# COST ACCOUNTING

STUDY TEXT

# A4

## Foundation level

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THE NATIONAL BOARD OF ACCOUNTANTS AND AUDITORS TANZANIA (NBAA)

A4 COST ACCOUNTING

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**STUDY TEXT**

NBAA

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**FOREWORD.**

The National Board of Accountants and Auditors is a professional body in Tanzania, established under the Auditors and Accountancy Registration Act No 33 of 1972 (CAP 286 R.E.2002). The Board has been charged with among other things, the responsibility to promote, develop and regulate the accountancy profession in the country.

In fulfilling its statutory obligations, NBAA prepares National Accountancy Examination Scheme for students aspiring to sit for Accounting Technician and Professional Examinations. Further, for effective implementation of the examination scheme and improve examination results, the Board provides Study Guides for all subjects to assist both examination candidates and trainers in the course of learning and teaching.

The Study Guides have been prepared in the form of text books with examples and questions to enable the user to have comprehensive understanding of the topics. The Study Guides cover a wide range of topics in the NBAA syllabi and adequately cover the most comprehensive and complete knowledge base that is required by a leaner to pass the respective examination levels.

Furthermore, the Study Guides have been prepared to match with the Competency Based Syllabi to enable the learners to be exposed to practical understanding of issues rather than memorisation of concepts. In this case, the Study Guides are characterized by the following features:-

1. Focus on outcomes – The outcomes shown in every topic provides clear understanding on what to be learnt.

2. Greater workplace relevance – the guides emphasize on the importance of applying knowledge and skills necessary for effectively performance in a work place. This is different from the traditional training where much concern has been expressed in theoretical perspectives.

3. Assessments as judgments of competence – The assessment questions embedded in the Study Guides are adequate measures of understanding of the subject matter.

Study Guides are also useful to trainers specifically those who are teaching in the review classes preparing learners to sit for the professional examinations. They will make use of these Study Guides together with their additional learning materials from other sources in ensuring that the learners are getting sufficient knowledge and skills not only to enable them pass examinations but also make them competent enough to perform effectively in their respectively workplace.

NBAA believes that these standard Study Guides are about assisting candidates to acquire necessary skills and knowledge that will enable them to perform as professionals. The outcomes to be achieved are clearly stated so that learners may know exactly the skills and knowledge they are supposed to acquire in a particular topic.

NBAA wishes all the best to NBAA Examination candidates, trainers in their review classes, lecturers in the higher learning institutions and all other beneficiaries of these learning materials in making good use of the Study Guides towards promoting the accountancy profession in Tanzania.

CPA. Pius A. Maneno
**EXECUTIVE DIRECTOR**
**JUNE, 2019**

# STUDY CONTENTS

**A4 – Cost Accounting**



| | |
|---|---|
| **Total Page Count:** | **238** |

## Features of the book

'The book covers the entire syllabus split into various chapters (referred to as Study Guides in the book). Each chapter discusses the various Learning Outcomes as mentioned in the syllabus.

**Contents of each Study Guide**

- ❑ **'Get Through Intro':** explains **why** the particular Study Guide is important through real life examples.

- ❑ **'Learning Outcomes':** on completion of a Study Guide, students will be able to understand all the learning outcomes which are listed under this icon in the Study Guide.

The Learning Outcomes include:

- ✓ **'Definition':** explains the meaning of important terminologies discussed in the learning Outcome.

- ✓ **'Example':** makes easy complex concepts.

- ✓ **'Tip':** helps to understand how to deal with complicated portions.

- ✓ **'Important':** highlights important concepts, formats, Acts, sections, standards, etc.

- ✓ **'Summary':** highlights the key points of the Learning Outcomes.

- ✓ **'Diagram':** facilitates memory retention.

- ✓ **'Test yourself'**: contains questions on the Learning Outcome. It enables students to check whether they have assimilated a particular Learning Outcome.
- ❑ **Self-Examination Questions'**: exam standard questions relating to the learning outcomes given at the end of each Study Guide.

**EXAMINATION STRUCTURE**

The syllabus is assessed by a three hour paper based examination.

The examination will consist of two sections.

| | |
|---|---|
| Section A | One conventional question of 20 marks |
| Section B | Forty multiple choice questions of 2 marks each |

# COST CLASSIFICATION

# 1

## Get Through Intro

Incurring costs is an inevitable part of running any business. Evaluating business ideas, finalising an idea, setting up a business and running it are all activities that incur costs.

Costs are classified into various categories based on behaviour, purpose, function and nature. These classifications help management in decision-making, forecasting and budgeting.

This Study Guide will help you understand costs, classify them into various categories and use them for management purposes and total cost calculations.

In the role of a management accountant you will need to have a thorough understanding of various costs and this Study Guide will prepare you for that. This is the basic introduction to costing and hence will help a strong foundation to understand the further Study Guides and complex concepts.

## Learning Outcomes

a) Define cost and explain their behavioural classification as fixed and variable costs.
b) Define and illustrate product costs and period costs.
c) Define and illustrate direct and indirect costs.
d) Classification of costs by nature, function and purpose.

**1. Define cost and explain their behavioural classification as fixed and variable costs.**
**[Learning Outcome a]**

**Definition**

Cost is the expenditure incurred on resources that are used to achieve a particular objective. Resources may be tangible (materials or machinery) or intangible (labour, patent, copyright etc.) It is the amount of money required to produce a product or perform a service.

Costs are classified into fixed and variable costs based on their behaviour. Variable costs and fixed costs behave differently with change in the activity levels and hence this classification is called the behavioural classification.

The distinction of costs into fixed and variable components is very important from the viewpoint of decisionmaking. It helps a manager to make crucial decisions such as whether to manufacture a component in-house or buy it from outside vendors, whether to continue the business or shut down, whether to start a new business etc.

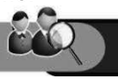
### 1.1 Fixed and semi-fixed or stepped fixed costs

**1. Fixed cost**

**Definition**

A cost that remains constant in total, within the current budget period, irrespective of changes in volume of activity, is called a **fixed cost.**

Fixed costs are the expenses which do not change in proportion to the activity of a business, within the relevant period of time.



**Example**

A retailer must pay rent and utility bills irrespective of the volume of sales he makes.

Fixed costs **do not vary in total**. The per **unit fixed cost decreases as production volume increases** and vice-versa.

They are also known as "**period cost**" as the cost is incurred in relation to a time period or "**stand-by cost**" because this cost will be incurred even if no production activity takes place.

**All fixed costs are overheads but all overheads are not fixed costs.** Overheads include certain costs that vary with the level of activity. These depict a direct relationship with the activity level and hence are categorised as variable overheads, e.g. overtime premium that changes with the number of hours of overtime worked, power costs, fuel costs and any other utility costs. Certain overheads, on the other hand, always remain fixed irrespective of the activity level, e.g. insurance costs, depreciation on assets etc.

**Example**

**Fixed costs**

- Rent of office building, factory premises
- Depreciation of building, plant and machinery
- Pay and allowances of managers, secretary and accountants Legal or audit fees

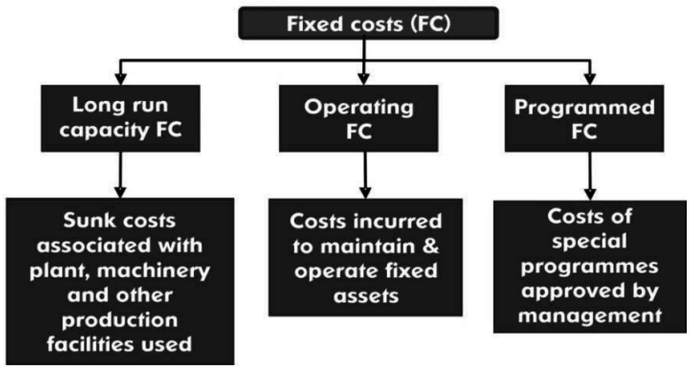
There are three types of fixed cost

**(a) Long-run capacity fixed costs:** these are sunk costs (i.e. costs already spent) associated with plant, machinery and other non-current assets used in factory or in office.

**(b) Operating fixed costs:** these overheads are incurred to maintain and operate non-current assets and include any other fixed costs relating to the factory, e.g. depreciation, factory manager's salary etc.

**(c) Programmed fixed cost:** these are the costs of special programmes approved by management, e.g. costs relating to research and development, market promotion expenses, staff training expenses.

**Diagram 1: Types of fixed costs**

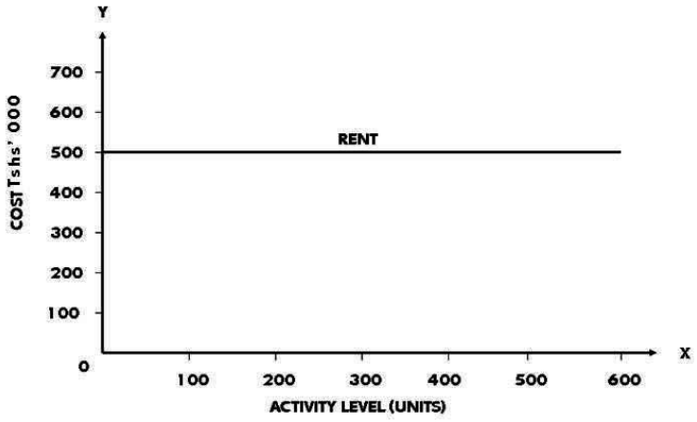



To have an idea of the graphical representation of fixed costs let us try to plot the graph using a simple example.

**Example**

Tim runs a saw mill and has hired a factory shed for the purpose. He pays Tshs6,000,000 (i.e. Tshs500,000 per month) as the annual rent. Although his other monthly expenses change each month, the rent cost remains the same. The following graph depicts the fixed cost remaining constant during the period.

**Diagram 2: Total fixed cost**




It can be observed from the above diagram that total annual rent cost remains constant throughout the budget period of one year.

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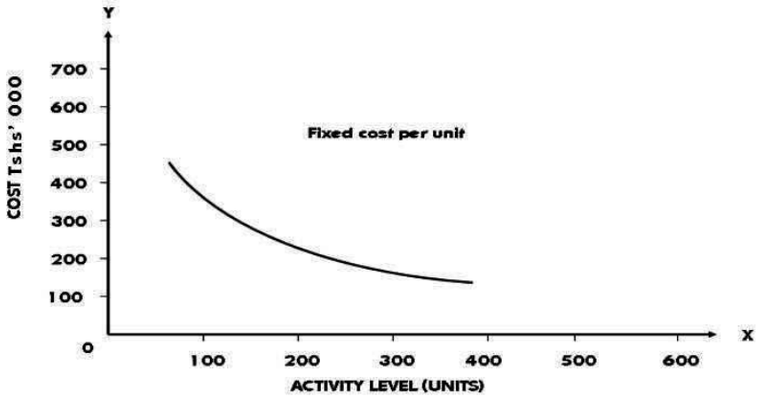
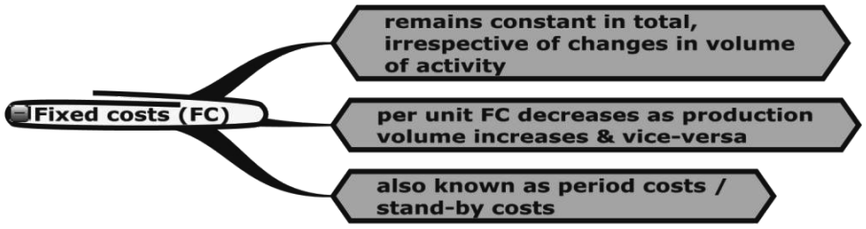
The above graph shows the total fixed cost. The graph below shows how the per unit fixed cost decreases as the volume of production increases.

**Diagram 3: Fixed cost per unit**



**SUMMARY**




## Test Yourself 1

Which of the below best describes a fixed cost?

**A** Remains fixed in a budget period
**B** Remains fixed forever
**C** Always varies
**D** Varies per hour

---

**2. Stepped fixed cost or semi fixed cost**

## Definition

Cost that are fixed for a given level of activity but in due course changes by a constant amount at some point is a **stepped fixed cost**.

---

A stepped fixed cost remains the same up to a certain level of activity or a certain period of time, then changes and again remains constant up to a new activity level or a period of time.

## Example

Sera International School has started to offer a pick-up service for its students this year. The cost of hiring one bus is Tshs100,000 per day. One bus can accommodate a maximum of 50 students.

At the beginning of the session only 40 students opted to take the bus. Therefore only one bus was hired at a cost of Tshs100,000 per day. The cost of this bus will remain Tshs100,000 until the number of students rises above 50.

However, the number of students using the bus rose from 40 students to 80 students by the middle of the session. As a result, the school had to hire another identical bus for the additional 30 students (80 - 50). The cost then became Tshs200,000 per day. This cost will again remain constant until the student count exceeds 100 (50 + 50).

---

Increasing salaries of managerial and administrative employees will cause fixed employee costs to step up. Similarly if there is a revision in the rent agreement that increases the monthly rent within the period under consideration, the cost will step up.

Graphical representation of stepped fixed cost is explained with the help of the following example.

## Example

Matrix Plc has its office in rented premises. The annual rent is Tshs10,000,000. The rent cost rises every two years by Tshs5,000,000 according to the rent agreement. This cost again remains constant at Tshs15,000,000 until the end of the fourth year and again rises by Tshs5,000,000. This therefore depicts a stepped fixed cost.

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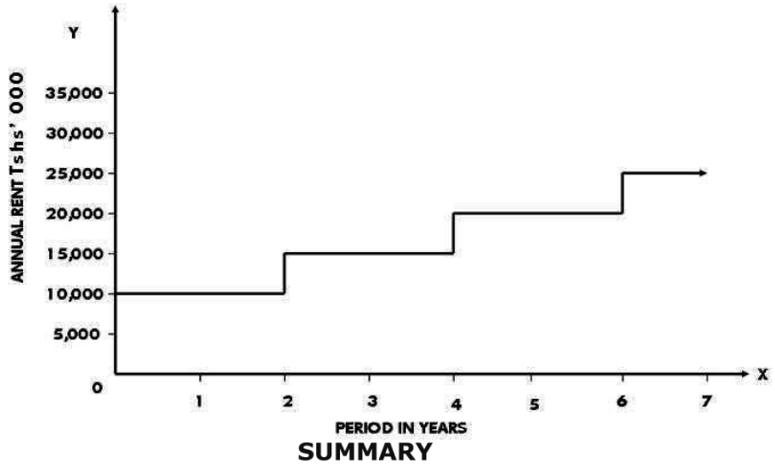
**Diagram 4: Stepped fixed cost chart**




**SUMMARY**


## Test Yourself 2

Which of the below sentence / s describes a stepped fixed cost?

**A** Remains unchanged irrespective of activity levels
**B** Has a fixed component only
**C** Is constant up to a certain activity level, then rises and remains constant up to a new level of activity **D** All of the above

### 1.2 Variable Cost

## Definition

The portion of total cost that varies with a change in the volume of activity is known as **variable cost.**

It **varies in total but its value per unit cost remains constant**. For example, 1 item costs Tshs10,000 and 10 items cost Tshs100,000. The cost of each individual unit is Tshs10,000, but in total the costs are Tshs100,000. Variable costs are expenses that change in **direct proportion** to the activity of a business.

## Example

- Direct material and labour cost
- Indirect material and labour cost
- Power and fuel
- Lubricants
- Tools and spares
- Products purchased for resale

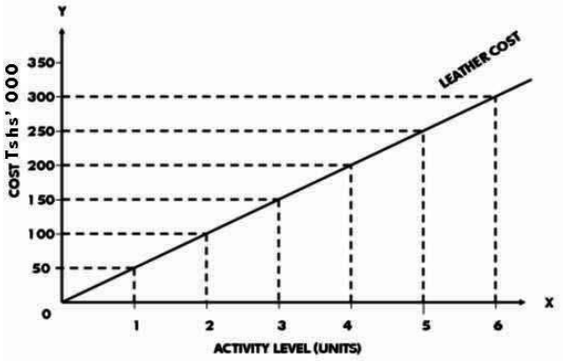
A graphical representation of variable cost is shown in the example given below.

## Example

To plot the variable cost line on a graph, consider the production of leather bags. Suppose each bag requires 2 square metres of leather that costs Tshs50,000. This is the material cost (i.e. a variable cost) that increases with every bag produced. This shows that it increases proportionately with the increase in output. It will increase by

Tshs50,000 with each additional bag manufactured. The graph showing this increase in the cost will be as below:

**Diagram 5: Total variable cost**




The above figure shows that variable cost varies in direct proportion to the change in the level of activity (in this case Tshs50,000 per unit), that is, it increases in total as the output increases.

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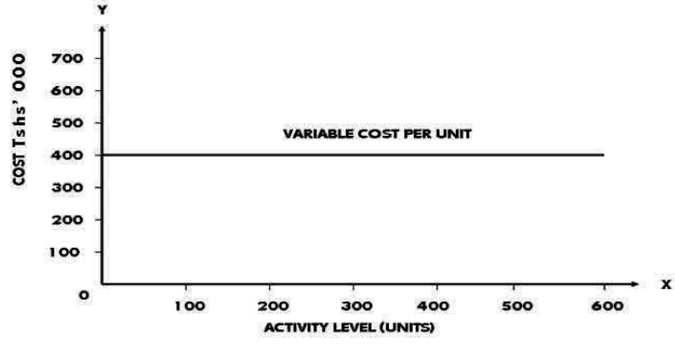
The above graph shows total variable cost. Per unit variable cost remains the same irrespective of the volume of production. The graph depicting this is given overleaf.

**Diagram 6: Per unit variable cost**

**Assuming, the per unit variable cost per product to be Tshs400,000.**




The total cost line consisting of fixed and variable cost is plotted below.

**Diagram 7: Total cost graph**

**Assuming, the per unit variable cost per product Tshs30,000 and total fixed costs Tshs200,000.**

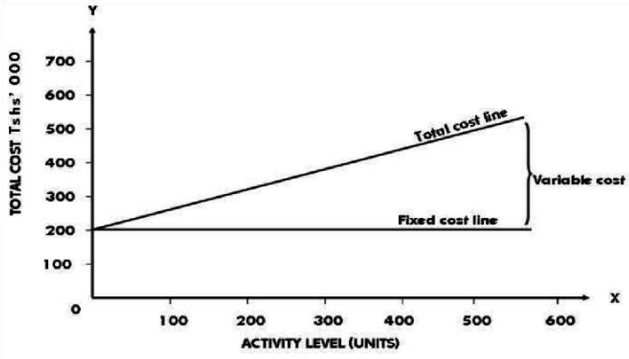
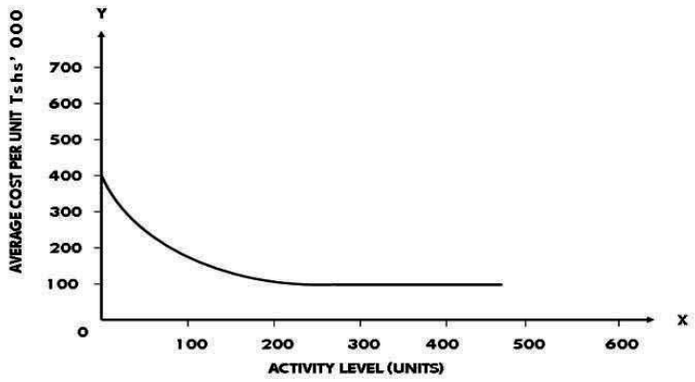


**Diagram 8: Average cost per unit**

**Assuming, cost per unit Tshs400,000.**




Total cost (fixed + variable) shows a rising trend as variable costs always increase with an increase in production. The average total cost i.e. per unit cost consisting of the fixed and variable elements, decreases with an increase in the volume of production. This is because the variable cost per unit remains constant but the fixed cost per unit decreases as the volume of production increases.

## Example

Trim Plc manufactures helmets. The fixed costs of production for the year are Tshs4,000,000. The variable costs per helmet are Tshs18,000. Although the total fixed costs will be incurred irrespective of the number of helmets manufactured, the total variable costs will increase in direct proportion to the number of helmets manufactured. If Trim manufactures 50 helmets, the total fixed cost for this will be Tshs4,000,000 and the total variable cost will be Tshs900,000. The total fixed cost to manufacture 70 helmets would again be Tshs4,000,000 but the variable cost would rise from Tshs900,000 to Tshs1,260,000.

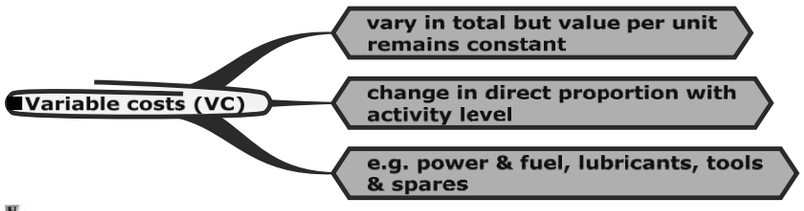
Let us now calculate the fixed and variable costs per unit at the two volumes of production.

**Variable cost per unit**
At level of 50 helmets variable cost per helmet = Tshs900,000/50 helmets = Tshs18,000 At level of 70 helmets variable cost per helmet = Tshs1,260,000/70 helmets = Tshs18,000

**Fixed cost per unit**
At level of 50 helmets fixed cost per helmet = Tshs4,000,000/50 helmets = Tshs80,000 At level of 70 helmets fixed cost per helmet = Tshs4,000,000/70 helmets = Tshs57,140

Hence total cost per unit at the two levels = variable cost per unit + fixed cost per unit
50 helmets - Tshs18,000 + Tshs80,000 = Tshs98,000
70 helmets - Tshs18,000 + Tshs57,140 = Tshs75,140
The cost per unit falls from Tshs98,000 to Tshs75,140

## SUMMARY




## Test Yourself 3

In a computer chip manufacturing unit, one chip requires 2.5 hours of labour per chip at Tshs10,000 per hour, direct material worth Tshs20,000 and direct expenses per chip amounting to Tshs5,000. The rent of the

workshop is Tshs1,000,000; the watchman's monthly salary is Tshs1,000,000, administrative staff salary amounts to Tshs2,500,000 per month and the floor manager is paid a salary of Tshs2,500,000 per month.

Prepare a monthly statement showing the fixed and the variable cost components at the output level of 500 computer chips for the month.

### 1.3 Semi-variable costs

**Definition**

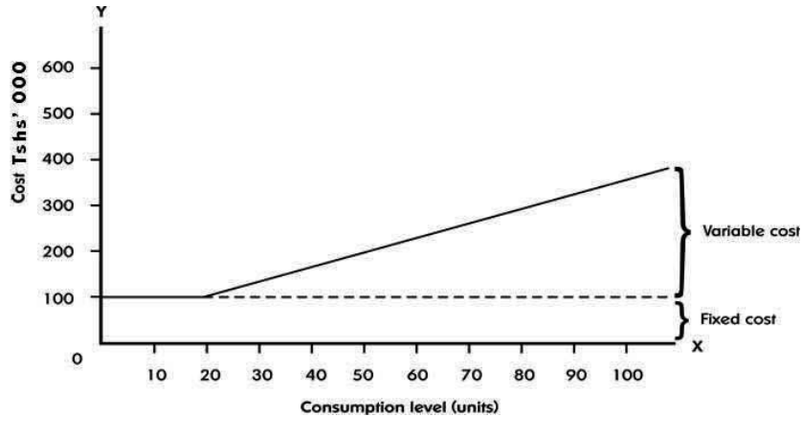
A cost that is composed of a mixture of fixed and variable components is known as a **semi-variable cost**. It is also known as a mixed cost.

In other words, these costs show a mixed relationship, when plotted against volume.

**Example**

A good example of a semi-variable cost is the telephone bill. This is generally divided into two components - a fixed charge payable per billing period (where there is no extra charge up to a certain level of usage) and a variable per unit usage charge (depending on the number of units consumed above the certain level of usage).

**Diagram 9: Semi-variable cost chart**



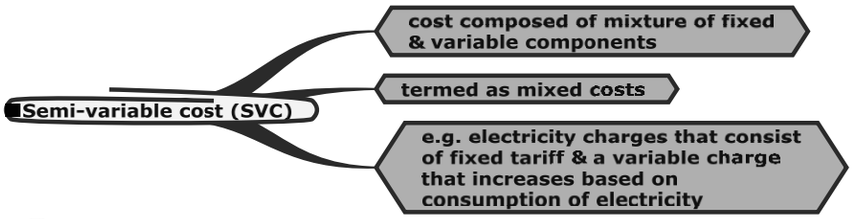

In the above graph, the fixed charge is Tshs100,000 up to the consumption level of 20 units. Then variable cost is charged for every unit consumed above this level. This shows that there is a fixed element of Tshs100,000 in the cost and the remaining portion varies depending upon the units consumed.

**Example**

You are a member of a local country club. You pay an annual membership fee, which enables you to stay on the club's list of members. So from your perspective, this is a fixed cost.

You also pay to use club facilities, such as facilities for sport and social gatherings, if and when you use them. These are variable costs because they are paid for only in the event of utilisation of a particular facility. Also, the charge is on a per facility basis and not a gross charge for all facilities.

**SUMMARY**




## Test Yourself 4

Which of the following can be a semi-variable cost?

**A** Telephone charges
**B** Internet usage charges
**C** Vehicle hire charges
**D** All of the above

## Example

| Cost type with examples | | Explanation |
|---|---|---|
| **(a)** | **Fixed costs** | |
| | Insurance | Cost incurred to protect against events that could damage business property. No relationship to activity of production and therefore does not vary with the volume of units manufactured. |
| | Depreciation on buildings | Accounting convention to reflect the reduction in value of assets due to wear and tear. No relationship to activity. |
| | Interest on borrowed money | Cost of money borrowed for the business. This cost generally does not change with the change in the level of activity or volume of production. |
| **(b)** | **Stepped fixed costs** | |
| | Depreciation on company owned vehicles | If the company operates a fleet of vehicles to reduce the delivery time, the depreciation cost on the vehicles will step up each time the number of vehicles increases. |
| | Rent costs for extra storage | The rent of the warehouse is a fixed cost as long as the storage does not exceed the capacity of the warehouse. Once the volume of materials increases beyond this limit, a new warehouse is rented and the rent cost steps up. |
| **(c)** | **Variable costs** | |
| | Direct material<br>Direct labour<br>Direct expenses | The cost of materials, labour or expenses per unit of production is constant, and as the units of production increase, so does the cost. A direct relationship with activity. |
| | Sales commission | The cost of rewarding sales persons according to the sales volume they achieve has a direct relationship with sales activity. |
| **(d)** | **Semi-variable costs** | |
| | Monthly telephone costs, electricity costs | Both telephone and electricity charges comprise fixed and variable components. Fixed component remains unchanged for any quantum of usage and the variable component varies with a change in usage level. |

## Test Yourself 5

Which of the following is correct regarding semi-variable costs?

**A** Change in the same direction and same proportion with the change in output
**B** Fluctuate with volume because of a variable element.
**C** Do not change in direct proportion to output because of the variable element.
**D** All of the above

### 1. High / low analysis

**High/low** analysis compares the costs at two different activity levels so as to identify the fixed and variable cost components of the total cost.

Since the fixed element of the total cost is likely to remain unchanged during different periods, changes in the total costs at two different levels of activity can be attributed solely to the **variable elements.**

Variable cost per unit is calculated as:

(a) Select the highest level of activity and the lowest level of activity in the given series of data.
(b) The difference in costs during these periods should be divided by the changes in output during the same periods.
(c) This calculation can be expressed mathematically as follows:

$$\text{Variable cost per unit} = \frac{\text{Highest total cost - lowest total cost}}{\text{Highest units - lowest units}}$$

**Fixed cost** = Total cost (at the highest / lowest level of activity) – (Total units (at the highest / lowest level) x Variable cost per unit (as calculated above)

Generally the highest and the lowest volumes of production are used to compute the variable cost per unit.

**Example**

The following data relates to the monthly output and related costs for Only Clean Plc, a soap manufacturing company.

| Month | Output (Units) | Total Cost (FC + VC) Tshs'000 |
|---|---|---|
| April | 10,000 | 50,000 |
| May | 11,000 | 54,000 |
| June | 12,000 | 58,000 |
| July | 13,000 | 62,000 |

To separate total cost into the fixed and variable elements, apply the high or low method.

$$\text{Variable cost per unit} = \frac{\text{Highest total cost - lowest total cost}}{\text{Highest units - lowest units}}$$

$$= \frac{\text{Tshs 62,000,000 - Tshs50,000,000}}{\text{13,000-10,000}}$$

= Tshs4,000 per unit

Fixed cost can be computed by using the following formula:

Fixed Cost = Total high cost – (Total high units x Variable cost per unit)

= Tshs 62,000,000 – (13,000 units x 4,000) = Tshs10,000,000

Let's check this with the low activity (at 10,000 units)

Total variable cost = Total cost – Fixed cost

= Tshs50,000,000 – Tshs10,000,000

= Tshs40,000,000

$$\text{Per unit variable cost} = \frac{\text{Tshs40,000,000}}{\text{10,000,000}}$$

= Tshs4,000

**Test Yourself 6**

A company incurs the following costs at various activity levels:

| Activity level (units) | Total cost Tshs'000 |
|---|---|
| 5,000 | 250,000 |
| 7,500 | 325,000 |
| 10,000 | 400,000 |

Using the high-low method what is the variable cost per unit?

**A** Tshs25,000
**B** Tshs30,000
**C** Tshs35,000
**D** Tshs40,000

**2. Situations involving stepped fixed cost and changes in variable cost per unit**

There are situations where the stepped fixed costs occur along with changes in per unit variable costs.

**Example**

An organisation has the following total costs at three activity levels:

| Activity level (units) | Total cost Tshs'000 |
|---|---|
| 4,000 | 38,000 |
| 6,000 | 54,000 |
| 8,000 | 68,000 |

The variable cost per unit is constant within this activity range and there is a step up of Tshs2,000,000 in the total fixed costs when the activity level exceeds 5,000 units.

What is the total cost at an activity level of 7,000 units?

**Answer**

There is a step up of Tshs2,000,000 when the activity level exceeds 5,000 units. Hence to calculate the per unit variable cost, we will have to reduce this amount of step up in the costs. This is because these are stepped fixed costs occurring due to a change in the activity level and the analysis assumes that the total fixed costs remain the same throughout the activity period. Hence by deducting the step up in the fixed costs we consider only the pure increase in the costs due to the increase in variable costs.

$$\text{Variable cost per unit} = \frac{\text{Highest total cost - Lowest total cost}}{\text{Highest units - Lowest units}}$$

$$= \frac{(\text{Tshs68,000,000} - \text{Tshs2,000,000}) - \text{Tshs38,000,000}}{\text{8,000 units - 4,000 units}}$$

$$= \frac{\text{Tshs28,000,000}}{\text{4,000}}$$

= Tshs7,000 per unit

Fixed costs at the activity level of 4,000 units = Tshs38,000,000 – (4000 x Tshs7,000/unit) = Tshs10,000,000

Therefore, the total cost at the activity level of 7,000 units
= Variable cost + Fixed cost + Stepped up fixed cost
= 7,000 x Tshs7,000 + Tshs10,000,000 + Tshs2,000,000
= Tshs61,000,000

**Test Yourself 7**

Summer Ltd produces a product, Winter. For 20X3, production was 10,000 units with total costs of Tshs150,000,000. For the next year, 20X4, the budget is prepared for the production of 15,000 units with total costs of Tshs220,000,000. The production capacity of the company is 12,000 units per annum. If the company exceeds its limit, its fixed costs will increase by Tshs20,000,000.

What will be the variable costs per unit?

**A** Tshs14,000
**B** Tshs10,000
**C** Tshs16,000
**D** Tshs20,000

## 2. Define and illustrate product costs and period costs..

**[Learning Outcome b]**

Product costs are the costs incurred in relation to manufacturing a product and period costs are the costs incurred in a specific production cycle period.

### 2.1 Product costs

**Definition**

Product costs are costs incurred in relation to the manufacturing process

The production process generally involves processing raw materials into the final product. All the costs incurred in a factory, directly or indirectly, until the stage when the goods can be marketed as final products are considered product or manufacturing costs.

**Example**

In the production of glassware (glasses, glass plates etc.), the costs incurred for glass, wages paid to labour and the cost of fuel used in making the glassware will all qualify as product costs.

Packing costs, where the products require primary packaging in order to sell the goods, are a part of product costs. In these cases, the product is incomplete unless it is packed, e.g. milk packed in bottles / cartons or hair shampoo bottled in plastic containers.

Product costs are sub-classified as:

- Direct material
- Direct labour
- Direct expense
- Production overheads(factory overheads)

### 2.2 Period cost

**Definition**

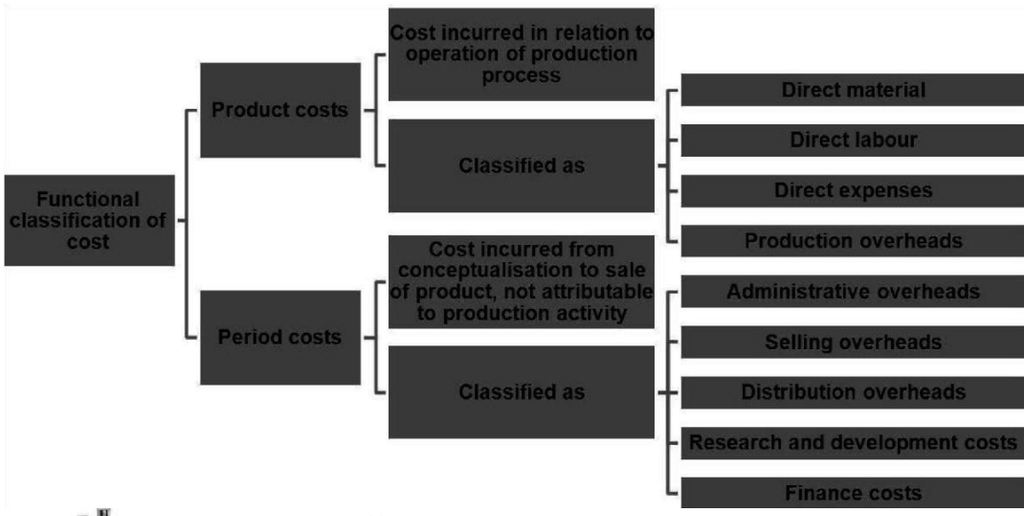
All the costs incurred from conceptualisation to sale of a product, other than those attributable to production activity, inclusive of administration costs, selling costs, distribution costs, finance costs and research and development costs are the **period costs**.

**Example**

Salaries paid to office staff of the finance department are non-production costs. These are not spent on actual production, but are essential for the running of the organisation.

These are costs incurred in relation to a period and not in relation to a product and hence are known as **period costs.** They are charged to the statement of profit or loss of the period and not charged to individual products**.**

**Diagram10**: **Functional classification of cost**




**Test Yourself 8**

The salary of a security guard for office premises is a:

**A** Product cost
**B** Period cost
**C** Manufacturing cost
**D** Direct cost

**Test Yourself 9**

The cost incurred for the purchase of wood for the manufacture of wooden tables by a furniture manufacture will be a:

**A** Product cost
**B** Fixed cost
**C** Routine cost
**D** Management cost

**2.3 Classification of product costs**

Product costs can be further split into prime costs consisting of direct material, direct labour and direct expenses and production overhead costs. These form the major divisions of production costs. The next section explains each of these terms.

**1. Material costs**

**Definition**

The costs of goods purchased for use in producing a product are known as **material costs**.

Materials that are used in producing the finished product are termed direct materials. The costs incurred on these can be **identified** with the product.

Material costs may include costs of:

- The ingredients from which the product is manufactured
- The spares and parts used for completion of the product
- Materials transferred from one process to another as input to the other process (work in process).
- Primary packing wherever essential in order to sell the product

**Example**

- Main ingredient - Plastic used in the production of pens. Leather used to make leather shoes.
- Spares and parts - Nuts used in the assembling of cars
- Work in process - Processed ointment in large jars which is transferred to the packing department where the ointment is transferred to tubes. The ointments in large jars here is a direct material for the next process of packaging.
- Primary packing - The cartons, in which the milk is packed, are a direct material as the product 'milk cartons' cannot be complete unless milk is packed in the cartons.

**Tip**

Any material that can be visibly identified in the final product is a direct material and hence the cost associated with it is a direct cost.

**Example**

Canvass cloth, used in producing 'Canvass bags', is a visible input in the final product. It is a direct material.

**2. Labour costs**

**Definition**

The remuneration paid to workers who are directly involved in the production process or the provision of a service is termed **labour costs**.

Direct labour costs are computed either on the basis of the hours of work put in by the workers or the number of units produced by them. Labour costs include:

- The cost of labour engaged in the actual production activity.
- Charges paid to special labour engaged in any production activity.

**Example**

- The salaries of people writing books for a publication company. Generally basic pay and overtime wages are a part of the direct labour cost.
- The salary of a qualified accountant handling audits in an audit firm.

**3. Direct expenses**

**Definition**

**Direct expenses** include all expenses other than direct material or direct labour that are specifically incurred for a particular product or process.

**Example**

- Royalties paid to authors while publishing books
- Freight, or carriage inwards
- Hire charges paid by a construction contractor for hiring a hot mix plant. (cement mixing machine)

**4. Overheads**

Overheads are all the indirect costs (material, labour and expenses) which are not directly identifiable with a product. Overheads in the context of production are production overheads.

## Definition

Indirect expenses incurred in a factory and forming a part of product costs are the **production overheads**.

Production overhead costs include:

A. Indirect materials
B. Indirect labour
C. Indirect expenses

These are incurred in relation to the production activity, in the factory or any place of production.

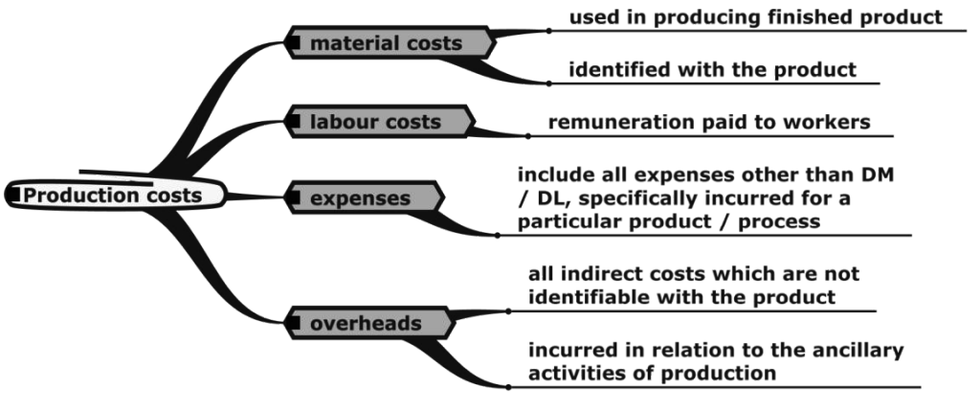
Production overheads are incurred in relation to the ancillary activities of production. Ancillary activities are activities other than the actual production activity that are essential for a product to come into existence.

## Example

Costs incurred on resources used in production such as

- Indirect materials - lubricants for machines, fuel used in a factory
- Indirect labour – factory supervisor's salary, support technicians' wages, material handlers' wages
- Indirect expenses - factory utilities, factory depreciation, factory maintenance and repairs

**SUMMARY**




## Test Yourself 10

The production cost of cars includes:

**A** Tyre costs
**B** Salary of technician engaged in car production
**C** Wages of foreman for the machinery used
**D** All of the above

## Test Yourself 11

All the indirect materials costs, indirect wages and indirect expenses incurred in a factory are called:

**A** Production overheads
**B** Production cost
**C** Non-production overheads
**D** Non-production cost

### 2.4 Distinction between product and period costs in valuation of output and inventories

Finished goods or finished products are products that are complete and ready for sale. Finished goods still in the warehouse are generally valued **excluding period costs** such as selling, distribution and administrative overheads etc. Remember, production costs are product costs and overhead costs are usually period costs. This is the reason why the **finished goods** inventory is valued at **production costs**. The items of costs that are included in the costs of the finished goods still in the warehouse are called inventoriable costs.

Sometimes **period costs** incurred within the factory itself may be added to the finished goods inventory cost. This is because these costs are incurred directly to facilitate production.

**Example**

The salary of the time-keeper in the factory, who keeps a record of the time spent by the workers at work, is an administrative cost but is still included in the cost of the finished goods. This is because this cost is spent to facilitate production.

---

**Closing inventory** at the end of the year is valued at **production cost** since the non-production costs are usually not yet incurred on this. Non-production costs are charged to the cost of sales of the product only when it is sold. Costs such as selling and distribution costs will be incurred on the inventory when it is sold. Until the time these are in finished goods inventory, only production costs form a part of their cost.

**Example**

Baggy Plc manufactures leather wallets for men. These are made at the factory where the leather is cut and wallets stitched and finished. The factory office looks after the day to day administration of the factory.

The cost of the finished wallets would include the cost of leather (direct material), labour cost for the workers who stitch the wallets, cost of finishing the wallets, cost of maintaining the machines (direct expense) and production overhead costs e.g. the costs of machine oil, cleaners' wages etc. The cost of the factory administration will also be a part of the costs of the finished product at this stage.

In this case, the wallets are still in the factory and the selling and distribution costs are not yet incurred since these are not sold. Hence, selling and distribution costs will not form a part of the cost of inventory.

---

**Non-production** costs form a part of the cost of sales only in the period in which these are sold. This is because these are period costs and are charged in the period in which these are incurred. On the contrary, production costs, being product costs, always form a part of the cost of the product even when the product is not sold in any particular period.

**Test Yourself 12**

The value of the unsold finished goods inventory includes non-production costs.

**A** True
**B** False

---

## 3. Define and illustrate direct and indirect costs.

**[Learning Outcome c]**

Costs are classified into direct and indirect by nature. The distinction of costs into direct and indirect is necessary because they need different treatments for cost computation and control. Most cost accounting techniques employed in decision making also consider this distinction to be essential for cost analysis.

### 3.1 Classification of costs as direct or indirect (classification of cost by nature)

This classification is based on the principle of **traceability of costs to the final product or service**.

**Definition**

Cost that can be specifically identified, or traced in full to the product or service, in an economically feasible manner is a **direct cost.**

**Definition**

Cost that cannot be specifically identified with a product or a service is an **indirect cost.**

**Example**

Potatoes and salt are the direct ingredients in the preparation of potato chips. Costs incurred on these will be direct costs.

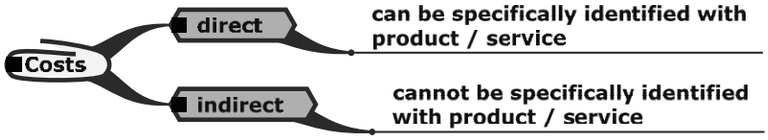
Apart from being easily traceable to the products, the traceability of costs should also be economically feasible for the costs to be classified as direct. If the traceability is not cost beneficial, a cost that is direct by nature will be classified as indirect.

**Example**

In the above example of potato chips, it is a difficult and costly affair to trace the amount of oil consumed by each pack of chips and so it will be treated as an indirect cost. Oil is easily traceable to the chips but still is classified as indirect cost.

Direct costs consist of all the **direct materials, direct labour and direct expenses**. Indirect costs consist of **indirect materials, indirect labour and indirect expenses**. These are collectively also termed overheads. According to the functional classification, overheads are classified as administrative, selling, distribution and research and development costs.

**SUMMARY**




**Test Yourself 13**

Direct material cost means a material cost that can be:

**A** Specifically, easily, or conveniently identified with a cost objective
**B** Attributed to, or allocated to a cost objective on a rational or logical basis
**C** Associated with a cost objective as it relates to the production process in general **D** All of the above

**Test Yourself 14**

Direct expenses are those which:

**A** Can be included in direct material or direct labour
**B** Are the same as direct material and direct labour
**C** Are incurred specifically in connection with a product or service
**D** All of the above

## 4. Classification of costs by nature, function and purpose.

**[Learning Outcome d]**

### 4.1 Classification of cost by nature

This is discussed in the Learning Outcome 3.

