
	228,520	532,010	346,330	442,720	420	-
Canteen	42	126	84	126	(420)	42
	228,562	532,136	346,414	442,846	-	42
Stores	12	5	13	12	-	(42)
	228,574	532,141	346,427	442,858	-	-

(ii) Algebraic method

Let x = total canteen overheads
Let y = total stores overheads

x = 50,000 + 0.2 y ……(1)
y = 100,000 + 0.1 x ……..(2)

Substitute y = 100,000 + 0.1 x in (1)
x = 50,000 + 0.2 (100,000 + 0.1 x)
x = 50,000 + 20,000 + 0.02 x
x = 70,000 + 0.02 x
x – 0.02 x = 70,000

0.98 x = 70,000
x = $^{70,000}/_{0.98}$
x = 71,429

Substitute x = 71,429 in (2)
y = 100,000 + 0.1 x
y = 100,000 + 0.1 x 71,429
y = 100,000 + 7,143
y = 107,143

	A	B	C	D
	K	K	K	K
Initial cost	200,000	500,000	300,000	400,000
Apportion Canteen (x) 10:30:20:30	7,143	21,429	14,286	21,429
Apportion Stores (y) 20:10:30:20	21,429	10,714	32,143	21,429
	228,572	532,143	346,429	442,858

(b) Overhead costs for service departments are reapportioned with the aim of calculating total product costs required for product pricing and measuring product profitability as in the long term it is necessary for any organization to recover all costs. However, the reapportionment of these overheads to production cost centres to assist in control and decision making is not worthwhile as the reapportionment is highly subjective and the costs are largely fixed making them uncontrollable in the short-term. An alternative treatment would be to charge the fixed component of such costs as a period cost and the variable component would be charged as a production cost on the basis of an appropriate measure of output.

Chapter 5

Howa Limited

(a) Profit statement

	K
Sales	2,400,000
Cost of sales 100,000 units x K16 (See workings)	1,600,000
Gross profit	800,000
Less: Fixed selling and administration costs	400,000
Net profit	400,000

Working 1

Production in May	100,000
May sales (units) $^{K2,400,000}/_{K24}$	45,000
Excess of production over sales units in May	145,000

Working 2

Production cost in May	
Variable cost of sales $^{K1,200,000}/_{100,000}$ x 145,000	1,740,000
Fixed manufacturing cost	580,000
Total production cost	2,320,000

Working 3

Full production cost per unit $^{K2,320,000}/_{145,000 \text{ units}}$	K16

(b) Profit reconciliation

Absorption costing profit	400,000
Adjust for movement in stock 45,000 units x K4 (16-12)	180,000
Marginal costing profit	220,000

(c) Attractions of marginal costing

(i) Marginal costing provides useful information for decision making purposes as it separates costs into their fixed and variable components.

(ii) Marginal costing removes the effect of stock changes on the calculate profit.

(iii) Marginal costing avoids capitalizing fixed overheads in unsaleable stocks.

Chapter 6

(a) The major differences relate to the two-stage allocation process. In the first stage, traditional systems allocate indirect costs to cost centers (normally departments) whereas activity-based systems allocate indirect costs to cost centers based on activities rather than departments. Since there are many more activities than departments, a distinguishing feature is that activity-based systems will have a greater number of cost centers in the first stage of the allocation process. In the second stage, traditional systems use a limited number of different types of second stage volume-based allocation bases (cost drivers) whereas activity-based systems use many different types of volume-based and non-volume based cause-and-effect second stage drivers.

(b)(i) Conventional absorption costing statement

Sales volume('000)	50	40	30
	X	Y	Z
Selling price per unit	45	95	73
Prime cost per unit	32	84	65
Contribution per unit	13	11	8
Total contribution (K'000)	650	440	240
Machine dept. overheads(K'000)*	120	240	144
Assembly dept. overheads(K'000)**	288.75	99	49.5
Profit(K'000)	241.25	101	46.5

*X=50,000x2hoursxK1.2; Y=40,000x5hoursxK1.20; Z=30,000x4xK1.2
**X=50,000x7hoursxK0.825; Y=40,000x3hoursxK0.825; Z=30,000x2xK0.825

(ii)Cost pools

	Machining Services	Assembly services	Set-ups	Order processing	Purchasing
Costs(K'000)	357	318	26	156	84
Cost drivers	420,000	530,000	520	32,000	11,200
Cost driver rates	K0.85/machine hour	K0.60/direct labor hr	K50/setup	K4.875/ customer order	K7.50/supplier's order

ABC Profit Statement

	X K'000	Y K'000	Z K'000
Total contribution	650	440	240
Less: overheads			
Machine dept at K0.85/hour	85	170	102
Assembly at K0.60 per hour	210	72	36
Set-up costs at K50 per set-up	6	10	10
Order processing at K4.867 per order	39	39	78
Purchasing at K7.50 per order	22.5	30	31.5
Profit(loss)	287.5	119	(17.5)

COSTING AND BUDGETARY CONTROL (TC9)

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