Costs are **classified by nature** as **direct and indirect**.

### 4.2 Functional classification of costs

Costs are **classified by function** as **administrative, selling, distribution and research and development**. These are all a part of indirect expenses / overheads.

For the entire organisational activity, these costs are directly taken to the SOPL (statement of profit or loss).

**1. Administrative costs**


Any cost incurred for the management or administration of the business that includes planning and controlling its operations, is an **administrative cost**.

Administrative costs of an organisation include the costs incurred in formulating the policy, directing the organisation and controlling its activities. In a big organisation, administrative costs are split into two types:

(a) Costs incurred at the factory level that are incurred to provide the staff with administrative support
(b) Costs incurred at head office level that are allocated to the factory


- Office rent
- Salary of office staff – cleaners, clerks
- Electricity and telephone costs of the office
- Legal fees, audit fees, insurance expense of office

**2. Selling costs**


Costs incurred in relation to the sale of a product or rendering of a service and allied activities are known as **selling costs**.

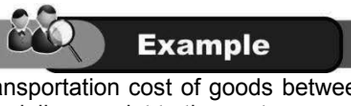
A product needs to be marketed and advertised so that the customers are aware of it, thereby creating a demand for the product in the market. Selling costs include all costs that help the sale of the product in the market place.


- Sales promotion expenses, showroom expenses
- Advertising costs such as catalogues, banners, brochures
- Salaries of sales and marketing personnel, commissions paid to salesmen

**3. Distribution costs**


Costs incurred for the transport of goods from the factory or depot to the customer and / or the costs incurred for maintaining the channel of distribution are known as **distribution costs**.

This cost also covers the cost of recovering and reconditioning empty containers for reuse.




- The transportation cost of goods between two points, namely there receipt point of goods from production and the delivery point to the customer
- The insurance cost of the goods between this period
- Depreciation on vehicles used for the distribution of goods
- Fuel used by vehicles in the distribution department
- Repairs and maintenance cost of the above vehicles

**4. Finance costs**

**Definition**

Costs incurred in relation to the provision of finance to the business, mainly interest costs, are known as **finance costs.**

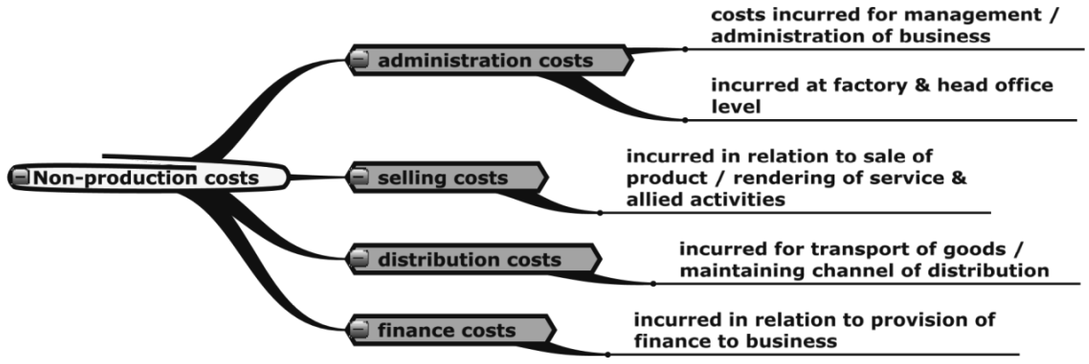
To incur all the previously discussed costs, the business needs a constant flow of money. This includes initial start-up costs – capital investment, working capital and costs required for the day to day running of the business, expansion costs – capital investment required for the expansion of the existing activities.

The money for these costs is raised by obtaining a loan from the bank or raising capital from the market by issue of shares and debentures. Finance costs are incurred to meet the working capital as well as long term finance needs of the organisation. This cost cannot be traced to the individual products, but will have to be allocated using a suitable base.

**Example**

- Interest paid on a fixed-term loan taken for the construction of a building
- Interest paid on a fixed-term loan taken for the purchase of plant and machinery
- Interest paid to debenture holders

**SUMMARY**

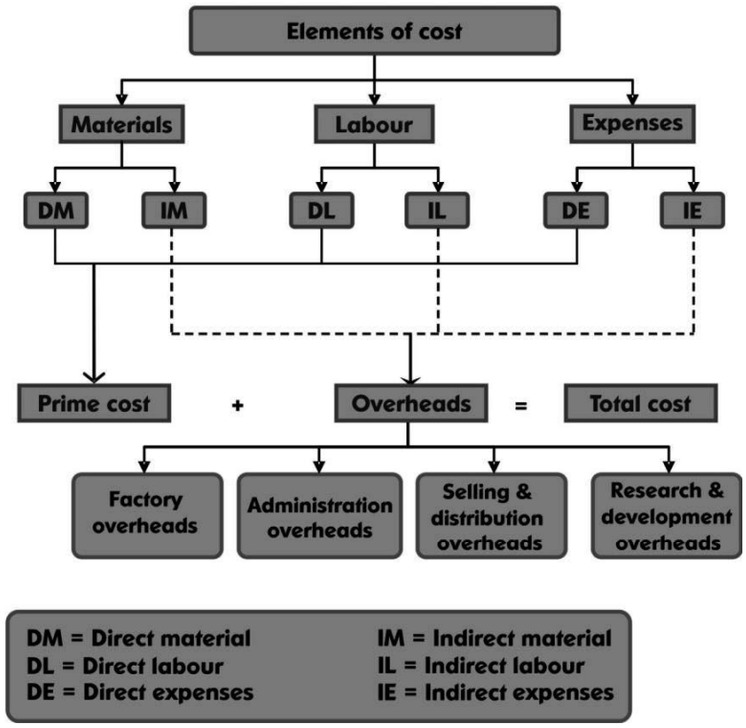



These various types of costs make up the total cost of a product. A cost sheet is the prime document for presenting the costs according to their function under the traditional absorption system of costing.

**Extract of Cost sheet**

| | Tshs | Tshs |
|---|---|---|
| Direct material | X | |
| Direct labour or direct wages | X | |
| Direct expenses | X | |
| **Prime cost** | | **X** |
| Production overheads | | X |
| **Production or factory or manufacturing cost** | | **X** |
| Administration cost | | X |
| Selling and distribution cost | | X |
| **Cost of sales** | | **X** |
| **Total cost** | | **X** |

**Diagram 12: Elements of cost**




## Test Yourself 15

Rent paid for office premises is cost related to:

**A** Production
**B** Sales
**C** Distribution
**D** None of the above

## Test Yourself 16

The salary of marketing personnel is an example of:

**A** Selling cost
**B** Distribution cost
**C** Finance cost
**D** Research and development cost

### 4.3 Cost classification by purpose

**Costs** can be **classified based on the purpose** of their classification. Moreover, costs may be required for the purpose of **external reporting** or **internal management use**. Based on this, costs are **classified** as **manufacturing** and **non-manufacturing** or **product and period** for **external reporting** and as **fixed or variable** for **management use**. We have seen these classifications in detail in the earlier Learning Outcomes.

Costs for the **purpose of decision-making** can be classified as follows:

1. **Relevant costs:** costs pertinent to the making of a specific managerial decision.
2. **Differential costs:** differences in total cost between alternatives that are calculated to assist decision making.
3. **Opportunity costs:** the value of benefits sacrificed when one course of action is chosen in preference to an alternative.
4. **Sunk costs:** costs already incurred and not relevant for decision-making.

**Example**

Amber Plc wants to purchase a new machine that will enhance its productivity to 3 times its existing capacity, and discard the old machine. The purchase cost of the new machine is Tshs50,000,000,000. The old machine was purchased for Tshs20,000,000,000. There will be a time gap of 1 month until the new machine is installed for production and hence sales upto Tshs50,000,000 will have to be forgone.

Relevant costs in the above case would be:
Purchase cost of new machine – Tshs50,000,000,000 (relevant since it needs to be incurred in future)

Sunk costs would be Tshs20,000,000,000 (these costs are irrelevant for decision-making since they are already incurred).

Opportunity costs would be Tshs50,000,000 (cost of opportunity lost due to decision of buying new machine). Opportunity costs are also relevant costs in this case since they are a direct result of the decision taken.

---

## Answers to Test Yourself

**Answer to TY 1**

The correct option is **A**.

Fixed costs remain fixed in a budget period. Although fixed costs remain fixed for a certain period they do not remain fixed forever. They may change for each period under study.

**Answer to TY 2**

The correct option is **C**.

A stepped fixed cost is one that is constant up to a certain activity level or a certain period, then rises and again remains constant up to a new level of activity or a new period. It can be compared with stairs that make up a staircase in that they rise up to a certain height, become flat and then rise again.

**Answer to TY 3**

Labour cost, material cost and direct expenses vary with each unit produced. They qualify as variable costs.

The rent of the workshop, watchman's salary, salary of the administrative staff and floor manager's salary will have to be paid even if there is no production in any month. These are therefore fixed costs.

The statement of cost can now be made as follows:

**Statement showing cost of producing 500 chips during the month**

| | Calculations and reasons | Tshs |
|---|---|---|
| **Variable costs** | | |
| Material cost | Tshs20,000 x 500 chips | 10,000,000 |
| Labour | 2.5 hrs/chip x Tshs10,000/hour x 500 chips | 12,500,000 |
| Direct expenses | Tshs5,000 x 500 chips | 2,500,000 |
| (a)Total variable cost | | 25,000,000 |
| **Fixed costs** | | |
| Rent of workshop | Monthly rent | 1,000,000 |
| Watchman's salary | Monthly salary | 1,000,000 |
| Administrative staff salary | Monthly salary | 2,500,000 |
| Salary of floor manager | Monthly salary | 2,500,000 |
| (b)Total fixed cost | | 7,000,000 |
| **Total cost (a + b)** | Tshs25,000,000 + Tshs7,000,000 | **32,000,000** |

**Answer to TY 4**

The correct option is **D**.

Telephone charges include certain fixed charge (rental) plus per unit usage charges based on the time spent making calls. Often in the case of internet charges, there is a fixed minimum charge plus a variable charge based on actual usage or downloading. Vehicle hire charges also include a fixed minimum charge plus a variable charge based on actual running of the vehicle.

**Answer to TY 5**

The correct option is **B**.

Semi-fixed costs contain fixed and variable elements. Because of the variable element, they fluctuate with volume and because of the fixed element they do not change in direct proportion to output. These costs change in the same direction as that of the output but not in the same proportion. For example depreciation for operating two shifts may be only 50% more than that for a single shift. It may change with comparatively small changes in output but not in the same proportion.

**Answer to TY 6**

The correct option is **B**.

$$\text{Variable cost per unit} = \frac{\text{Highest total cost - Lowest total cost}}{\text{Highest units - Lowest units}}$$

$$= \frac{\text{Tshs400,000,000 - Tshs250,000,000}}{\text{10,000 - 5,000}}$$

$$= \frac{\text{Tshs150,000,000}}{\text{5,000}}$$

$$= \text{Tshs30,000 per unit}$$

**Answer to TY 7**

The correct option is **B**.

There is a step up of Tshs20,000 in fixed costs, when the activity level exceeds production capacity of 12,000 units. Hence, to calculate the per unit variable costs, we will have to reduce this amount of step up in the costs.

$$\text{Variable cost per unit} = \frac{\text{Highest total cost - Lowest total cost}}{\text{Highest units - Lowest units}}$$

$$= \frac{\text{(Tshs220,000,000 - Tshs20,000,000) - Tshs150,000,000}}{\text{15,000 units - 10,000 units}}$$

$$= \frac{\text{Tshs50,000 ,000}}{\text{5,000 units}}$$

$$= \text{Tshs10,000/unit}$$

**Answer to TY 8**

The correct option is **B**.

The salary paid to the security guard of the office premises will be a period cost. This is because he guards the office premises and is not a part of the production activity

**Answer to TY 9**

The correct option is **A**.

Cost incurred for purchasing materials for the main product will always be product cost. Fixed cost is one of the elements of cost, routine cost is regular cost and management cost is incurred for overall administration and management of the organisation (qualifies as period cost).

**Answer to TY 10**

The correct option is **D**.

Production cost includes all direct material cost, direct labour and direct expenses. The tyre cost, technician's salary and wages of foreman satisfy the criterion of production costs. As such they all are a part of the production costs.

**Answer to TY 11**

The correct option is **A**.

All these costs are a part of production overheads. Production cost includes all costs related to production. Non-production costs and overheads are related to activities outside the factory until the products are sold.

**Answer to TY 12**

The correct option is **B**.

The cost of unsold finished goods in the closing inventory as valued at the factory gate does not include nonproduction costs such as the overheads of selling, distribution, administration, research and development and finance costs. These are charged to the finished goods inventory only in the period when these are sold.

**Answer to TY 13**

The correct option is A

Direct cost is specifically and easily identifiable with the cost object. Direct material cost is not allocable; it is identifiable with a cost objective or cost unit. Direct material cost is not related to the production process in general but is specifically identifiable with the product.

**Answer to TY 14**

The correct option is C.

These are called direct expenses because they are directly attributable to production or service provision i.e. incurred in such a way that their benefit can be easily visualised in a product and form a substantial part of the total direct costs. Direct expenses are separately identifiable and cannot be included in direct material or direct labour costs and can be distinguished from them.

**Answer to TY 15**

The correct option is **D**.

It is an administration cost, which is the cost of managing a business activity. It is neither production, nor sales, nor distribution expense.

**Answer to TY 16**

The correct option is **A**.

Marketing personnel help in selling the product, hence it is a selling cost. Distribution cost is an expense incurred from the time production is complete until the goods reach the final consumer. Finance cost is the cost of financing the business. Research and development cost is incurred for improving the quality of a product or inventing new methods of production.

## Self-Examination Questions

**Question 1**

Production employees' work directly on the goods being manufactured, their labour costs are recorded as:

**A** Direct expenses
**B** Direct labour
**C** Indirect labour
**D** Manufacturing overhead

**Question 2**

A person gets payment in the form of fixed salary of Tshs750,000, commission based on productivity of Tshs300,000 and an annual bonus of Tshs250,000. What is the total direct labour cost?

**A** Tshs250,000
**B** Tshs750,000
**C** Tshs300,000
**D** Tshs1,050,000

**Question 3**

Primary packing materials, such as wrappers and cartons, are known as:

**A** Indirect expenses
**B** Indirect material
**C** Direct material
**D** Direct expenses

**Question 4**

Direct expenses should be considered part of:

**A** Product cost
**B** Period cost

**Question 5**

The maintenance cost of office building forms a part of:

**A** Direct expenses
**B** Selling and distribution cost
**C** Indirect expenses
**D** Administration cost

**Question 6**

Excise duty paid is an example of:

**A** Direct material
**B** Selling cost
**C** Direct expense
**D** Factory overhead

**Question 7**

Find the production cost per unit from the following details. The total number of units manufactured is 500. All the units are sold during the year. Assume that there is no opening and closing inventory.

The cost per unit is as follows:

| | Tshs |
|---|---|
| Materials | 1,500,000 |
| Direct wages | 1,200,000 |
| Indirect material | 500,000 |

The total costs incurred are as follows:

| | |
|---|---|
| Indirect wages | Tshs500,000 |
| Administration overheads | Tshs345,000 |
| Selling and distribution overheads | Tshs202,500 |

**A** Tshs3,200,000
**B** Tshs2,700,000
**C** Tshs5,295,000
**D** Tshs4,200,000

**Question 8**

Sun Co produces a product, M. For each unit of product M, it requires 1kg of material A and 2 kg of material B. The market prices of materials A and B for the current year are Tshs1,500 and Tshs2,000 per kg respectively. Next year, the price of material A will increase by 10%, while the market price of B will remain as it is. If Sun Co wants to produce 5,000 units of product M next year, calculate the total price of direct materials.

**A** Tshs8,250,000
**B** Tshs20,000,000
**C** Tshs28,250,000
**D** Tshs15,000,000

**Question 9**

Which of the below can be an example of a stepped fixed cost?

**A** Machine maintenance where beyond an output level an additional machine is needed to produce more
**B** Telephone and electricity charges
**C** Annual factory rent and insurance
**D** All of the above

**Question 10**

Which of the below could be examples of fixed costs?

**A** Rent of office or factory premises
**B** Insurance of current and non-current assets
**C** Repairs and maintenance according to the annual maintenance contract
**D** All of the above

**Question 11**

Which of the below could be examples of variable costs?

**A** Plywood used for making tables
**B** Cement and other materials per square metre of building construction
**C** Concrete used per square metre of a road
**D** All of the above

**Question 12**

Which of the following statements is incorrect?

**A** Semi-variable cost is a mixture of fixed and variable components
**B** The per unit variable cost changes in direct proportion with change in output
**C** Non-linear cost changes disproportionately with change in output
**D** Fixed cost remains the same regardless of the amount of product the company makes or sells

**Question 13**

Find the production cost per unit from the following details. The total number of units manufactured is 500, and all the units are sold during the year. Assume that there is no opening and closing inventory.

The cost per unit is as follows:

| | **Tshs'000** |
|---|---|
| Materials | 1,500 |
| Direct wages | 1,200 |
| Indirect material | 500 |

The total costs incurred are as follows:

| | **Tshs'000** |
|---|---|
| Indirect wages | 500,000 |
| Administration overheads | 345,000 |
| Selling and distribution overheads | 202,500 |

**A** Tshs3,200,000
**B** Tshs2,700,000
**C** Tshs5,295,000
**D** Tshs4,200,000

**Question 14**

Beautiful Plc is a cosmetic manufacturing company. The costs incurred at three different production levels are given below.

| **Production (make-up kits)** | **Total cost Tshs'000** |
|---|---|
| 22,000 | 240,000 |
| 26,000 | 270,000 |
| 30,000 | 300,000 |

Find out the total fixed cost and variable cost per make-up kit using high / low analysis.

## Answers to Self-Examination Questions

**Answer to SEQ 1**

The correct option is **B**.

The wages of the shop floor employees form a part of the cost of labour employed. Direct expenses are the repairs and maintenance charges at the factory; indirect labour is the foremen and maintenance staff. Manufacturing overheads are the expenses incurred for the activities other than production in the factory.

**Answer to SEQ 2**

The correct option is **D**.

The direct labour expenses are the fixed salary and the commission. The bonus is generally treated as an indirect expense. Hence the total direct labour cost = Tshs750,000 + Tshs300,000 = Tshs1,050,000.

**Answer to SEQ 3**

The correct option is **C**.

Primary packing is essential for the goods to be complete. As such it forms a part of the direct materials. Indirect material is the material that does not form a part of the final product. Direct and indirect expenses are the expenses other than material costs.

**Answer to SEQ 4**

The correct option is **A**.

Direct costs are all costs incurred in direct relation to production activity.

**Answer to SEQ 5**

The correct option is **C**.

Indirect expenses are those expenses which cannot be directly and conveniently allocated to cost units. For example rent and insurance of factory, depreciation, repairs and maintenance of machinery, building etc.

**Answer to SEQ 6**

The correct option is **C**.

Excise duty is a cost that can be identified with the product.

**Answer to SEQ 7**

The correct option is **D**.

Production cost per unit is Tshs4,200,000.

**Cost sheet**

| | **Per unit** (Tshs'000) | **Total costs** (Tshs'000) |
|---|---|---|
| Materials | 1,500 | 750,000 |
| Direct wages | 1,200 | 600,000 |
| **Prime cost** | **2,700** | **1,350,000** |
| Indirect materials | 500 | 250,000 |
| Indirect wages (W1) | 1,000 | 500,000 |
| **Production cost** | **4,200** | **2,100,000** |
| Administration overheads (W2) | 690 | 345,000 |
| Selling and distribution overheads (W3) | 405 | 202,500 |
| **Cost of sales / Total costs** | **5,295** | **2,647,500** |

**Workings**

**W1** Per unit indirect wages = Total indirect wages/Units produced
= Tshs500,000,000/500 units
= Tshs1,000,000
Note: administration overheads and selling and distribution overheads are period costs.

**W2** Per unit administrative costs = Total administrative costs/Units produced
= Tshs345,000,000/500 units
= Tshs690

**W3** Per unit selling and distributive costs = Total selling and distributive costs/Units produced
= Tshs202,500,000/500 units
= Tshs405

**Answer to SEQ 8**

The correct option is **C**.

For one unit of M, 1kg of material A and 2 kg of material B are required.
Hence, to produce 5,000 units of M, 5,000 kg of material A and 10,000 kg of material B are required

Cost of material A = (5,000 kg x Tshs1500) + 10% price increase
= 7,500,000 + 750,000
= Tshs8,250,000

Cost of material B = 10,000 kg x Tshs2,000
= Tshs20,000,000

Hence, the direct materials for product M will cost Tshs28,250,000 (Tshs8,250,000 + Tshs20,000,000).

**Answer to SEQ 9**

The correct option is **A**.

Machine maintenance cost is a stepped fixed cost, where beyond a certain output level an additional machine is needed to produce more. Telephone and electricity charges are semi-variable because they exhibit cost behaviour of both fixed and variable components. Annual factory rent and insurance are fixed costs. These do not depend on output, but remain unchanged irrespective of the output level.

**Answer to SEQ 10**

The correct option is **D**.

All the instances given pertain to expenses that do not change or vary with respect to the overall activity level. In other words, these costs are incurred irrespective of whether operations are in progress or not.

**Answer to SEQ 11**

The correct option is **D**.

Plywood will be the main ingredient (in terms of cost and volume) of a table. Its quantity will be fixed per table and therefore, will vary with the number of tables made. Cement and concrete used in building and road construction projects do not change per square metre but depend on the size of the building or road area respectively.

**Answer to SEQ 12**

The correct option is **B**.

Semi-variable or semi-fixed cost contains an element of both fixed and variable cost. Variable cost per unit is constant but the total variable cost changes depending on the levels of output. Non-linear or curvilinear variable cost changes disproportionately with change in output. Fixed cost is independent of the volume of product the company produces or sells.

**Answer to SEQ 13**

The correct option is **D**.

Production cost per unit is Tshs4,200,000.

**Cost sheet**

| | Per unit (Tshs'000) | Total costs (Tshs'000) |
|---|---|---|
| Materials | 1,500 | 750,000 |
| Direct wages | 1,200 | 600,000 |
| Prime cost | **2,700** | **1,350,000** |
| Indirect materials | 500 | 250,000 |
| Indirect wages (W1) | 1,000 | 500,000 |
| **Production cost** | **4,200** | **2,100,000** |
| Administration overheads (W2) | 690 | 345,000 |
| Selling and distribution overheads (W3) | 405 | 202,500 |
| Cost of sales / Total costs | **5,295** | **2,647,500** |

**Workings**

**W1** Per unit indirect wages = Total indirect wages/Units produced
= Tshs500,000,000/500 units
= Tshs1,000,000

**Note**: administration overheads and selling and distribution overheads are non-production costs.

**W2** Per unit administrative costs = Total administrative costs/Units produced
= Tshs345,000,000/500 units
= Tshs690,000

**W3** Per unit selling and distributive costs = Total selling and distributive costs/Units produced
= Tshs202,500,000/500 units
= Tshs405,000

**Answer to SEQ 14**

$$\text{Variable cost per unit} = \frac{\text{Highest total cost - Lowest total cost}}{\text{Highest units - Lowest units}}$$

$$= \frac{\text{Tshs300,000,000 - Tshs240,000,000}}{\text{30,000 - 22,000}}$$

$$= \frac{\text{Tshs60,000,000}}{\text{8,000}}$$

= Tshs7,500 per kit

**Fixed Cost** = Highest total cost – (Highest units x Variable cost per unit)
= Tshs300,000,000 – (30,000 x Tshs7,500)
= Tshs300,000,000 – Tshs225,000,000
= Tshs75,000,000

# MATERIAL, LABOUR AND OVERHEAD COSTS

# 2

## Get Through Intro

Materials, labour and overhead costs are the three major components of any product or service costs. A thorough understanding of these is essential to arrive at the correct total cost of a product or service. Materials and labour always form a part of direct costs of a product, and overheads are indirect expenses but an essential component of total costs.

This Study Guide introduces the concepts of managing materials, calculation of labour costs, relating them to products and calculations of various overhead absorption rates.

A thorough understanding of these concepts will help you as a management accountant in efficiently managing raw materials and labour costs and controlling overhead costs.

## Learning Outcomes

a) Identify and explain the importance of material costs and the various costs like ordering and holding costs of materials.
b) Calculate optimal reorder quantities.
c) Explain and distinguish between direct and indirect costs of labour.
d) Relate input labour costs to work done.
e) Explain the different treatment of direct and indirect costs.
f) Procedures involved in determining production overhead absorption rates.
g) Under and over absorption of overheads.

**1. Identify and explain the importance of material costs and the various costs like ordering and holding costs of materials.**

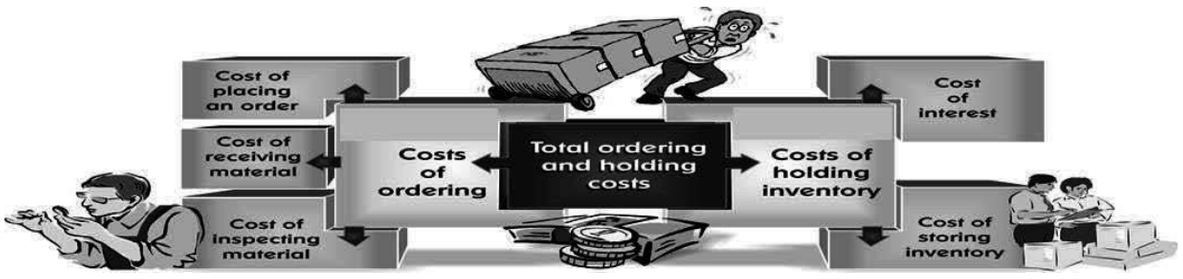
**[Learning Outcome a]**

Materials account for a very big portion of the total cost of a product. Materials mismanagement can lead an organisation to a crisis due to excessive investment in, and poor control over, the raw materials used.

The materials ordering and holding costs are the two major components of material management costs.

The cost of ordering and holding inventory can be distinguished as follows:

**Diagram 1: Ordering and carrying costs of inventory**




There are two types of costs which are associated with inventory; the cost of making a purchase and the cost of keeping the goods in inventory. These are known as the ordering costs and the carrying costs respectively.

**1.1 Inventory ordering cost or order placing cost**

Ordering costs of inventory include the costs of placing a purchase order including the clerical costs of preparing a purchase order, cost of receiving the material and the costs involved in the inspection of the material.

**1. Preparing a purchase order and placing costs**

The cost of placing an order involves the cost of order processing, costs of correspondence and communication, advertising costs for inviting tenders, tender evaluation costs etc. These costs are directly proportional to the number of orders to be placed in a year. To save on this cost the organisation needs to keep the number of orders to a minimum.

**Example**

The ordering cost per order is Tshs100,000. This includes all the costs of placing the order, order processing, advertising and tender evaluation. The total orders placed in a year are 10; hence the total ordering cost for the year becomes Tshs1,000,000 (Tshs100,000 x 10).

On the other hand, if the entire annual demand is ordered at one time, the number of orders reduces from 10 to 1 in a year, and then the total ordering cost for the period becomes Tshs100,000 (Tshs100,000 x 1). There is an annual **saving of Tshs900,000.**

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The increase in the number of orders multiplies the costs of order processing, advertising for tenders, communication and tender evaluation.

**2. Costs of receiving the material**

After the order is placed, the vendor will execute the order by supplying the material. This involves transport costs. The cost of receiving is the cost incurred on the transport of material from the supplier to the factory or depot.

This cost will increase only when the number of vehicles / boxes etc. required for transport increases. The capacity of a carrier is generally fixed and any consignment / batch within this capacity will cost the same for transportation. If the transportation increases directly with the number of purchase orders in a year and vice versa, it becomes relevant to be included in the ordering cost.


In Beta Co, the cost of sending one container from one location to another is Tshs500,000. The capacity of the carrier is 5000 kilograms. This cost of transportation will remain Tshs500,000 for any volume of material between 0-5000 kilograms. It will increase when the size of the batch increases beyond 5,000 kilograms.

So if Beta Co orders 1,000 kilograms of material in January and another 1,000 kilograms in June, it will incur a cost of Tshs1,000,000 (Tshs500,000 + Tshs500,000) for two trips. If Beta Co had ordered 2,000 kilograms of material in January, they would have incurred only Tshs500,000.

---

**3. Material inspecting or testing cost**

The inspection cost of material affects the total ordering costs only when inspection is taken up on a sample basis, where only a sample of the material is inspected from each purchase lot. In this case, if the number of batches ordered in a year increases, the inspection or testing will also increase. This will increase the inspection cost and hence the ordering cost of the material.


If the inspection or testing cost per lot is Tshs50,000, and the total number of lots to be tested is 10, then the total inspection or testing cost for the year becomes Tshs500,000.

If however, only 5 lots were bought, the inspection cost would be halved. Again if the number of inspections or testing increases from 10 to 20 in a year, the total inspection or testing cost for the period becomes Tshs1,000,000. There is an **additional cost of Tshs500,000.**

---

If the entire batch is inspected, the inspection costs do not form a part of the ordering cost as it is not dependent on the number of orders. In this case the inspection cost is considered as a separate overhead cost. The above **costs of ordering, receiving and inspection together make up the total "ordering cost".**

**1.2 Holding (carrying) cost of inventory**

The following costs make up the cost of holding inventory:

**1. Interest costs**

Every purchase requires payment to a supplier. This is the investment made in inventory. If the amount required for purchase is borrowed from a bank or from a lender then the interest payable is the cost of investment in inventory.


Suppose a working capital loan of Tshs100,000,000 is taken at 8% from the bank for purchasing raw materials, the interest of Tshs8,000,000 (Tshs100,000,000 x 8%) paid on this loan is the cost of investment in inventory.

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**2. Storage cost**

Storage costs mainly include costs relating to renting the premises, insurance for the premises and for the inventory. The insurance cost is included in the holding costs only if it varies with the variation in the size of the batch.

Normally the **rent cost** is fixed for an area irrespective of the volume of material stored in it. If the material ordered exceeds the capacity of the storage space, additional space needs to be hired. This additional space will often cost more.

**Example**

The rent paid for 500 sq. ft. of warehouse space that can accommodate 1,000 kilograms of material, is Tshs50,000,000. This is the storage cost.

---

The inventory in store needs to be insured against any mishaps such as natural calamities, fire, floods etc. The cost of **insurance** depends upon the value of inventory insured. Normally the entire inventory is covered by insurance. This cost increases when the volume of inventory in storage increases. If the size of the batches ordered are large, then automatically the volume of inventory in storage will increase and hence the cost of insurance will also increase.

**Example**

The insurance cost is 1% of the value of inventory insured. The insurance cost of Tshs50,000,000 worth of inventory comes to Tshs500,000 (Tshs50,000,000 x 1%). If the company decides to increase the holding of inventory to Tshs100,000,000, then the insurance cost will increase to Tshs1,000,000 (Tshs100,000 x 1%).

---

**3. Other costs**

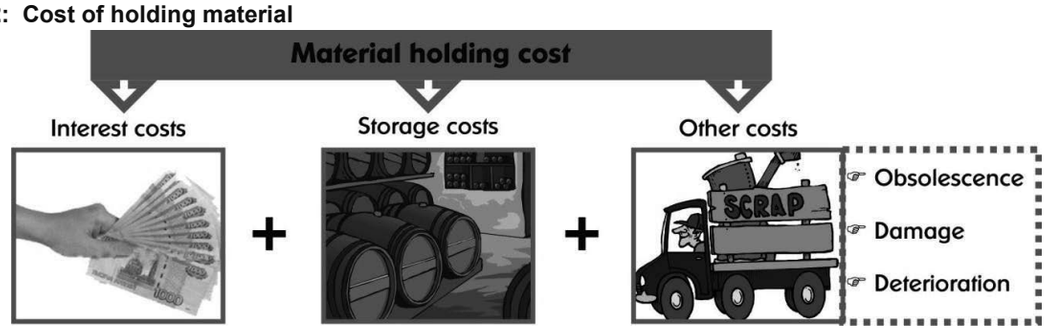
Other costs include risk of obsolescence, deterioration and theft. When material and components become outdated and/or useless, the existing inventory should be thrown away and its cost must be written off in the SOPL (Statement of Profit or Loss). In the case of theft, the loss arising from theft should be written off in the SOPL.

**Buffer inventory**

There is a possibility that unpredictable events such as poor quality of supplier's product, or poor delivery may disturb the smooth functioning of the inventory system. Buffer inventory is the inventory held on hand that is over and above the currently needed inventory. It is the minimum amount of inventory required to be maintained in order to avoid uncertainties of supply and demand. It is also called the safety stock. The cost of holding buffer inventory is also considered a part of the total holding and ordering cost of inventory.

All the above costs together make up the total inventory holding cost.

**Diagram 2: Cost of holding material**




**Test Yourself 1**

The inventory holding cost is the total cost of the investment in inventory, and includes:

**A** The salary of the watchman who guards the warehouse.
**B** The salary of the factory supervisor.
**C** The manager's salary.
**D** Interest cost for capital which is borrowed for the purchase of inventory.

---

## 2. Calculate optimal reorder quantities.

**[Learning Outcome b]**

When an organisation follows a system of ordering fixed amounts of inventory, the order size is vital. This is because the size of the order affects the ordering as well as the carrying costs.

When the order size is large, the number of orders required to be placed in a year will reduce, and hence the ordering cost will also reduce. However, in this case the holding costs will increase, as the quantities to be held at the same time increase.

When the order size decreases, the holding costs will decrease but the number of orders per annum increases, thereby increasing the ordering costs.

In this situation, it is vital to arrive at an optimal order size that minimises the total ordering and holding costs of inventory.

Large order (fewer number of orders) → High carrying cost → Lowered ordering cost

Small order (more number of orders) → High ordering cost → Lowered carrying cost

### Definition

The **optimal re-order quantity** or the **economic order quantity (EOQ)** is a size of order for which the total of the ordering and carrying costs is at the lowest possible.

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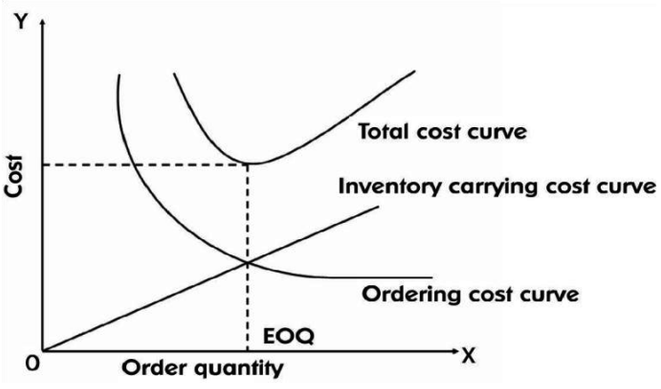
Economic order quantity can be understood with the help of a graph:

**Diagram 3: Economic order quantity**

Ordering quantity is measured on the X - axis and cost on the Y - axis.




The graph shows the total cost curve, the carrying (holding) cost curve and the ordering cost curve. In the above graph, the total cost starts high when the ordering cost is initially high and the holding cost is low. When the ordering cost is low and the holding cost is high the total cost is on a rising trend. This happens when one cost is minimised the other cost rises, and vice versa.

However, there is a point where the total cost curve is at its minimum level. If a straight line is drawn from this point passing through the ordering cost line as well as the holding cost line, it passes through the intersection point of these two lines. It implies that the **total cost** is at its **minimum** when ordering and holding costs are equal. This is an important observation based on which the formula for the Economic Ordering Quantity (EOQ) can be derived.

When deriving the EOQ, there are some assumptions underlying it without which the formula would not hold true.

(a) The annual demand is certain and known.
(b) The time required for the receipt of material (known as lead time) ordered is certain.
(c) There is no situation of stock outs.
(d) The entire material ordered is received in a single batch.
(e) The per unit costs of material does not change.
(f) The costs are always known with precision.

$$EOQ = \sqrt{\frac{2 \times D \times C_0}{C_h}}$$

**Where,**
$C_0$ = cost of ordering per order / consignment from supplier
$C_h$ = cost of holding per unit of inventory per annum / time period
D = total demand during the period

The underlying data for the calculation of EOQ has to remain the **same throughout the period** for which the calculations are made.

The average inventory is taken to calculate the annual holding cost as one does not hold units equal to the optimal re-order quantity at all times. We might hold inventories greater than this quantity or less than this quantity. In order to calculate the annual holding cost we multiply the holding cost per unit per annum with the average level of inventory. This average level is arrived at by dividing the EOQ by 2.

**Example**

Calculate the economic order quantity from the following information. Also state the number of orders to be placed in a year and explain briefly the amounts you have calculated.

| | |
|---|---|
| Consumption of material per annum | 10,000 Kilograms |
| Order placing cost per order | Tshs50,000 |
| Cost per kilogram of raw material | Tshs2,000 |
| Storage cost | 8% of material cost |

**Answer**

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

$\text{EOQ}=\sqrt{\frac{2x\ 10{,}000\ x\ 50{,}000}{2{,}000\ x\ 8\%}}$

$\text{EOQ}=\sqrt{6{,}250{,}000}$

$\text{EOQ}=2{,}500$

EOQ = **2,500 kilograms**

No. of orders to be placed in a year = Consumption of material per annum/EOQ
= 10,000/2,500
= **4 orders per year**

4 orders need to be placed per year with an order size of 2,500 kilograms to keep the ordering and the holding costs at the minimum level.

---

The above question has shown how to calculate the optimal re-order quantities. Another example will be helpful for further understanding.

**Example**

Tubes Plc manufactures picture tubes for televisions' Details of their operation during 20X3 are as follows:

| | |
|---|---|
| Normal weekly usage | 100 tubes |
| Ordering cost | Tshs50,000 per order |
| Inventory holding cost | 20% per annum |
| Cost of tubes | Tshs300,000 per tube |

Calculate the optimal re-order quantity.

**Answer**

The EOQ calculation requires the annual use in units, ordering cost per order and the carrying cost per unit per annum. These will be calculated as follows:

Annual use (A)= Weekly usage x number of weeks in a year
= 100 tubes x 52 weeks
= 5,200 tubes

Ordering cost per order (O) = Tshs50,000 per order (given)

The carrying cost is given in the question as a percentage of the cost of tubes.
Cost of one tube = Tshs300,000
Carrying cost per tube per annum (C) = Tshs300,000 x 20%
= Tshs60,000 per tube per annum

Therefore

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

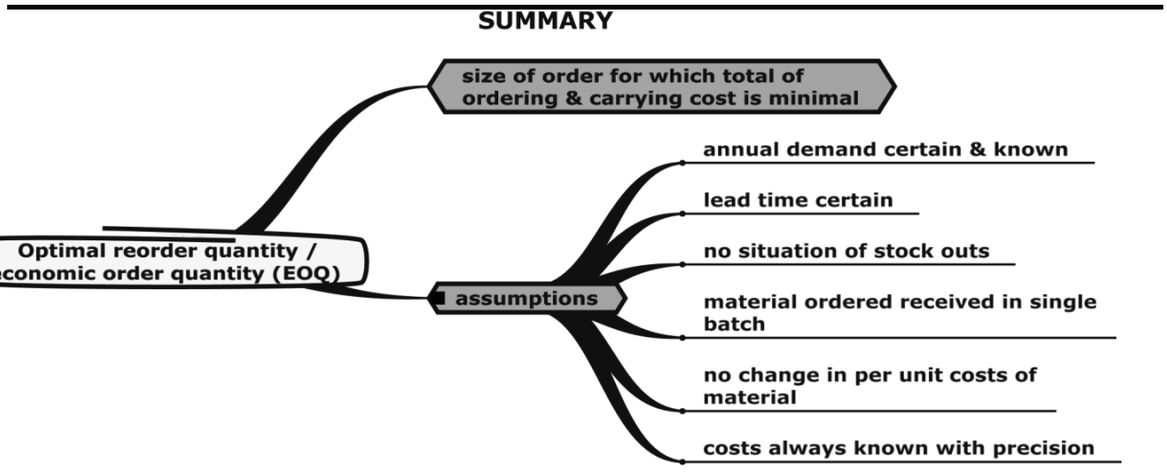
$$\text{EOQ}=\sqrt{\frac{2x\ 5{,}200\ x\ 50{,}000}{60{,}000}}$$

$$\text{EOQ}=\sqrt{8{,}666.7}$$

$$\text{EOQ}=93.09$$

= 93 tubes approximately

The optimal re-order quantity is 93 tubes.




Bearings Plc committed to supply 24,000 bearings per annum to Motor plc. It is estimated that it costs Tshs100 as inventory holding cost per bearing per month, and that the set-up cost per run of bearing manufacture is Tshs324,000.

The optimum run size for Bearings Plc would be:

**A** 4,600 bearings
**B** 6,300 bearings
**C** 3,600 bearings
**D** 3,000 bearings

---

**3. Explain and distinguish between direct and indirect costs of labour.**
**[Learning Outcome c]**

### 3.1 Direct and indirect labour costs

Like materials, labour costs are also an equally important and major part of product costs. Labour costs are recorded separately as direct and indirect labour costs. The basis of the classification of labour costs as direct and indirect is:

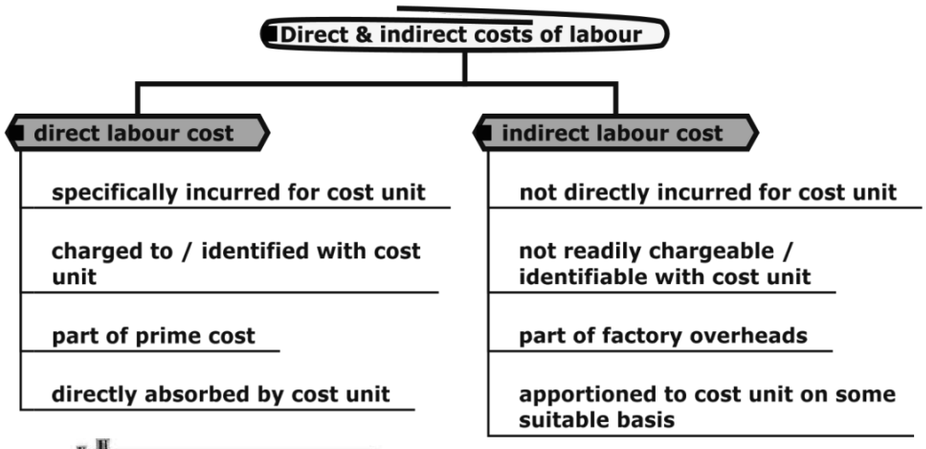
- Labour costs **directly identifiable** with the production of products, rendering of services or completion of jobs are **direct labour costs**.
- Labour costs that are **not readily identifiable** with the production of products, rendering of services or completion of jobs are **indirect labour costs**.

**The following table distinguishes between direct and indirect labour costs**

| | Direct labour cost | Indirect labour cost |
|---|---|---|
| **Definition** | Any labour cost that is specifically incurred for or can be readily charged to or identified with a product or a service is a direct labour cost. | Any labour cost which is not directly incurred or cannot be readily chargeable or identifiable with a product or service is an indirect labour cost. |
| **Allocation, apportionment or absorption** | It is directly charged to:<br>• specific job or<br>• contract work or<br>• any other cost object<br>For example, in a clothes factory, the cost object would be a unit of clothing produced | It is not directly charged to a product / service or to a job. Instead, this cost is assigned to a product / service or to a job on a suitable basis, such as no. of machine set-ups, no. of labour hours, no. of inspections, etc. |
| **Examples** | Labour costs for cutting wood to make a table.<br><br>Labour cost for a call centre operator taking calls from clients. | Labour cost incurred for packing and dispatching the tables for sale.<br>Although these workers are not directly involved in the production of the tables, they provide essential support services.<br><br>Computer technicians in a call centre do not provide a direct service to clients, but they are important in the operation |

| | | |
|---|---|---|
| **Direct or indirect is a relative term** | Labour that is direct in one industry may be indirect in another industry, due to different methods or process of work.<br>Example of direct labour is a courier boy working in a courier agency whose main job is sending and receiving couriers.<br><br>It mainly includes basic pay of direct workers. | Labour that is indirect in one industry may be direct in another industry, due to different methods or process of work.<br><br>Example of an indirect labour is a courier boy (who delivers and receives courier documents) in a 'credit processing division' of a bank (as he is not involved in any direct banking work).<br><br>It also includes bonus payments, idle time payment, sick leave payment, contribution to employers' national insurance fund, etc.<br><br>It also includes overtime premium. However, overtime premium paid for jobs done at special request of customers is a direct labour cost. |
| **Place in the cost sheet** | Direct labour is a part of prime cost. **Prime cost** consists of direct material, direct labour and direct expenses that are necessary for making a product. | Indirect labour is a part of factory overheads and eventually becomes a part of "cost of production". |

**SUMMARY**




**Test Yourself 3**

Direct labour cost:

**A** Is the effort of employees who transform direct materials into a finished product and is physically traceable to the finished goods or services
**B** Is allocated to the product using a suitable base
**C** Does not alter the construction of the product but generally contributes to such work
**D** Forms part of factory overhead

---

## 4. Relate input labour costs to work done.

**[Learning Outcome d]**

### 4.1 The methods used to relate input labour costs to work done

**1. Direct charging of direct labour cost**

Direct labour cost is charged directly to the product, process or job. It is charged for the work done on an hourly basis or per unit basis. On an hourly basis, the cost per unit is calculated based on the number of labour hours consumed by the product. On a per unit basis, the cost is charged at the rate applicable.

**Example**

A software firm is working for its client to develop debugging software called “Fighter”. 10 employees worked for 8 hours a day for 25 days for the “Fighter” project. The labour hour rate is given as Tshs20,000. The total direct labour cost will be 10 (employees) x 8 (hours a day) x 25 (days) x Tshs20,000 = Tshs40,000,000 The whole of this Tshs40,000,000 will be charged directly to the project since it consumed 2,000 man hours (8 hours x 25 days x 10 employees) at the rate of Tshs20,000 / hour.

---

**2. Allocation and apportionment of indirect costs on a suitable basis**

Any indirect labour cost is added to factory overheads and suitably absorbed / apportioned to the product, process or job.

Generally, indirect labour cost is caused by the direct labour hours that are put into any activity e.g. as production increases, supervision (indirect labour) costs also increase along with direct labour cost. Therefore, generally, the indirect labour cost is assigned to the output **as a percentage of direct labour hours** consumed.

**Example**

In an umbrella manufacturing company the direct labour hour rate is Tshs12,000. The indirect labour rate is 35% of the direct labour hour rate. The indirect labour rate will therefore be Tshs12,000 x 35% = Tshs4,200.

Direct labour here consists of people who manufacture umbrellas, whereas indirect labour would be involved in the packing and transportation of these to the retailer for sale. As the number of hours worked by direct labour increases and more umbrellas are produced, indirect labour would also have to put in more hours of work. This clarifies that indirect labour is caused by direct labour.

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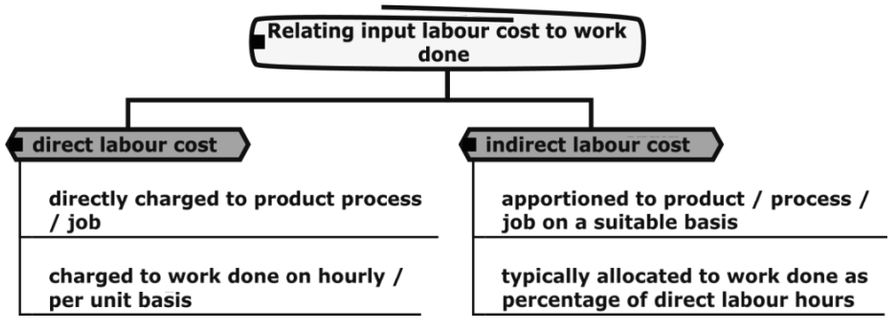
The procedure of allocation and apportionment of indirect labour costs is exactly the same as any other overheads.

**SUMMARY**




**Test Yourself 4**

What is the method of charging indirect labour cost?

**A** Charging it to the product directly
**B** Allocation and absorption on a suitable basis
**C** Direct allocation to the product and service
**D** None of the above

---

**5. Explain the different treatment of direct and indirect costs.**
**[Learning Outcome e]**

### 5.1 Classification of direct and indirect costs

Direct costs i.e. direct material, direct labour and direct expenses are those that can be easily traced to the physical units produced.

**Example**

The direct materials consumed for a particular job can be identified from the material requisition note and the direct labour cost to be charged to the job can be traced from the summaries of work tickets.

The work ticket (alternatively called the time card) indicates the time spent on a specific job by a labourer. Recording the work tickets can be done either manually or electronically.

---

On the contrary, by their very nature, indirect (overhead) costs cannot be specifically traced to physical units produced. However, the making of goods would be impossible without incurring such overhead costs.

**Example**

In the production of an exercise book, the amount of paper used can be easily traced to the product from the material requisitions. The cost of paper is hence a traceable cost. The machine that is used to bind the exercise book undergoes wear and tear each day. The depreciation of the machine is also a cost involved in the manufacture of notebooks. This cost however, cannot be easily traced to the product. Therefore this will be an indirect (overhead) cost of the product.

---

Overhead (i.e. indirect) costs include depreciation, fuel, heating, lighting, material handling, repairs, property taxes, cost of services facilitating the day to day operations etc. that are essential for any production activity. Since these costs are not easily traceable to the products, they need to be assigned to the products on a suitable, pre-determined basis.

The rates for assigning the indirect costs to the products are determined on the basis of the budgeted figures that are calculated at the start of an accounting period. This assignment of the indirect costs to the products is known as the allocation and apportionment of overheads, which we will learn in Learning Outcome 3.

**Example**

Considering the above example of producing an exercise book, the paper cost (the direct material cost) will be directly charged to the product; the printed material or book. The depreciation of the printing machine will be assigned to the book using a suitable basis.

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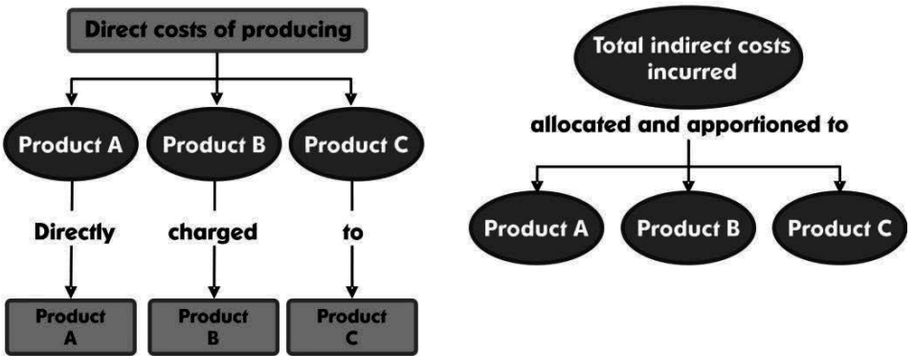
**Diagram 4: Treatment of direct and indirect costs**



According to their function and on the basis of their origin, overheads are classified as:

1. Production, manufacturing, or factory overheads
2. Non-manufacturing overheads
   (a) Administrative overheads
   (b) Selling and distribution overheads
   (c) Research and development overheads

**5.2 Treatment of manufacturing and non-manufacturing overheads**

The overhead absorption rates are arrived at using a two stage procedure:

1. Departments (more specifically cost centres) accumulate their costs.
2. The costs of the department are applied to the physical units (or any other measure of output) that pass through the departments. This step is called **overhead absorption.**

Manufacturing overheads are always absorbed by products on the basis of **machine hours** or **labour hours**. Non-manufacturing overheads are absorbed as a percentage of manufacturing overheads.

**Example**

In a bottling plant, overhead costs e.g. the costs of oil and lubricants for the bottling machine, are indirect materials that will form a part of factory costs. These are the costs incurred in the factory.

The transport cost for carrying the bottles from the bottling plant to the market for sale is an indirect distribution cost which will be a part of the cost of sales. This cost is incurred once the finished products leave the factory.

---

The segregation of the costs into direct and indirect is also essential from the management's point of view as it helps in controlling costs.

**Example**

Alan Plc manufactures leather purses. The major raw materials required are leather, dyes and high quality threads. Apart from these, it needs sewing machines to sew the purses and also workers who will sew them. These machines need a lot of maintenance. The cost sheet of Alan Plc is given below:

**Extract from cost sheet of Alan Plc**

| | **Tshs'000** |
|---|---|
| Direct materials | |
| Leather | 400 |
| Dyes | 250 |
| Threads | 100 |
| Direct labour | 400 |
| **Prime cost** | **1,150** |
| Machine maintenance | 400 |
| | **1,550** |

The above extract from the cost sheet shows all the expenses split under different headings. If, in any month, the total costs increase or decrease, then management can investigate this difference immediately by looking at the monthly cost sheets. This helps management take corrective steps to control the costs.

---

The line of demarcation between direct and indirect costs is very thin, as direct costs in one industry may be indirect costs in another.

**Example**

Ink cartridges and paper are direct materials in the printing business. The cost of these will be direct material costs.

The same ink and paper are an administrative overhead expense in an automobile spare parts manufacturing company, where they are used only for record-keeping in the accounts department. Accounts writing is a secondary activity compared to the main activity of manufacturing.

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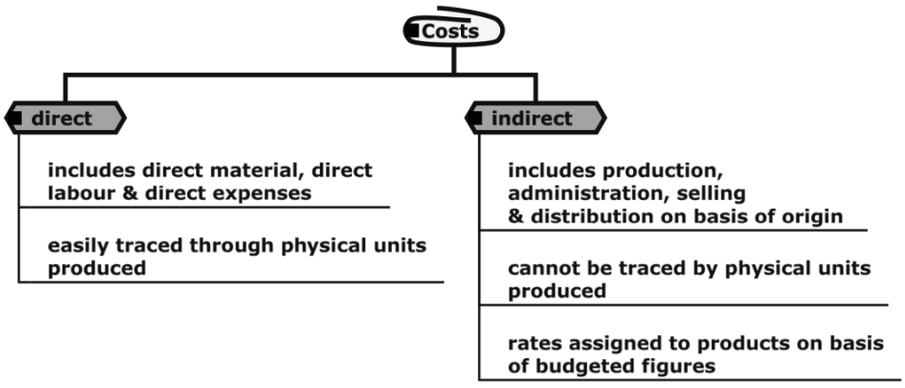
**SUMMARY**




## Test Yourself 5

Why do indirect costs need to be apportioned to products?

**A** Because they are incurred only once.
**B** To avoid double charging of the same costs.
**C** Because they are incurred by all the cost centres in common and not by any single cost centre separately.
**D** None of the above.

---

## 6. Procedures involved in determining production overhead absorption rates.

**[Learning Outcome f]**

This is a two stage procedure involving the accumulation and then the application of overhead costs to the products produced. There are two types of cost centres where overheads are incurred: the **production cost centre** and the **service cost centre**. The actual processing and manufacture of the product takes place in the production cost centre whereas service cost centres provide services to the production cost centres.

The **first stage** is where the accumulation of overheads occurs, according to the department. The total overheads are allocated and apportioned to the production and service cost centres. Thereafter, in the **second stage**, these costs are applied to the products that are processed in these cost centres.

### 6.1 Classification of overheads

The first step is to classify the overheads. Overheads can be classified according to their function. Another classification can be made on the basis of variability i.e. fixed and variable overhead costs.

This is discussed in detail in SG 1, Learning outcome 4.

## Example

Administrative overheads – cost of book-keeping
Fixed overheads – factory rent, staff salaries
Variable overheads – cost of lubricating oil for machines
Production overheads – salary of the factory supervisor, foremen and tools cost.

---

### 6.2 Codification of overheads

Once the overheads are classified, they need to be codified (i.e. coded into categories). Codification is done as it helps in recording the costs. Once the overheads are classified, they are given ‘standing order numbers’ that are listed in a schedule. All of these are now recorded in computer files in pre-designed packages that assist in the accounting function.

### 6.3 Allocation and apportionment of overheads

Once the classification and codification of the overheads is complete, the accumulation of overheads is the next step. This is the first stage in the two stage process of calculation of the absorption rates. The overhead costs are collected from various records such as financial accounts, cost records and so on.

Costs are accumulated for each cost centre. The costs are either allocated or apportioned to the cost centres. Whenever the overhead costs can be **assigned** to the cost centres **on an accurate basis,** the costs are **allocated** to the cost centres. Allocation is performed only when we can precisely assign the costs to a cost centre.

**Example**

Large organisations provide canteen facilities for their employees. If the organisation has a system of coupons against which food is served, then the costs of the canteen can be allocated to the various departments / cost centres on the basis of the coupons submitted by the workers in each department.
This is a case of allocation of canteen costs as we have an accurate basis on which to allocate the costs. Coupons are an accurate basis as each coupon has a value that can give us a clear idea of the cost of food consumed by each department.

**Apportionment of costs** to the cost centres is performed when we do not have a precise basis to assign the overheads to the cost centres. In this case we generally apportion the costs using the most suitable basis available.

**Example**

Consider the canteen example above. If the organisation does not have a coupon system, then it will not be in a position to accurately calculate the cost of food consumed by each department. In this case, we will take the most suitable basis for assigning the canteen costs to various departments. We will take the number of people in each department as the basis to assign the canteen costs to each department.

The method of apportionment of costs is used when the basis is not accurate. This is the most suitable method available that can give us reasonable assurance that the costs are not apportioned wrongly.

**Tip**

**Cost allocation** refers to the charging of identifiable /traceable indirect cost items to either cost centres or cost units.
**Cost apportionment** involves division of costs amongst two or more cost centres or cost units in proportion of the expected benefit gained.

Allocation and apportionment of overheads assigns the entire overheads to production and service cost centres.

We still need to re-distribute the service cost centre overheads to the production cost centres. This is because service centres provide services to the production cost centres. Hence the production cost centres have to bear the cost of these services. This is called **re-apportionment of overheads,** since the overheads once apportioned to the service cost centres are again re-apportioned to the production cost centres in this stage.

**Example**

In a factory which makes plastic goods, the production department is involved in the actual moulding and finishing of the plastic goods. The stores department does the work of receiving material requisitions and satisfying them. This is a service provided by the stores department to the production department.

If, in the first stage of apportionment, the stores department is apportioned a Tshs400 electricity cost then this cost will be again re-apportioned on a suitable basis to the production department. One may take as a basis the number of requisitions received from the production department.

### 6.4 Calculation of overhead absorption rates

Once the apportionment and the re-apportionment of the overheads are complete in the first stage, all the overheads are allocated and apportioned to the production departments. These are now to be assigned to the products. This is the stage where **the overhead absorption rates are calculated**.

Once we have the pool of overheads allocated and apportioned to the production departments, we need to divide these by the total number of a suitable unit. The most commonly used unit is a machine hour or a labour hour.

The above procedure provides us with the rate per machine hour / labour hour (or any other unit used). When this rate is multiplied by the number of machine hours or labour hours consumed by each product, the amount of overheads to be assigned to each product is obtained.

**Example**

Suppose the total machine maintenance cost allocated to a production department is Tshs120,000,000 and the machine hours recorded in the department are 6,000. The machine maintenance will be assigned to the products on the basis of machine hours required per product as this is the most suitable basis.

The overhead absorption rate will be calculated as = Tshs120,000,000/6,000 machine hours
= Tshs20,000 per machine hour.

If one unit of a product processed requires 5 machine hours then the overheads to be assigned to the product will be calculated as

Overhead absorption rate x number of machine hours consumed by the product
= Tshs20,000 x 5 hours
= Tshs100,000

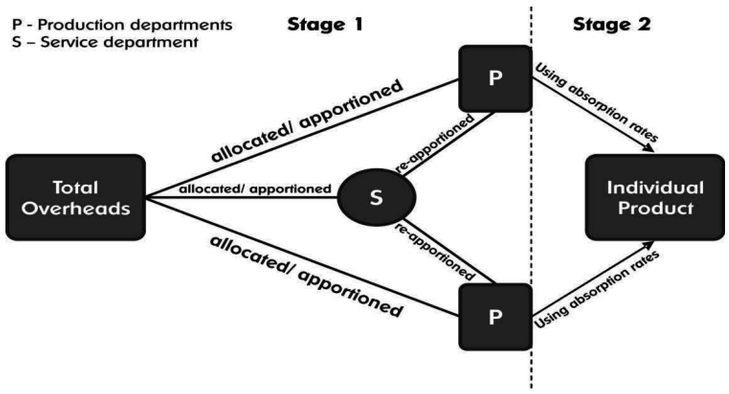
In conclusion, the amount of overheads assigned to the product will be Tshs100,000. This represents all the indirect costs which have gone into making that product.

---

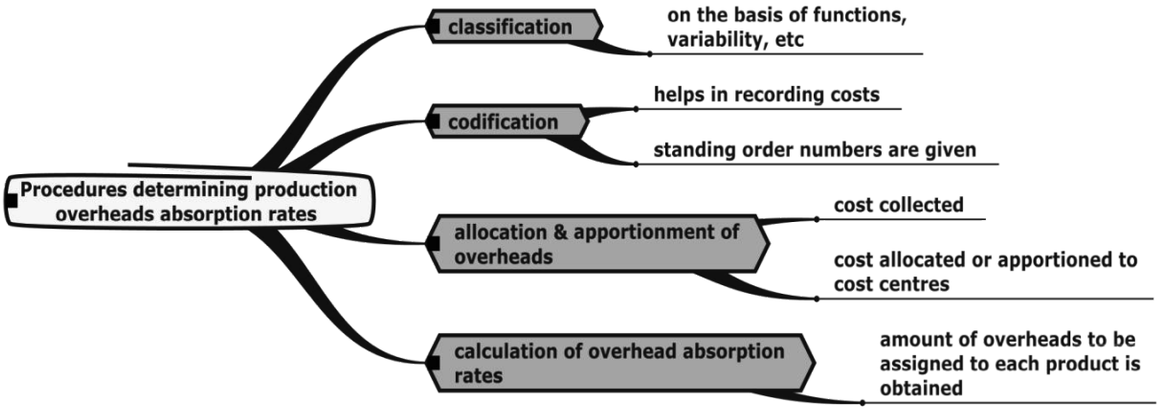
The detailed procedure for determining the **individual rates of absorption of overheads** for each department can be summarised as follows:

(a) Allocate and apportion the total amount of overhead expenses incurred to the production and service cost centres.
(b) Reapportion the service cost centre overheads to the production cost centres.
(c) Calculate separate overhead rates for each production cost centre. (d) Assign cost-centre overheads to products.

**Diagram 5: Allocation, apportionment and absorption of overheads**



**SUMMARY**




## Test Yourself 6

In the two stage procedure of calculation of the overhead absorption rates the overheads are first:

**A** Apportioned to the service centres.
**B** Allocated to the departments or cost centres.
**C** Re-apportioned to the production centres.
**D** Assigned directly to the products.

---

**(a) Blanket overhead absorption rate**

## Definition

**Blanket overhead rate** is a single overhead recovery rate calculated for all the departments. organisation.

---

Blanket overhead absorption rate = $\frac{\text{Total budgeted overheads for entire factory for the period}}{\text{Total budgeted labour hours or machine hours}}$

The allocation basis is normally taken as machine hours or labour hours as these are the most appropriate allocation bases.

This method of overhead absorption is suited to single product industries that have uniform cost structures in all production departments. This is because the overhead rates are the same for all the products processed in every department.

## Example

Manney Plc operates two production departments, the details of which are given below. Calculate a single overheads recovery rate for the overheads.

| | Production dept. chairs | Production dept. tables | Total |
|---|---|---|---|
| Budgeted overheads | Tshs140,000,000 | Tshs200,000,000 | 340,000,000 |
| Budgeted labour hours | 20,000 | 50,000 | 70,000 |

The blanket overhead rate = $\frac{\text{Total overhead}}{\text{Total labour hours}}$

= $\frac{340,000,000}{70,000}$

= Tshs4,857 per labour hour

---

The overhead rate as calculated above is used for all the products that are produced in the period.

If the products undergo different processes and consume different quantities of resources e.g. machine hours or labour hours (the allocation bases), then this method will not hold true. Here, the departmental overhead rate will have to be computed, meaning each department has a separate overhead absorption rate.

**(b) Departmental overhead absorption rates**

**Definition**

**Departmental overhead rate** is a **separate overhead rate calculated for each department** according to the nature of work carried out in each department.

The budgeted overheads are divided by the budgeted machine hours or labour hours or any other suitable allocation basis to arrive at an absorption rate for each department.

$$\text{Departmental overhead absorption rate} = \frac{\text{Overheads for respective department}}{\text{Labour hours or machine hours for that department}}$$

**Example**

**Continuing the example of Manney Plc,**

Let us calculate a separate overhead rate for the chair and table departments:

**Overhead absorption rate for Chair dept and Table dept**

$$\text{Chair dept.} = \frac{\text{Overheads of department}}{\text{Labour hours of department}}$$

$$= \frac{\text{Tshs140,000,000}}{20,000}$$

$$= \text{Tshs7,000}$$

$$\text{Table dept.} = \frac{\text{Overheads of department}}{\text{Labour hours of department}}$$

$$= \frac{\text{Tshs200,000,000}}{50,000}$$

$$= \text{Tshs4,000}$$

In this case if a certain product does not pass through one of the departments then the overheads for that department will not be charged to that product at all.

Departmental overhead absorption rates are preferred where the machine hours as well as labour hours consumed are different for different departments. These rates are calculated according to different **working conditions** in each department. It is a very logical method of charging overheads in multi-product organisations where each product does not pass through all the departments.

**Example**

Stitch Plc manufactures ready-made formal shirts as well as t-shirts. The formal shirts pass through three departments A, B and C while the t-shirts pass through only two departments A and C. The departmental overhead absorption rates are Tshs500 for department A, Tshs8,000 for department B and Tshs500 for department C. The total labour hours consumed by each t-shirt are 5. One t-shirt requires 3 hours in department A and 2 hours in department C.

According to the departmental overhead rate method the overheads allocated will be:

= (departmental overhead rate for department A x hours in department A) + (departmental overhead rate for department C x hours in department C) = (Tshs500 x 3 hours) + (Tshs500 x 2 hours)
= Tshs1,500 + Tshs1,000
= Tshs2,500

We can observe here that the t-shirts would have to bear an unnecessary burden of extra overheads from department B under the blanket rate method. In reality, they only pass through departments A and C and as a result, need only bear the proportion of overheads incurred in these departments.

---

The departmental overhead rates are calculated using different **allocation bases** such as:

(i) Direct labour hours
(ii) Machine hours
(iii) Percentage of direct material cost
(iv) Percentage of direct labour cost
(v) Percentage of prime cost

**(i) Direct labour hour rate**

Under this method, **direct labour hours consumed in the department** are taken as the **basis for charging overheads**. According to this method, the absorption rate is calculated by dividing the overheads allocated and apportioned to a department by the number of labour hours consumed by the department.

$$\text{Labour hour rate} = \frac{\text{Total overheads allocated / apportioned}}{\text{Direct Labour hours worked}}$$


The overheads allocated to the production department amount to Tshs10,000,000 and the direct labour hours utilised are 5000. The overhead absorption rate will be calculated as:

$$\text{Overhead absorption rate} = \frac{\text{Tshs10,000,000}}{5000}$$

Tshs2,000 per hour

If one unit of output consumes 1.5 labour hours, then the overheads absorbed by the product will be = Tshs2,000 per hour x 1.5 hours per unit = Tshs3,000

---

This method is a scientific method as a majority of the overhead expenses are related to the labour time. This is a perfect method for typically **labour-driven industries**. Most overhead expenses are generally incurred on this resource. These include welfare expenses, canteen expenses etc. This method therefore qualifies as the most logical method for computation of the overhead rate.

**(ii) Machine hour rate**

Under this method, the products absorb overheads on the basis of **machine hours consumed** for production. The absorption rate is calculated as:

$$\text{Machine hour rate} = \frac{\text{Amount of overhead}}{\text{Machine hours consumed in the department}}$$

**Example**

The overheads allocated to the production department for the month are Tshs25,000,000 and the machine hours consumed are 2,500,000. The absorption rate will be calculated as:

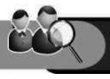
$$\text{Overhead absorption rate} = \frac{\text{Tshs25,000,000}}{\text{2,500}}$$

= Tshs10,000 per machine hour

If one product consumes 2 machine hours for production, the overheads absorbed for the product will be = 2 hour x Tshs10,000 per machine hour = Tshs20,000

---

Machine hours are generally used as an allocation basis for assigning overheads to products, by **highly mechanised industries**. Labour is very sparingly used in these industries. It appears more logical to use this basis, as most of the overheads such as depreciation, insurance, repairs, power etc. are machine-related overheads in such industries.



**Example**

Car manufacturing units are fully automated and produce cars with minimum human involvement. Using the machine hours as the basis for overhead absorption in this case is a logical way to assign overheads to products.

---

**(iii) Direct material cost percentage rate**

This method takes the **cost of the direct material consumed** by the department as an allocation base to calculate the overhead rate. It is expressed as a percentage, calculated as:

$$\text{Direct material cost percentage rate} = \frac{\text{Amount of overhead}}{\text{Direct material cost}} \times 100$$

**Example**

If the overheads for the production department in the organisation are Tshs20,000,000 and the direct material cost in the department is Tshs80,000,000 then the direct material percentage rate is worked out as follows:

$$\text{Overhead absorption rate} = \frac{\text{Tshs20,000,000}}{\text{Tshs.80,000,000}} \times 100 = 25\%$$

As a result, if the material consumed per unit is Tshs100,000, the overhead assigned for one unit will be = 100,000 x 25% = Tshs25,000

---

This method of allocation is generally preferred when the **material cost is the most important component of the total cos**t of a product. However it is not a widely used method.

**(iv) Direct labour cost percentage rate**

The **direct labour cost incurred** in the department is taken as the basis of allocation for calculating the overhead recovery rate under this method. This method is different from the labour hour rate method as it uses the **labour cost instead of the labour hours** to charge the overheads to the products.
It is calculated as:

$$\text{Direct labour cost percentage rate} = \frac{\text{Amount of overhead}}{\text{Direct labour cost}} \times 100$$

**Example**

Overhead costs allocated to the production department are Tshs7,000,000 and direct wages incurred are Tshs35,000,000

$$\text{Overhead absorption rate} = \frac{\text{Tshs7,000}}{\text{Tshs 35,000}} \times 100 = 20\%$$

If the direct labour cost of a product is Tshs100,000 the overheads absorbed by the product will be = 100 x 20% = Tshs20,000.

---

The direct labour cost percentage method is beneficial when the department is **labour intensive** and the **labour cost is the most important component of the total cost**.

**(v) Prime cost percentage method**

Prime cost is the total of the direct material cost, direct labour cost and direct expenses. Overheads form a part of the costs that are added to the prime cost of the product. The prime cost percentage method absorbs the overheads **as a percentage of the prime cost** of the product. It is calculated as:

$$\text{Prime cost percentage rate} = \frac{\text{Amount of overhead}}{\text{Prime cost}} \times 100$$

**Example**

The overheads incurred in the production department are Tshs10,000,000 and prime cost for the cost centre is Tshs100,000,000.

$$\text{Overhead absorption rate} = \frac{\text{Tshs10,000,000}}{\text{Tshs100,000,000}} \times 100 = 10\%$$

The overheads absorbed in a product whose prime cost total is Tshs100,000, will be = Tshs100,000 x 10% = Tshs10,000

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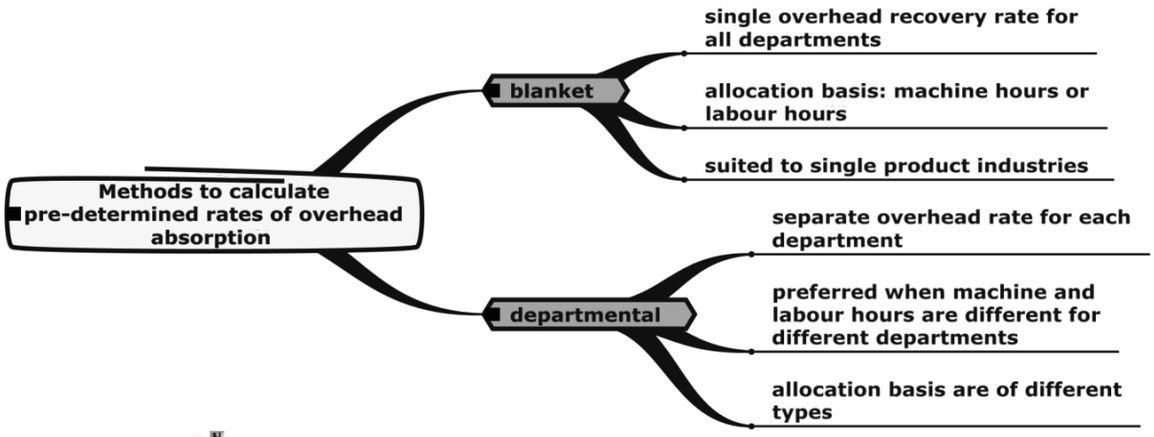
**SUMMARY**




**Test Yourself 7**

The monthly budget of the production department of Amazing Plc is as follows:

| | |
|---|---|
| Direct material | Tshs45,000,000 |
| Direct wages | Tshs60,000,000 |
| Overheads | Tshs90,000,000 |
| Direct labour hours | 15,000 |
| Machine hours | 30,000 |

Calculate the overhead recovery rate based on at least five different possible methods of absorption of overheads.

---

**Test Yourself 8**

Bingo Ltd has two departments: X and Y. The information given below is extracted from its cost records for January 20X3:

| Department | Machine hours | | Overheads (Tshs'000) | |
|---|---|---|---|---|
| | **Budgeted** | **Actual** | **Budgeted** | **Actual** |
| X | 12,000 | 11,500 | 24,000 | 28,000 |
| Y | 35,000 | 37,000 | 63,000 | 64,500 |
| | **47,000** | **48,500** | **87,000** | **92,500** |

Budgeted production 38,000 units
Actual production 35,000 units

Calculate:

(a) Blanket overhead absorption rate
(b) Departmental overhead absorption rate
(c) Actual overhead absorption rate
(d) Pre-determined overhead absorption rate

---

## 7. Under and over absorption of overheads.

**[Learning Outcome g]**

Pre-determined overhead absorption rates are calculated by dividing the budgeted overheads by the budgeted units. However, these figures are subject to change.

**Example**

Suppose the budgeted units are 200 and budgeted overheads are Tshs400,000. In this case the pre-determined overhead recovery rate will be Tshs400,000/200 = Tshs2,000 per unit. If the actual overheads amount to Tshs420,000 and the units produced are 230 then the actual overhead rate will be Tshs420,000/230 = Tshs1,826.09 per unit.

---

The overheads under the normal costing procedures are absorbed on the basis of the **pre-determined overhead absorption rates**. In the above case, if the overheads are absorbed in the units produced on the basis of the pre-determined absorption rates the overhead cost of the actual units will be = 230 units x Tshs2,000 per unit = Tshs460,000

| | Overheads (Tshs) | Rate |
|---|---|---|
| Actual | Tshs420,000 | Tshs1,826.087 per unit |
| Pre-determined | Tshs460,000 | Tshs2,000 per unit |

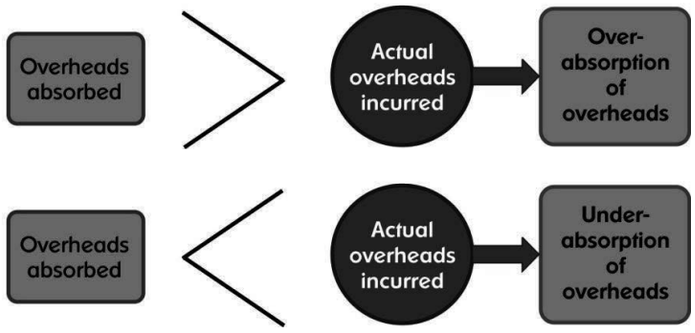
From the above table it is clear that there is a difference between the actual figures and the figures according to the costing records. This is a drawback of cost accounting. The final records according to costing rules and the actual records according to financial accounting rules have to be reconciled at the end of the activity period for the difference in cost.

This phenomenon is called **under-absorption and over-absorption of overheads**. The under- /overabsorbed overheads present substantial problems of analysis for management. In the above example, the overheads absorbed per unit are Tshs2,000, whereas the actual overheads incurred are Tshs1,826.09. The overheads are **over-absorbed to the extent of Tshs174 per unit.**

| | Overheads per unit | Units | Total overheads Tshs |
|---|---|---|---|
| Overheads absorbed | Tshs2,000 | 230 | Tshs460,000 |
| Actual overheads | Tshs1,826.09 | 230 | Tshs420,000 |

The above case reflects that the overheads have been **over-absorbed by Tshs40**. Similarly there can be a case of under-absorption of overheads where the overheads absorbed will be less than the actual overhead costs incurred.

**Diagram 6: Under- and over-absorption of overheads**




**Tip**

**In summary**

**Overheads** are **under-absorbed** when the amount of **actual overheads** is **more than** the amount of the **overheads absorbed**.
**Overheads** are **over-absorbed** when the amount of the **actual overheads** is **less than** the amount of the **overheads absorbed.**

**Example**

Riverside Plc has budgeted overheads of Tshs600,000,000 for the activity period. The organisation has decided to absorb the overheads on the basis of the budgeted machine hours. The budgeted machine hours worked for the period are 600,000.

The actual overheads incurred for the period are Tshs650,000,000 and the machine hours worked are 560,000. Calculate the under- / over-absorption of overheads and give reasons.

**Answer**

$$\text{Overhead absorption rate} = \frac{\text{Budgeted overhead}}{\text{Budgeted machine hours}}$$

$$\frac{\text{Tshs600,000,000}}{\text{600,000 hours}}$$

Tshs1 ,000 per machine hour

| | Tshs |
|---|---|
| Actual overheads incurred | 650,000,000 |
| Overheads absorbed (Tshs1,000 x 560,000 hours worked) | 560,000,000 |
| Overheads under-absorbed | 90,000,000 |

The overheads are under-absorbed as the hours worked are less than the budgeted hours and also the actual overheads are more expensive as the actual overhead rate per machine hour is Tshs650,000,000/560,000 = Tshs1,161 per machine hour as compared to the budgeted rate of Tshs1,000 per machine hour.

## Test Yourself 9

Thermo Plc has provided the following data regarding the six month period ending June 20X3:

| | Budgeted | Actual |
|---|---|---|
| Overheads | Tshs250,000,000 | Tshs300,000,000 |
| Number of units | 200,000 | 200,000 |

Calculate and give reasons for the under- / over-recovery of overheads.

---

## Answer to Test Yourself

**Answer to TY 1**

The correct option is **D**.

Interest cost paid for a loan borrowed for the purchase of inventory is a part of the costs that arise due to the holding of inventory. The salaries of the manager, the watchman guarding the warehouse and of the factory supervisor are all fixed costs that will be incurred irrespective of whether or not one holds inventory. Hence these costs are not incurred as a result of holding inventory. As such, they do not form a part of the inventory holding costs.

**Answer to TY 2**

The correct option is **C**.

The calculation of the EOQ will require us to calculate the carrying cost per unit per annum.

The carrying cost is given as Tshs100 per bearing per month. Hence the carrying cost per bearing per annum will be calculated as = Tshs100 x 12 months = Tshs1200

Optimum production run size (EOQ)

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

$$\text{EOQ}=\sqrt{\frac{2x\ 24{,}000\ x\ 324{,}000}{1200}}$$

$$\text{EOQ}=\sqrt{12{,}960{,}000}$$

= 3,600 bearings

**Answer to TY 3**

The correct option is **A**.

Direct labour cost is physically traceable to the finished product or service and hence directly charged to that product or service. It forms part of the prime cost. The overhead costs which are general in nature and spent across all the departments are allocated using a suitable basis. Indirect labour cost does not alter the construction, conformation or composition of the product but it contributes to such work and to the completion of the product. It forms part of factory overhead.

**Answer to TY 4**

The correct option is **B**.

The indirect labour cost is allocated to output on some suitable basis such as a percentage of the direct labour hours. Only direct and traceable costs are charged directly to the products. Direct allocation is applied to departments and not to products and therefore this option is wrong.

**Answer to TY 5**

The correct option is **C**.

Indirect costs are generally incurred for all cost centres and not for any single cost centre. Hence these need to be apportioned to products. Indirect expenses are not incurred once but they are incurred continuously. There is no question of double charging of indirect costs as these are not directly charged to the products.

**Answer to TY 6**

The correct option is **B**.

In the two stage procedure, overheads are first allocated to the departments or cost centres. Apportionment of costs to the service cost centres will be the next step after the overheads have been allocated to the various cost centres. Thereafter the overheads which cannot be directly identified with the departments or cost centres are apportioned to service as well as other departments on a suitable basis. Re-apportionment can happen only after basic apportionment is complete. Assignment of overheads to the products is the last stage in the procedure of calculating overhead absorption rates.

**Answer to TY 7**

Calculation of overhead recovery / absorption rate for Amazing Plc's production department

**(a) Direct material cost percentage method**

$$\text{Overhead recovery rate} = \frac{\text{Amount of overheads}}{\text{Direct material cost}} \times 100$$

$$= \frac{\text{Tshs}90{,}000{,}000}{45{,}000{,}000} \times 100$$

**= 200% of direct material**

**(b) Direct labour cost percentage method**

$$\text{Overhead recovery rate} = \frac{\text{Amount of overheads}}{\text{Direct labour cost}} \times 100$$

$$= \frac{\text{Tshs}90{,}000{,}000}{\text{Tshs}60{,}000{,}000} \times 100$$

**= 150% of direct labour cost**

**(c) Prime cost percentage method**

$$\text{Overhead recovery rate} = \frac{\text{Amount of overheads}}{\text{Prime cost}} \times 100$$

$$= \frac{90{,}000{,}000}{105{,}000{,}000} \times 100$$

**= 85.71% of prime cost**

**(d) Direct labour hour rate method**

$$\text{Overhead recovery rate} = \frac{\text{Amount of overheads worked}}{\text{Direct labour hours}}$$

$$= \frac{\text{Tshs90,000,000}}{\text{15,000}}$$

**= Tshs6,000 per direct labour hour**

**(e) Machine hour rate method**

$$\text{Overhead recovery rate} = \frac{\text{Amount of overheads}}{\text{Machine hours}}$$

$$= \frac{\text{Tshs90,000,000}}{\text{30,000,000}}$$

**= Tshs3,000 per machine hour**

**Working**

Prime cost = Direct material cost + Direct labour cost
= Tshs45,000,000 + Tshs60,000,000
= Tshs105,000,000

**Answer to TY 8**

Calculation of overhead absorption rates for Bingo Ltd

**(a)** Blanket overhead absorption $= \frac{\text{Total budgeted overheads}}{\text{Total budgeted machine hours}}$

$$= \frac{\text{Tshs87,000,000}}{\text{47,000 hours}}$$

**= Tshs1,851 per machine hour**

**(b)** Departmental overhead absorption rate

For department X $= \frac{\text{Budgeted overheads dept. X}}{\text{Budgeted machine hours for dept. X}}$

$$= \frac{\text{Tshs24,000,000}}{\text{12,000 hours}}$$

**= Tshs2,000 per machine hour**

For department Y $= \frac{\text{Budgeted overheads dept. Y}}{\text{Budgeted machine hours for dept. Y}}$

$$= \frac{\text{Tshs63,000,000}}{\text{35,000 hours}}$$

**= Tshs1,800 per machine hour**

**(c)** Actual overhead absorption rate = Actual overheads / Actual production

= Tshs92,500 000 / 35,000 units

**= Tshs2,643 per unit**

Actual overhead absorption rate is always calculated based on number of units produced since it is calculated for total number of finished goods based on actual figures post production. Hence bases such as machine hours and labour hours are not used here as they differ department-wise, but remain the same 'in total' for the entire organisation.

**(d)** Pre - determine overhead absorption rate = Budgeted overheads / Budgeted production

= Tshs87,000,000 / 38,000 units

**= Tshs2,289 per unit**

**Answer to TY 9**

| | Budgeted | Actual |
|---|---|---|
| Overheads (a) | Tshs250,000,000 | Tshs300,000,000 |
| Number of units (b) | 200,000 | 200,000 |
| Overhead rate (a/b) per unit | Tshs1,250 | Tshs1,500 |

**Thermo Plc - Statement showing under- / over-absorption of overheads for six months ending June 20X3**

| | Tshs | Reason |
|---|---|---|
| Overheads incurred | Tshs300,000,000 | Although the number of units is the same, the overheads per unit have become more expensive. The actual rate is Tshs1,500 per unit whereas the budgeted rate is Tshs1,250 per unit |
| Budgeted overheads | Tshs250,000,000 | |
| **Under-absorption** | **Tshs50,000,000** | |

## Self-Examination Questions

**Question 1**

Symphony Industries wants to purchase oil tins. The annual use is 5,000 tins. Each order costs Tshs250,000. The cost of carrying inventory is Tshs20,000.

EOQ will be:
**A** 500
**B** 354
**C** 400
**D** None of the above

**Question 2**

The monthly use of Libra Ltd is 400 units. The purchase price per unit is Tshs15,000. Holding cost and ordering cost are 10% of the price, and are Tshs100,000 respectively. The total inventory cost for the current year is Tshs75,000,000 including purchase cost, holding cost and ordering cost. If EOQ is used, in comparison to the current ordering policy, the amount saved will be (in Tshs):
**A** (800,000)
**B** 800,000
**C** (1,800,000)
**D** 1,800,000

**Question 3**

The wages of a worker looking after the maintenance of a machine is an example of:
**A** Machine cost
**B** Indirect labour cost
**C** Labour maintenance cost
**D** Direct labour cost

**Question 4**

The overhead absorption rate of Magnum Ltd is Tshs4,750 per machine hour. The budgeted machine hours for the period are 46,000. The actual total overheads incurred during the same period are Tshs205,665,000 and the actual machine hours recorded are 43,000.

What are the total overheads for the period?

**A** Over-absorbed by Tshs1,415,000
**B** Over-absorbed by Tshs12,835,000
**C** Under-absorbed by Tshs1,415,000
**D** Under-absorbed by Tshs12,835,000

**Question 5**

Remo Plc absorbs its fixed overheads on the basis of machine hours. During the last year, total overheads incurred Tshs120,000,000 and actual machine hours were 45,520. The fixed overheads were under absorbed by Tshs6,200,000. Assuming the budgeted machine hours 42,000, what is the fixed overheads absorption rate?

**A** Tshs2,640
**B** Tshs2,500
**C** Tshs2,860
**D** None of the above

## Answers to Self-Examination Questions

**Answer to SEQ 1**

The correct option is **B**.

Here, D = annual demand = 5,000 units
$C_o$ = ordering costs = Tshs250,000
$C_h$ = holding costs = Tshs20,000
Optimum purchase order size

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

$$EOQ=\sqrt{\frac{2x\ 5{,}000\ x\ 250{,}000}{20{,}000}}$$

$$EOQ=\sqrt{125{,}000}$$
= 353.55 tins

= 354 tins

**Answer to SEQ 2**

The correct option is **D.**

Saving is always a positive amount.

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

$$\text{EOQ}=\sqrt{\frac{2x\ 100{,}000\ x\ 40x\ 12}{15{,}000x\ 10\%}}$$

= 800 units

| | **Tshs'000** |
|---|---|
| Purchase costs (4,800 units x Tshs15,000) | 72,000 |
| Order costs (4,800/800 x 100,000) | 600 |
| Holding costs (800/2 x 15,000 x 10%) | 600 |
| **Total costs** | **73,200** |
| **Less:** Original inventory costs | 75,000 |
| **Savings** | **1,800** |

**Answer to SEQ 3**

The correct option is **B**.

Any labour cost which is not directly incurred or cannot be readily chargeable or identifiable with a specific job, contract, work order or any other unit of cost is termed an indirect labour cost. The machine cost is the cost of producing machines and forms a part of the non-current asset cost. The labour maintenance cost is not a part of the machine maintenance cost. The direct labour cost is the cost of the efforts to produce the product.

**Answer to SEQ 4**

The correct option is **C**.

Overheads absorbed are less than the actual overheads incurred.

| | **Tshs'000** |
|---|---|
| Actual overheads incurred | 205,665 |
| Overheads absorbed Tshs4,750 x 43,000 | 204,250 |
| **Overheads under-absorbed** | **1,415** |

**Answer to SEQ 5**

The correct option is **B.**

| | |
|---|---|
| Actual overheads | Tshs120,000,000 |
| **Less:** Under absorption of overheads | (Tshs6,200,000) |
| **Absorbed overheads** | **Tshs113,800,000** |

Overhead absorption rate = Budgeted fixed overheads/Budgeted machine hours

Hence,

Machine hours worked = Overhead absorbed/Overhead absorption rate
45,520 hours = Tshs113,800,000/OAR
OAR = Tshs2,500

# 3

# COST ACCOUNTING TECHNIQUES FOR PRODUCTS, SERVICE, PROCESS AND PROJECTS

## Get Through Intro

Production systems are either continuous or operate one job at a time. In certain industries like the aircraft manufacturing industry, each aircraft is manufactured as a separate job, whereas in other industries such as chemical industries, a series of continuous processes lead to the manufacture of a chemical. Accordingly, these industries use different costing techniques. The aircraft industry uses job costing whereas the chemical industry uses process costing to calculate total cost.

This Study Guide will help you
to understand and calculate the total costs in different industries using job costing, process costing and service costing techniques.

Management accountants are often required to perform cost management functions, and learning the different costing techniques discussed in this Study Guide will prepare you for this.

## Learning Outcomes

a) Identify and calculate product costs.
b) Identify and calculate project costs including process costs.
c) Identify and calculate service costs.

## 1. Identify and calculate product costs.

**[Learning Outcome a]**

Product costs typically consist of three major components: material, labour and overheads. Material costs are the costs of direct and indirect materials used in the production process, labour costs are the costs of labour used in making the product (manpower) and overheads are all the indirect costs associated with the production process.

Product costs are calculated by adding together the material, labour and overhead costs. Material and labour costs are taken at actual figures, whereas overheads are absorbed using an appropriate absorption rate. Product costs can be calculated by using a simple cost sheet.

We have already studied the proforma of cost sheet in the previous Study Guide.

### Test Yourself 1

Find the production cost per unit from the following details:

The total number of units manufactured by a company is 1,000. All the units are sold during the year. Assume that there is no opening and closing inventory.

**Cost per unit**

| | **Tshs'000** |
|---|---|
| Materials | 4,500 |
| Direct wages | 3,200 |
| Indirect material | 800 |

**Other costs incurred**

| | **Tshs'000** |
|---|---|
| Indirect wages | 800,000 |
| Administration overheads | 225,000 |
| Selling and distribution overheads | 315,200 |

**A** Tshs1,025,000
**B** Tshs1,115,200
**C** Tshs1,340,200
**D** Tshs4,200,000

## 2. Identify and calculate project costs including process costs.

**[Learning Outcome b]**

### 2.1 Project costs

Project costs are all costs incurred in completing a project. Project cost accounting tracks all costs during the life cycle of the project and allocates them to the project. This information helps managers in project management. Project costs are accumulated separately for each individual job, and revenues from that job are then compared with these costs to arrive at the profit.

### Tip

**Project cost accounting is also called job cost accounting/ job costing.**

In the case of projects spanning more than one accounting period, project costs are recorded based on the percentage completion of the project or job at each year end / accounting period. Revenues of the job are also recorded accordingly, based on the percentage completion of the job. Budgeted project costs are compared to actual project costs to analyse variances, if any.

**1. Job Costing**

**Definition**

**Job costing** is a form of specific order in which costs are attributed to individual jobs.

**CIMA official terminology, 2005**

This method of costing is used to calculate the cost of production for non-repetitive, non-standard jobs for each work or job order undertaken by an organisation. Under this method, individual jobs are identifiable and each job becomes a separate cost centre. All direct costs are accumulated, and indirect costs are assigned (on some suitable basis) to each job separately.

Typically, industries like aircraft manufacturing, ship-building, tailor-made garments etc. use job order costing.

The calculation of job costs can be done by adding up the direct material cost, direct labour cost and the portion of overheads that need to be assigned to a job.

The steps to be followed in the calculation of job costs from the given information are stated below:

- Identify the material costs.
- Identify the direct labour costs.
- Compute the indirect / overhead costs using a suitable basis. This can either be direct labour hours or machine hours in most cases.
- Add up all the costs to arrive at the total cost of the job.
- Once the costs are calculated, profit per job can be computed by deducting the cost from the sales price or by computing it as a percentage of cost.

**Example**

**Job costing**

Shaun Plc is an event management company. Job 2365, organising a wedding ceremony, and job 5698 arranging a business party have been completed during the year. The following costs relate to the jobs. Calculate the total costs of the jobs.

| | Job 2365 Tshs'000 | Job 5698 Tshs'000 |
|---|---|---|
| Cost of direct materials such as lighting and decorating materials | 4,000 | 5,000 |
| Cost of the personnel at work | 6,000 | 7,500 |
| Hire charges for sound equipment | 1,250 | 2,000 |

The overheads incurred, such as the travel charges, the cost of using the company's own equipment etc. are absorbed in each job at the rate of Tshs15,000 per direct labour hour. The direct labour hours for job 2365 are 50 hours and that for job 5698 are 70 hours.

**Answer**

| | Job 2365 (Tshs'000) | Job 5698 (Tshs'000) |
|---|---|---|
| Material costs | 4,000 | 5,000 |
| Labour costs | 6,000 | 7,500 |
| Direct expenses (hire and other charges) | 1,250 | 2,000 |
| Overheads absorbed at Tshs15,000 per direct labour hour | 750 (50 x Tshs15,000,000) | 1,050 (70 x Tshs15,000,000) |
| **Total cost** | **12,000** | **15,550** |

**2. Calculation of Profit or Loss**

Let us calculate profit or loss from a job work order to understand the recording of job costs and income calculations.

**Example**

A specialist manufacturer of purpose-built plants is engaged in three separate jobs in May 20X3. The following costs were incurred:

| | Job A | Job B | Job C |
|---|---|---|---|
| Direct material | Tshs524,000 | Tshs671,000 | Tshs382,000 |
| Direct labour Skilled-hours | 158 | 170 | 16 |
| Semi-skilled - hours | 316 | 190 | 30 |
| Site expenses | Tshs118,000 | Tshs170,000 | Tshs25,000 |
| Selling price of job | Tshs3,318,000 | Tshs2,750,000 | Tshs1,950,000 |
| Completed at 30 April20X3 | 100% | 80% | 25% |

The following information is available:

(i) Direct material for the completion of the jobs has been recorded.

(ii) Direct labour is paid - skilled Tshs5,000 per hour; semi-skilled Tshs4,000 per hour.

(iii) Site expenses tend to vary with output.

(iv) Administration expenses total Tshs440,000 per annum and are to be allocated to the jobs on the basis of direct labour hours.

(v) On completion of the work, the practice of the manufacturer is to split the calculated profit on each job; 20% to site staff as a bonus, and 80% to the company. Calculated losses are absorbed by the company in total.

**You are required to:**
(a)
(b) Calculate the profit or loss by the company of job A.
(c) Project the profit or loss by the company of job B and C.

**Answer**

**From the information given in the question job costs and profit / loss thereon are computed as:**

**(a) Profit or loss by the company on Job A**

| | Job Cost | | |
|---|---|---|---|
| | **Job A Tshs** | **Job B Tshs** | **Job C Tshs** |
| Material | 524,000 | 671,000 | 382,000 |
| Labour - skilled (W1) | 790,000 | 850,000 | 80,000 |
| - unskilled (W1) | 1,264,000 | 760,000 | 120,000 |
| Site expenses | 118,000 | 170,000 | 25,000 |
| Administration expenses (apportioned on labour hours) (W2) | 237,000 | 180,000 | 23,000 |
| **Cost to date** | **2,933,000** | **2,631,000** | **630,000** |
| Selling price | 3,318,000 | | |
| **Total profit** | **385,000** | | |
| **Less:** 20% bonus (385 x 20%) | (77,000) | | |
| **Company share** | **308,000** | | |

**(b) Projected profit of Jobs B and C**

The selling price is always calculated on 100% of the job completed. Also, projected profit or loss is calculated on the job which is complete. If the job is not 100% complete, then the estimated cost of the job for 100% completion needs to be computed based on the given information.

| | Job B (Tshs'000) | Job C (Tshs'000) |
|---|---|---|
| Costs to date | 2,631,000 | 630,000 |
| Costs of completion | | |
| B - 20% (excluding material) (W3) | 490,000 | |
| C- (excluding material) (W3) | | 744,000 |
| **Projected total cost (a)** | **3,121,000** | **1,374,000** |
| Selling price (b) | 2,750,000 | 1,950,000 |
| **Profit (Loss) (b – a)** | **(371,000)** | **576,000** |
| Staff bonus | | (115,000) |
| **Profit (Loss) to company** | **(371,000)** | **461,000** |

**Workings**

**W1**

**Calculation of labour cost**

**Job A**

Skilled = 158 hours x Tshs5,000 = Tshs790,000
Semi-skilled= 316 hours x Tshs4,000 = Tshs1,264,000

**Job B**

Skilled = 170 x Tshs5,000 = Tshs850,000
Semi-skilled = 190 x Tshs4,000 = Tshs760,000

**Job C**

Skilled = 16 x Tshs5,000 = Tshs80,000
Semi-skilled = 30 x Tshs4,000 = Tshs120,000

**W2**

**Calculation of administration expenses**

The administration expenses will be apportioned on the basis of the total labour hours skilled and unskilled = 158 + 316 + 170 +190 +16+ 30 = 880 hours

Absorption rate for administration expenses = Tshs440,000 / 880 hours = Tshs500

**Job A**

Total labour hours = skilled + unskilled
= 158 + 316
= 474 hours

Administration expenses = 474 x 500
= Tshs237,000

**Job B**

Total labour hours = 170 + 190
= 360 hours

Administration expenses = 360 x 500
= Tshs180,000

**Job C**

Total labour hours = 16 + 30
= 46 hours

Administration expenses = 46 x 500
= Tshs23,000

**W3 Calculation of costs of completion**

Job B is 80% complete, hence we need to add the remaining 20% of costs, to arrive at the 100% cost of Job B. It is generally assumed that the jobs are 100% complete regarding material,(only the labour and overheads portion is incomplete). Hence, we add only that portion, assuming that the material costs are 100% incurred.

Total cost of Job B (excluding material)
Tshs2,631,000 – Tshs671,000 = Tshs1,960,000

This cost is 80% cost, therefore we will now calculate the estimated 20% cost based on this information as below:

$$= \frac{\text{Tshs1,960,000}}{80\%} \times 20\%$$

= Tshs490,000

Similarly we calculate the cost for Job C (excluding material)
= Tshs630,000 – Tshs382,000 = Tshs248,000

Estimated cost of the remaining 75%

$$= \frac{\text{Tshs248,000}}{25\%} \times 75\%$$

= Tshs744,000

## 2.2 Process costing


**Process costing** is the costing method applicable where goods or services result from a sequence of continuous or repetitive operations or processes.

**CIMA official terminology, 2005**

**1. The features of process costing are:**

(a) **Costs** relating to a process are always **accumulated for a period**. The period may be a week, a month, six months or a year. Unlike job costing, the costs are booked periodically.

(b) The direct as well as the indirect costs are accumulated for a **clearly defined process** or operation as a whole. The cost centre here is the process or operation.

(c) Costs are **accumulated into processes** and not directly into products. The total cost of each process is divided by the total number of units produced during a period to arrive at the cost per unit.

(d) The cost of the units of **normal loss** is borne by the good units as certain losses in production are considered to be normal e.g. evaporation, shrinkage etc.

**Example**

If in a paint producing factory the total cost incurred per month is Tshs5,000,000 to manufacture 2,500 litres of paint and a loss of 50 litres of paint per day is a normal occurrence, then the entire cost of Tshs5,000,000 will be spread over only (2500 – 50) = 2450 litres of paint.

(e) Any **work in process** (incomplete work) at the end of the period, in any of the processes, is **treated as "equivalent finished goods"**. (We will discuss this in later Learning Outcomes).

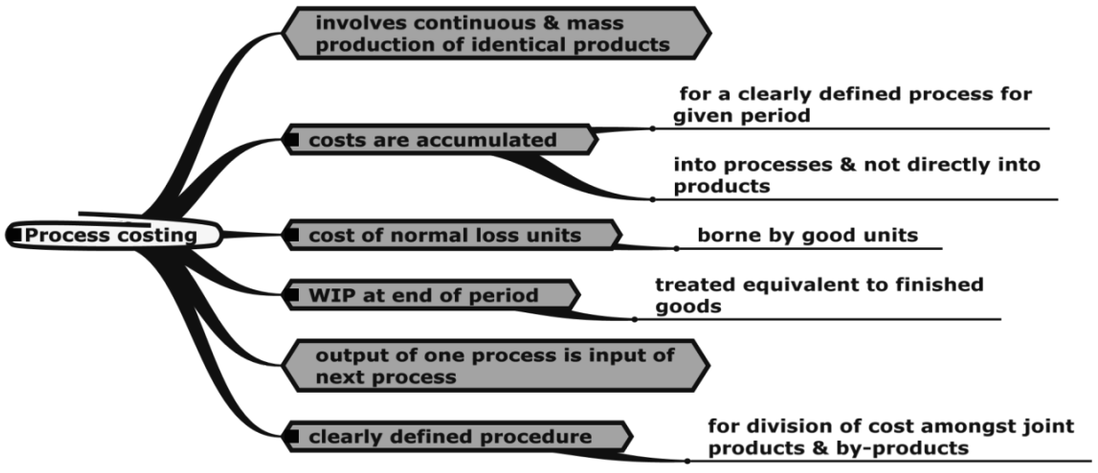
(f) The cost of one process is transferred and added to the cost of the next process, because the **output of one process** (except the final process) is treated as the **input of the next process**.

**Example**

Suppose the entire process of paint manufacture is split into two processes – process 1 and process 2. The costs incurred at the end of process 1 total Tshs650,000. This cost will be transferred and added to the cost of process

Process industries comprise companies manufacturing a single product on a continuous basis and multi-product companies. Certain examples are mines and quarries, cotton, wool and jute textiles, chemicals, paper plastics, oil refineries, canneries.

**SUMMARY**




**Test Yourself 2**

When is the process costing technique used?

**A** When the production flows continuously and through various stages
**B** When the production is done for one order at a time
**C** When the production is undertaken in batches
**D** When an intangible service is provided

**2. Process account**

There are clearly defined procedures for division of costs amongst the **joint products** and the by-products emerging from a process.

Process costing treats all units of output produced in a period alike by accumulating and averaging costs over the units produced.
In process costing, a separate account is set up for each process. At the end of the final process, the finished products are transferred to the Finished Goods Account.
To calculate the process cost per unit we will first try to understand the entries in the process account. A separate account is prepared for each process.

Process accounts are explained in the Example below.

Under process costing, each process account records all the expenses incurred for the process. This account is debited with material cost, direct expenses and overhead allocated to the process. It is credited with wastage of materials and gains from the sale of scrap, if any.

The balance of this account is the cost of the products produced which is transferred to the next process. The amount of good units when they are fully processed is transferred to the 'finished goods account'. In some cases, a certain part of the output of a process is kept in inventory and the balance is transferred to the next process. The cost per unit is calculated as:

$$\text{Cost per unit} = \frac{\text{Total cost - Scrap value of normal loss}}{\text{Total input quantity - Normal loss quantity}}$$

The process account given below will make the above clear.

**Example**

In the course of manufacture, a product passes through three distinct processes: A, B and C. During a four week period 1,000 units are produced and the following information is available:

| | Process A Tshs'000 | Process B Tshs'000 | Process C Tshs'000 |
|---|---|---|---|
| Direct Material | 2,000 (1,000 units) | | -- |
| Additional material | | 1,000 | |
| Direct Wages | 1,500 | 700 | 800 |
| Direct Expenses | 300 | 100 | -- |

The indirect production cost was Tshs4,500,000 and this is to be apportioned to the processes on the basis of the direct wage cost. Prepare the process account and ascertain the cost per unit.

**Answer**

**Dr** **Process 'A' Account** **Cr**

| | Units | Tshs'000 | | Units | Tshs'000 |
|---|---|---|---|---|---|
| Direct Material | 1,000 | 2,000 | | | |
| Direct Wages | | 1,500 | | | |
| Direct Expenses | | 300 | | | |
| Overhead (Indirect production cost) (W1) | | | Output of process A transferred to process B (entire cost transferred to process B) | | |
| | | 2,250 | | 1,000 | 6,050 |
| | | **6,050** | | | **6,050** |

**Dr** **Process 'B' account** **Cr**

| | Units | Tshs'000 | | Units | Tshs'000 |
|---|---|---|---|---|---|
| Process A a/c | 1,000 | 6,050 | | | |
| Direct Material | | 1,000 | | | |
| Direct Wages | | 700 | | | |
| Direct Expenses | | 100 | Output of process B | 1000 | 8900 |
| Overhead | | 1,050 | transferred to process C | | |
| (Indirect production cost) (W1) | | | (entire cost transferred to process C) | | |
| | **1,000** | **8,900** | | **1,000** | **8,900** |

**Dr** **Process 'C' account** **Cr**

| | Units | Tshs'000 | | Units | Tshs'000 |
|---|---|---|---|---|---|
| Process B a/c | 1,000 | 8,900 | | | |
| Direct material | | -- | | | |
| Direct wages | | 800 | | | |
| Direct expenses | | -- | | | |
| | | | Output of process C transferred to | | |
| Overhead (Indirect production cost) (W1) | | 1,200 | Finished Inventory a/c (entire cost transferred to finished goods a/c) | 1,000 | 10,900 |
| | **1,000** | **10,900** | | **1,000** | **10,900** |

Now, in process 'C', finished goods are produced. It is given in the problem that 1,000 units were produced.

Therefore the per unit cost of goods produced in the last stage i.e.

Process 'C' will be = Tshs10,900/1,000 units
= Tshs10.90 per unit

**Workings**

**W1**

Total indirect production cost is Tshs4,500,000. According to the information, it is to be apportioned on the basis of direct wages. The direct wages for the three processes are Tshs1500,000, Tshs700,000 and Tshs800,000.
Therefore, the ratio comes to 15:7:8.
Apportionment of production cost will be calculated as follows:

| | Calculation | Cost per process Tshs'000 |
|---|---|---|
| Process A | Tshs4,500,000 x 15/30 | 2,250 |
| Process B | Tshs4,500,000 x 7/30 | 1,050 |
| Process C | Tshs4,500,000 x 8/30 | 1,200 |
| | **Total** | **4,500** |

**Note**

In this example, the unit's column specifies the amount of direct material which goes into production at the start of the process. This is carried forward as it is to the next process, unless there are any normal or abnormal losses **(these will be discussed in the next Learning Outcome**).

Any additional materials which are input in any further processes are not assigned any units as these are not the basic materials but only additional materials that are required to complete the process of production.

However, there can be cases where some additional basic material is added in the subsequent processes. In these cases the relevant units are also written in the quantity column.

The labour costs and other expenses are debited as and when these are incurred. Any overhead expenditure is allocated to the processes on a suitable basis according to the given information.

**Test Yourself 3**

A product passes through two different processes: A and B. The output of process A is transferred to process B and the output of process B is transferred to finished goods. The following details relate to the processes.

| | Units Process A | Units Process B |
|---|---|---|
| Input | 5,000 | - |
| | **Tshs'000** | **Tshs'000** |
| Direct Material | 5,000 | |
| Additional Material | 6,000 | 3,000 |
| Direct Labour | 7,000 | 4,000 |
| Manufacturing Expense | 2,000 | 2,000 |

Prepare process A and process B accounts

**Test Yourself 4**

The value of materials input into a process is:

**A** Debited to the process account.
**B** Credited to the process account.
**C** Not reflected at all in the process account.
**D** Depicted as a loss in the process account.

**3. Normal and abnormal losses and gains and their accounting treatment**

The term **"process loss"** may be defined as the difference between the input quantity of raw material and the output. In order to account for the losses incurred one needs to identify them as normal and abnormal losses.

**(a) Normal process loss**

Normal loss is **unavoidable** and is often caused by such factors as evaporation, chemical change, withdrawals for test or sampling, unavoidable spoilage or other reasons for physical loss of input.

These types of losses can be estimated from the nature of the material and the operation, previous experience and the input–output ratio inherent to a particular industry. Normal loss is generally calculated as a certain percentage of the input of units introduced in the process. The percentage of losses thereby calculated is always a fixed percentage of normal loss. As a result, if the percentage of normal loss is calculated as 5% then any process loss incurred up to 5% is treated as normal.

**Definition**

From the recovery value point of view 'waste' and 'scrap' can be defined as:

**Waste:** "discarded substances having no realisable value."

**Scrap:** "discarded material, having some recovery value which is usually disposed of without further treatment or re-introduced into the production process in place of raw material."

**(b) Accounting treatment for normal loss**

The normal process loss is borne by the good units produced, meaning that the total cost of the process is spread over the number of good units only (i.e. ignoring the loss units.). Any salvage (scrap) value generated from scrap will be deducted from the total cost as it will reduce the cost to that extent. As a result, even though the costs are incurred on the entire input units, the cost is borne only by the good units. The cost is however reduced to the extent of the scrap value of normal loss.

$$\text{Unit cost of good units produced} = \frac{\text{Total process cost - Scrap value of normal loss}}{\text{Input quantity - Normal loss quantity}}$$

**Example**

Suppose the material input is 100 units and the loss is 5%, then the good units will be 100 – 5% of 100 = 95 units. If the cost incurred in the process is Tshs200,000 and the revenue from sale of the scrap is Tshs10,000 then the entire cost per unit for the 95 good units will be:

$$\text{Unit cost of goods units produced} = \frac{\text{Tshs200,00 -Tshs10,000}}{\text{(100 -5) units}} = \text{Tshs2,000 per unit}$$

In the above example, if there is no resale value for scrap then the entire cost of Tshs200,000 will be split between the 95 units as Tshs200,000/95 = Tshs2,110 per unit.

---

As far as the accounting entry for normal loss is concerned, the units of normal wastage are recorded on the credit side of a process account in the quantity column only. The sale value of scraps, if any, should be included in the amount column on the credit side at saleable value. This reduces the cost of normal output. Usable units share the process loss. As a result, in the above example the normal loss will be recorded at the sale value i.e. at Tshs10,000.

**The accounting entries in respect of normal loss will be as follows:**

| | | |
|---|---|---|
| 1 | Normal loss | Dr Normal loss account<br>Cr Process account<br>Being normal loss charged to process |
| 2 | For sale of scrap, if any | Dr Cash account<br>Cr Normal loss account<br>Being cash realised on sale of scrap |

**Example**

In Process 1 the costs incurred by Alpha Co were as follows:

| | Units | Tshs'000 |
|---|---|---|
| Materials | 1,000 | 5,000 |
| Labour | | 500 |
| Expenses | | 350 |
| Overheads apportioned | | 450 |

The normal loss incurred in the process was 5%. The sale values of scrap, if sold, is Tshs20,000. Prepare the process account and ascertain the cost of materials to be transferred to Process 2.

**Answer**

The Process 1 account will be prepared as follows:

**Dr** **Process 1 account** **Cr**

| | Units | Tshs'000 | | Units | Tshs'000 |
|---|---|---|---|---|---|
| Direct Material | 1,000 | 5,000 | Normal Loss a/c (5% x 1,000 units) | 50 | 20 |
| Direct Wages | | 500 | | | |
| Direct Expenses | | 350 | | | |
| Overhead (Indirect production cost) | | 450 | Process 2 account | 950 | 6,280 |
| | **1,000** | **6,300** | | **1,000** | **6,300** |

**(c) Abnormal process loss**

When the loss is caused by **unexpected** or abnormal conditions, it is called **"Abnormal Loss**". Any wastage arising in excess of normal wastage is known as "Abnormal Wastage".

**Calculation of abnormal losses**

Abnormal loss may be **avoided.** It can be controlled by the management by taking proper care. Units of abnormal loss are calculated as shown in the below example:

**Example**

**Continuing with the previous example of Alpha Co**

| | |
|---|---|
| Units introduced | 1000 |
| **Less**: 5% Normal loss (5% of 1,000) | 50 |
| **Normal output** | **950** |
| **Less**: Actual output | 930 |
| **Abnormal loss** | **20** |

Hence, the difference between normal output and actual output is abnormal loss.

Normal output = Units input – normal loss in units

**(d) Accounting treatment of abnormal process losses**

The accounting procedure for abnormal loss is different. The abnormal loss is valued at the rate at which the good units would be valued if there was only normal loss. The amount of abnormal wastage is credited to the process concerned. A separate abnormal wastage account is opened and the scrap value if any is credited to the abnormal loss account. The balance on it is ultimately transferred to the costing profit and loss account.

The value of abnormal wastage is calculated as follows:

$$\text{Value of abnormal loss (wastage)} = \frac{\text{Normal cost of normal output}}{\text{Normal output}} \times \text{Units of abnormal loss}$$

Normal output = Units input - Normal loss in units
Normal cost = Normal cost of process – Realisable value of normal loss if any

The **accounting entries** in respect of abnormal loss are as follows:

| | | |
|---|---|---|
| 1 | Abnormal loss | Dr Abnormal loss account<br>Cr Process account<br>Being abnormal loss charged to process |
| 2 | If any amount is received from the sale of scrap | Dr Cash account<br>Cr Abnormal loss account<br>Being sale value realised on sale of abnormal loss units |
| 3 | For closing the abnormal loss a/c | Dr Costing profit and loss account<br>Cr Abnormal loss account<br>Being loss transferred to costing profit and loss account |

**Example**

In the above process (example for 'accounting for normal losses'), if the actual output is 900 units then the balance of 50 units (950 – 900) units will be abnormal loss units. As stated above, these units will be valued at the rate at which the normal good units are valued. The Process 1 account will be as follows:

**Dr** **Process '1' account** **Cr**

| | Units | Tshs'000 | | Units | Tshs'000 |
|---|---|---|---|---|---|
| Direct Material | 1,000 | 5,000 | Normal Loss a/c | 50 | 20 |
| Direct Wages | | 500 | Abnormal Loss a/c (6280/950 x 50) | 50 | 330 |
| Direct Expenses | | 350 | | | |
| Overhead (Indirect production cost) | | 450 | By Process 2 account | 900 | 5,950 |
| | | | | | **6,300** |
| | **1,000** | **6,300** | | **1,000** | |

If the units of abnormal loss are sold in the market at Tshs200 then the abnormal loss account will be prepared as:

**Dr** **Abnormal Loss account** **Cr**

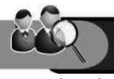
| | Tshs'000 | | Tshs'000 |
|---|---|---|---|
| Process 1 account | 330 | Cash | 200 |
| | | Costing profit and loss a/c | 130 |
| | **330** | | **330** |

**(e) Abnormal gain**

The normal loss is an estimated figure. The actual loss may be more or less than the normal loss. If the actual loss is more than the normal loss, it is treated as an abnormal loss. But if the actual loss is less than the normal loss it is known as an abnormal gain.

An abnormal gain is therefore a reduction in loss and not an actual gain in itself. The abnormal gain is calculated in a similar manner to the abnormal loss.

Units of abnormal gain are calculated as below:



**Example**

In the hypothetical example given below, the calculation of abnormal gain can be understood. All the figures are assumed to be given.

| | Units |
|---|---|
| Actual input | 1,500 |
| Normal loss | 250 |
| **Normal output (1,500 – 250)** | **1,250** |
| Actual output | 1,400 |
| **Abnormal gain will be difference between the actual output and the normal output**<br>Actual output | 1,400 |
| **Less:** Normal output | 1,250 |
| **Abnormal gain (Units)** | **150** |

**(f) Accounting treatment of abnormal gain**

Like abnormal loss, abnormal gain also **does not affect the cost of normal production**. The process account is debited with the quantity and value of abnormal gain and the abnormal gain account is credited. The units of abnormal gain are valued in the same way as abnormal loss units.

Value of abnormal gain = $\frac{\text{Normal cost of normal output}}{\text{Normal units produced}}$ x Units of abnormal gain

**(g) Accounting entries in an abnormal gain account**

The abnormal gain account will reflect the entries for the abnormal gain valued at par with the good units as well as the adjustment entries for the sale of scrap. The balance of the account is transferred to the 'costing profit and loss account' The accounting entries are as follows:

| | | |
|---|---|---|
| 1 | Abnormal gain | Dr Process account<br>Cr Abnormal gain account<br>Being abnormal gain recognised |
| 2 | Adjustment of the scrap value of abnormal gain | Dr Abnormal gain account<br>Cr Normal loss account<br>Being normal loss reduced to the extent of the abnormal gain |
| 3 | Closing entry for abnormal gain account | Dr Abnormal gain account<br>Cr Costing profit and loss account<br>Being amount of abnormal gain transferred to costing profit and loss account |
| 4 | Sale of normal loss units | Dr Cash account<br>Cr Normal loss account<br>Being cash realised on sale of scrap units |

**Example**

Manufacture Plc produces a high quality product, Elba, which is an ointment passing through two processes.
The weight lost in each process is 5% of the input and the normal loss percentage is 10%. The scrap realises Tshs80,000 per kilogram for process A and Tshs200,000 per kilogram for process B. The expenses relating to production are as follows:

| | Process A | Process B |
|---|---|---|
| Materials in kilograms | 1,000 | 70 |
| Materials value (Tshs'000) | 125,000 | 14,000 |
| Conversion costs (Tshs'000) | 36,000 | 15,250 |
| Output in kilograms | 830 | 780 |

Assuming that there is no opening or closing work in process, prepare the process accounts.

**Answer**

**Dr** **Process A account** **Cr**

| | Units | Tshs'000 | | Units | Tshs'000 |
|---|---|---|---|---|---|
| Materials | 1,000 | 125,000 | Normal weight loss | 50 | |
| Conversion costs | | 36,000 | Normal loss | 100 | 8,000 |
| | | | Abnormal loss | 20 | 3,600 |
| | | | Process B | 830 | 149,400 |
| | **1,000** | **161,000** | | **1,000** | **161,000** |

**Dr** **Process B account** **Cr**

| | Units | Tshs'000 | | Units | Tshs'000 |
|---|---|---|---|---|---|
| Process A | 830 | 149,400 | Normal weight loss | 45 | |
| Materials | 70 | 14,000 | Normal loss | 90 | 18,000 |
| Conversion costs | | 15,250 | | | |
| Abnormal gain | 15 | 3150 | Process B | 780 | 163,800 |
| | **915** | **181,800** | | **915** | **181,800** |

**Workings**

**Calculation of abnormal loss or abnormal gain in each process**

**Process A**

| | |
|---|---|
| Input | 1,000 |
| Weight loss at 5% | 50 |
| Normal loss at 10% | 100 |
| Output as given | 830 |
| **Abnormal loss** | **20** |

**Process B**

| | |
|---|---|
| Input | 70 |
| Input from process A | 830 |
| Total input | 900 |
| Weight loss at 5% | 45 |
| Normal loss at 10% | 90 |
| Output as given | 780 |
| **Abnormal gain** | **15** |

**Calculation of cost per unit of output**

**Process A**

$$\text{Normal cost per unit} = \frac{\text{Total cost - Value of normal loss}}{\text{Total input quantity - Normal loss quantity}}$$

$$= \frac{(\text{Tshs125,000,000} + \text{Tshs36,000,000}) - (\text{Tshs80,000} \times 100)}{1{,}000 - (100+50)}$$

$$= \frac{\text{Tshs153,000,000}}{850}$$

$$= \text{Tshs180,000}$$

Valuation of abnormal loss = 20 x Tshs180,000 per unit = Tshs3,600,000

**Process B**

$$\text{Normal cost per unit} = \frac{\text{Total cost - Value of normal loss}}{\text{Total input quantity - Normal loss quantity}}$$

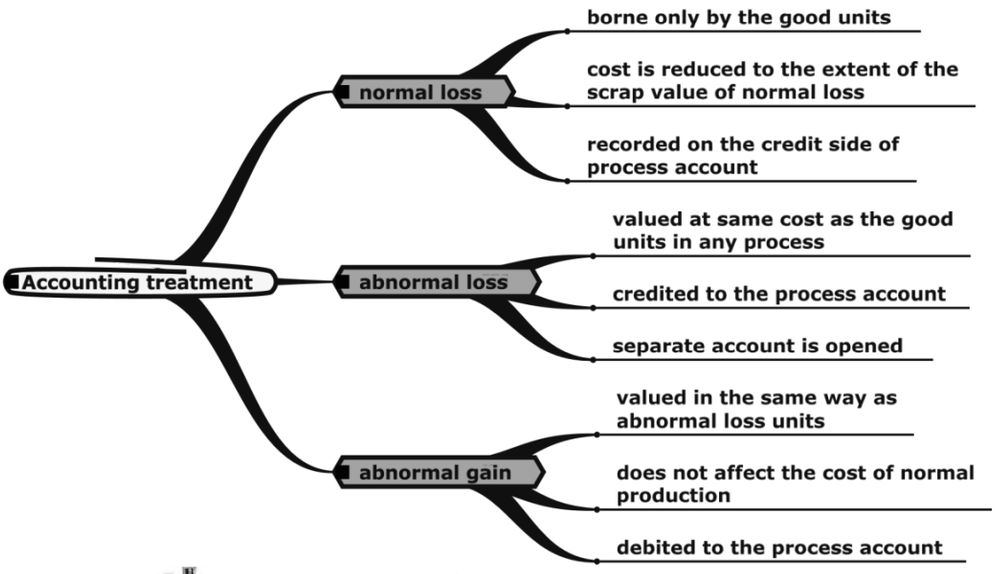
$$= \frac{(\text{Tshs149,400,000} + \text{Tshs14,000,000} + \text{Tshs15,250,000}) - (\text{Tshs200,000} \times 90)}{(830+70) - (90+45)}$$

$$= \frac{\text{Tshs160,650,000}}{765}$$

$$= \text{Tshs210,000}$$

Valuation of abnormal gain = 15 x Tshs210,000 per unit = Tshs3,150,000

**SUMMARY**




## Test Yourself 5

The following are the details given for process A.

| | |
|---|---|
| Material input into the process | 1,000 kilograms |
| Value of the material input | Tshs5,000,000 |
| Units transferred to next process | 930 kilograms |
| Normal loss percentage | 5% (scrap value is nil) |
| Conversion costs | Tshs3,600,000 |

The value abnormal loss units will be:

**A** Tshs271,500
**B** Tshs140,000
**C** Tshs181,000
**D** Tshs452,500

## Test Yourself 6

The cash received from the sale of scrap is for the units

**A** Of normal scrap according to the percentage of the normal loss
**B** Of normal scrap less the units for abnormal gain if any
**C** Of abnormal gain
**D** None of the above

**4. Calculate equivalent units in a process and allocate process costs to equivalent units**

In a process system, some units of output can remain incomplete at the period end. These units of incomplete output are known as **work in process** units. While transferring the costs of a process from one period to another these units need special consideration for valuation.

The questions dealt with above assumed that the entire output was complete from the point of view of production and there were no work in process units. However, real life is never so easy! There is usually opening work in process as well as closing work in process.

Total process costs are borne by the number of units completely produced as well as the partly produced units during the period under consideration. The concept of equivalent units of production will help us divide the process cost between the completed units and the units of work in process.

**Definition**

**Equivalent units** are units that represent the incomplete units of production as equivalent to fully complete units of production. This helps split the process costs into the complete units and work in process units.

The principle applies when operation costs are being apportioned between work in process and completed output.

**Example**

50 units are complete in all respects at the end of the year while 20 units are complete only to the extent of 25% in respect of materials and conversion costs. 20 incomplete units will be converted to equivalent complete units as = 20 x 25% = 5 units.

In each process, an estimate is made of the percentage completion of any work in process. The calculation of the equivalent units is based on this percentage of completion that is calculated. This percentage is generally arrived at on the basis of the pre-planned production schedules and budget plans. The formula for equivalent production is as follows:

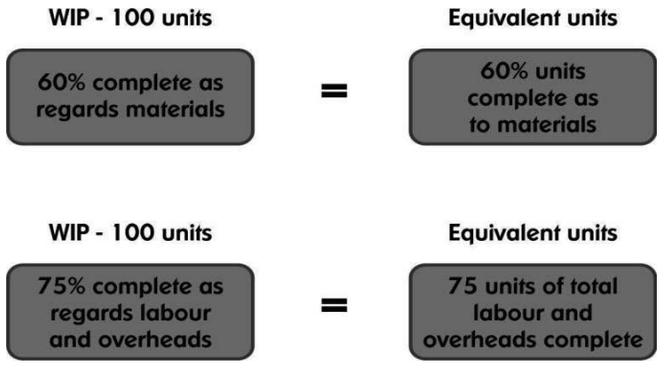
Equivalent units of work in process = Actual number of units in process x Percentage of work completed

For the purpose of cost determination, the incomplete units are to be converted in terms of completed units on the basis of degree of completion.

**Example**

800 units partly completed to the extent of 25% of the work done will be equivalent to 800 x 25% = 200 equivalent units. Instead of expressing 800 units to be 75% incomplete or only 25% complete, we say that these are equal to 200 complete units.

**Diagram 1: Equivalent units**




To value the work in process as equivalent units we follow the following steps. The steps have been given with the help of an example for easy understanding.

**Example**

The details of Process 1 are given below. Ascertain the amount to be allocated to the WIP and finished goods. The units input into the process are 1,000 and the finished units are 750 whereas the WIP units are 250. The materials cost is Tshs1,500,000 and the conversion costs are Tshs1,200,000. The work in process is complete as regards materials - 100% and as regards conversion costs - 40%. The process account is as follows:

| Dr | | Process 1 account | | | Cr |
|---|---|---|---|---|---|
| | **Units** | **Tshs'000** | | **Units** | **Tshs'000** |
| Materials cost | 1,000 | 1,500 | Finished goods a/c | | ? |
| Conversion costs | | 1,200 | Work in process a/c | | ? |
| | | **2,700** | | | |

The total cost of Tshs2,700,000 needs to be split amongst the finished goods and the work in process.

**Step 1**

Ascertain the extent of work completed on the work in process units with regards to materials as well as labour and overheads. This information is generally given in the question as the percentage of work completed as regards 'materials' and percentage of work completed as regards 'labour and overheads' (collectively termed 'conversion costs' in many cases). Remember that the percentage of work completed as regards 'materials' and 'labour and overheads' or 'conversion costs' may be different.

**Step 2**

Multiply the percentage of work completed by the number of units of work in process. These will again be separate for 'materials' and 'labour and overheads'.

In the given example the percentage completion as regards materials is 100% and for conversion costs is 40%. The following table computes the equivalent units by multiplying these percentages by the number of units of work in process.

**Statement of equivalent units**

| | **Units** | **Materials** | | **Conversion costs** | |
|---|---|---|---|---|---|
| | | **Percentage completion** | **Equivalent units** | **Percentage completion** | **Equivalent units** |
| Units input | 1,000 | | | | |
| **Less:** | | | | | |
| Finished units | 750 | 100 | 750 | 100 | 750 |
| Work in process | 250 | 100 | 250 | 40 | 100 |
| **Balance units** | **0** | | | | |
| **Total** | | | **1,000** | | **850** |

**Step 3**

Once we have ascertained the number of equivalent units we calculate the cost per equivalent unit. This calculation will again be separate for the equivalent units of 'materials' and 'labour and overheads'.

The following statement computes the cost per equivalent unit by dividing the total costs as given in the example by the number of equivalent units as computed in the table above.

**Statement of cost per equivalent unit**

| | **Materials** | **Conversion costs** |
|---|---|---|
| Costs incurred | 1,500,000 | 1,200,000 |
| Equivalent units | 1,000 | 850 |
| Cost per equivalent units | Tshs1500 | Tshs1411.764 |

**Step 4**

In this step we calculate the total cost for WIP units and finished units by multiplying the units for each category by the cost per equivalent unit as computed in the last step. The cost is separately calculated for materials as well as labour and overheads.

**Statement of evaluation**

| | Equivalent units as regards materials (a) | Materials cost per equivalent unit (b) Tshs | Cost (c) Tshs | Equivalent units as regards conversion costs (d) | Conversion cost per equivalent unit (e) Tshs | Cost (f) Tshs | Total cost (c + f) Tshs |
|---|---|---|---|---|---|---|---|
| Finished units | 750 | 1,500 | 1,125,000 | 750 | 1411.764 | 1,058,824 | 2,183,824 |
| Work in process | 250 | 1,500 | 375,000 | 100 | 1411.764 | 141,176 | |

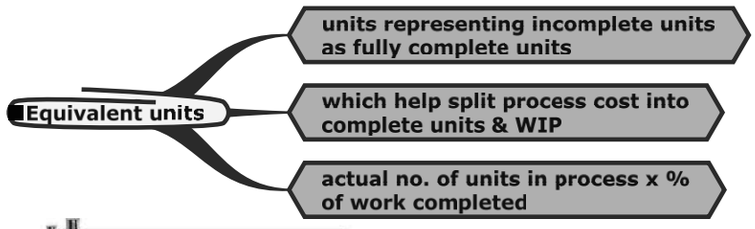
The process account will now be as follows:

**Dr** **Process 1 account** **Cr**

| | Units | Tshs | | Units | Tshs |
|---|---|---|---|---|---|
| Materials cost | 1,000 | 1,500,000 | Finished goods a/c | | 2,183,824 |
| Conversion costs | | 1,200,000 | Work in process a/c | | 516,176 |
| | | **2,700,000** | | | **2,700,000** |

The total process cost is split into the finished goods and WIP units in the above manner.

**SUMMARY**




## Test Yourself 7

The details of Process A are given below. Ascertain the amount to be allocated to the WIP and finished goods. The input in the process is 1,500 kilograms and the finished units are 1,125 kilograms whereas the WIP units are 375 kilograms. The materials cost is Tshs2,250,000 and the conversion costs are Tshs1,800,000. The work in process is 100% complete as regards materials and 60% complete as regards conversion costs.

The process account will be depicted as follows:

**Dr** **Process 1 account** **Cr**

| | Units | Tshs | | Units | Tshs |
|---|---|---|---|---|---|
| Materials cost | 1,500 | 2,250,000 | Finished goods a/c | | ? |
| Conversion costs | | 1,800,000 | Work in process a/c | | ? |
| | | **4,050,000** | | | |

The total cost of Tshs4,050,000 needs to be split amongst the finished goods and the work in process.

## Test Yourself 8

A manufacturing company uses the product costing system.

The following information relates to the last month:

| | |
|---|---|
| Opening inventory (WIP) | NIL |
| Units introduced | 10,000 |
| Closing inventory (WIP) | 2,000 |
| Degree of completion on WIP | 30% |
| Total costs of that month | Tshs4,300,000,000 |

The total cost of fully completed output is:

**A** Tshs5,000,000,000
**B** Tshs4,300,000,000
**C** Tshs4,000,000,000
**D** None of the above

## Test Yourself 9

Speed star Plc employs a process costing system. The following costs were incurred by Department A during January:

| | | Tshs'000 |
|---|---|---|
| Direct materials | | 46,200 |
| Conversion costs | | |
| Direct labour | 21,000 | |
| Variable overhead | 4,680 | |
| Fixed overhead | 4,000 | 29,680 |
| | | **75,880** |

Direct materials are introduced at various stages of the process. All conversion costs are incurred evenly throughout the process.

There was no opening inventory on 1 January. Of the 2,200 units started during January, 1,800 were completed and transferred to Department B. Engineers estimated that the units in process at 31 January were 75% complete as regards direct materials and 80% complete as regards conversion costs. Calculate the cost of the units completed and transferred and the cost of the WIP.

## 3. Identify and calculate service costs.

**[Learning Outcome c]**

### 3.1 Service cost

## Definition

**Service cost** is the charge for providing a facility / service. **Service costing** is the procedure applied for determining the cost of the service provided.

Services are intangible in nature. They cannot be quantified easily into units of measurement. Therefore the accumulation of the costs of a service requires careful analysis of the inputs that are consumed to provide the service. In order to identify the areas where service costing applies it is important to take note of the peculiar characteristics of services.

Every service area has a distinct measure of cost. Unlike product or output costing there is no standard unit cost measure for all services. The following is an illustrative list of the cost measures used in different service industries:

| Nature of industry | Cost measures |
|---|---|
| Tour operator, railway, bus companies | Cost per passenger-mile |
| Hospital | Cost per patient per day, per bed per day |
| Canteen | Cost per meal served per person |
| Cargo transport | Cost per tonne per mile |
| Electricity supply | Cost per kilowatt-hours |
| Hotel | Cost per room per day |
| Telecommunication | Cost per unit time (e.g. per minute / second) |

The above cost measures do not have a single measure but a double measure of cost. The costs for a tour operator are not calculated as cost per mile but as cost per passenger mile. The cargo transport costs incurred are affected not only by the total number of miles travelled but also by the volume of weight carried by the vehicle. As a result, in the case of transport companies, the unit of cost measure contains both the factors of miles and passengers making it a passenger mile.

**Calculation of the per unit cost of service provided**

The costs of a service are always calculated by classifying the costs associated with a service into fixed, semi variable and variable. The costs under each classification – fixed, semi-variable and variable are accumulated and the total cost under each heading is divided by the total number / volume of units.

The per unit cost of a service is always calculated in steps. The per unit variable cost, per unit fixed cost and per unit semi-variable cost are added together to arrive at the total per unit cost. **This is always calculated per period or for a period of time.**

**Step I**

$$\text{Calculation of per unit variable cost} = \frac{\text{Total variable cost incurred in providing a service}}{\text{Number of units of service provided}}$$

**Step II**

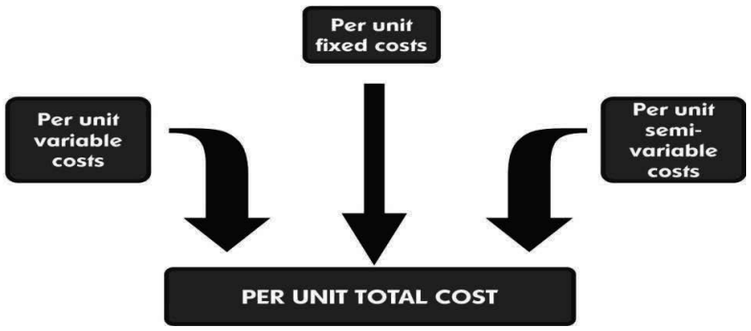
$$\text{Calculation of per unit fixed cost} = \frac{\text{Total fixed cost incurred in providing a service}}{\text{Number of units of service provided}}$$

**Step III**

$$\text{Calculation of per unit semi - variable cost} = \frac{\text{Total semi - variable cost incurred in providing a service}}{\text{Number of units of service provided}}$$

Once the per unit cost under these three headings is calculated, we arrive at the total cost per unit by adding the three together.

**Diagram 2: Calculation of per unit cost of service**




Let us try to compute the cost of services provided by a transport operator. The cost per mile travelled by the vehicle hired needs to be calculated.

**Example**

From the following data calculate the cost per mile of a vehicle.

| | |
|---|---|
| Value of vehicle | Tshs15,000,000 |
| Annual road licence charge | Tshs500,000 |
| Insurance charges per year | Tshs100,000 |
| Garage rent per year | Tshs600,000 |
| Driver's wages per month | Tshs200,000 |
| Miles per litre | 8 miles |
| Cost of petrol per litre | Tshs800 |
| Proportional charges for tyres and maintenance per mile | Tshs200 |
| Estimated life | 150,000 miles |
| Estimated annual mileage | 6,000 miles |

**The treatment and reasoning for each cost classification**

| | Tshs / miles | Treatment of cost | Reasons |
|---|---|---|---|
| Value of vehicle | Tshs15,000,000 | The value of the vehicle is a fixed cost which will be the basis for calculating the depreciation cost. Since the estimated life is given in miles the depreciation cost will be termed a variable cost as it will vary with the change in the number of miles travelled. | It is also stated that the estimated life of a vehicle is 150,000 miles. Therefore our interpretation should be that for a cost of Tshs15,000,000, the vehicle will run for 150,000 miles. Therefore depreciation per mile = Tshs15,000,000/150,000 = Tshs0100 per mile. Therefore variable cost per mile = Tshs100 |
| Road licence for the year | Tshs500,000 | This will be an annual fixed cost. | |
| Insurance charges per year | Tshs100,000 | This will be an annual fixed cost. | |
| Garage rent per year | Tshs600,000 | This will be an annual fixed cost. | |
| Driver's wages per month | Tshs200,000 | This is a monthly cost, which can be converted into an annual cost by multiplying it by 12. It is a fixed cost. | |

**Continued on the next page**

| | | | |
|---|---|---|---|
| Miles per litre | 8 miles | | We have details such as miles per litre and cost per litre, we have to find out cost per mile. Look at the workings. |
| Cost of petrol per litre | Tshs800 | | |
| Proportional charges for tyres and maintenance per mile | Tshs200 | This cost is given as a cost per mile. Therefore, this is a variable cost. | |
| Estimated life | 150,000 miles | | Information given. |
| Estimated annual mileage | 6,000 miles | | We will first calculate fixed cost per year. This information help in calculating fixed cost per mile. |

**Workings**

Mileage is 8 miles per litre (given) Cost per litre of petrol is 800 (given)

We have to calculate cost per mile (Tshs / mile)
Therefore, cost per mile = Tshs800/8 miles = Tshs100
Therefore, put cost per mile which is Tshs100, in the variable cost column.

| | Calculation | Tshs | Cost per mile (Tshs) |
|---|---|---|---|
| **Fixed expenses** | | | |
| Road licence | Given | 500,000 | |
| Insurance charges | Given | 100,000 | |
| Garage rent | Given | 600,000 | |
| Driver's wages | Tshs200 per month x 12 months | 2,400,000 | |
| Total fixed cost per year | | 3,600,000 | |
| **Fixed cost per mile** | **Tshs3,600/ 6,000 miles per year** | | **600** |
| **Variable cost** | | | |
| Depreciation per mile | Tshs15,000/150,000 miles | | 100 |
| Petrol cost per mile | Cost per mile = Tshs800/8 miles = Tshs100 per mile | | 100 |
| Tyre and maintenance cost per mile | | | 200 |
| **Variable cost per mile** | ( 100 + 100 + 200) | | **400** |
| **Total cost** | **(600 + 400)** | | **1000** |

### 3.2 Service unit costs in a variety of situations

Because of the diverse nature of activities carried out in service undertakings, the cost system used is different for different situations. Service costing for two different service costing situations is explained below.

**1. Transport services**

Transport service is a common example of services. Passenger transport and cargo distribution services provide services to external customers such as companies or tourists and other passengers. The following steps are usually followed:

(a) We need to calculate the cost of operating the vehicles carrying either passengers or goods. As a result, the per unit measurement of cost is a passenger mile travelled or a tonne mile travelled. Therefore the costs need to be computed taking into consideration the bulk of goods carried, the number of passengers who occupied the vehicle and the distance covered.

**Example**

A bus with a seating capacity of 50 students is employed by a school to transport students between their homes and the school. If the bus runs 100 miles to and from the school carrying an average of 45 students and the operating costs are given as Tshs500 then the cost per student will be calculated as -

Total student miles = 45 students x 100 miles = 4,500 student miles

Cost per student mile = Tshs500/4,500 student miles = Tshs0.11 per student mile

(b) Costs which are typical to the distribution / transport services are the costs of:

- Operating and running, such as fuel, lubricants, wages of drivers.
- Maintenance such as repairs and overhauls, painting, hire of spare vehicles when firm's own vehicles are unavailable due to some reason.
- Fixed charges such as insurance of vehicles, salaries of supervision staff, taxes, depreciation, interest on capital borrowed for purchase of vehicle.

These costs need to be classified according to their variability so as to present them under different headings in the cost statement.

**Variable costs**

Costs of operating and running the vehicle such as fuel costs, lubricants, maintenance charges if calculated on the basis of the distance travelled, depreciation charges if computed on the basis of distance covered etc.

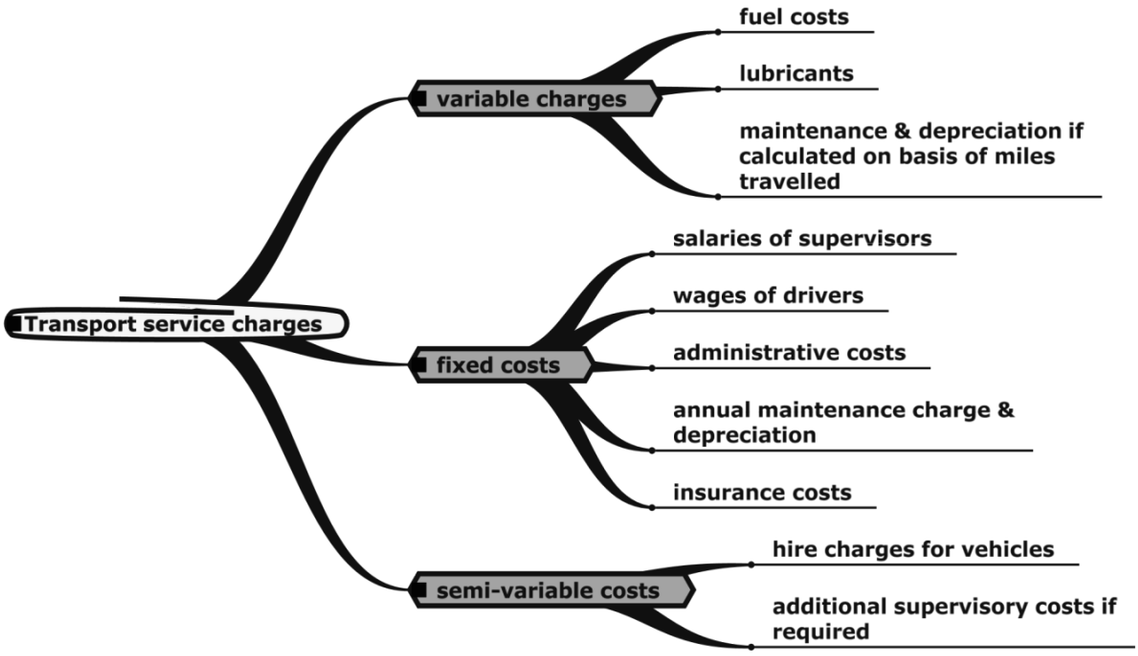
**Fixed costs**

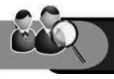
Fixed charges will generally include the wages and salaries of the supervisory staff, maintenance personnel, drivers etc. Annual maintenance charges that are fixed per annum, depreciation calculated on the basis of expected life of vehicles and interest on capital borrowed for purchase of vehicles will also be classified under this heading.

**Semi-variable costs**

At times, certain costs are semi-variable and need to be classified and presented under this heading. The semi variable costs include the cost of hiring vehicles and the cost of employing extra supervisors. These costs increase when the activity level rises above a certain level.

**SUMMARY**



**Example**

Listed below is the data relating to the monthly cost of a transport company operating two trucks:

| | Truck 1 Tshs'000 | Truck 2 Tshs'000 |
|---|---|---|
| Driver's salary | 750 | 825 |
| Cleaner's wages | 450 | 480 |
| Petrol | 900 | 1,050 |
| Mobile oil | 75 | 90 |
| Garage rent | 375 | 375 |
| Taxes and insurance | 150 | 150 |
| Depreciation | 1,680 | 1,860 |
| Expenses of supervision | 300 | 300 |
| Repairs | 360 | 420 |
| Miscellaneous overheads | 120 | 120 |

The two trucks carried 450 tonnes of goods each during the month of November 20X3. The distances covered by the two trucks were 105 miles and 150 miles respectively.

You are required to prepare an operating cost sheet for November 20X9 from the above data.

Tonne-miles of operation of the two trucks are as follows:

Truck 1: 450 tonnes x 105 miles = 47,250 tonne-miles

Truck 2: 450 tonnes x 150 miles = 67,500 tonne-miles

It is assumed that depreciation is charged based on distance covered.

**Answer**

**Operating cost sheet for the month of November 20X3**

| | Tonne-miles | Truck 1<br>47,250<br>Tshs'000 | Truck 2<br>67,500<br>Tshs'000 |
|---|---|---|---|
| 1 | **Fixed costs:** | | |
| | Garage rent | 375 | 375 |
| | Taxes and insurance | 150 | 150 |
| | Supervision | 300 | 300 |
| | Driver's salaries | 750 | 825 |
| | Cleaner's wages | 450 | 480 |
| | Miscellaneous overheads | 120 | 120 |
| | **Total fixed cost** | **2,145** | **2,250** |
| | | **45.4** | **33.3** |
| | **Fixed cost per tonne-mile (a)** | (Tshs2,145,000/47,250) | (Tshs2,250,000/67,500) |
| 2 | **Variable costs:** Petrol | | |
| | | 900 | 1050 |
| | Mobile oil | 75 | 90 |
| | Depreciation | 1,680 | 1860 |
| | Repairs | 360 | 420 |
| | **Total variable cost** | **3,015** | **3,420** |
| | | **63.8** | **50.7** |
| | **Variable cost per unit (b)** | (Tshs3,015,000/47,250) | (Tshs3,420,000/67,500) |
| | **Total cost per tonne-mile (a + b)** | **109.2** | **84** |

## Answer to Test Yourself

**Answer to TY 1**

The correct option is **D**.

Production cost per unit is Tshs4,200,000

**Cost sheet**

| | Per unit (Tshs'000) | Total costs (Tshs'000) |
|---|---|---|
| Materials | 4,500 | 4,500,000 |
| Direct wages | 3,200 | 3,200,000 |
| **Prime cost** | **7,700** | **7,700,000** |
| Indirect materials | 800 | 800,000 |
| Indirect wages (W1) | 800 | 800,000 |
| **Production cost** | **9,300** | **9,300,000** |
| Administration overheads (W2) | 225 | 225,000 |
| Selling and distribution overheads (W3) | 315.2 | 315,200 |
| Cost of sales / Total costs | 9840.2 | 98,402,000 |

**Workings**

**W1** Per unit indirect wages = Total indirect wages/Units produced
=Tshs800,000,000/1,000units
= Tshs800,000
**Note**: administration overheads and selling and distribution overheads are non-production costs.

**W2** Per unit administrative costs = Total administrative costs/Units produced
=Tshs225,000,000/1000units
= Tshs225,000

**W3** Per unit selling and distributive costs = Total selling and distributive costs/Units produced
= Tshs315,200,000/1000 units
= Tshs315,200

**Answer to TY 2**

The correct option is **A**.

Process costing applies and is suitable to industries where there is continuous and mass production. When the production is undertaken one order at a time, job order costing system is used to record costs. Batch costing applies where production is undertaken in batches and when an intangible service is provided we record costs under service or operation costing method.

**Answer to TY 3**

**Dr** **Process A account** **Cr**

| | Units | Tshs'000 | | Units | Tshs'000 |
|---|---|---|---|---|---|
| Direct material | 5,000 | 5,000 | | | |
| Additional material | | 6,000 | | | |
| Direct labour | | 7,000 | | | |
| Manufacturing expense | | 2,000 | Process 'B' a/c (entire cost transferred to process 'B') | 5,000 | 20,000 |
| | **5,000** | **20,000** | | **5,000** | **20,000** |

**Dr** **Process B account** **Cr**

| | Units | Tshs'000 | | Units | Tshs'000 |
|---|---|---|---|---|---|
| Process A | 5,000 | 20,000 | | | |
| Material | | 3,000 | | | |
| Direct labour | | 4,000 | | | |
| Manufacturing expense | | 2,000 | Finished goods a/c | 5,000 | 29,000 |
| | **5,000** | **29,000** | | **5,000** | **29,000** |

**Answer to TY 4**

The correct option is **A**.

The value of the materials input into the account is debited to the process account as it is a cost incurred for the process. Any amount credited to the account is an amount which is an income or which reduces the value of the expenses incurred.

**Answer to TY 5**

The correct option is **C**.

**Statement showing the units of abnormal loss**

| | Units – kilograms |
|---|---|
| Material input | 1,000 |
| Normal loss at 5% | 50 |
| **Normal output** | **950** |
| Actual output transferred to next process | 930 |
| **Abnormal loss** | **20** |

The abnormal loss will be valued as normal output.

$$\text{Normal cost per unit} = \frac{\text{Total cost - scrap value of normal loss}}{\text{Total input quantity - normal loss quantity}}$$

$$= \frac{(\text{Tshs5,000,000} + \text{Tshs3,600,000}) - 0}{1{,}000\text{-}50}$$

$$= \text{Tshs9,050}$$

The value for abnormal loss will be = Tshs9,050 x 20 kg
= Tshs181,000

**Answer to TY 6**

The correct option is **B**.

The cash received from the sale of normal scrap is always received for the actual units of normal loss. When there is abnormal gain the sale will only be of the units of actual loss. The units of abnormal gain will be subtracted from the units of normal loss and cash will be received only for these. The units of abnormal gain are not the ones that are sold.

**Answer to TY 7**

**Statement of equivalent units**

| | Units | Materials | | Conversion costs | |
|---|---|---|---|---|---|
| | | Percentage completion | Equivalent units | Percentage completion | Equivalent units |
| Units input | 1,500 | | | | |
| **Less:** | | | | | |
| Finished units | 1,125 | 100 | 1,125 | 100 | 1,125 |
| Working in Process | 375 | 100 | 375 | 60 | 225 |
| **Balance units** | **0** | | | | |
| **Total** | | | **1,500** | | **1,350** |

**Statement of cost per equivalent unit**

| | | Materials | Conversion costs |
|---|---|---|---|
| Costs incurred | (a) | 2,250,000 | 1,800,000 |
| Equivalent units | (b) | 1,500 | 1350 |
| **Cost per equivalent units (a)/(b)** | | **Tshs1500** | **Tshs1333.333** |

**Statement of evaluation**

| | Equivalent units as regards materials | Materials cost per equivalent unit | Cost | Equivalent units as regards conversion costs | Conversion cost per equivalent unit | Cost | Total cost |
|---|---|---|---|---|---|---|---|
| Finished units | 1,125 | Tshs1500 | 1,687,500 | 1,125 | Tshs1333.333 | 1,500,000 | 3,187,500 |
| Work in process | 375 | Tshs1500 | 562,500 | 225 | Tshs1333.333 | 300,000 | 862,500 |

The process account will appear as:

**Dr** **Process 1 account** **Cr**

| | Units | Tshs | | Units | Tshs |
|---|---|---|---|---|---|
| Materials cost | 1,500 | 2,250,000 | Finished goods a/c | | 3,187,500 |
| Conversion costs | | 1,800,000 | Work in process a/c | | 862,500 |
| | | **4,050,000** | | | **4,050,000** |

**Answer to TY 8**

The correct option is **C**.

Total output = Units introduced – Closing inventory (WIP)
= 10,000 units – 2,000 units
= 8,000 units

**Total equivalent units**

| | Units | Degree of completion | Equivalent units |
|---|---|---|---|
| Opening inventory (WIP) | NIL | - | - |
| Total output (10,000 units – 2,000 units) | 8,000 units | 100% | 8,000 |
| Closing inventory (WIP) | 2,000 units | 30% | 600 |
| | | | 8,600 |

Per unit cost of equivalent units = Total costs/Equivalent units
= Tshs4,300,000,000/8,600 units
=Tshs500,000

Value of fully complete output unit = Total output x Per unit cost
= 8,000 units x Tshs500,000
= Tshs4,000,000,000

**Answer to TY 9**

**Statement of equivalent units**

| | Units | Additional Materials | | Conversion | |
|---|---|---|---|---|---|
| | | Percentage completion | Equivalent units | Percentage completion | Equivalent units |
| Units input | 2,200 | | | | |
| **Less:** | | | | | |
| Finished units | 1,800 | 100 | 1,800 | 100 | 1,800 |
| Work in process, 31 January | 400 | 75 | 300 | 80 | 320 |
| Work in process, 31 January | | | | | |
| **Total** | | | **2,100** | | **2,120** |

**Statement of cost per equivalent unit**

| Input | Cost Tshs'000 | Equivalent production in units | Cost/unit Tshs'000 |
|---|---|---|---|
| Direct material | 46,200 | 2,100 | 22 |
| Conversion costs | 29,680 | 2,120 | 14 |

**Statement of evaluation**

| | Equivalent units as regards materials | Materials cost per equivalent unit Tshs'000 | Cost Tshs'000 | Equivalent units as regards conversion costs | Conversion cost per equivalent unit Tshs'000 | Cost | Total cost Tshs'000 |
|---|---|---|---|---|---|---|---|
| Finished units | 1,800 | 22 | 39,600 | 1,800 | 14 | 25,200 | 64,800 |
| Work in process | 300 | 22 | 6,600 | 320 | 14 | 4,480 | 11,080 |

**Costs of work completed and work-in-process**

| | | |
|---|---|---|
| Units completed and transferred out during January | | 64,800 |
| **Work-in-process, 31 January** | | |
| Direct materials | 6,600,000 | |
| Conversion costs **Total** | 4,480,000 | 11,080,000 |
| | | **75,880,000** |

## Self Examination Questions

**Question 1**

Job orders are:

**A** Standardised.
**B** Non-standardised.
**C** Both of the above.
**D** None of the above.

**Question 2**

What is the primary objective of job costing?

**A** To find out Expenses incurred on each job.
**B** To find out Profit or loss on each job.
**C** Both of the above
**D** None of the above

**Question 3**

To which of the below industry is job costing method applicable?

**A** Aviation and electronics industry
**B** Hardware and pharmaceutical industry
**C** Garment works and shoe companies
**D** Railway locomotive and printing press

**Question 4**

Gentil Plc has a job order cost system. The following debits (credits) appeared in the work-in-process account in the general ledger for the month of March 20X3:

| | | **Tshs'000** |
|---|---|---|
| March 1 | Balance | 18,000 |
| March 31 | Direct material | 60,000 |
| March 31 | Direct labour | 45,000 |
| March 31 | Factory overhead applied | 40,500 |
| March 31 | To finished goods | (150,000) |

Gentil Plc applies overheads to production at a budgeted rate of 90% based on the direct labour cost. Job 365, the only job still in process at the end of March 20X3 has been charged with factory overheads of Tshs3,375. What was the amount of direct material charged to Job 365?

**A** Tshs3,375,000
**B** Tshs4,500,000
**C** Tshs6,375,000
**D** Tshs13,500,000

**Question 5**

Cuisine Plc is a jobbing company. It has set up a scheme for employees working on Job 999, whereby employees who take less than the standard time to complete the job, will be paid a bonus of 60% of their normal pay (an hourly rate).

The data relating to Job 999 completed by an employee is as follows:

- time allowed for Job 999: 5 hours
- time taken to complete Job 999: 3 hours
- normal hourly rate of pay: Tshs12,000

What is the total pay of the employee for Job 999?

**A** Tshs36,000
**B** Tshs50,400
**C** Tshs60,000
**D** None of the above

**Question 6**

Which of the following companies would most likely use a process costing system?

**A** Producer of gasoline
**B** Producer of stain glass windows
**C** Road and bridge construction firm
**D** All of the above

**Question 7**

The value of abnormal gain in a process is

**A** Credited to the process account
**B** Debited to the process account
**C** Credited to the profit and loss account
**D** Not reflected at all in the process account

**Question 8**

The following are the details given for process P:

| | |
|---|---|
| Material input into the process | 1,500kg |
| Value of the material input | Tshs7,500,000 |
| Units transferred to next process | 1,300 kilograms |
| Normal loss percentage | 5% (scrap value is nil) |
| Conversion costs | Tshs4,000,000 |

The abnormal loss will be:

**A** Tshs1,000,000
**B** Tshs11,500,000
**C** Tshs1,009,000
**D** None of these

**Question 9**

A product is manufactured in two processes, P and Q. The details of process Q are:

| | |
|---|---|
| Material transferred from process P | 5,000kg valued at Tshs20,000,000 |
| Labour costs | Tshs2,800,000 |
| Overheads | 50% of Labour costs |
| Closing work in process | 500kg |
| Output transferred to finished goods | 4,500kg |

Closing WIP is 100% complete for material and 75% complete for labour and overheads

What is the value of the closing work in process?

**A** Tshs2,323,070
**B** Tshs2,000,000
**C** Tshs2,107,689
**D** Tshs4,500,000

**Question 10**

In a factory processing goods, products are passed from process P to process Q. For the purposes of costing, the items received from process P by process Q should be treated as:

**A** WIP units
**B** Equivalent units
**C** Input material
**D** Finished goods

**Question 11**

In which of the following situations is process costing used?

**A** When small numbers of identical products are manufactured
**B** When large numbers of different products are manufactured
**C** When small numbers of distinctly different products are manufactured
**D** When large numbers of nearly identical products are manufactured

**Question 12**

The following information relates to a manufacturing company.

| | Process A | Process B |
|---|---|---|
| Input (kg) | 10,000 | 8,500 |
| Normal loss of input (kg) | 10% | 8% |
| Actual output (kg) | 8,500 | 7,900 |

For each process, was there an abnormal loss or an abnormal gain?

| | Process A | Process B |
|---|---|---|
| **A** | Abnormal gain | Abnormal gain |
| **B** | Abnormal gain | Abnormal loss |
| **C** | Abnormal loss | Abnormal gain |
| **D** | Abnormal loss | Abnormal loss |

**Question 13**

The following details relate to a manufacturing company which operates a process costing system:

| | Units | Valued at | Degree of completion |
|---|---|---|---|
| Opening inventory (WIP ) | 500 units | Tshs1,850,000 | 70% in all costs |
| Completed and transferred units | 2,200 units | | |

The cost per equivalent unit was Tshs15.

The total value of the units introduced and transferred in this process will be:

**A** Tshs29,600,000
**B** Tshs25,500,000
**C** Tshs33,000,000
**D** None of the above

**Question 14**

Which method of costing is appropriate for doctors?

**A** Standard costing
**B** Marginal costing
**C** Service costing
**D** Job costing

**Question 15**

Cost per passenger mile of XOTC Travel Company and Royal Travel Company comes to Tshs5,000 and Tshs6,000 respectively.

Both companies provide an equal standard of service.

Both the companies charge the customers Tshs7,000 per passenger mile.

Which company will be more profitable?

**A** XOTC Travel Company
**B** Royal travel Company

**Question 16**

From the following information, prepare an operating cost sheet.

| | Truck Tshs'000 | Bus Tshs'000 |
|---|---|---|
| Driver's salary | 2,000 | 3,000 |
| Petrol | 4,500 | 3,750 |
| Repairs | 750 | 500 |
| Depreciation | 1,250 | 1,750 |
| Rent and taxes | 500 | 500 |
| Other overheads | 1,200 | 1,800 |

The truck carried 100 tonnes of raw material and the bus carried 25 passengers per day during a month.

In a month, the truck covered 3,000 miles and the bus, 2,000 miles.

Monthly working days are 25.

## Answers to Self-Examination Questions

**Answer to SEQ 1**

The correct option is **B**.

Job orders are non-standardised as each job is different from the other, and are made according to the customer's specifications. Thus, non-standardised procedures are followed to complete each different job.

**Answer to SEQ 2**

The correct option is **C**.

The primary objective of job costing is to charge direct material, direct labour and manufacturing overheads correctly to calculate profit or loss on each job.

**Answer to SEQ 3**

The correct option is **D**.

Job costing is applied to the railway locomotive and the printing press, as jobs in these industries are independent of each other.

**Answer to SEQ 4**

The correct option is **C**.

Two steps are used to obtain the answer.

First, calculate the balance of work in process at the end of the period in the general ledger.

By adding the debits and subtracting the credit, the balance is Tshs13,500,000. This amount is also the balance of Job 365 in the subsidiary ledger because it is the only job still in process at the end of the month.

Second, calculate the amount of direct material charged to Job 365:

| | Tshs'000 | Tshs'000 |
|---|---|---|
| Total costs charged to Job 365 | | 13,500 |
| Deduct: Factory overhead applied | (3,375) | |
| Direct labour (Tshs3,375,000/0.90) | 3,750 | 7,125 |
| **Direct materials charged to Job 365** | | **6,375** |

**Answer to SEQ 5**

The correct option is B.

| | Pay per hour | Total pay (Tshs) |
|---|---|---|
| Allowed time 5 hours | | |
| Time taken 3 hours | Tshs12,000 | 36,000 |
| Saved time 2 hours | 2 x Tshs12,000 x 60% = Tshs7,200 | 14,400 |
| | | **50,400** |

**Answer to SEQ 6**

The correct option is **A**.

Process costing applies to industries that produce homogenous products on a continuous basis. Production of gasoline is a continuous process that results in production of homogenous products that are identical in all respects.

Option **B** - Stain glass window production is done on the basis of specific job requirement and hence job or batch costing will apply.

Option **C** - In road and bridge construction, contract costing is applicable.

**Answer to SEQ 7**

The correct option is **B**.

The process account is debited with the quantity and value of abnormal gain and abnormal gain account is credited. This effectively accounts for the reduction in the value of normal loss.

**Answer to SEQ 8**

The correct option is **C**.

**Calculation of abnormal loss**

| **Process P** | **Units** |
|---|---|
| Materials input | 1,500 |
| **Less** | |
| Normal loss @5% (1,500 x 5%) | 75 |
| Normal output | 1,425 |
| Actual output | 1,300 |
| Abnormal loss (1425 – 1300) | 125 |

**Valuation of abnormal loss**

Cost per unit

$$= \frac{\text{Process cost - scrap value of normal loss}}{\text{Actual input - normal loss}}$$

$$= \frac{(\text{Tshs7,500,000} + \text{Tshs4,000,000})}{1{,}500 - 75}$$

$$= \frac{\text{Tshs11,500,000}}{1{,}425}$$

= Tshs8070

Value of abnormal units = Units of abnormal loss x Cost per unit
= 125 x Tshs8070
= Tshs1,009,000

**Answer to SEQ 9**

The correct option is **A**.

The correct option is option a, the calculations for which are given below:

**Process Q - Statement of equivalent units**

| | Units | Materials | | Labour | | Overheads | |
|---|---|---|---|---|---|---|---|
| | | Percentage completion | Equivalent units | Percentage completion | Equivalent units | Percentage completion | Equivalent units |
| Units transferred from process P | 5,000 | | | | | | |
| Less: Finished goods | 4,500 | 100 | 4,500 | 100% | 4,500 | 100 | 4,500 |
| Work in process | 500 | 100 | 500 | 75% | 375 | 75 | 375 |
| Total | | | **5,000** | | **4,875** | | **4,875** |

**Process Q - Statement of cost per equivalent unit**

| Input | Cost Tshs | Equivalent production in units | Cost/unit Tshs |
|---|---|---|---|
| Direct material | 20,000,000 | 5,000 | 4,000 |
| Labour | 2,800,000 | 4,875 | 574.35 |
| Overheads | 1,400,000 | 4,875 | 287.17 |
| Total cost per unit | | | |

**Working 2**

| | Units | Cost per unit Tshs | Total cost Tshs |
|---|---|---|---|
| Finished goods | 4,500 | 4861.5 | 21,876,750 |
| WIP | | | |
| Material | 500 | 4,000 | 2,000,000 |
| Labour | 375 | 574.35 | 215,381 |
| Overheads | 375 | 287.17 | 107,689 |
| **Value of closing WIP** | | | **2,323,070** |
| **Total** | | | 24,199,820 |

**Answer to SEQ 10**

The correct option is **C**.

In process costing, each process performs part of the total operation and transfers it as finished goods to the next process, in which it is treated as input / raw material for further processing. Therefore the products passed from process P to process Q will be input materials for process Q.

**Answer to SEQ 11**

The correct option is **D**.

The process costing system refers to the procedure of determining the average unit cost in situations where the product passes through more than one manufacturing process. This is applicable when identical units are produced continuously in the uniform production process.

Option (a) - Is suitable for batch costing
Option (b) - When the products are not homogenous, job or batch costing is applicable
Option (c) - This is also a situation where job costing will apply for each different job or production undertaken

**Answer to SEQ 12**

The correct option is **C**.

| | Process A | Process B |
|---|---|---|
| Input (kg) | 10,000 | 8,500 |
| Normal loss of input (kg) | 10% | 8% |
| Normal loss (kg) | 1,000 | 680 |
| Normal output (kg) (W1) | 9,000 | 7,820 |
| Actual output (kg) | 8,500 | 7,900 |
| Abnormal gain (Actual output >Normal output) | - | 80 |
| Abnormal loss (Normal output > Actual output) | 500 | - |

**Workings**

**W1**

Normal output = Input – Normal loss
For process A: 10,000 – 1,000 = 9,000kg
For process B: 8,500 – 680 = 7,820kg

**Answer to SEQ 13**

The correct option is **A**.

| | Units | Cost per equivalent unit Tshs | Tshs |
|---|---|---|---|
| Value of opening WIP - 70% complete | 350 | | 1,850,000 |
| Cost incurred on opening inventory (500 x 30%) | 150 | 15 | 2,250,000 |
| Units introduced and transferred (2,200 – 500) = 1,700 units | 1,700 | 15 | 25,500,000 |
| | 2,200 | - | 29,600,000 |

**Answer to SEQ 14**

The correct option is **C**.

Doctors are professionals who provide services of an intangible nature to the patients.

As a result, the most appropriate method of recording the costs for the activity is service costing.

**Answer to SEQ 15**

The correct option is **A**.

Although the prices charged to the customers by the operators are equal, the costs for XOTC are lower compared to Royal Travel Company.

As a result, profit will be higher for XOTC (Tshs7,000 - Tshs5,000 = Tshs2,000) than for Royal Travel Company (Tshs7,000 - Tshs6,000 = Tshs1,000).

**Answer to SEQ 16**

**Operating Cost Sheet**

| | Truck (Tshs'000) | Bus (Tshs'000) |
|---|---|---|
| **Fixed Cost** | | |
| Driver's Salary | 2,000 | 3,000 |
| Depreciation | 1,250 | 1,750 |
| Rent and Taxes | 500 | 500 |
| Other Overheads | 1,200 | 1,800 |
| **Total Fixed Cost** | **4,950** | **7,050** |
| Variable Expenses<br>Petrol | 4,500 | 3,750 |
| Repairs | 750 | 500 |
| **Total Variable cost** | **5,250** | **4,250** |
| **Total cost** | **10,200** | **11,300** |

**Truck**

| | Details given in the problem | Interpretation |
|---|---|---|
| 1 | The truck carried 100 tonnes raw material | During the month, the truck carried 100 tonnes, therefore per day it carried 4 tonnes (100 tonnes/25 days ) |
| 2 | In a month the truck covered 3000 miles | Total distance covered in a month was 3,000 miles, working days were 25, therefore, distance covered per day = 3,000/25 = 120 |
| 3 | Monthly working days are 25 | Tonne miles in a month = Tonnes carried per day x No. of days x miles travelled<br>= 4 x 25 x 120<br>= 12,000 tonnes miles |

**Bus**

| | Details given in the problem | Interpretation |
|---|---|---|
| 1 | The bus carried 25 passengers per day during a month. | 25 people travelled everyday |
| 2 | In a month, the bus covered 2,000 miles | Total distance covered in a month was 2,000 miles, working days are 25, therefore, distance covered per day = 2,000/25 = 80 |
| 3 | Monthly working days were 25 | Passenger miles in a month= no. of passenger per day x no. of days x miles travelled<br>= 25 x 25 x 80<br>= 50,000 passenger miles |

**Operating cost statement**

| | Reasons / calculations | Truck (Tshs'000) | Bus (Tshs'000) |
|---|---|---|---|
| **Fixed costs** | | | |
| Driver's salary | Fixed monthly expense | 2,000 | 3,000 |
| Depreciation | Assumed to be fixed based | 1,250 | 1,750 |
| Other overheads | Assumed all overheads are fixed | 1,200 | 1,800 |
| Rent and Taxes | | 500 | 500 |
| **Total fixed costs** | Fixed expense | **4,950** | **7,050** |
| Tonne mile travelled | | 12,000 | 50,000 |
| **Fixed cost per passenger mile (a)** | | **0.4125** | **0.1410** |
| **Variable costs** | It varies according to the distance travelled hence variable cost | | 3,750 |
| Petrol | | 4,500 | |
| Repairs | It depends on the running of the vehicle and hence is a variable cost. | 750 | 500 |
| **Total variable costs** | | **5,250** | **4,250** |
| Tonne miles travelled | | 12,000 | 50,000 |
| **Variable cost per passenger mile (b)** | | **0.4375** | **0.0850** |
| **Total cost per unit (a + b)** | | **0.85** | **0.226** |

# 4

# COSTING METHODS - MARGINAL, ABSORPTION AND STANDARD COSTING

## Get Through Intro

Cost ascertainment and management requires a management accountant to take many decisions based on different cost considerations. There are various methods / systems of costing that are designed to aid this decision-making process.

The marginal costing method recognises cost behaviour and divides costs into those which vary with production (e.g. raw materials) and those which are fixed for a period (e.g. rent). According to this method only variable costs are included in inventory valuation.

In contrast, the absorption costing method suggests computing unit product costs by adding up all the manufacturing costs – fixed and variable.

The standard costing method sets standards for revenues and costs and ensures the desired level of performance. It is an excellent control technique that helps in analysis of variances, which in turn helps to take corrective action. Standards act as benchmarks for operational performances. Standards and budgets can also be used in estimating products / service costs, prices and in decision-making.

This Study Guide will introduce you to all the above mentioned concepts. An accountant needs a thorough knowledge of these concepts while taking all cost related decisions.

## Learning Outcomes

a) Identify and calculate unit costs and the effect of different costing methods on reported financial results using marginal and absorption costing approaches.
b) Select and explain the most appropriate costing approach for a given product or service for reporting and decision-making purposes.
c) Describe standard costing and basic, ideal, attainable and current standards
d) Evaluate the objectives of standard costing and, illustrate its use and how it is set for direct materials, labour and overheads.

**1. Identify and calculate unit costs and the effect of different costing methods on reported financial results using marginal and absorption costing approaches.**
**[Learning Outcome a]**

Absorption costing and marginal costing are the two basic methods of recording product / service costs used in management accounting.

Absorption costing method records all the costs / expenses incurred / associated with manufacturing a product to arrive at It follows the historical accounting approach costs are recorded only once they are incurred. Absorption costing approach is hence a method preferred for external reporting.

Product cost calculations using the product cost. absorption costing approach have been where explained in Study Guide 1 and 2.

Marginal costing on the other hand records costs by differentiating between fixed and variable costs. This differentiation forms the basis for all the concepts and profit calculations under marginal costing.

### 1.1 The elementary concept of marginal costing

We have already learnt that fixed and variable costs behave differently with changes in the volume of production. Variable costs (also known as marginal costs) change with an increase or decrease in volume of production (accordingly, the variable costs per unit remain fixed) whereas fixed costs normally remain unaltered with a change in the volume of production. Fixed costs however, will change over time.

When fixed costs are included in total costs, the cost per unit of a product or a service varies from one accounting period to another in accordance with the volume of production / service in each period.

Consequently, one school of thought has said that fixed costs should be **taken out** of total costs, to avoid the variation. This is termed marginal costing.

**Definition**

**'Marginal costing'** is the accounting system in which variable costs are charged to cost units and fixed costs of the period are written-off in full against the aggregate contribution. Its special value is in recognising cost behaviour, and hence assisting in decision-making.

**CIMA Official Terminology, 2005**

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The **product costs** under marginal costing only include direct materials, direct labour, direct expenses and variable overheads. It recognises cost behaviour and hence is useful in decision-making.
Knowledge of marginal cost is fundamental to understanding the concept of marginal costing. Marginal cost is defined as:

**Definition**

**Marginal cost** is the cost of one unit of product or service which would be avoided if that unit were not produced or provided.

**CIMA Official Terminology, 2005**

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In other words, it is the amount at any volume of production by which aggregate costs are changed if the volume of production is increased or decreased by one unit. The terms marginal cost and variable cost tend to be used interchangeably.

**Example**

Roberto Plc is in the business of producing toiletries. The variable cost of producing a unit of bathing soap is Tshs1,500. The company is currently producing 1,000 units of soap a week. Its fixed costs for the week are Tshs500,000. Therefore, the cost of producing the weekly lot of soaps is Tshs2,000,000 (Tshs1,500 x 1,000 + Tshs500,000). If the company decides to increase the production of the soaps by one unit (i.e. if 1,001 units are produced) its total costs will be Tshs2,001,500 (Tshs1,500 x 1,001 + Tshs500,000). This signifies that the differential cost for producing one extra unit is Tshs1,500. By its definition, therefore, Tshs1,500 is the marginal cost (which is the variable cost per unit) of the product.

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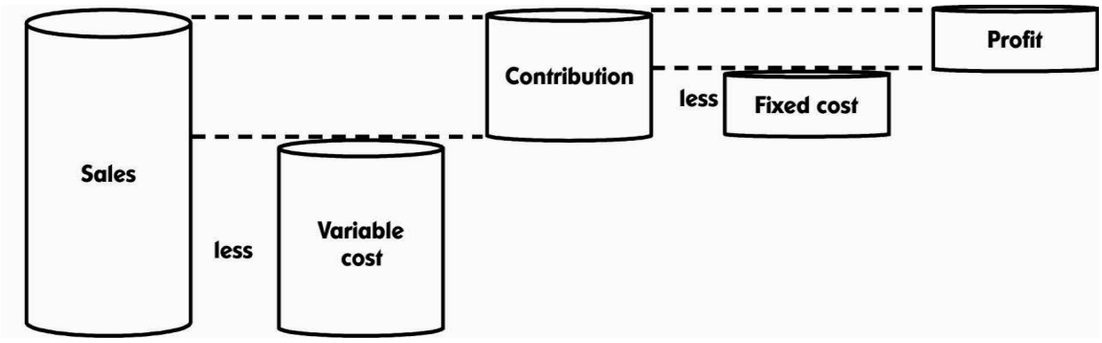
### 1.2 The concept of contribution

In marginal costing, the term contribution signifies an alternative measure of profit, which is computed as sales less the total variable costs of sales.

Accordingly, **Contribution = Sales – Variable costs**

**Diagram 1: Contribution**




Contribution for the period provides a pool (since it recognises a surplus generated by sales revenue over variable costs) out of which the fixed costs for the period are met and any surplus constitutes the profit. It is called contribution because it literally contributes towards fixed costs and profit.

As a result, **Contribution = Fixed costs + Profit**

**Example**

In the above example of Roberto Plc, if the selling price of the bathing soaps is Tshs2,000 per soap then the contribution per unit of soap will be calculated as below.

Contribution per unit will be:
Selling price – variable cost
Tshs2,000 – Tshs1,500 = Tshs500

Similarly, total contribution for 1,000 soap bars will be:
Tshs500 x 1,000 = Tshs500,000

Total profit will be
Tshs500,000 – Tshs50,000 = Tshs450,000

Let us verify whether the equation **Contribution = Fixed costs + Profit** holds true for the above example –
Tshs500,000 = Tshs50,000 + Tshs450,000
Tshs500,000 = Tshs500,000

---

The sales price as well as the variable cost per unit is fixed for each unit produced and sold. Accordingly, contribution is also fixed per unit. Therefore, like the sales price and the variable costs per unit, the contribution per unit also remains unaltered (unlike profit per unit) over the accounting periods. Accordingly, profit planning for the future becomes easier if the contribution of a product is known rather than its profit.

Profit is calculated as sales less cost of sales (including fixed costs) and so, with an increased volume of sales, a higher profit per unit is generated (as fixed cost is generally constant within a range).

On the other hand, contribution changes with a change in the number of units sold. However, it remains constant per unit. Since contribution is controllable and easier to predict than profit, it is used extensively in managerial decision-making such as identifying the most profitable product mix, deciding on whether to make a component or to buy it for use in manufacturing a product (or to sell it outright) and so on.

Also, the concept of contribution is useful for identifying the break-even point, the margin of safety, and for other sorts of cost-volume-profit analysis.

**Definition**

**Cost–volume–profit (CVP) analysis** is the study of the effects on future profit of changes in fixed cost, variable cost, sales price, quantity and mix

---

The following example presents how contribution and profit are computed and also the effects of change in activity level on contribution per unit and profit per unit.

**Example**

An excerpt from the financial projections of Ricky Ltd for the month of January, 20X8 is presented as follows:

| | |
|---|---|
| Direct material (per unit) | Tshs8,000 |
| Direct labour (per unit) | Tshs4,000 |
| Variable production overhead (per unit) | Tshs1,000 |
| Variable sales overheads (per unit) | Tshs2,000 |
| Selling price | Tshs20,000 |
| Total fixed cost (per month) | Tshs3,000,000 |
| Budgeted production | 1,500 units |
| Potential demand for the product | 500 or 600 or 1,200 units |

Calculating the contribution at the budgeted activity levels of 500, 600 and 1,200 units requires the following steps:

(i) Deduct the variable costs of sales from the sales revenue to calculate contribution

(ii) Value the closing inventory at variable cost of production

(iii) Deduct the total fixed costs from the total contribution to get the total profit of the business.

| | **Situation-1** | **Situation-2** | **Situation-3** |
|---|---|---|---|
| | **500 units Tshs'000** | **600 units Tshs'000** | **1,200 units Tshs'000** |
| Sales (a) | 10,000 | 12,000 | 24,000 |
| **Less:** Variable cost | | | |
| Production cost | 6,500 ((Tshs8,000+ Tshs4,000+Tshs1,000) x 500) | 7,800 ((Tshs8,000+ Tshs4,000+Tshs1,000) x 600) | 15,600 ((Tshs8,000+ Tshs4,000+Tshs1,000) x 1,200) |
| Selling expenses | 1,000 (Tshs2,000 x 500) | 1,200 (Tshs2,000 x 600) | 2,400 (Tshs2,000 x 1,200) |
| Total Variable cost of sales (b) | 7,500 | 9,000 | 18,000 |
| **Contribution (a – b)** | 2,500 | 3,000 | 6,000 |
| **Less:** | | | |
| Fixed cost | 3,000 | 3,000 | 3,000 |
| **Profit / (loss)** | **(500)** | **0** | **3,000** |
| Contribution per unit | Tshs5 (Tshs2,500,000/500 units) | Tshs5 (Tshs3,000,000/600 units) | Tshs5 (Tshs6,000,000/1,200 units) |

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The conclusions from the above example are given below:

(a) **Contribution per unit remains the same** irrespective of the level of activity. Therefore, the total contribution at any level of activity is the contribution per unit multiplied by the sales volume. Contribution increases in direct proportion to sales volume.

(b) When contribution exceeds fixed costs, the business starts making a profit (see situation 3).

(c) When contribution equals fixed cost there is a situation of no profit no loss (see situation 2)

(d) When the contribution is less than fixed costs, the business incurs losses (see situation 1).

Unlike contribution, profit per unit does not remain constant. It changes along with a change in the level of activity.

**Diagram 2: Total cost graph**

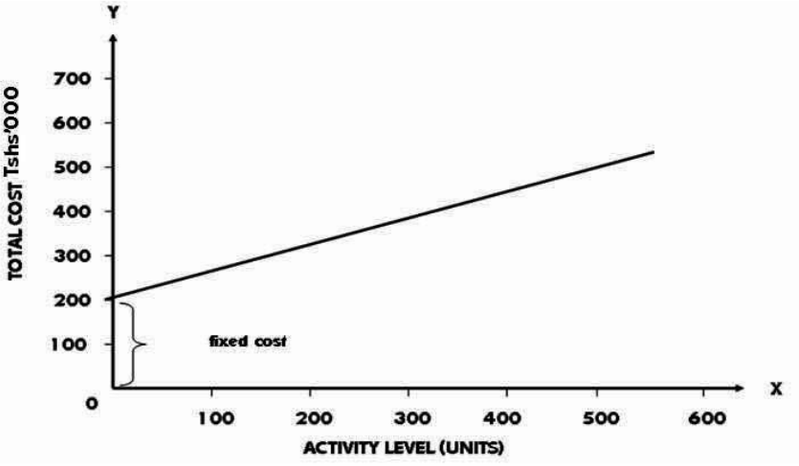
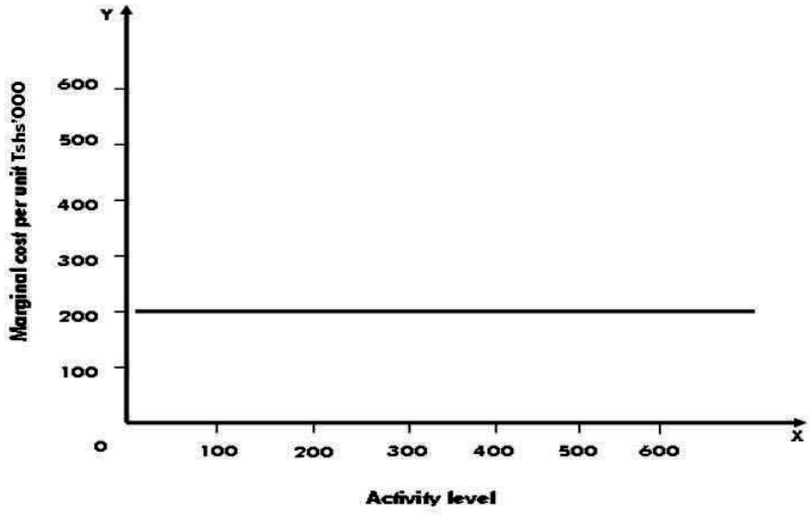



**Diagram 3: Marginal cost (per unit) graph**




**1.2 Effects of using marginal costing and absorption costing on reported financial results**

Differences in reported financial results when marginal and absorption costing are used arise due to the difference in product and inventory valuations under both these methods of costing.

Absorption costing is the basis of preparing all financial accounting statements. Using absorption costing, all costs are absorbed into production and therefore operating statements do not distinguish between fixed and variable costs.

Under **absorption costing**, the entire costs of production, whether variable or fixed, are considered to be the product costs and only the non-manufacturing costs (both variable and fixed) are considered to be period costs.

**Non-manufacturing costs** (i.e. administration costs, research and development costs and selling and distribution costs) are not allocated to the products; instead, they are charged as an expense to the period in which they are incurred. This means, under absorption costing, for product costing and valuation of inventory all the costs that are **incurred in order to produce an item** are considered.

On the other hand, under **marginal costing**, fixed costs are not absorbed into the cost of production.

Only the **variable costs of production** are considered to be **product costs** and the inventory is valued accordingly. **Fixed production costs** as well as all **non-manufacturing costs** (both variable and fixed) are considered to be **period costs** and accordingly they are not considered in determining the product costs or for valuation of inventories.

The following illustration highlights how determination of the cost of production (the cost at which inventories are valued) differs under the two methods:

**Example**

| | Under absorption costing (Cost per unit) (Tshs'000) | Under marginal costing (Cost per unit) (Tshs'000) |
|---|---|---|
| Direct material | 27.50 | 27.50 |
| Direct labour | 7.50 | 7.50 |
| Direct expenses | 2.50 | 2.50 |
| | 37.50 | 37.50 |
| - Fixed overhead | 2.00 | - |
| - Variable overhead | 6.00 | 6.00 |
| **Cost of production** | **45.50** | **43.50** |

**1. The effect of absorption and marginal costing on inventory valuation**

Under marginal costing, no fixed manufacturing cost is charged to the product. Only variable manufacturing costs are charged to the product and therefore considered for inventory valuation. Consequently, the cost per unit remains constant irrespective of a change in the activity level.

In contrast, under absorption costing, fixed manufacturing costs are assigned to the product. Therefore, the cost per unit changes along with a change in the activity level.

**Example**

Metal Plc follows the absorption costing system. Metal Plc's fixed production cost is Tshs100,000,000. The variable cost (inclusive of direct and indirect costs) per unit is Tshs10,000. In the month of April 20X3, the company's production was 10,000 units. Therefore, each product absorbs a fixed cost of Tshs10,000 (Tshs100,000,000/10,000) making the per unit total cost of production Tshs20,000 (variable costs Tshs10,000 + fixed costs Tshs10,000).

However, in the month of May 20X3, the production volume rose to 12,500 units. Accordingly, the fixed production cost was assigned to each product as Tshs8,000 (Tshs100,000,000/12,500). Therefore, per unit production cost was Tshs18,000 (Tshs10,000 + Tshs8,000).

This shows that with a change in the activity level (i.e. from 10,000 units to 12,500 units), the cost per unit of the product also changes (from Tshs20,000 to Tshs18,000) under absorption costing.

Consider the example below to understand how the valuation of inventory differs under marginal costing and absorption costing.

**Example**

During the month of May, 20X3, Sunshine Ltd produced 1,500 units, and sold 1,200 units.
Cost information of Sunshine Ltd:

| | **Cost per unit of production (Tshs'000)** |
|---|---|
| Direct material | 10 |
| Direct labour | 8 |
| Variable overheads | 3 |
| Fixed overheads absorption rate per unit | 2 |

In this case, closing inventory is valued under marginal costing and absorption costing as follows:

| **Closing Inventory** | **Marginal costing 300 units (Tshs'000)** | **Absorption costing 300 units (Tshs'000)** |
|---|---|---|
| Direct material | 10 | 10 |
| Direct labour | 8 | 8 |
| Variable overheads | 3 | 3 |
| Fixed overheads | - | 2 |
| **Per unit cost** | **21** | **23** |
| **Total inventory value** | **Tshs6,300** | **Tshs6,900** |

The example above reveals that the value of closing inventory under absorption costing is higher than the value of closing inventory under marginal costing. The difference in inventory valuation between the two methods is attributable to the fixed costs that are considered in inventory valuation under the absorption costing method whereas they are not considered under the marginal costing method.

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**2. General format of reporting financial results under marginal costing**

| | **Tshs** | **Tshs** |
|---|---|---|
| Sales | | X |
| **Less**: **Variable costs** | | |
| Direct material | X | |
| Direct labour | X | |
| Variable overhead | X | |
| Difference in opening and closing inventory | (X) | |
| **Total adjusted variable cost** | | X |
| **Contribution margin** | | X |
| **Less: Fixed overheads** | | |
| Production | X | |
| Administration | X | |
| Selling expenses | X | X |
| **Net profit** | | **X** |

**3. General format of reporting financial results under absorption costing**

| | Tshs | Tshs | Tshs |
|---|---|---|---|
| Sales | | | X |
| **Less**: **Production costs** | | | |
| Direct material | X | | |
| Direct Labour | X | | |
| Direct expenses | X | | |
| **Prime cost** | X | | |
| Variable production overheads | X | | |
| Fixed production overheads (Budgeted fixed cost per unit x No of units produced) | X | | |
| **Factory costs or production cost** | | X | |
| Difference in opening and closing inventory | | X | |
| **Cost of goods sold** | | | X |
| **Gross margin** | | | X |
| Under / Over absorption of fixed overheads | | | X / (X) |
| **Less: Non-manufacturing costs** | | | |
| Administration overheads | | X | |
| Selling and distribution overheads | | X | X |
| **Net profit** | | | **X** |

**Test Yourself 1**

Which of the following statements is /are correct with reference to marginal costing?

(i) Only variable costs are taken into account for computing the value of inventory
(ii) Profitability is determined in terms of marginal contribution
(iii) Variable costs are charged to cost units and fixed costs are written-off

**A** (i) and (ii)
**B** (ii) and (iii)
**C** (i) and (iii)
**D** All of the above

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**2. Select and explain the most appropriate costing approach for a given product or service for reporting and decision-making purposes.**

**[Learning outcome b]**

Decision-making is an exercise of choosing a particular course of action out of several alternative courses to achieve the given objective. In the context of an organisation, this decision mainly involves choosing between alternatives that will either lead to profit and sales maximisation or cost minimisation.

The marginal costing method gives more importance to variable costs than fixed costs, since variable costs are the only costs that increase when an additional unit of a product is manufactured. Decision-making involves calculation of profit with the chosen alternative by deducting additional costs from the additional income expected. Variable costs are the only additional costs incurred, while fixed costs always remain the same between two alternatives.

**Marginal costing** gives more importance to contribution as a tool for profit ascertainment. We may justify this putting forward some **principles justifying marginal costing as a better tool for reporting profits and decision-making:**

1. **Fixed costs never undergo any change** (within the given range) as long as the activity levels do not change and sales volumes never affect the amount of fixed costs incurred. Hence fixed costs should not be deducted from sales to calculate profit. Profit calculations should be based more on an analysis of contribution. Final profit may be arrived at by deducting the total fixed costs from the total contribution.

2. **Fixed costs** always relate to an **activity period**. These costs do not change with any change in the sales volume. Marginal costing hence operates on the basis of the following assumptions:

(a) Variable costs increase when any additional unit is produced.
(b) Fixed costs remain constant.
(c) Hence profit earned should be calculated as the difference between the sales price and the variable additional costs incurred. This is called contribution.
(d) If sales reduce, only the variable cost of manufacture reduces and hence profit is again equal to the contribution earned on lost sales.

Similarly the valuation of **closing inventories** should also be based on the variable costs incurred on these ignoring the fixed cost component. This is because fixed costs remain the same whether the units are sold or they remain in inventory. Attributing only variable costs to inventory will provide a more realistic picture.

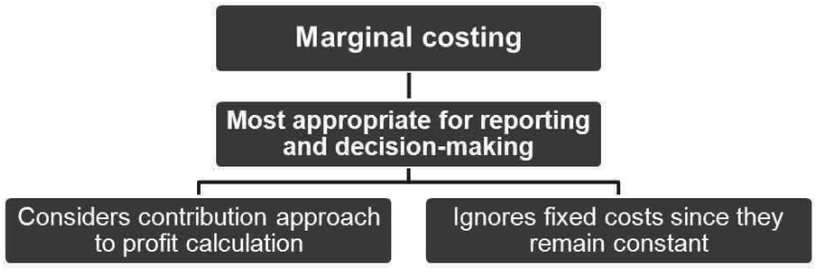
**Example**

Floral Designs is a fashion apparels manufacturer and wants to decide whether they may order raw materials from a new supplier. The new supplier will charge them Tshs40,000 per meter of cloth. The existing inventory of cloth is valued at Tshs35,000 per meter of cloth. There will be an additional sale of 10,000 units of apparel if the new cloth from the new supplier is used in manufacturing. In this situation the variable costs of materials of Tshs40,000 per meter of cloth are relevant for decision-making purposes.

The profit from the additional sales will also be calculated by considering sales minus variable costs and not total costs. This is because fixed costs like, may be, machine cost or any other fixed overhead cost like rent etc have been incurred already. Buying cloth from the new supplier will not make any difference to these costs.

Hence marginal costing approach of calculating additional contribution from additional units of sale is relevant for decision-making here.

**Diagram 4: Marginal costing**




**Test Yourself 2**

Decision-making and reporting profits can be best achieved by use of marginal costing because:

**A** It considers the contribution approach to profit calculation
**B** It considers fixed costs as irrelevant to decision-making since they do not change between alternative courses of action
**C** It values units of production and inventories at variable cost since these are the only additional costs incurred
**D** All of the above

**3. Describe standard costing and basic, ideal, attainable and current standards.**
**Evaluate the objectives of standard costing and, illustrate its use and how it is set for direct materials, labour and overheads.**
**[Learning Outcomes c and d]**

### 3.1 Definition and explanation of standard costing


Standard cost is the planned unit cost of the products, services or components produced in a period. The standard cost may be determined on a number of bases. The main uses of standard costs are in performance measurement, control, inventory valuation and in the establishment of selling prices.

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**Standard costing** is a control technique which compares standard costs and revenues with actual results to obtain variances, which are used to stimulate improved performance.

**CIMA official terminology, 2005**

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Standard costing is a control technique that uses standard costs and revenues as a yardstick for measuring actual performances. It consists of the following steps:

(a) Setting the standards (both for the items of cost as well as for revenue).
(b) **Comparing** the actual cost with the standard cost, and the actual revenue with standard revenue.
(c) **Calculating** the **variance,** if any (i.e. identifying whether or not actual performance deviates from the desired level).
(d) Analysing and investigating the reasons for the variance (to make the exercise cost effective, only the significant variances are investigated).
(e) Taking corrective action **-** either by improving the actual performance (if performance is not up to the mark), or by revising the standards (if they were set at a level that is unachievable for any reason).

### 3.2 Classification of standard costs

Although it is accepted that standard costs are predetermined costs or cost estimates in a particular set of circumstances or conditions, there are differences of opinion on the circumstances or conditions that should be considered for setting standards. As a result, several types of standard costs are used in practice.

Standards may be classified primarily as current standards and basic (or static) standards. Apart from current standards or basic standards, the other modes of expressing standards are normal standards, ideal standards and attainable standards.

**1. Current standards**

These are subject to alterations in prevailing conditions during the period the standards are to be used. The standards outline costs and efficiencies that are currently being achieved. They may require periodical review and frequent revisions in order to adjust them with the changes in the production method or price level. Therefore, these standards normally remain valid only for the accounting period under consideration.

**2. Basic standards**

Basic standards are designed to be used over a long period of time. These are not intended for revision in the short run and therefore, they may not reflect current conditions. These standards are suitable for industries where technical processes and operations are fully established and do not change materially over a number of years.

**3. Normal standards**

These are the average standards that are anticipated to be attained over a future period of time, typically, long enough to cover a trade cycle.

**Example**

If a trade cycle continues for eight years standard costs may be ascertained based on the average conditions (considering both boom and recession periods) over the period.

---

Normal standards are useful for long-term planning and decision making. The standard represents costs and efficiencies which can normally be achieved.

**4. Ideal standards**

These standards are set considering the ideal prevailing conditions and demand a high degree of efficiency and performance. Ideal standards consider consumption of the minimum quantity of material at the lowest price, labour at the minimum rate and time, and overhead at the maximum efficiency. Ideal standards are mostly theoretical and found to be unachievable most of the time. In an automated production plant where efficient methods of production and production control exist, ideal standards may be most suitable.

**5. Attainable or expected standards**

These standards take into account the conditions and circumstances expected to prevail during the period for which the standards are set. Allowances for wastage and idle time are provided for in the standards. Expected standards are more realistic than ideal standards.

### 3.3 Objectives of standard costing

Standard costs are predetermined costs per unit that should be achieved under predetermined conditions. They are calculated from the management's standards of efficient operation and the relevant necessary expenditure. Standard costs are useful for cost estimation, performance measurement, control, price determination etc.

Their objectives / usefulness encompass

**1. Planning**

Standard costs are the building blocks for budgeting, which is an operational planning tool. Setting standards for any cost, revenue or volume of activity is the first step in devising a budget.

**Example**

Material specification standards are used in calculating the materials purchase budget. Similarly, standard labour times or standard machine usage are the basis for preparing labour budgets and production plans.

---

**2. Control and performance measurement**

Standard costs act as a benchmark (by establishing standards) for comparison with actual performance (by analysing variances) in order to evaluate the level of achievements and to fix responsibility for variances (if any). It is critical to decide whether to set standards at an ideal level or at an achievable level.

**3. Decision making**

Standard costs form the basis for ascertaining the cost of a new product and for identifying the future profitability of a product. Also, standard costs are used in determining the price of the products / jobs.

**Example**

Standard costs can be used as the starting point for preparing a tender.

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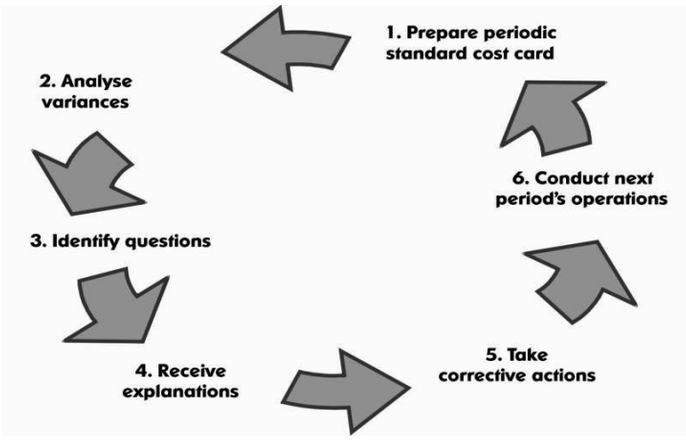
**4. Improvement and change**

Improvement and change in performance can be achieved by monitoring variances over a period of time. Monitoring variances provides a good insight into the prevailing conditions of the environmental factors that might have caused changes in the performance. Variance analysis also provides information on the controllability of costs, which helps in improving performance.
A standard has a direct impact on the level of motivation of the employees. Performance level may be improved by setting a standard slightly higher than the achievable standard and thereby inducing the employees to achieve the new standard.

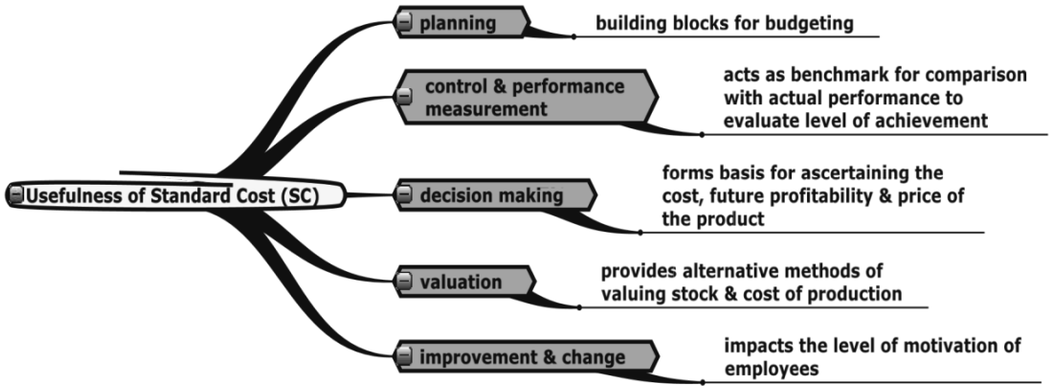
**5. Alternative method of valuation**

Standard costing provides alternative methods of valuing inventory (such as FIFO, LIFO and the weighted average method) and cost of production. Standards are suitable for organisations whose activities involve common or repetitive operations and where the material and component parts of products can be specified. Standards are normally set at an ideal level to reflect perfect performance or an attainable level of performance under efficient operating conditions.
Some organisations use standard costing for statistical purposes only. The best use of standard costs can, however, be made only if they are incorporated into the accounting system. Many ERP systems have built in mechanism for valuing inventory at standard costs.

**Diagram 5: Standard cost and variance analysis cycle**




**SUMMARY**




**Test Yourself 3**

Briefly state the objectives / usefulness of standard costs.

### 3.4 Setting standard costs for materials, labour and overheads

**Deriving standard raw material cost**

Standard costs per unit must be set for each element of cost viz. material, labour and overheads. Material is the first component of the total standard cost. The standard material cost is derived from the standard price and quantity. Therefore,

Standard material cost = Standard material price x Standard material quantity
So as to set standards for raw materials costs, the following information is essential:

**1. For material price**

(a) Prevailing price in the market for the raw material to be purchased
(b) Last purchase price of the same raw material
(c) Prevailing inflationary trend and continuance of the trend during the budget period

**2. For material quantity**

(a) The availability of quantity discount for bulk purchases
(b) The pattern of consumption of raw materials per unit of output (c) The quality of raw materials required for production etc.

Standard quantity depends on the bill of material which specifies how much quantity of every item of material is to be used to produce one unit of finished output. The quantity should be set after giving appropriate allowance for normal losses.

To derive standard material cost, it is essential to ensure standard purchase procedures and steps and, at the same time, to have a standardised consumption pattern of the raw materials by the production process. Based on the above information, the purchasing department arrives at a predetermined cost which is ideal as well as achievable in reality. Standard material cost is computed per unit of finished product. A unit of finished product may have more than one items of raw material.

**Deriving standard direct labour cost**

Another component of standard cost is the standard labour cost. It is calculated as:

Standard labour cost = Standard labour rate x Standard labour hours

To set standards for direct labour costs, the following information is essential:

**1. For labour rate**

(a) Prevailing wages according to the payroll
(b) Whether any agreement on a pay rise with employee representatives has taken place or not (c) Prevailing inflationary trend and continuance of the trend during the budget period

**2. For labour hours**

(a) If there is any possible idle time that can be estimated prior to the budget period, then whether the idle time is material enough to be considered in setting standards or not
(b) Historical data regarding labour time required for each job of repetitive nature etc.

To derive standard labour cost, it is important that a work study of the whole production system comprising a method study, motion study and time study is made at each work station. Moreover, in arriving at the standards, use of the above information assumes immense importance.

**Deriving standard overheads**

Overheads are classified into variable and fixed for planning and control purpose. Standard production variable overheads are derived from standard hours (labour hours or machine hours) and the standard variable overhead rate per hour.

Overheads are absorbed by production (unlike the direct costs that are directly charged to production) based on certain predetermined parameters (known as allocation bases) such as machine-hour, labour-hour, direct wages etc. Determination of the allocation base is of primary importance for setting standards. The overhead absorption rate per hour is obtained from the budget.

Estimates of total hours (if machine hour or labour hour is the allocation base) and total overheads (variable and fixed separately) are of critical importance for identification of overhead absorption rate.

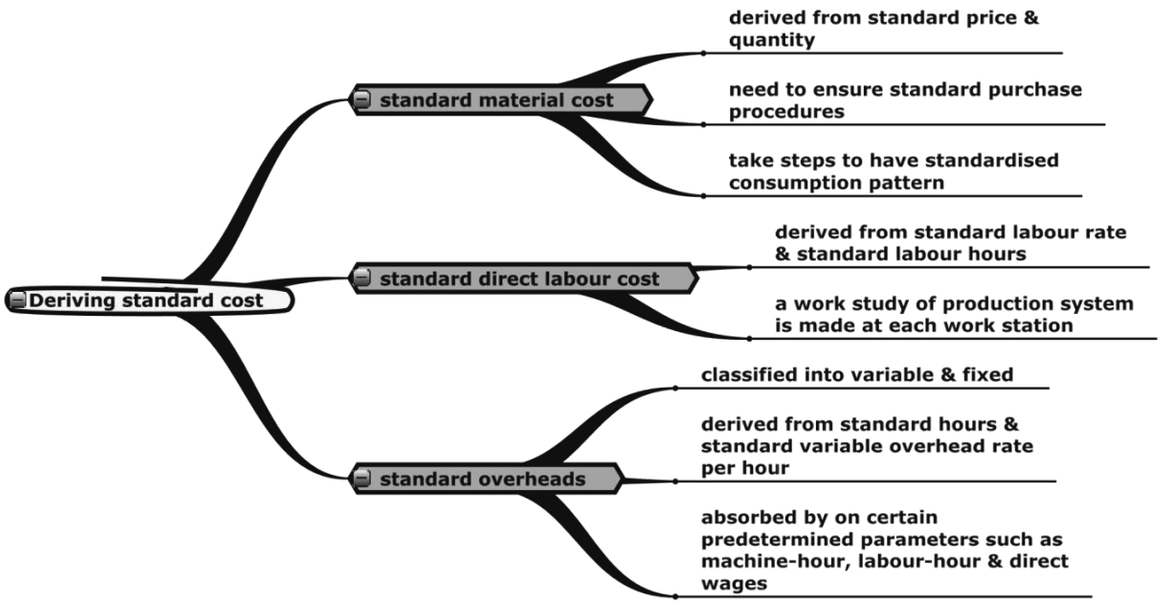
**Example**

The following table highlights the importance of estimating the volume of the allocation base. The estimate of allocation base or the total overheads may lead to under- or over-absorption of the overheads and, accordingly, cause the calculated costs of a product or a service to be different from the actual costs.

| | | | | |
|---|---|---|---|---|
| 1 | Budgeted fixed factory overhead | Tshs36,000,000 | Tshs36,000,000 | Tshs36,000,000 |
| 2 | Labour hours | 5,000 hours | 4,000 hours | 6,000 hours |
| 3 | Overhead rate per hour | Tshs7,200 | Tshs9,000 | Tshs6,000 |
| 4 | Absorbed (5,000 units of output x rates in row 3) | Tshs36,000,000 | Tshs45,000,000 | Tshs30,000,000 |
| 5 | Overheads under- / (over) - absorbed (1 - 4) | 0 | Tshs(9,000,000) | Tshs6,000,000 |

Also, estimating the optimum time required for each unit of production by resorting to time study (the work measurement method that studies each of the operations in an organisation so as to identify the time taken by each operation and thereby to determine the ideal time for performing each operation) assumes critical importance.

**SUMMARY**




**Test Yourself 4**

Briefly state the steps involved in setting standard cost.

## Answers to Test Yourself

**Answer to TY 1**

The correct option is **D**.

Under marginal costing, only variable costs are accumulated and charged to cost units. Fixed costs of the period are fully written-off. Hence, profitability is determined in terms of marginal contribution that is sales less variable costs. Under this method, only variable manufacturing costs are considered for valuation of inventory.

**Answer to TY 2**

The correct option is **D**.

Marginal costing calculates profit based on the contribution approach, does not consider fixed costs as relevant for decision-making and values production units and inventories at variable costs. All these factors make it a more realistic approach for profit calculations, reporting financial results and decision-making.

**Answer to TY 3**

Standard costs are useful for cost estimation, performance measurement, control, inventory valuation and price determination purposes.

Standard costing is an exercise in planning. It is, in fact, an essential element of budgetary planning. Standard costing assists in managerial planning for efficient operation and benefits all the divisions concerned.

A standard costing system provides a yardstick for measuring the efficiency of actual performances. This facilitates control and infuses cost consciousness amongst the executives. The standards motivate employees to put greater effort into their work.

Standard costing helps in formulating production and pricing policies in advance, before production starts. This allows decisions to be taken promptly.

Improvement and change in performance can be achieved by monitoring variances over time. Monitoring the variances provides a good insight into the prevailing conditions of the environmental factors that might have caused changes in the performances. Moreover, standard costs assist in performance analysis by providing a ready means of preparing and interpreting information.

Standard costing provides alternative methods of valuing inventory (such FIFO, LIFO and the weighted average method) and cost of production.

**Answer to TY 4**

The first step of developing a standard costing system is to set standard costs for each cost element, namely, direct material, direct labour and overheads. Extreme care is essential in setting standards as the success of a standard costing system depends largely upon the accuracy of the standard costs used.

**The steps involved in setting a standard costing system include the following:**

(a) Studying of the technical and operational aspects of the organisation is the first step towards setting a standard. The study includes observing the method of manufacture and the processes involved, division of the organisation into cost centres, measurement of input and output, estimation of wastes, rejections and losses, expected efficiency and capacity likely to be utilised.

(b) Reviewing the existing costing system and the cost records and forms in use.

(c) Deciding on the type of standard (i.e. current, basic, ideal or normal standard) to be used. The choice of a particular type of standard depends upon two factors, i.e. which type will be the most effective for cost control in the organisation, and whether the standards will be considered to be a part of the accounting system or will be kept outside the accounts as statistical data.

(d) Properly classifying costs so that variances may be determined effectively and accurately.

(e) Setting up a standards committee consisting of all the functional heads and representatives of top management. This committee will assign specific responsibility for occurrences of variances to the heads of the departments who engaged themselves in setting standards and are also responsible for actual performances.

## Self-Examination Questions

**Question 1**

Under marginal costing closing inventories are valued at:

**A** Full cost
**B** Total production cost
**C** Variable production cost
**D** Total variable cost

**Question 2**

Which of the following statements is incorrect?
**A** Under absorption costing inventory is valued at variable cost of production
**B** Absorption costing is also known as full costing
**C** In the short term, marginal cost remains constant
**D** Marginal cost is the cost of one product which can be avoided if that unit is not produced

**Question 3**

Strickland Company manufactures office furniture. The company provides the following information pertaining to its first year of operation:

| | |
|---|---|
| Sales | 10,000 units |
| Production | 12,000 units |
| Sales price | Tshs18,000 |
| Direct material (per unit) | Tshs3,000 |
| Direct labour (per unit) | Tshs5,000 |
| Variable overheads | Tshs2,000 |
| Selling and distribution overheads | |
| Fixed | Tshs10,000,000 |
| Variable | Tshs1,000 |
| Fixed production overheads | Tshs24,000,000 |

If the company uses absorption costing, what would be the cost of production and gross margin of the company?

**A** Tshs144,000,000, Tshs60,000,000
**B** Tshs180,000,000, Tshs36,000,000
**C** Tshs120,000,000, Tshs 40,000,000
**D** None of the above

**Question 4**

Following is the budgeted data provided by Marine Ltd, a boat manufacturing company.

| | |
|---|---|
| Budgeted production quantity (for July 20X3) | 20,000 units |
| Actual production quantity | 18,000 units |
| Actual sales (for July 20X3) | 15,000 units |
| Sales price (per unit) | Tshs50,000 |
| Direct material (per unit) | Tshs10,000 |
| Direct labour (per unit) | Tshs10,000 |
| Variable production overheads | Tshs5,000 |
| Fixed production costs | Tshs72,000,000 |
| Fixed selling expenses | Tshs30,000,000 |

Assuming that there is no closing inventory in the month of June 20X3, what should be the value of closing inventory for July 20X3 under the marginal costing system as well as the absorption costing system?

**A** Tshs75,000,000 and Tshs87,000,000
**B** Tshs84,000,000 and Tshs87,000,000
**C** Tshs84,000,000 and Tshs96,000,000
**D** Tshs75,000,000 and Tshs96,000,000

## Answers to Self-Examination Questions

**Answer to SEQ 1**

The correct option is **C**.

Marginal costing is a costing method in which prime costs and variable factory overheads are used to value inventories.

**Answer to SEQ 2**

The correct option is **A**.

Statements **B C** and **D** are correct statements. Statement **A** is an incorrect statement because under marginal costing, inventory is valued at the variable production cost. This does not happen under absorption costing. Under absorption costing, inventory is valued at total production cost.

**Answer to SEQ 3**

The correct option is **A**.

Under absorption costing, cost of goods is calculated as follows:

| | Tshs'000 | Tshs'000 |
|---|---|---|
| Sales (10,000 x Tshs18,000) | | 180,000 |
| Direct material (Tshs3,000 x 12,000) | 36,000 | |
| Direct labour (Tshs5,000 x 12,000) | 60,000 | |
| Variable overheads (Tshs2,000 x 12,000) | 24,000 | |
| Fixed production overheads | 24,000 | |
| **Cost of production** | **144,000** | |
| Difference in opening and closing inventory (W1) | (24,000) | 120,000 |
| **Gross Margin** | | **60,000** |

**Workings**

**W1** Difference in opening and closing inventory

| | Tshs'000 |
|---|---|
| Opening inventory | 0 |
| Closing inventory (12,000 - 10,000) x (Tshs144,000,000 /12,000) | (24,000) |
| | (24,000) |

**Answer to SEQ 4**

The correct option is **A**.

**Explanation**

| | **Marginal costing** | **Absorption costing** |
|---|---|---|
| Closing Inventory (18,000 -15,000) | 3,000 units | 3,000units |
| | **Tshs'000** | **Tshs'000** |
| Inventory value includes: | | |
| Direct material | 10 | 10 |
| Direct labour | 10 | 10 |
| Variable overheads | 5 | 5 |
| Fixed overheads Tshs72,000/18,000 units | 0 | 4 |
| Per unit cost | 25 | 29 |
| Total inventory value | **75,000** | **87,000** |

# 5 DECISION-MAKING

## Get Through Intro

An entrepreneur always invests in a business with the hope of receiving maximum returns on his investment. In order to understand business statistics one needs to know the impact of business decisions on financial results. Various decision-making techniques are used by cost accountants to assess business parameters.

Some of the crucial questions that businesses face are:

1. Will investments reap expected returns?
2. What sales levels will ensure profits?
3. What factors act as limiting factors for the business?

These questions can be answered by calculating break-even point sales and margin of safety, and by application of various capital budgeting techniques for investment appraisals and limiting factor analysis. This Study Guide will help you learn all these techniques in detail.

An accountant needs to regularly use these techniques for day to day decision-making. This Study Guide is also important for exams since long questions can be based on topics from this Study Guide.

## Learning Outcomes

a) Calculate, explain and comment upon contribution, break-even point and margin of safety of a product or service.
b) Calculate and explain simple and compound interest and differentiate between compounding and discounting
c) Calculate, explain and comment upon the accounting rate of return, payback period, net present value and internal rate of return for an investment proposal.
d) Calculate, explain and comment upon the best allocation of scarce resources to a product or service based on contribution per unit of limiting factor.

**1. Calculate, explain and comment upon contribution, break-even point and margin of safety of a product or service.**

**[Learning outcome a]**

**1.1 Contribution**

Contribution signifies an alternative measure of profit, which is computed as sales less the total variable costs of sales for a product / service.

Accordingly, **Contribution = Sales – Variable costs**

We have studied the concept of contribution in detail in Study Guide 4, Learning Outcome 1.

For a product / service, contribution provides a pool (since it recognises a surplus generated by sales revenue over variable costs) out of which fixed costs for the period are met and any surplus constitutes the profit. It is called contribution because it literally contributes towards fixed costs and profit.

Therefore alternatively, Contribution = Fixed costs + Profit

By combining these two equations,

Sales – variable cost = Fixed cost + profit

This equation can also be rearranged in the following ways:

1. Sales – Fixed cost – Profit = Variable cost
2. Sales – (Variable cost + Fixed cost) = Profit

**Example**

The variable cost of a calculator is Tshs5,000, whereas the per annum fixed cost is Tshs50,000,000. As contribution contributes to fixed cost and profits, if the business does not produce and sell a single unit during the budget period, then there is no contribution to cover fixed costs. Therefore the loss is equal to the fixed costs of Tshs50,000,000.

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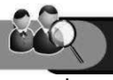
If any three of the factors in the marginal cost equation are known, the fourth factor can easily be computed.



**Example**

A business produces 10,000 units per month. The selling price of the product is Tshs10,000 per unit and the variable cost is Tshs6,000 per unit. Fixed expenses incur monthly to the extent of Tshs34,400,000. The monthly profit of the business may be computed as follows:

Sales – variable cost = Fixed cost + profit

10,000 (Tshs10,000 - Tshs6,000) = Tshs34,400,000 + profit
Profit = 10,000 (Tshs10,000 - Tshs6,000) - Tshs34,400,000
Profit = Tshs5,600,000

---

**Example**

A business produces 5,000 units per month. The selling price is Tshs20,000 per unit and the variable cost is Tshs12,000 per unit. The business earns a profit of Tshs10, 000,000per month.

The fixed cost incurred per month will be as follows:

Sales - variable cost = Fixed cost + profit

5,000 (Tshs20,000 - Tshs12,000) = Fixed cost + Tshs10,000,000
Tshs40,000,000 - Tshs10,000,000 = Fixed cost
Fixed cost = Tshs30,000,000

---

### 1.2 Contribution to sales ratio

This ratio is also termed profit-volume ratio (P/V ratio). Usually the contribution to sales ratio is expressed as a percentage. The contribution to sales ratio remains constant if the selling price and variable cost of an organization remain constant.

C/S ratio is a measure of profitability. A high C/S ratio is indicative of high profitability. An increase in the ratio signifies that contribution grows more quickly compared to increase in sales level.

**Tip**

C/S ratio is the indicator of the profitability of a business.

$$\text{Contribution to sales ratio} = \frac{\text{Total contribution}}{\text{Sales value}} \times 100$$

$$= \frac{\text{(Sales - Variable cost)}}{\text{Sales value}}$$

**Example**

Blackberry Plc has given the following details about its cost structure

| | Tshs |
|---|---|
| Direct materials | 8,000 |
| Direct labour | 4,000 |
| Variable overheads | 3,000 |

The sales price of its sole product is Tshs22,000 and the fixed cost per annum is Tshs85,000,000. The company achieved a sales volume of 18,000 units in the year. Calculate the C/S ratio.

**Answer**

Contribution = Sale value per unit – variable cost per unit
= Tshs22,000 – Tshs(8,000+4,000+3,000)
= Tshs7,000

C/S ratio = Tshs7,000/Tshs22,000 x 100
= 31.818%

A high contribution to sales ratio is indicative of high profitability. The C/S ratio as computed may be considered to be not very high. The C/S ratio also indicates that variable cost is 68.182% of total sales. It implies that the company will have low profitability per unit.

**Tip**

As we know, sales – variable cost = contribution

If the contribution to sales ratio is 80% this implies that variable cost is 20% of sales i.e. the variable cost to sales ratio is 20%

### 1.3 Calculating and interpreting a break-even point

Whenever a new product is going to be introduced in the market, it is obvious that the organisation needs to know the sales level at which the sales revenue would be sufficient to recover the entire costs. This is a vital indicator because any additional quantity of sales beyond this level would make a profit for the organisation.

Knowing the break-even point is also important for any product which has undergone any change in its cost structure, whose price has been revised or which is going to be launched in a different sales territory.
As sales revenue grows with every additional unit of sales, the contribution also grows in tandem and at a certain level of sales; contribution just covers the fixed cost. At this level of sales, the amount of contribution must match the amount of fixed costs exactly. This is known as the break-even point.

The break-even point may either be expressed in terms of sales units or in terms of sales value (i.e. in monetary terms) as follows:

$$\text{Break - even point sales in units} = \frac{\text{Total fixed costs}}{\text{Contribution per unit}}$$

Break-even point in terms of sales value = Fixed costs/C/S ratio
Break-even point in terms of sales value = Break-even point in units x Sales price per unit

If the business continues to produce a product over and above the break-even point, it starts contributing to profits only because at this stage the entire fixed costs are already recovered.

**Example**

Green Plant Inc manufactures herbal creams. The variable cost per unit is Tshs5,000 and the sales price per unit is Tshs9,000. The total fixed cost is Tshs28,000,000 per month.

In this situation the break-even point is calculated as follows:

$$\text{Break - even point (in units)} = \frac{\text{Total fixed costs}}{\text{Contribution per unit}}$$

$$= \frac{\text{Tshs 28,000,000}}{\text{(9,000 - Tshs5,000)}}$$

= 7,000 units

Break-even point (in terms of sales value) = 7,000 units x Tshs9,000
= Tshs63,000,000

Alternatively, by using the C/S ratio, the break-even point in terms of the sales value may be computed as follows:

$$\text{C/S ratio} = \frac{\text{(Sale- Variable cost)}}{\text{Sales price per unit}} \times 100$$

$$= \frac{\text{(Tshs 9,00-Tshs5,000)}}{\text{Tshs.9,000}} \times 100$$

= 44.444%

$$\text{Break - even point in revenue} = \frac{\text{Total fixed costs}}{\text{C/S ratio}}$$

$$= \frac{\text{Tshs28,000,000}}{44.444\%}$$

= Tshs63,000,000

So, Green Plant Inc must produce and sell 7,000 units per month, in order to reach the situation of no profit or no loss, i.e. **break-even.**

**Test Yourself 1**

Time Ltd manufactures watches. The cost structure for the products is as follows:

| | Tshs'000 |
|---|---|
| Raw material | 10 |
| Labour | 5 |
| Variable overheads | 2 |

Other pertinent information:

(a) The sales price is Tshs25,000 per unit
(b) Total fixed cost is Tshs80,000,000 (per annum)

How many units should the company produce and sell during the year so that there will be a no profit or no loss situation?

**A** 3,200
**B** 4,705
**C** 10,000
**D** 8,000

---

**1.4 Calculate and interpret a margin of safety (MOS)**

Sales beyond the break-even volume bring in profits. The margin of safety is the difference between the budgeted sales or actual sales and the break-even point. It measures the soundness of a business.

A high margin signifies that the break-even point is far below the sales level under consideration so that even if there is a fall in sales, there will still be a profit. On the other hand, a small margin suggests a difficult position as sales may not totally cover fixed costs.

If a low margin is coupled with high fixed costs and a high contribution to the sales ratio, action needs to be taken to reduce the fixed cost or increase the sales volume.

If both the margin of safety and the contribution to the sales ratio are low (the fixed cost being reasonable), then efforts should be taken to reduce the variable cost or the selling price should be increased.

Margin of safety in absolute terms:

| Margin of safety = Budgeted / expected sales – Sales at break-even point |
|---|

Margin of safety expressed as a ratio or percentage:

| Margin of safety (%) = ((Budgeted / expected sales – Sales at break-even point) / Sales) x 100 |
|---|

**Example**

Pentagon Ltd gives the following financial information about its product:

| | |
|---|---|
| Fixed costs | Tshs9,000,000 |
| Variable costs | Tshs15,000,000 |
| Sales | Tshs30,000,000 |
| Units sold | 10,000 |

From the above information the margin of safety is calculated as below:

$$\text{Break even point (units)} = \frac{\text{Fixed cost}}{\text{Contribution per unit}}$$

$$= \frac{\text{Tshs9,000,000}}{\text{Tshs1,500}}$$

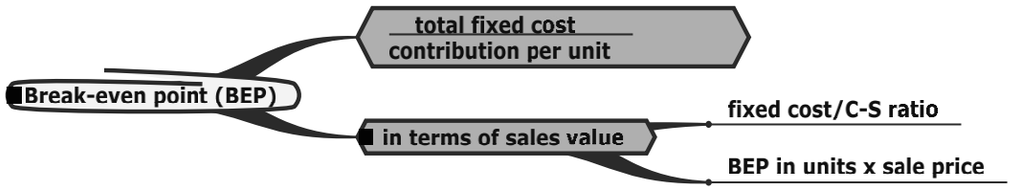
=6,000 units

Margin of safety = actual sales or expected sales volume – break-even point volume
= 10,000 units – 6,000 units
= 4, 000 units

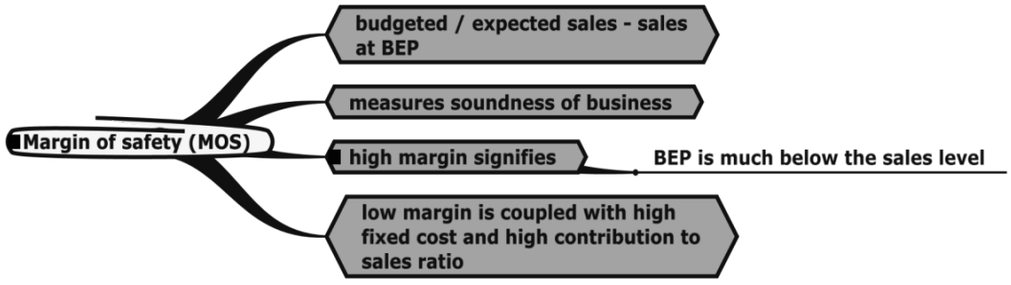
**W1**

Contribution per unit = sales price per unit – variable cost per unit
= (Tshs30,000,000/10,000) – (Tshs15,000,000/10,000)
= Tshs3,000 - Tshs1,500
= Tshs1,500

**SUMMARY**




**SUMMARY**




## Test Yourself 2

With the help of the information below, show the calculation of margin of safety as a percentage and as a value.

| | |
|---|---|
| Per unit sales price | Tshs100,000 |
| Per unit variable cost | Tshs78,000 |
| Break-even point | 35,000 units |
| Expected level of activity | 42,100 units |

**2. Calculate and explain simple and compound interest and differentiate between compounding and discounting**

**[Learning outcome b]**

Before understanding the various techniques for investment appraisal, we need to understand some basic concepts of capital investment.

**2.1 Interest**

It is the amount of money earned or money payable during the period of investments made or money borrowed. Interest is an amount charged by a lender to a borrower for letting him use the lender's money for specified time. Interest compensates the lender for not being able to use the funds and for the risk that the borrower may not repay the loan.

There are two methods to calculate interest. First is simple interest and second is compound interest.

The value of an investment at a future maturity date inclusive of the interest earned is the future value of the investment.


**Future value** is the value at a future date, of an amount invested today at a particular simple or compound interest rate.

Future values may be calculated under both simple and compound interest methods. Let us understand how this is done.

Simple interest is the interest that is payable or receivable in equal amount of money every year over the period of money borrowed or of investment made. Formula for calculating simple interest is

FV = PV + nrPV

Where,

PV= Principal Amount Invested,

r = rate of interest,

n = the number of years

FV= Sum of money invested for a period of time


John invests Tshs10,000,000 at 12% simple interest per annum. Calculate John's earnings after five years.

Using the formula: FV = PV + nrPV

Where,
PV = Amount Invested = Tshs10,000,000
r = rate of interest = 12% n = the number
of years = 5
FV= Sum of money invested for a period of time
FV = Tshs10,000,000 + (5 x 0.12 x Tshs10,000,000) = Tshs16,000,000

When simple interest is agreed to be earned / paid, interest will be earned / paid only on the principal amount and no interest is earned / paid on accrued interest.


Tshs100,000,000 is lent for 3 years at simple interest of 10%. Interest is equal to Tshs10,000,000 x 10% = Tshs1,000,000 per year. The total interest is equal to Tshs1,000,000 x 3 = Tshs3,000,000. The future value of the initial investment of Tshs10,000,000 is Tshs13,000,000.

### 2.2 Compound Interest

If the interest is earned at each period end on the total amount inclusive of interest earned up to date then it is known as compound interest. With compound interest, interest is paid on the original principal amount plus accrued interest; hence interest earns interest.

**Example**

**Continuing the above example let us calculate compound interest for three years:**

| | |
|---|---|
| Principal amount of investment | Tshs10,000,000 |
| Interest earned after one year (10%) | Tshs1,000,000 |
| Total investment after one year | Tshs11,000,000 |

After completion of second year the total investment will be Tshs12,100,000as mentioned below:

| | |
|---|---|
| Principal amount of investment | Tshs11,000,000 |
| Interest earned after second year (10%) | Tshs1,100,000 |
| Total investment after second year | Tshs12,100,000 |

The total interest earned of Tshs2,100,000(Tshs1,000,000 + Tshs1,100,000) after completion of second year represents 10% interest earned on the principal investment made in the second year and 10% of the interest earned in the first year.

After completion of third year the total investment will be Tshs13,310,000.

| | |
|---|---|
| Principal amount of investment | Tshs12,100,000 |
| Interest earned after third year (10%) | Tshs1,210,000 |
| Total investment after third year | Tshs13,310,000 |

**This can be given in a table format as follows:**

Compound interest and future value for the above example will be as follows:

| Year No | Opening balance Tshs'000 | Interest for the year Tshs'000 | Closing balance Tshs'000 |
|---|---|---|---|
| 1 | 10,000 | 1,000 | 11,000 |
| 2 | 11,000 | 1,100 | 12,100 |
| 3 | 12,100 | 1,210 | 13,310 |

The future value after 3 years will be Tshs13,310,000. Note that this is higher than the future value, based on simple interest calculated earlier, which was Tshs13,000,000. This is because interest compounds upon interest earned.

**We can make the above calculations with the help of a formula as follows:**

$FV=PV\ (1+r)^{n}$

Where,
FV = Future value
PV = Present value
r = rate of interest
n = term in periods

**Difference between Simple Interest and Compound Interest**

1. Simple interest is calculated on the **original principal only whereas** compound interest is calculated in each period on the **original principal plus the interest accumulated during past periods.**
2. Simple interest gives lower returns as compared to compound interest since under the compounding method interest is charged on interest. Compound interest is hence more beneficial from an investor point of view.

**Example**

**Continuing the above example**, we get:

FV = Tshs10,000,000 x $(1+ 0.1)^3$
= Tshs10,000,000 x $1.10^3$ =
Tshs10,000,000 x 1.331
= Tshs13,310,000

---

**2.3 Compounding vs. discounting**

In the process of compounding, we proceeded from the present value and found out the future value by adding on or compounding interest. Discounting is the opposite; interest is deducted from the future value in order to ascertain the present value. In effect it's working backwards. The formula above which was used to calculate FV can be manipulated as follows:

$$PV = FV \times \left[\frac{1}{(1+r)^n}\right]$$

Where,
FV = Future value
PV = Present value
r = rate of interest
n = term in periods

**Example**

An amount of Tshs146,410,000 is expected to be received after 4 years. Assuming a discount rate of 10%, what is its present value?

$$PV = FV \times \left[\frac{1}{(1+r)^n}\right]$$

$$= \frac{\text{Tshs146,410,000}}{(1+ 0.10)^4}$$

$$= \frac{\text{Tshs146,410,000}}{1.46410}$$

= Tshs100,000,000

---

**Tip**

In the above example the formula $[\frac{1}{(1+r)^n}]$ calculates the 'discount factor' required to bring the future value of a cash flow back to its present value. As many discount factors will be required in the exam while appraising capital investments, a table of discount factors as well as annuity factors will be provided so as to avoid calculating discount factors each time they are required

**Example**

Find out the present value of Tshs10,000,000 to be received at the end of each of next 5 years, with a discount rate of 8%. Use the discount table to find the applicable discount factor.

If you refer to the table of cumulative present value factors, you will see that for the cell which falls under the row of 5 periods and the column of 8%, the sum is 3.993. This means that the present value of annuity of Tshs1 to be received at the end of each of the next 5 years, with a discount rate of 8%, is Tshs3.993. Therefore, the present value of annuity of Tshs10,000,000 will be Tshs3.993 x Tshs10,000,000 = Tshs39,930,000.

---

**Test Yourself 3**

What is the effective annual rate of interest of 3·1% compounded every four months?

**A** 6·29%
**B** 8·40%
**C** 11.29%
**D** 9.59%

---

**3. Calculate, explain and comment upon the accounting rate of return, payback period, net present value and internal rate of return for an investment proposal.**

**[Learning outcome c]**

Investment proposals in a business are always assessed based on the returns that they would fetch in the long term. There are various techniques using which an investment proposal may be assessed. The management generally sets an expected rate of return from an investment proposal and compares this with the projected rate in order to decide whether to choose an investment option.

Capital budgeting process is the process through which an organisation generates, evaluates and selects various capital investment proposals. It allows an organisation to assess the financial viability of a capital investment proposal.

There are various techniques under capital budgeting to evaluate an investment proposal.

**3.1 Calculate accounting rate of return and comment upon its use as a tool for investment appraisal**

Accounting rate of return or ARR is the expected return from an investment. It is calculated as follows:

$$ARR = \frac{\text{Net income / average income}}{\text{Initial investment}}$$

The ARR method compares the incremental revenues from an investment with the initial amount invested in order to arrive at the returns from the proposals. The management compares the desired rate of return from investment with the ARR and accepts the investment proposal only if ARR is greater than the desired rate of return.

**Example**

The Frilly Frocks Factory wants to invest in a new machine and sell the old one whose expected life is over. A buyer has been identified who will buy the old machine for Tshs30,000,000. The new machine will generate revenues ofTshs250,000,000 and annual operating expenses are expected to beTshs80,000,000. Cost of the new machine is Tshs750,000,000. The estimated useful life of the machine is 15 years with zero salvage value.

**Required:**

(a) Calculate ARR of the machine.

(b) If the desired rate of return is 15%, should Frilly Frocks opt for investment in the new machine?

**Answer**

(a) ARR = Net income / average income

Initial investment

= [Tshs250,000,000- (Tshs80,000,000 + Tshs50,000,000 W1)]* x 100
(Tshs 750,000,000-Tshs30,000,000) **

= 16.67%

**W1**

Annual depreciation on machine = Cost of machine/expected life of machine in years
= 750,000,000/15 years

*Revenue is adjusted for the expenses and depreciation on machine.

** Initial investment has been adjusted for the value of sale of old machine.

(a) **Decision** – Frilly Frocks should opt for the investment proposal since the ARR is 16.67%, which is more than the desired rate of return on investment.

---

ARR as a tool for investment appraisal has advantages as well as disadvantages.

1. The advantages are:

(a) It is a comparatively simple tool for investment appraisal.

(b) It can be used for comparison between two or more investment proposals.

2. The disadvantages are:

(a) It ignores the time value of money and hence inflation over a period of time is ignored.

(b) It can also be calculated as average income/average investment and hence provides distorted results at times.

(c) It ignores cash flows which can be extremely important for a business since cash flows affect investment decisions.

**3.2 Calculate net present value and discuss its usefulness as an investment appraisal method**

The projects which are having positive and maximum NPV and IRR should in be selected. NPV and IRR are discounted cash flow techniques used to evaluate investment proposals. These indicate whether projects will increase shareholder wealth.

IRR discussed Para 3.3

**1. Net Present Value**

**Definition**

The net present value (NPV) of an investment (project) is the difference between the amount of initial investment and the sum of the discounted cash flows which the investment is predicted to generate.

---

The value of money depends upon the time of the cash flows. The same amount of money received or paid at different times has different values because of the effect inflation has on money value. To make the cash flows at different dates comparable, their present values are calculated. Thereafter, the net present values are calculated as:

| NPV = Present value of cash inflows - Present value of cash outflows |
|---|

This present value can be either positive (cash inflow greater than outflow), negative (cash outflow greater than inflow) or zero (cash outflow and inflow exactly equal). The rule is to accept all the independent projects with positive net present value or the competing projects with highest NPV.

**Example**

An initial investment in a project is Tshs100,000,000. Target or required rate of return is 12%

Expected cash inflows are as follows:

| Year | Tshs'000 |
|---|---|
| 1 | 60,000 |
| 2 | 50,000 |
| 3 | 45,000 |

**Calculation of present value**

| Year | Cash flow Tshs'000 | Disc factor | Present value Tshs'000 |
|---|---|---|---|
| 0 | (100,000) | 1.000 | (100,000) |
| 1 | 60,000 | 0.893 | 53,580 |
| 2 | 50,000 | 0.797 | 39,850 |
| 3 | 45,000 | 0.712 | 32,040 |
| | | **NPV** | **25,470** |

Since the project's NPV is positive Tshs25,470,000 it should be accepted. The positive NPV equates to a net cash inflow which would indicate that the investment will yield higher returns than what is invested.

**Test Yourself 4**

A company currently has spare machine capacity and is considering taking on sub-contract work for a period of five years.

The company has surplus machinery and would otherwise be sold. The sub-contract work would be carried out by utilising the surplus machinery. The net book value of the machinery is Tshs200,000,000 but the current disposal value is only Tshs150,000,000. The expected disposal value would be Tshs25,000,000 if the machinery is used for five years. The depreciation on machinery is on a straight-line basis over the five years.

At the end of each year, net cash inflows from the sub-contract work are forecasted to be:

| | |
|---|---|
| Year 1 | Tshs50,000,000 |
| Year 2 | Tshs65,000,000 |
| Year 3 | Tshs60,000,000 |
| Year 4 | Tshs70,000,000 |
| Year 5 | Tshs65,000,000 |

**Required:**

Calculate the net present value (NPV) at a cost of capital of 10% per annum.

Discount factors at 10%:

| | |
|---|---|
| Year 1 | 0·909 |
| Year 2 | 0·826 |
| Year 3 | 0·751 |
| Year 4 | 0·683 |
| Year 5 | 0·621 |

---

**2. How is the rate of discount determined for the purpose of the calculation of present values?**

Normally Companies will target a rate of return that is more than or equal to the cost of capital. E.g. a company invests Tshs500,000,000 today on purchase of machinery, this will be an outflow. The company has invested with an expectation to earn more than Tshs500,000,000 at a future date. The company has taken loan from a bank and the rate of interest on the loan amount is 10%. This rate will be termed as the cost of capital for the company. The company expects the rate of return to be 12%. This rate will be termed as target rate of return.

**3. Timing assumptions or conventions**

The discounted value depends on the date of expected cash flows. Some assumptions relating to NPV calculations include:

**(a)** **Initial cash outlay** is incurred at the **beginning of the first period**, i.e. the year is taken as **0**. The present value of this initial investment is the same as the amount of investment; it is not required to be discounted since the time is 'now'. The discount factor for year 0 is 1.000.
**(b)** **Any transaction** during a period is assumed to **occur at the end of the period**. e.g. receipts during year 2 are assumed to have taken place at the end of year 2.
**(c)** **Cash** flows occurring at the beginning of a year will be assumed to have occurred in the previous year for discounting purposes only.

**Example**

A cash payment of Tshs60,000 on 1 January 20X2 will be assumed to have occurred in 20X3, for the purposes of cash flow discounting.

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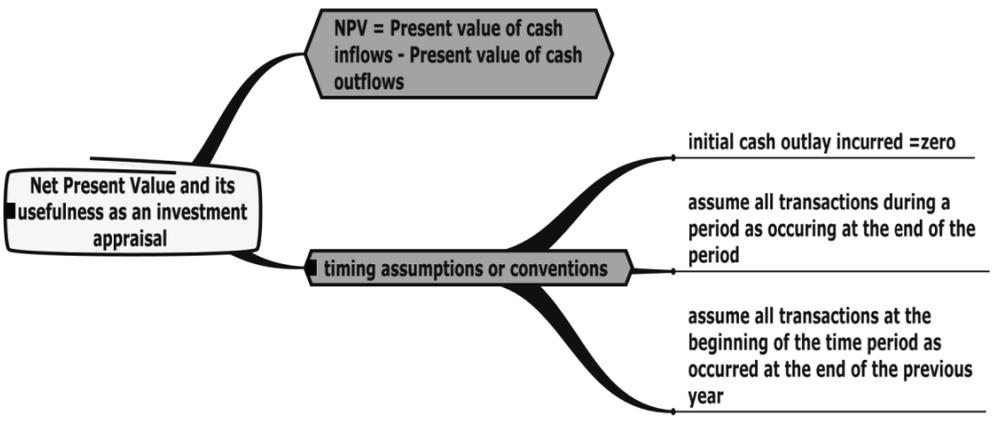
**SUMMARY**



### 3.3 Calculate internal rate of return (IRR) and discuss its usefulness as an investment appraisal method

#### 1. Internal Rate of Return (IRR)

**Definition**

An investment project's internal rate of return is the required rate of return or cost of capital which produces a net present value of zero when used to discount the project's cash flows.

---

In other words, **when internal rate of return is used to discount the cash flows, the present value of outflows and the present value of inflows will be equal.**

#### 2. Calculation of IRR

Two different methods can be used for calculation of IRR in the following two situations:

- When the project cash inflows are identical.
- When the project cash inflows are not identical.

#### 3. When the project cash inflows are identical

The **table of cumulative present value factors** can be used in cases where the project cash inflows are identical.

**Example**

The following table gives the particulars of a proposed project X of Strilco.

| Period | Cash flow Tshs'000 |
|---|---|
| 0 | (6,000) |
| 1 | 1,450 |
| 2 | 1,450 |
| 3 | 1,450 |
| 4 | 1,450 |
| 5 | 1,450 |
| 6 | 1,450 |

Calculate the internal rate of return.

In this case, the inflows are identical, therefore, we can use the cumulative present value factors table.

As we know, IRR represents the rate where NPV is Nil. Therefore, substituting this logic in a formula we can say that PV of inflows for each year – PV of outflows = (Tshs1450,000 x $CPVF_{r6}$) - Tshs6,000,000 = 0

Where $CPVF_{r6}$ is the cumulative present value factor for 6 years, and r is IRR

$CPVFr_6$ = Tshs6,000,000/Tshs1,450,000
= 4.137931

Looking at the cumulative present value factors table and checking the row of 6 years, we find that the value of 4.111 which is the nearest to 4.137 appears in the column of 12%

Therefore, we can conclude that the internal rate of return is approximately 12%.

---

**4. When the project cash inflows are not identical**

In such a situation, the interpolation method is to be used. The NPV at two discount rates will be required.

$$IRR = a + \left(\frac{A}{(A-B)}\right) x(a - b)\%$$

Where,
a is lower of two rates of return used
b is higher of two rates used A is
NPV obtained using rate a
B is NPV obtained using rate b

**Example**

**Continuing the previous example of Strilco,**

Following are the particulars of proposed project Y of Strilco.

| Period | Cash flow Tshs'000 |
|---|---|
| 0 | (6,000) |
| 1 | 1,450 |
| 2 | 3,250 |
| 3 | 500 |
| 4 | 1,450 |
| 5 | 600 |
| 6 | 1,450 |

**Find out the internal rate of return**

First, we take 10% as a PV factor. That gives us a positive NPV of Tshs560,000
Next, since the NPV is positive, we increase the rate to 14% (to get the negative NPV)

| Period | Cash flow Tshs'000 | 10% PV factors | Present value Tshs'000 | 14% PV factors | Present value Tshs'000 |
|---|---|---|---|---|---|
| 0 | (6,000) | 1.000 | (6,000) | 1.000 | (6,000) |
| 1 | 1,450 | 0.909 | 1,318 | 0.877 | 1,272 |
| 2 | 3,250 | 0.826 | 2,685 | 0.769 | 2,499 |
| 3 | 500 | 0.751 | 376 | 0.675 | 338 |
| 4 | 1,450 | 0.683 | 990 | 0.592 | 858 |
| 5 | 600 | 0.621 | 373 | 0.519 | 311 |
| 6 | 1,450 | 0.564 | 818 | 0.456 | 661 |
| **NPV** | | | **560** | | **(61)** |

$$IRR = 10\% + \frac{560,000}{560,000 - (-61,000)} x\ (14 - 10)\%$$

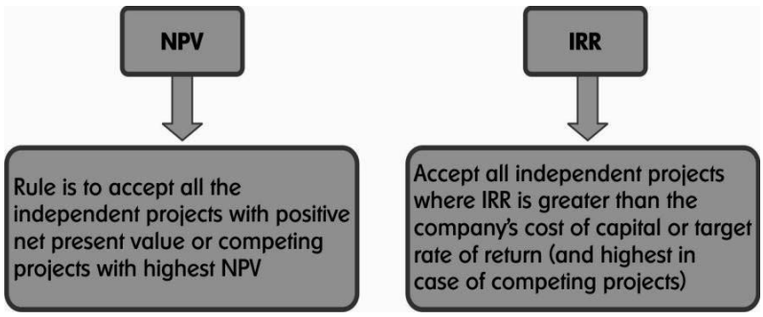
$$= 10\% + 3.61\%$$

$$= 13.61\%$$

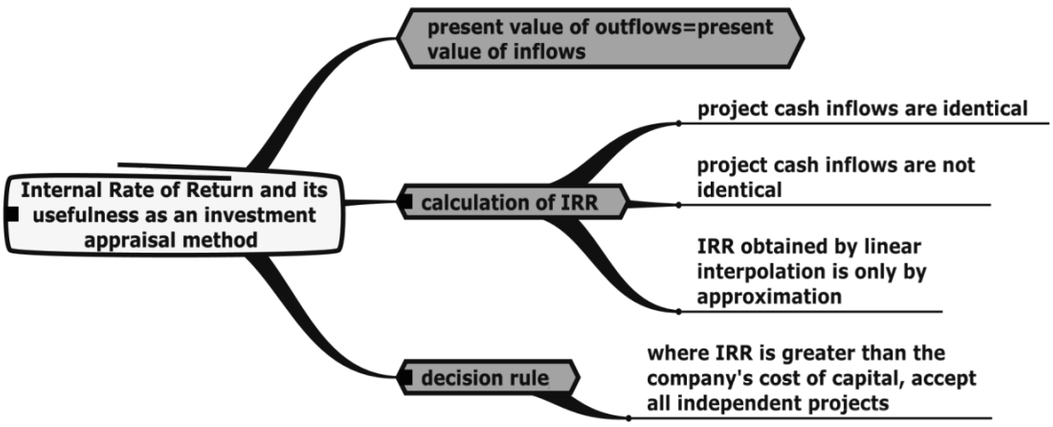
**5. Decision Rule**

Accept all independent projects where IRR is greater than the company's cost of capital or target rate of return.

**Diagram 1: NPV and IRR**




**SUMMARY**




**3.4 Payback period**

The expected amount of time a project will take to pay back the initial investment is called as payback period. The payback period is based on the expected cash inflows from initial investment made. The payback period is calculated by identifying the point at which net cash inflows equal the cost of the initial investment.

**Example**

A company has purchased a new machinery on 1 st January 20W9 for Tshs100,000,000. The company starts using the machine and cash inflows start, when the products produced by the machine are sold. The inflows total to Tshs100,000,000 in the year 20X3. This means that the money invested in the machine was fully recovered by the end of 20X3 which is a period of 5 years (01.01.20W9 to 31.12.20X3). Therefore the payback period for this investment is 5 years.

---

**Advantages of payback period as an investment evaluation method**

1. It is simple to understand and easy to calculate
2. The quick cash flow returns on initial investments help in maximising liquidity 3. The quick cash flow returns on initial investments help in minimising risks.

**Disadvantages of payback period as an investment assessment method**

1. It doesn't take time value of money into consideration.
2. payback ignores profitability

$$\text{Formula for payback period} = \frac{\text{Initial investment}}{\text{Annual cash inflow}}$$


The company spend Tshs250,000,000 on purchase of a new machine. Annual cash inflow from the machine will be Tshs60,000,000. What is the payback period?

Payback period = Initial Investment/Annual cash inflow

Payback period = Tshs250,000,000/Tshs60,000,000 = 4.167 years

---


The company will be expecting cash inflow from a project as below

| Year | Cash flow Tshs'000 |
|---|---|
| 0 | (5000,000) |
| 1 | 900,000 |
| 2 | 1150,000 |
| 3 | 1200,000 |
| 4 | 1250,000 |
| 5 | 1300,000 |

**What is the payback period?**

| Year | Cash flow Tshs'000 | Cumulative cash flow Tshs'000 |
|---|---|---|
| 0 | (5000,000) | (5,000,000) |
| 1 | 900,000 | (4,100,000) |
| 2 | 1,150,000 | (2,950,000) |
| 3 | 1,200,000 | (1,750,000) |
| 4 | 1,250,000 | (500,000) |
| 5 | 1,300,000 | 800,000 |

The payback period is between the end of year 4 and the end of year 5, in other words during year 5.

---

**3.5 Non-DCF methods suffer from certain drawbacks which are overcome by the DCF methods. In this sense, the DCF methods are superior for the following reasons:**

1. The timing of cash flows and the time value of money are taken into account through discounting


Tshs100,000,000 to be received after one year is considered to be worth Tshs100,000,000 today under nonDCF methods. However, under DCF methods, if the discount rate is 10%, its present value will be treated as Tshs90,900,000 (0.909 x Tshs100,000,000) and not Tshs100,000,000. This is more logical. If we invest Tshs90,900,000 today, and invest it at 10%, the amount will have increased to Tshs100,000,000 by the end of the year.

---

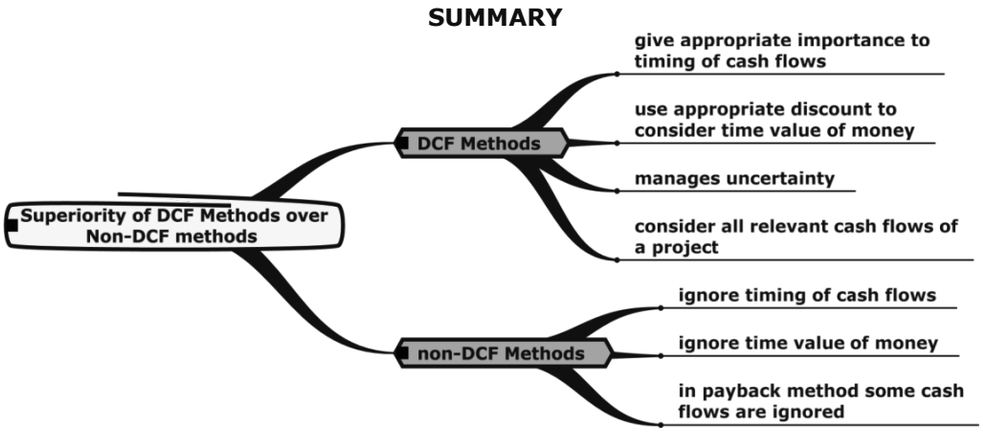
2. Discounting also helps in taking care of uncertainty

The further into the future the cash flows are, the more uncertainty there will be. The more uncertain they are, the lower their value. Discounting reflects this.

3. Projects are considered over their entire lives and hence a full evaluation is facilitated

4. Only cash flows are incorporated into calculations as opposed to profit which are susceptible to manipulation.

5. DCF techniques can indicate how undertaking investments can affect shareholders' wealth.




### 3.6 Interpret the results of NPV, IRR and payback calculations of investment viability

The different methods for analysing the financial viability of capital investment have been explained in this Study Guide. On the basis of the analysis of the financial viability of capital investments, decisions are taken. These decisions rules are explained below.

1. **Net Present value**: the rule is to accept all the independent projects with positive net present value or the competing projects with highest NPV.

2. **Internal rate of return:** the rule is to accept all independent projects where IRR is greater than the company's cost of capital (cost of raising finance for business) or target rate of return.

**Example**

Suppose the target rate of return of the company is 14% and the cost of capital is 12% then the IRR should be greater than both these rates i.e. may be 15% or above. This will enable that the company earns more than what it spends and also more than what it expects to earn.

3. **Simple and Discounted Payback**: the amount of time expected to make cash inflows from an initial investment equal to the cash outflows in a given period of time. The investment which is expected to do this should be accepted.

**Example**

**Continuing the previous example of project Y of Strilco**

The following additional information of project, Z is given:

| Period | Cash flow Tshs'000 |
|---|---|
| 0 | (10,000) |
| 1 | 4,500 |
| 2 | 2,900 |
| 3 | 500 |
| 4 | 2,000 |
| 5 | 2,500 |
| 6 | 1,450 |

The internal rate of return for this project is 12.54% (calculations not given)

The cost of capital for the company is 8%. Help management to decide which one of the two projects to select assuming that they are mutually exclusive, using the appropriate DCF techniques.

**1. IRR**

IRR of project Y is 13.61% and that of project Z is 12.54%. On this criterion, project Y is better.

**2. NPV**

Since the cost of capital is 8%, let us find out the NPV of both the projects, using this discounting rate.

| Period | 8% discount factor | Project Y | | Project Z | |
|---|---|---|---|---|---|
| | | Cash flow Tshs'000 | Present value Tshs'000 | Cash flow Tshs'000 | Present value Tshs'000 |
| 0 | 1.000 | (6,000) | (6,000) | (10,000) | (10,000) |
| 1 | 0.926 | 1,450 | 1,343 | 4,500 | 4,167 |
| 2 | 0.857 | 3,250 | 2,785 | 2,900 | 2,485 |
| 3 | 0.794 | 500 | 397 | 500 | 397 |
| 4 | 0.735 | 1,450 | 1,066 | 2,000 | 1,470 |
| 5 | 0.681 | 600 | 409 | 2,500 | 1,703 |
| 6 | 0.630 | 1,450 | 914 | 1,450 | 914 |
| **NPV** | | | **914** | | **1,136** |

Both projects are financially viable as both have produced positive NPVs. However, since the projects are mutually exclusive, Project Z would be selected as its NPV is higher.

The logic behind giving preference to the NPV method is that it is consistent with the overriding goal of financial management, i.e. maximisation of returns on investment; by selecting the project which gives higher NPV, shareholder wealth will be maximised.

## Test Yourself 5

**The following information relates to a proposed investment for manufacturing organisation:**

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Sales and production (units) | 337,500 | 157,500 | 135,000 | 135,000 |
| Selling price (Tshs per unit) | 25,000 | 24,000 | 23,000 | 22,000 |

**Financial information for the first year of production is as follows:**

| | |
|---|---|
| Direct material cost | Tshs5,400 per product |
| Other variable production cost | Tshs6,000 per product |
| Fixed overhead costs | Tshs4,000 per product |

The fixed overhead represent an apportionment of existing fixed costs. Total fixed costs are expected to remain unchanged**.**

| | |
|---|---|
| Advertising cost in the first year | Tshs1,462,500,000 |
| Advertising cost in the second year | Tshs225,000,000 |
| No advertisement costs are expected in third and fourth year | - |
| Cost of machine to be used for the production | Tshs1,800,000,000 |
| After tax discount rate used by the company for evaluating investment projects | 10% |

**Required:**

Ignoring taxation and capital allowances, calculate the net present value of the proposed investment and comment on the results.

---

**4. Calculate, explain and comment upon the best allocation of scarce resources to a product or service based on contribution per unit of limiting factor.**

**[Learning outcome d]**

**4.1 Conceptualising what 'limiting factor' (scarce resource) is**

A limiting factor is a factor of production (or of any other activity) that is in short supply and that prevents an organisation from expanding its production (or activities) and maximising its profit. It refers either to a scarce resource needed for production or to a limited market demand for the items produced. The most common limiting factors for organisations are the demand for their products and services, availability of materials, labour supply, and machine capacity etc. The scarcity of most of the factors of production (or activities) may be a short term phenomenon which can be overcome in the long run.


Machine capacity or the availability of skilled labourers may be limited for one year or so until steps are taken to enhance machine capacity or to hire more skilled labourers

---

**4.2 Identifying the optimum alternative in a situation where resources are available in abundance**

Decision-making lies in a situation where there are alternatives and one has to choose amongst those alternatives. In a situation where all the resources needed to optimise the decision objective (e.g., maximising contribution / profit or minimising cost, etc.) are available in abundance, the highest unit contribution margin (or lowest unit cost) provided by the alternative is to be chosen.


Atlanta Company has met all production requirements for the current month and has an opportunity to produce additional units of a product with its excess capacity. Unit selling prices and unit costs for three models of one of its product lines are as follows:

| | Plain Model (Tshs'000 per unit) | Regular Model (Tshs'000 per unit) | Super Model (Tshs'000 per unit) |
|---|---|---|---|
| Selling price | 120 | 130 | 160 |
| Direct material cost | 36 | 40 | 38 |
| Direct labour cost (Tshs10,000 per hour) | 20 | 30 | 40 |
| Variable overhead | 16 | 24 | 32 |
| Fixed overhead | 32 | 10 | 30 |

Variable overhead is applied on the basis of direct labour hours while fixed overheads are applied on the basis of machine hours. There is sufficient demand for additional production of any model of the product line.

If Atlanta Company has excess machine capacity and can add more labour as needed (i.e. neither capacity nor labour is a constraint), the excess production capacity should be devoted to producing the model with the highest unit contribution margin (since demand, machine capacity and labour are not constraints).

The unit contribution margin has been shown as follows:

| | Plain Model (Tshs'000 per unit) | Regular Model (Tshs'000 per unit) | Super Model (Tshs'000 per unit) |
|---|---|---|---|
| **A. Selling Price** | **120** | **130** | **160** |
| Variable costs: | | | |
| Direct materials | 36 | 40 | 38 |
| Direct labour (@Tshs10,000 per hour) | 20 | 30 | 40 |
| Variable overheads | 16 | 24 | 32 |
| **B. Total Variable Cost per unit** | **72** | **94** | **110** |
| **C. Unit Contribution Margin (A – B)** | **48** | **36** | **50** |

Since Super model generates the maximum unit contribution out of the three models; its production should be optimised so as to maximise overall profitability.

### 4.3Identify the optimum alternative in a situation when one of the resources is scarce or is the limiting Factor

The unit contribution margin provides a good indication of how to prioritise an alternative in order to optimise profit (or other object function) when the resources are available in abundance. However, this is not a sufficient measure to optimise objective function when the resources are scarce. When any one of the resources is scarce but other resources are available in abundance, the contribution margin per unit of the scarce resource / limiting factor most appropriately identifies the best possible solution amongst the different alternatives. To maximise contribution, the scarce resource needs to be allocated to those products that earn the most contribution per limiting factor.

**Example**

**Continuing the above example**

If Atlanta Company has unlimited machine capacity but a limited amount of labour time available, the excess production capacity should be devoted to producing the model with the highest **contribution margin per hour of labour**. It can be calculated as 'contribution margin/direct labour hour per unit'.

Plain model Tshs48,000/(Tshs20,000/10,000) = Tshs24,000 per hour Regular model Tshs36,000/(Tshs30,000/10,000) = Tshs12,000 per hour
Super model Tshs50,000/(Tshs40,000/10,000) = Tshs12,500 per hour

The above calculation indicates that Plain model has the highest contribution per limiting factor (i.e., direct labour hour) and therefore, maximising production of this model will optimise the utilisation of the scarce resource and thereby maximise profit.

Let us understand how limiting factors work in the service industry.

**Example**

Woodland Hotel is well known for its services of banqueting and lodging. It provides three options for lodging - special rooms, deluxe rooms and super deluxe rooms. All its rooms usually have sufficient demand in the peak season. However, in off season, the overall profitability declines.

The following cost data is available for Woodland Hotel

| | Special room | Deluxe room | Super deluxe room | Total |
|---|---|---|---|---|
| Number of rooms available | **10** | **10** | **10** | **30** |
| Rent charged to customers per room | Tshs50,000 | Tshs60,000 | Tshs75,000 | |
| Variable costs per room | Tshs30,000 | Tshs45,000 | Tshs50,000 | |
| Fixed costs | | | | Tshs100,000,000 |

In the off season, Woodland reduces the charge per room by 5%. Furthermore, in order to increase the overall profitability, Woodland wants to offer the most proftable room first during the off season.

The contribution can be calculated as follows:

| | Special room (Tshs) | Deluxe room (Tshs) | Super deluxe room (Tshs) |
|---|---|---|---|
| Rent charged to customers per room in off season | 47,500 | 57,000 | 71,250 |
| Less: Variable costs per room | 30,000 | 45,000 | 50,000 |
| **Contribution per room** | 17,500 | 12,000 | 21,250 |

Since the highest contribution per room is earned by super deluxe rooms, the hotel should offer super deluxe rooms first to the customers. Therefore, to whoever inquires, Woodland should offer the most profitable room first. However, in service industries, it is pretty difficult to control sales in accordance with the contribution per limiting factor. Here, other factors like customer preferences, availability of a substitute, etc. also play a major role in profitability.


A limiting factor is a factor that acts as

**A** A constraint in meeting the demand
**B** An assistance in meeting the demand
**C** An irrelevant factor as far as demand is concerned
**D** None of the above


Sure shot Plc manufactures bed linen. It produces three varieties of bed linen, which are immensely popular because they are designed in a very innovative style. Information on future market demands as well as machine hours is given in table below.

| | Type 1 | Type 2 | Type 3 |
|---|---|---|---|
| Contribution | Tshs8,000 | Tshs6,000 | Tshs10,000 |
| Machine hours required per unit | 2 | 3 | 4 |

Machine hours are a limiting factor. Prepare a statement showing contribution per machine hour and identify the product with the highest contribution per limiting factor.

## Answers to Test Yourself

**Answer to TY 1**

The correct option is **C**.

To know the level of activity at which there will be a no profit no loss situation, we need to calculate the breakeven point.

Calculation of per unit contribution:

| | **Tshs'000** |
|---|---|
| Selling price (per unit) | 25 |
| **Less:** Variable costs (Tshs10,000 + Tshs5,000 + Tshs2,000) | 17 |
| Contribution (per unit) | 8 |

$$\text{Break-even point (in units)} = \frac{\text{Total fixed costs}}{\text{Contribution per unit}}$$

$$= \frac{\text{Tshs80,000,000}}{\text{Tshs8,000}}$$

= 10,000 units

Time Ltd must produce and sell 10,000 watches so that there will be a no loss no gain situation.

**Answer to TY 2**

Margin of safety (in units) = expected sales – break-even point
= 42,100 units – 35,000 units
= 7,100 units

$$\text{Margin of safety (as a percentage )} = \frac{\text{Margin of safety in volume}}{\text{expected sales}} \text{ x } 100$$

Expected sales

$$\frac{7,100}{42,100} \text{ x } 100$$

= 16.86%

**Answer to TY 3**

The correct option is **D**.

$(1.031)^3 - 1) \times 100 = 9.59\%$

**Answer to TY 4**

Net present value at a cost of capital of 10% per annum

| Time | Cash flow (Tshs'000) | Discount factor (10%) | Present value (Tshs'000) |
|---|---|---|---|
| 0 | (150,000) | 1·000 | (150,000) |
| 1 | 50,000 | 0·909 | 45,450 |
| 2 | 65,000 | 0·826 | 53,690 |
| 3 | 60,000 | 0·751 | 45,060 |
| 4 | 70,000 | 0·683 | 47,810 |
| 5 | 90,000 | 0·621 | 55,890 |
| | | | **97,900** |

Cash flow would be: Tshs65,000,000 + Tshs25,000,000

Net present value of using the machinery for sub-contract work is Tshs97,900.

**Answer to TY 5**

**Calculation of NPV**

| Year | 0<br>Tshs'000 | 1<br>Tshs'000 | 2<br>Tshs'000 | 3<br>Tshs'000 | 4<br>Tshs'000 |
|---|---|---|---|---|---|
| Initial cost | (1800,000) | | | | |
| Sales Revenue | | 8,437,500 | 3,780,000 | 3,105,000 | 2,970,000 |
| Direct materials | | (1,822,500) | (850,500) | (729,000) | (729,000) |
| Variable production costs | | (2,025,000) | (945,000) | (810,000) | (810,000) |
| Advertising | | (1,462,500) | (225,000) | | |
| **Net cash flow** | **(1800,000)** | **3,127,500** | **1,759,500** | **1,566,000** | **1431,000** |
| Discount at 10% | 1.000 | 0.909 | 0.826 | 0.751 | 0.683 |
| **Present values** | **(1800,000)** | **2,842,898** | **1,453,347** | **1,176,066** | **977,373** |
| Present value of cash inflow – [(1800,000)+2,842,898+ 1,453,347+1,176,066+ 977,373] | 6,449,684 | | | | |
| Initial investment | (1,800,000) | | | | |
| **Net present value** | **4,649,684** | | | | |

- **Conclusion:** Since the project's NPV is positive it is financially viable and should be accepted.
- **Note:** Fixed costs were irrelevant as they represented an apportionment of overheads and were unaffected by the investment decision.

**Answer to TY 6**

The correct option is **A**.

A limiting factor limits our production as it is a factor which is essential for production but is scarce. It is a necessary factor for production and due to its scarcity it does not assist but limits the production.

**Answer to TY 7**

The contribution per unit is given. Let us now calculate the contribution per limiting factor.

| | Type 1 | Type 2 | Type 3 |
|---|---|---|---|
| Contribution | Tshs8,000 | Tshs6,000 | Tshs10,000 |
| Machine hours required per unit | 2 | 3 | 4 |
| Contribution per machine hour | Tshs4,000 | Tshs2,000 | Tshs2,500 |

Type 1 gives the highest contribution per limiting factor i.e. Tshs4,000 per machine hour.

## Self-Examination Questions

**Question 1**

Machinery requires an investment of Tshs200,000,000. Annual cash inflows are expected to be Tshs45,000,000 per year for 4 years. The machine has disposal value of Tshs15,000,000 after four years.

Calculate the payback period of the investment based on future incremental cash flows.

**A** 4.2 years
**B** 4 years
**C** 4.3 years
**D** 4.4 years

**Question 2**

Calculate the annual cash inflow from the following details.

A company requires cash outflow of Tshs104,000,000 from an investment project with the constant annual cash inflows for five years (Years 1 to 5).

| | |
|---|---|
| Net present value (NPV) | Tshs13,588,000 (positive) |
| Discount rate | 10% per annum |
| Internal rate of return | 15% |

Annuity factors (Years 1 to 5) at 10% and 15% are 3.79 and 3.352 respectively.

**A** Tshs31,026,000
**B** Tshs36,657,000
**C** Tshs33,508,000
**D** Tshs32,659,000

**Question 3**

Sun Inc is investing in new machinery costing Tshs300,000,000. The machinery has seven years of estimated life. The cost of capital is 10% per annum. Estimated cash flows are:

| Year | Cash flows | Cumulative discount factor @ 10% |
|---|---|---|
| 1 to 7 (inflows) | Tshs97,000,000 per annum | 4.23 |
| 7 (residual value) | Tshs23,000,000 | 0.84 |

What is the net present value of the project?

**A** Tshs116,200,000
**B** Tshs129,630,000
**C** Tshs132,320,000
**D** Tshs165,450,000

**Question 4**

Which of the sentences below is correct regarding the break-even point?

**A** Break-even point = $\frac{\text{Total fixed cost}}{\text{Number of units produced}}$

**B** At the break-even point contribution is equal to variable cost.

**C** At BEP of activity, there is neither a loss nor a profit.
**D** None of the above

**Question 5**

Paper Ltd had given the following information. Based on the information, suggest to them how much they should produce per year so that all the fixed cost is recovered.

| | **Tshs'000** |
|---|---|
| Selling price (per unit) | 50 |
| Variable cost (per unit) | 40 |
| Total fixed cost (per year) | 120,000 |

**A** 10,000 units
**B** 12,000 units
**C** 3,000 Units
**D** 2,400 units

**Question 6**

Doll Co runs a toy manufacturing unit. The company's target for 20X3 is to manufacture 30,000 units. The per unit selling price of the product is Tshs12,000. The total variable cost of the product is Tshs6,000. During 20X3 the company expects to earn a profit of Tshs48,000,000.

What must be the company's per annum fixed cost?

**A** Tshs132,000,000
**B** Tshs18,000,000
**C** Tshs78,000,000
**D** None of the above

**Question 7**

Baby Care Co is a company that manufactures baby shampoo. It recently launched a special new shampoo for babies. The cost structure for the product is as follows:

| | **Tshs'000** |
|---|---|
| Direct material cost | 18 |
| Direct labour cost | 12 |
| Variable overhead | 7 |
| Fixed cost (per annum) | 147,000 |

The selling price of the product is Tshs50 per unit. In this situation, the C/S ratio of the company is:

**A** 62%
**B** 40%
**C** 26%
**D** None of the above

## Answers to Self Examination Questions

**Answer to SEQ 1**

The correct option is **D**.

Payback period

$$= \frac{\text{Tshs200,00,000}}{\text{45,000,000}}$$

= 4.4 years

**Answer to SEQ 2**

The correct option is **A**.

$$\frac{[\text{Tshs104,000,000} + \text{Tshs13,588,000}]}{3.79} \text{ OR } [\frac{\text{Tshs104,000,000}]}{3.352}$$

= Tshs31,026,000

**Answer to SEQ 3**

The correct option is **B**.

= [(Tshs97,000,000 x 4.23) + (Tshs23,000,000 x 0.84) – Tshs300,000,000]
= Tshs429,630,000 – Tshs300,000,000
= Tshs129,630,000

**Answer to SEQ 4**

The correct option is **C**.

The break-even point is a no loss no profit situation.

At the break-even point, contribution is just enough to recover fixed costs. Any activity below the BEP, the firm will make a loss, while above this level it will make a profit.

**Answer to SEQ 5**

The correct option is **B**.

From the given information we may compute the sales as follows.

Contribution = Sales – variable cost
= Tshs50,000 - Tshs40,000
= Tshs10,000

$$\text{Break-even point (units)} = \frac{\text{Total fixed cost}}{\text{Contribution per unit}}$$

$$= \frac{\text{Tshs120,00,000}}{\text{Tshs10,000}}$$

= 12,000 units

**Answer to SEQ 6**

The correct option is **A**.

The contribution per unit will have to be computed from the given data as

Contribution per unit = Selling price per unit – variable cost per unit
= Tshs12,000 - Tshs6,000
= Tshs6,000

Fixed cost = Required contribution – profits
= (30,000 x Tshs6,000) - Tshs48,000,000
= Tshs132,000,000

**Answer to SEQ 7**

The correct option is **C**.

$$\text{C/S ratio} = \frac{(S - V)}{S} \times 100$$

$$= \frac{(\text{Tshs50,00} - (\text{Tshs18,000,+ Tshs12,000 + Tshs7,000}))}{\text{Tshs50,000}} \times 100\%$$

= 26%

In the above solution we have deducted all the costs of direct material, direct labour and variable overheads from the selling price of Tshs50,000 to arrive at the contribution.

# 6

# FORECASTING AND BUDGETING

## Get Through Intro

Planning is the first step towards achieving the goals of an organisation. Budgeting and forecasting are tools that help the management give front line managers an operational level plan that they may execute. Forecasting is also an essential forward-looking technique that helps forecast variables such as demand. Similarly, analysing past trends is also essential in order to predict future trends with ease.

Budgeting and forecasting are essential tools that help management in setting targets and devising strategy. This Study Guide will help you learn forecasting techniques like trend analysis, regression analysis and other qualitative techniques such as the Delphi method. It will also introduce you to basic budgets and the compilation of budgets from given data.

In an organisation, it is the responsibility of an accountant to prepare budgets and forecasts for management in order to devise production, sales and marketing plans for the year ahead. This Study Guide will equip you with the basic knowledge essential to prepare budgets and forecasts. It is also an important topic from exam point of view for practical questions on budgets and forecasts.

## Learning Outcomes

a) Compile forecasts for management information purposes.
b) Compile budgets and extracts from budgets using information provided.
c) Select and justify the choice of the most appropriate methods of budgeting for planning and controlling including motivational considerations, including:
   i. Bottom-up and top-down approaches
   ii. Marginal and absorption approaches
   iii. Activity based costing
   iv. Zero-based and incremental approaches
   v. Beyond budgeting approaches.
d) Compile and identify and explain the business consequences of a cash budget identifying flows, balances and limits.
e) Calculate and explain the working capital and cash cycles of a business.

## 1. Compile forecasts for management information purposes.

**[Learning Outcome a]**

Forecasting is predicting or estimating the future results by using past and present data. It is used by organisations to budget costs and revenues. Moreover, it gives an idea regarding the future events and prepares management to face the challenges that lie ahead.

Some of the methods of forecasting used by management are:

- Qualitative methods like the 'Delphi method' and the product lifecycle method
- Quantitative methods like time series, regression analysis and moving averages

All these are statistical methods of forecasting that help management predict sales and revenue forecasts and cost estimations for future periods.

### 1.1 Delphi method (qualitative method)

The Delphi method was first used during the cold war to estimate the effects of technology on warfare. This method uses the opinion of experts on the variables to be forecasted using present and past data. These opinions are shared amongst the experts and a consensus is reached through continuous feedback and questioning sessions.

The Delphi method follows a questionnaire approach where experts are supposed to present their forecasts, opinions and observations on a certain variable under consideration. This method maintains complete secrecy about the group participants and the identities of the participants are never revealed. This overcomes the open group problems where participants are heavily influenced by the group leader and cannot change their opinion even after listening to diverse opinions from other participants. The Delphi method appoints a facilitator who assimilates all comments and opinions from participants and discards all unnecessary information generated. This keeps the process focussed on the real issue. Opinions and counter opinions are systematically collected and a consensus is gradually reached.


The Delphi method can be used to predict future sales demand by preparing a set of questions to be answered by experts regarding past and present data. These questions can be asked over and over again to different groups of experts to form a consensus, and finally decide upon sales forecasts for a future period. These forecasts can be used to plan production and marketing activities of the organisation.

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### 1.2 Forecasting by adjustment for price movements

The forecasting based on the historical data is reliable only under the conditions of stable prices. However it suffers from major limitations under the condition of inflation or deflation. When the purchasing power of money has been constantly fluctuating, the historical data based costing fails to recognise the impact of such changes.

Thus the cost accounting which has not been adjusted for the impact of such price movements can mislead both the internal and external user. This is because the decisions taken on the basis of such unadjusted historical or forecast data could be wrong.

A price index (price indices) is used in order to adjust the data with the price movements. These indices identify the level of changes in prices and the rate of inflation or deflation. A price index is a standard average of prices for particular group of goods or services in a given period of time.

It is a statistic used to compare how prices differ between time periods. It depicts how prices have changed compared with the price at a particular point of time (base period). A base period has index number of 100.

Let us take the following example to understand the adjustment of prices using price level index.

**Example**

Beenee Plc has provided the following data price level index and total cost for the last three years.

| Year | Price level index | Total cost (Tshs'000) |
|---|---|---|
| 20W8 | 100 | 105,000 |
| 20W9 | 108 | 120,000 |
| 20X0 | 112 | 122,000 |
| 20X1 | 120 | 128,000 |
| 20X2 | 125 | 132,500 |
| 20X3 (forecast) | 130 | |

Restate the total cost for the five years (from 20X3 to 20X7) to the forecast price level using price index.

**Answer**

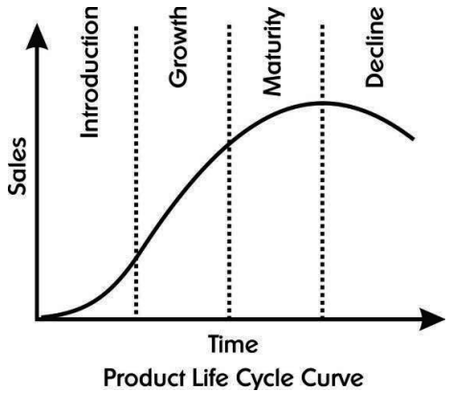
| Year | Price level index | Total adjusted cost |
|---|---|---|
| 20W8 | 105,000,000 x 130/100 | 136,500,000 |
| 20W9 | 120,000,000 x 130/108 | 144,444,444 |
| 20X0 | 122,000,000 x 130/112 | 141,607,143 |
| 20X1 | 128,000,000 x 130/120 | 138,666,667 |
| 20X2 | 132,500,000 x 130/125 | 137,800,000 |

## 1.3 Forecasting using the product life cycle concept (qualitative method)

The term 'product life-cycle' refers to the succession of stages a product goes through during its lifetime. It is claimed that every product has a life-cycle. It is launched; it grows and may, at some point of time, die.

Product life cycle describes the process by which a new product is introduced, is gradually accepted, is sold well for a particular time and then gradually become out-dated. The progression of a product through these stages is however, not certain.
The following diagram shows the different stages of a product life cycle

**Diagram 1: Product life cycle curve**



Product Life Cycle Curve

### 1. Importance of PLC in forecasting

As explained above, a product life cycle model shows how a product goes through different stages during its lifetime.

For each of the business functions at each stage of life-cycle of each product, costs keep on being incurred.

- At the **introduction and development stage**: research and development cost, costs of product design, capital equipment etc.

- At the **growth and maturity stage**: these stages witness both growth and maturity in sales. All the manufacturing, marketing (customer service, promotion etc.), selling and distribution costs (transport and handling) are incurred at this stage.

- At the **decline stage**: the demand for the product declines at this stage. The producers may be required to provide after sales service for the products sold in the past. Costs that are incurred in this stage include all costs relating to after sales service including provision of spares, expert services and costs of abandonment and disposal of the product.

Including sales forecasting, the concept of PLC also helps in forecasting:

- pricing,
- advertising,
- product planning, and
- other aspects of marketing

**2. Role of PLC in sales forecasting**

The demand for a product can be forecast by understanding the characteristics of the various stages of a product life cycle.

The various stages indicate different degrees of competition and different requirements of marketing expenses and research and development costs etc.


A high amount of research and development expenses are incurred at the initial stage of the product life cycle. Every product life cycle stage determines the extent to which a product is accepted by consumers. All these functions ultimately facilitate sales forecasting.

---

According to the product life cycle theory, sales of a new product initially grows at a rapid rate, then the rate of growth starts diminishing and finally sales decline, after a certain period of time. This is the most common pattern of a product sale, which can be easily identified with the help of the product cycle curve.

However, enormous technological improvements and competition in the market have reduced the length of the product life cycle for many products e.g. mobile phones, laptops etc. As a result of this, the life cycle model, along with predicting the sales of products, also addresses the transitional phases of a product's life (period after introduction and prior to phase-out) .

**3. Role of PLC in price forecasting**

Most accounting systems report revenue, costs and profit on a periodic basis, and product profits are not monitored over their life-cycle. A failure to trace all costs of products over their life-cycle hinders management's understanding of product profitability, because a product's actual life-cycle profit is unknown.

Life-cycle costing estimates and accumulates costs over a product's entire life-cycle so as to determine whether the profits earned during the manufacturing phase will cover the costs incurred during the pre- and post manufacturing stages. To estimate the life-cycle costs it is essential to identify the costs incurred through different stages of life-cycle of a product.

Only on knowing the life-cycle costs of a product, can one appropriately decide on its price.

Moreover, if viewed from the angle of customer life-cycle costs, the life-cycle costs provide input for pricing across the lifecycle.

**Example**

An automobile manufacturer's aim is to design cars that would minimise maintenance cost. The company expects to charge a higher price and / or gain greater market share by selling these cars. Similarly, manufacturers of washing machines and dishwashers charge higher prices for models that save electricity and have low maintenance costs.

**Test Yourself 1**

From the following information, restate the total overheads to the base year (20W8) price level using price index.

| Year | Price level index | Overheads (Tshs'000) |
|---|---|---|
| 20W8 | 100 | 20,000 |
| 20W9 | 105 | 22,000 |
| 20X0 | 110 | 23,500 |
| 20X1 | 113 | 24,150 |
| 20X2 | 116 | 25,200 |
| 20X3 | 120 | 26,000 |

### 1.4 Forecasting using time-series analysis (quantitative method)

A **time series** is a series of data points i.e. figures or values recorded over time that indicates the trend of the data series.

**Example**

Monthly sales volume over the last five years; or sales during a particular season over the last ten years are examples of time series.

Time series analysis is one of the quantitative techniques of forecasting that aims to understand the trend of the data collected in regular intervals over a period of time, in order to project the trend for the future period. Under this method the past data is collected to understand its behaviour, and projected into the future to estimate the variable under consideration.

#### 1. Components of times series

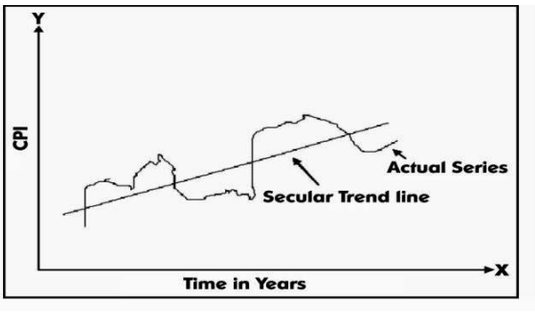
The variations observed in time series analysis (**principles of time series**) can be attributed to the following:

**(a) Secular trend**

Secular trend is an accurate (without having any influence of cyclical fluctuations, seasonal variations and irregular variation) trend of data over a long period of time to analyse whether the value of the variable is decreasing, increasing or constant. From the actual time series, a trend line is plotted in order to understand the trend.

In the graph, we may notice that the variable is moving in a particular direction as indicated by the secular trend line.

**Diagram 2: Secular trend of consumer price index**




This gives an understanding of the behaviour of the variable and enables this behaviour to be projected into the future.

**Example**

An organisation has provided you with the following time series covering data over the last six years.

| Year | Sales Tshs million | Profit Tshs million | Production Units |
|---|---|---|---|
| 1 | 20,000 | 1,300 | 12,000 |
| 2 | 21,500 | 1,400 | 11,850 |
| 3 | 21,000 | 1,250 | 11,800 |
| 4 | 22,000 | 1,350 | 11,950 |
| 5 | 22,200 | 1,200 | 11,700 |
| 6 | 24,000 | 1,200 | 11,560 |

Let us find out the trend of changes in the value of the given variables over the period of time.

**Sales revenue:** From the given data, we can observe that there is an upward trend in sales revenue. Though there is a decrease in sales revenue between years 2 and 3, the overall movement in sales revenue for the given period indicates a rising trend.

**Profit:** The time series has shown an increase from year 1 to year 2, a decrease from year 3 to year 4, and constant between year 5 and year 6. Hence there is no clear movement in the amount of profit over the given period of time.

**Production volume:** Observing the given time series, we can find that the production volume is decreasing every year except year 4, where production has increased. Hence, there is a downward trend in total production volume over the last 6 years.

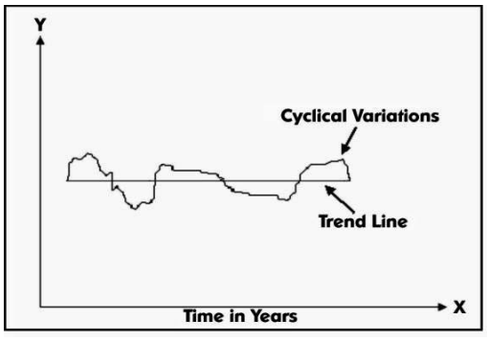
---

**(b) Cyclical fluctuations**

Sometimes, the variations in the given data series might occur as a result of cyclical fluctuations. The most common reason for a cyclical fluctuation is the movement in the business cycle. Here too, the variable is analysed over a long period.

The future movement of the variable under consideration can be forecast taking into consideration the possible movements of the business cycle during the period under consideration. (e.g.. an anticipated boom in the economy would cause the trend line to move upwards and vice-versa).

**Diagram 3: Cyclical variations**

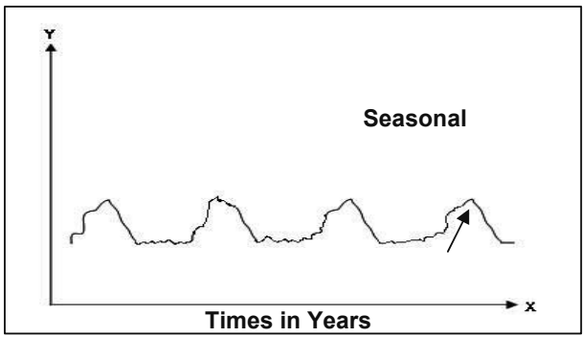


**(c) Seasonal variations**

Seasonal variation is a component of time series which takes place in a short period of time. It indicates the regular and predictable fluctuations within a year or period of less than a year e.g. quarterly, monthly or weekly.

When a curve plotted, representing a time series shows a similar pattern during a certain period over successive years, it is indicative of seasonal variation.

**Diagram 4: Seasonal variation**




## Example

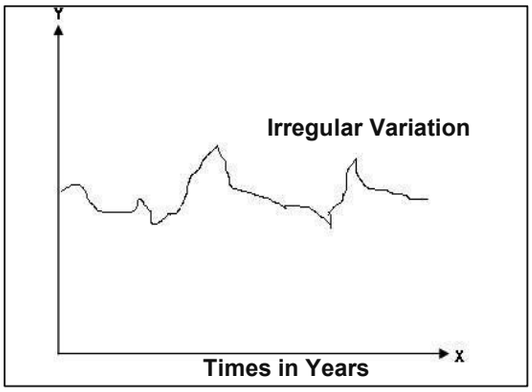
If we observe the trend for the sale of winter garments over a number of years, it will be revealed that, in the winter season, the sales increase substantially in all the years under observation. This trend of raised sales during the winter season is attributable to seasonal variations. We can, therefore, predict that, in the coming years, the sale of winter garments will increase during the winter season.

**(d) Irregular variation**

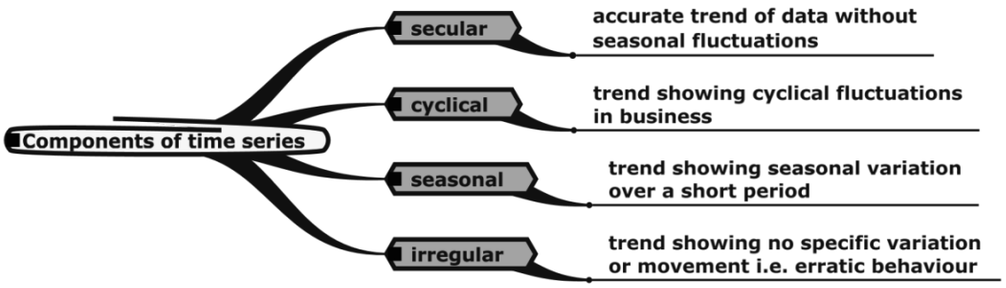
Sometimes, the time series may not show any specific trend, and the variable may move inconsistently. It is difficult to pinpoint any reason for the erratic behaviour of the variable under consideration.

These kinds of variations are generally observed in cases where the time series are analysed for a few days or months and not over a long period.

**Diagram 5: Irregular variation (no trend)**




**SUMMARY**




## Test Yourself 2

Which of the following is/are correct?

(i) Time series analysis is a quantitative method of forecasting.
(ii) A seasonal variation is a component of time series that indicates the regular and predictable movements in the value of a given variable over a short period of time.
(iii) Time series analysis identifies the changes and direction of change in values of variables over a period of time.

**A** (i)
**B** (i) and (ii)
**C** (ii) and (iii)
**D** All of the above

---

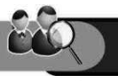
### 1.5 Forecasting using moving averages, seasonal variations and regression coefficients to make budget forecasts

#### 1. Calculation of moving averages

One of the **methods of finding a trend** is the moving average method. Moving averages are widely used in time series analysis for forecasting purposes. It is an average of the different outcomes of a given number of periods. The moving average method redistributes the results obtained over a wider period of time to remove the effect of random and large variations from time series data. Moving averages remove the effects of seasonal variations and smooth the data set for further analysis.

For a given time series, the moving total is calculated for a fixed number of periods (e.g. three years or three quarters etc.). From the moving total, the average for that period is calculated.

Let us understand the calculation of moving averages with the help of the following example.



**Example**

The following are the sales figures for the last five years. Calculate the moving average for three years.

| Years | Sales (in units) |
|---|---|
| 20X4 | 200 |
| 20X5 | 250 |
| 20X6 | 225 |
| 20X7 | 260 |
| 20X8 | 280 |

**Answer**

| Years | Sales (in units) | Moving Total | Moving average |
|---|---|---|---|
| 20X4 | 200 | | |
| 20X5 | 250 | 675 (200 + 250 + 225) | 225 (675/3) |
| 20X6 | 225 | 735 (250 + 225 + 260) | 245 (735/3) |
| 20X7 | 260 | 765 (225 + 260 + 280) | 255 (765/3) |
| 20X8 | 280 | | |

---

When the set of data considered in a time series is **odd**, the moving averages are already centred as shown in the above example, but when the set of data considered is even, the moving averages do not become centred. In this case, we need to calculate the centred moving average.

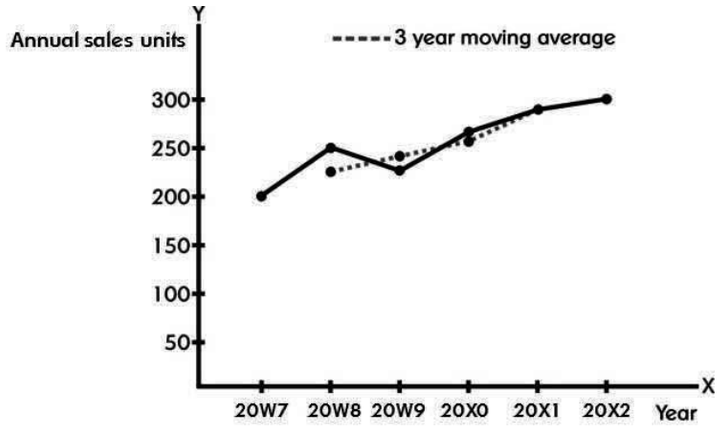
When calculating a moving average, placing the average in the middle of the time period makes sense. If we average an **even number of terms**, we need to smooth out the value. To do this, the centred moving average is calculated by taking the mean of the two moving averages.

**Example**

In the above example, if we add one more year, and the corresponding sales are 300, the centred moving average would be calculated as follows:

| Years | Sales (in units) | Moving Total | Moving average | Centred moving average |
|---|---|---|---|---|
| 20W7 | 200 | | | |
| 20W8 | 250 | 675 | 225 | |
| 20W9 | 225 | 735 | 245 | 235 [(225 + 245)/2] |
| 20X0 | 260 | 765 | 255 | 250 [(245 + 255)/2] |
| 20X1 | 280 | 840 | 280 | 267.5 [(255 + 280) /2] |
| 20X2 | 300 | | | |

The **graphical presentation** of moving averages is explained below.




**2. Seasonal variations (additive and multiplicative) to make budget forecasts**

There are two models of time series analysis: the additive model and the multiplicative model, used to estimate the seasonal variations.

**(a) Additive model**

In order to forecast the future by using time series analysis, we consider various factors influencing the variable over the time period under consideration. They could include secular trend, cyclical variations, seasonal variations and irregular fluctuations.

Under the additive model, it is assumed that the factors of the series i.e. seasonal variations, secular trend, cyclical variations and irregular fluctuations are independent of each other and do not have any impact on each other.

**Example**

The trend of sales of shoes may be attributable to factors such as the trend of the growth of the business, the trend of a boom in the business cycle, the growth of sales of shoes during festive seasons and other unknown factors causing erratic behaviour of the overall trend of sales. However, these factors act independently on the trend and do not influence each other.

Therefore under this method, time series is predicted using the formula below:

$$y = T + S + C + I$$

Where,
y = the actual time series
T = the trend series
S = the seasonal component
C = the cyclical component
I = the irregular component

**(i) Finding out the seasonal trend from the additive model**

The effect of each phase of cyclical variation is felt through a long period of time, about 10 to 12 years, whereas the future is generally forecasted for a shorter period which may be a quarter, six months or at the most a year. Therefore, the effect of cyclical variation on the variable may not be significant.

Also, in time series analysis, generally, a moving average is used, in which the earliest year is eliminated and a new year is added. This takes care of the impact of cyclical variations on the time series analysis.
Therefore, the time series formula may be written, ignoring the effect of the cyclical variation as: y = T + S + I.

Once the moving or centred moving averages are calculated, variance is calculated and, on the basis of these variances, adjustments are made to reduce the effect of seasonal variations.

It is assumed that irregular fluctuations will have a negligible effect on the trend, and hence can be ignored. Therefore, actual time series can only be ascertained by considering secular trend and seasonal variations. Seasonal variations can be calculated as S = y – T.

**Example**

The following is the quarterly data for the last three years' sales (Tshs'000) of Ramco Plc. Find out the seasonal components of the trend using the additive model.

| Year | Actual | | | |
|---|---|---|---|---|
| **20Y0** | **I** | **II** | **III** | **IV** |
| | 420,000 | 440,000 | 500,000 | 620,000 |
| **20X1** | **I** | **II** | **III** | **IV** |
| | 450,000 | 460,000 | 540,000 | 660,000 |
| **20X2** | **I** | **II** | **III** | **IV** |
| | 500,000 | 490,000 | 590,000 | 690,000 |

**Answer**

Its four years moving average

| Years | Quarters | Actual Y | Moving Average | Centred Moving Average T | Seasonal Variations (Y – T) |
|---|---|---|---|---|---|
| 20Y0 | I | 420,000 | | | |
| | | | | | |
| | II | 440,000 | | | |
| | | | 495,000 | | |
| | III | 500,000 | | 498,750 | 1,250 |
| | | | 502,500 | | |
| | IV | 620,000 | | 505,000 | 115,000 |
| | | | 507,500 | | |
| 20X1 | I | 450,000 | | 512,500 | (62,500) |
| | | | 517,500 | | |
| | II | 460,000 | | 522,500 | (62,500) |
| | | | 527,500 | | |
| | III | 540,000 | | 533,750 | 6,250 |
| | | | 540,000 | | |
| | IV | 660,000 | | 543,750 | 116,250 |
| | | | 547,500 | | |
| 20X2 | I | 500,000 | | 553,750 | (53,750) |
| | | | 560,000 | | |
| | II | 490,000 | | 563,750 | (73,750) |
| | | | 567,500 | | |
| | III | 590,000 | | | |
| | | | | | |
| | IV | 690,000 | | | |

Years

**Notes:**

1. Calculation of moving averages (in Tshs'000) :

(420,000 + 440,000 + 500,000 + 620,000)/4 = 495,000
(440,000 + 500,000 + 620,000 +450,000)/4 = 502,500

Other moving averages are calculated in the same manner.

2. Calculation of centred moving averages (in Tshs'000):

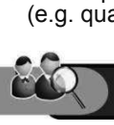
(495,000 + 502,500)/ 2 = 498,750 (502,500
+ 507,500)/2 = 505,000

Subsequent centred moving averages are calculated in the same manner.

---

**(ii) Predicting future value of time series**

To project the actual trend into the future, the seasonal variations need to be identified. The seasonal variations over the periods will not be the same, but the average of the variations for the preceding similar periods (e.g. quarter-wise) can be taken as representative figures.



**Example**

**Continue with the above example of Ramco Plc**

| Year | Quarters | | | | Total |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| 20Y0 | | | 1,250 | 115,000 | |
| 20X1 | (62,500) | (62,500) | 6,250 | 116,250 | |
| 20X2 | (53,750) | (73,750) | | | |
| **Averages** | **(58,125)** | **(68,125)** | **3,750** | **115,625** | **(6,875)** |

---

**(iii) Projecting the trend**

The sum of the variations due to seasonal factors around the basic trend line should be zero in ideal conditions. Therefore, we need to adjust -6,875 in total i.e. -6,875/4 = -1,718.75 per quarter to have the sum of the quarterly variances as zero.

**Example**

**Continuing the above example of Ramco Plc**

| | Tshs'000 | Tshs'000 | Tshs'000 | Tshs'000 | Total Tshs'000 |
|---|---|---|---|---|---|
| Averages | (58,125) | (68,125) | 3,750 | 115,625 | (6,875) |
| Adjustment | 1,718.75 | 1,718.75 | 1,718.75 | 1,718.75 | 6.875 |
| **Trend of seasonal variations** | **(56,406)** | **(66,406)** | **5,468.75** | **117,344** | **0** |

The moving average trend for the projected period is identified by averaging out the increase in the secular trend during the period of observation.

$$\text{Average increase in trend} = \frac{\text{Last centred moving average - first centred moving average}}{\text{Number of time periods - 1}}$$

It comes out to be (563,750– 498,750)/(8-1) = 65,000/7 = 9,285.7.

The actual trend may be calculated as follows:

| Quarters | 20X2 | | 20X2 | |
|---|---|---|---|---|
| | III | IV | I | II |
| Base trend (central moving average for II quarter, 20X2) | 563,750 | 563,750 | 563,750 | 563,750 |
| **Add:** Quarterly increasing trend | 9,285.7 | 18,571.4 (9,285.7 x 2) | 27,857.1 (9,285.7 x 3) | 37,142.8 (9,285.7 x 4) |
| **Actual trend** | **573,035.7** | **582,321.4** | **591,607.1** | **600,892.8** |
| **Quarterly projected sales** | **Tshs573,035,700** | | **Tshs591,607,100** | |

**(b) Multiplicative models**

Under this method, it is assumed that the components of time series have an impact on each other, which therefore multiplies the effect.

The formula used under this method is:

$$y = T \times S \times I \times C$$

Under this model, seasonal variations can be calculated as S = y/T, ignoring the irregular and cyclical variations.

**Example**

Forecast the sales of Fortune Ltd from the given quarterly data of the last three years, assuming the multiplicative model

| Years | Quarters | Sales (Tshs'000) |
|---|---|---|
| 20Y0 | I | 280,000 |
| | II | 360,000 |
| | III | 350,000 |
| | IV | 310,000 |
| 20X1 | I | 320,000 |
| | II | 400,000 |
| | III | 370,000 |
| | IV | 350,000 |
| 20X2 | I | 340,000 |
| | II | 420,000 |
| | III | 390,000 |
| | IV | 360,000 |

**Answer**
**Figures in Tshs'000**

| Years | Quarters | Actual (a) | Moving Average (b) | Centred moving Average (c) | Seasonal variations percentage (d)=[(a)/(c)] x 100 |
|---|---|---|---|---|---|
| 20Y0 | I | 280,000 | | | |
| | II | 360,000 | 325,000 | | |
| | III | 350,000 | | 330,000 | 106 |
| | IV | 310,000 | 335,000 | 340,000 | 91 |
| | | | 345,000 | | |
| 20X1 | I | 320,000 | | 347,500 | 92 |
| | II | 400,000 | 350,000 | 355,000 | 113 |
| | III | 370,000 | 360,000 | 362,500 | 102 |
| | IV | 350,000 | 365,000 | 367,500 | 95 |
| | | | 370,000 | | |
| 20X2 | I | 340,000 | | 372,500 | 91 |
| | II | 420,000 | 375,000 | 376,250 | 112 |
| | III | 390,000 | 377,500 | | |
| | IV | 360,000 | | | |

**Continued on the next page**

| Year | Quarters | | | | Total |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| 20Y0 | | | 106 | 91 | |
| 20X1 | 92 | 113 | 102 | 95 | |
| 20X2 | 91 | 112 | | | |
| **Averages** | **91.5** | **112.5** | **104** | **93** | **401** |

For all the quarters, the modified mean percentage should come to 400 assuming 100 for each quarter. But the sum is 401; therefore, an adjustment of 0.25 per quarter is needed.

| | Quarters | | | | Total |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| Averages | 91.5 | 112.5 | 104 | 93 | 401 |
| Adjustment | (0.25) | (0.25) | (0.25) | (0.25) | (1) |
| **Trend of seasonal variations** | **91.25** | **112.25** | **103.75** | **92.75** | **400** |

The average percentage increase in the trend of centred moving average (in Tshs'000)
= (376,250– 330,000)/7 = 6,607.14

Forecast centred moving average trend (in Tshs'000) = 376,250 x 106.607%
= 401,346

Forecast sales for quarter I of year 20X2(in Tshs'000) = 401,346 x 91.25%
= 366,228.225
= 366,228 units

---

**3. Regression analysis**

Regression analysis establishes a relationship between:

- One or more **response variables** (also known as dependent variables, explained variables or predicted variables) and
- **Predictors** (also called independent variables, explanatory variables or control variables).

After learning about a close correlation between two variables, we will now try to assess the value of one variable given the value of the other. Regression Analysis is a statistical device used for predicting these unknown values of one variable (dependant variable) from the known values of the other (independent variable). This is accomplished through the regression line that describes the average relationship between two variables, say x and y. The regression line is the line which best represents the data on a graph.

For the purpose of this syllabus requirement, you will be dealing with **simple linear regression,** that is, regression on two variables only.

This is a statistical method, which illustrates the relationship between two variables using a linear equation. It assumes the best estimate of a response.

**(a) Least Squares Method of linear regression analysis**

This method envisages plotting the "line of best fit" (the line that best represents the given situation*)* for a given number of observations, by using a mathematical equation. Here we will make use of the linear equation learnt in Study Guide A3. The equation portrays a linear relationship between two variables **x and y** as below:

**y = a + bx**

In any given situation we will have the data for only one variable and the other variable will have to be derived using the formula **"y = a + bx".** When we have the value of one variable, say x, we now need to have the values of the constants **'a'** and **'b'** which can be put in the equation to arrive at the value of **y**.

The steps mentioned below guide us to derive the equations that will help us find the values of **a** and **b.**

The equation **"y = a + bx"** can be expressed for every period of activity as below:
Period 1: $y_1 = a + bx_1$
Period 2: $y_2 = a + bx_2$
Period n: $y_n = a + bx_n$
If you add these values, you get:

$\Sigma y = na + \Sigma bx$ ……. **(1)**

**Therefore,**

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

Again, by multiplying both sides of the equation **y =** a + bx by **x**, you get:

Period 1: $x_1y_1 = ax_1 + bx_1^2$
Period 2: $x_2y_2 = ax_2 + bx_2^2$
Period n: $x_ny_n = ax_n + bx_n^2$
When these are added together:
$\Sigma xy = a\Sigma x + b\Sigma x^2$ …… **(2)**

Substituting the value of 'a' as derived in the above equation in equation (2) we get

$$\Sigma xy = [\Sigma y/n - b\,\Sigma x/n]\,\Sigma x + b\Sigma x^2$$

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

$$n(xy - bx^2) = xy - b(x)^2$$

$$nxy - nbx^2 = xy - b(x)^2$$

$$nxy - xy = nbx^2 - b(x)^2$$

$$nxy - xy = b\,[nx^2 - (x)^2]$$

$$n(\Sigma xy - b\,\Sigma x^2) = \Sigma x\,\Sigma y - b\,\Sigma x^2$$

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

By using these 2 equations (1 and 2), you can arrive at the value of constants a and b and determine the trend in the cost line accordingly. Here are some noteable points:

- The straight line equation is **y = a + bx.** In this equation, a and b are constants.
- Once the values of constants a and b are known, the value of y corresponding to any value of x can be computed.

**Example**

You are provided with the following data:

| Month | Production (Units) | Semi-variable overheads (Tshs) |
|---|---|---|
| July | 220 | 22 |
| August | 220 | 23 |
| September | 240 | 23 |
| October | 240 | 25 |
| November | 260 | 25 |
| December | 260 | 27 |

Find the regression line by the least squares method. What would be the semi-variable overheads in January if production level increases to 2,700 units?

**Answer**

Calculation of the information required according to the formula to compute the regression coefficient:

| Month | Production volume (x) | Semi-variable overheads (y) | $x^2$ | xy |
|---|---|---|---|---|
| July | 220 | 22 | 48,400 | 4,840 |
| August | 220 | 23 | 48,400 | 5.060 |
| September | 240 | 23 | 57,600 | 5,520 |
| October | 240 | 25 | 57,600 | 6,000 |
| November | 260 | 25 | 67,600 | 6,500 |
| December | 260 | 27 | 67,600 | 7,020 |
| **Total** | **x = 1,440** | **y = 145** | **$x^2$ = 347,200** | **xy= 34,940** |

n = 6

You know that:
$y = na + b\Sigma x$ …….. **(i)**
$xy = ax + b\Sigma x^2$…… **(ii)**

Substituting these values in the above equations:
145 = 6a + 1,440b…… **(iii)**
34,940 = 1,440a + 347,200b……. **(iv)**

You will have to solve the above two equations to find the values of a and b. For this, we will have to subtract one equation from the other in such a way, that either ‘a’ or ‘b’ gets cancelled.

Observing equation **(iii)** we can see that if we multiply 6a by 240 we get 1440a.

So, multiplying equation (iii) by 240:
34,800 = 1,440a + 345,600b…… **(v)**

Now deduct equation (v) from equation (iv) to get:

34,940 = 1,440a + 347,200b
(-) 34,800 = 1,440a + 345,600b
140 = 0 + 1,600b
b = 140/1,600 **b**
**= 0.0875**

Substituting this value of b in equation (iii):
145 = 6a + (1,440 x 0.0875)
145 = 6a + 126
6a = 19
a = 3.167

Equation of a straight line is: y = a + bx
By substituting a and b by their values, the equation becomes: y
= 3.167 + 0.0875x
This is the regression line of best fit, where:
y = semi-variable overhead; x = volume of production

If x = 2700,

Then: y = 3.167 + 0.0875x  y = 3.167+ (0.0875 x 2700)
y = 236.25 + 3.167
y = 239.417

Thus, if production level is 2,700 units in January, semi-variable overhead will be Tshs239.417.

**(b) Use of regression analysis to determine trend and forecasting**

As in time series analysis, a trend is represented by a straight line, the following equations are used to predict the future:

$\Sigma y = nc + m\Sigma x$

$\Sigma xy = c\Sigma x + m\Sigma x^2$

In time series analysis, the independent variable is time. In the given equations, x is the independent variable representing time, and y represents the variable that is dependent on time. The values of y can be obtained for every value of x by identifying and replacing the values of m and c in the equation of the straight line. Here m is the variable element (co-efficient of x) and c is the fixed element.
Therefore, y = mx + c
Let us take an example to understand how future outcomes can be predicted using the regression equations under time series analysis.

**Example**

The following is the sales volume data of Compact Ltd, which has been selling personal computers for 5 years. With reference to this data, predict the sales volume for the sixth year.

| Period | Sales volume ('000 units) |
|---|---|
| 20W6 | 30 |
| 20W7 | 32 |
| 20W8 | 34 |
| 20W9 | 36 |
| 20X0 | 38 |

**Answer**

In order to predict the sales volume for the next year, we will use the following formulae -

$\Sigma y = nc + m\Sigma x$

$\Sigma xy = c\Sigma x + m\Sigma x^2$

As we know, in time series x, the independent variable represents time and the dependent variable y, represents sales volume. For the convenience of solving the problem, we replace x by X where X = x – 20W5

Therefore,

X = 1, 2, 3, 4, 5.
n = 5
X = 1 + 2 + 3 + 4 + 5 =15
y = 30 + 32 + 34 + 36 + 38 = 170

xy and $x^2$ are calculated below -

| | X | y | Xy | $X^2$ |
|---|---|---|---|---|
| | 1 | 30 | 30 | 1 |
| | 2 | 32 | 64 | 4 |
| | 3 | 34 | 102 | 9 |
| | 4 | 36 | 144 | 16 |
| | 5 | 38 | 190 | 25 |
| **Total** | **15** | **170** | **530** | **55** |

Put these values in the relevant places of the formulae:

170 = 5c + 15m (equation 1)

530 = 15c + 55m (equation 2)

Multiply equation (1) by 3 to get:

510 = 15c + 45m (equation 3)
530 = 15c + 55m

Subtract equation 3 from equation 2 to get:

20 = 10m
Therefore, m = 2

Put the value of m in equation (1) to get the value of c i.e. c = 28.

Put the values of m and c in the straight line equation i.e. y = mx + c to calculate 'y' i.e. the volume of sale with respect to a given year.

Therefore, for the sixth year,

y = 2 x 6 + 28 (Being the calculation of y for 20X1, X would be 6) y
= 40

For 20X1 the sales volume is expected to be 40,000 units.

**Example**

A regression line for sales forecasting is derived as follows on the base of the past experience of five years: Y = 343 + 0.2X. Forecast the sales units for the second month of the sixth year.

Here,
X = 62 (as in the example it is given five years i.e. 60 months and second month of the sixth years = 2)

Sales forecast: Y = 343 + 0.2X
= 343 + 0.2(62)
= 343 + 12.4
= 355.4

**Example**

From the following statistics, forecast the value of Y for the third quarter of 20X2.

n = 100, Y = 1,525, X = 2,536 and b = -2.36.

**Hint:** Consider X = 0 corresponds to first quarter of 20X1.

$$a = \frac{\Sigma Y}{n} - \frac{(b)\,\Sigma X}{n} = 15.25 - (-2.36)\,(25.36) = 15.25 + 59.85 = 75.10$$

As mentioned, the value of X (for the third quarter of 20X2) will be 7

$$Y = a + bx$$
$$= 75.10 + (-2.36)\,(7)$$
$$= 75.10 - 16.52$$
$$= 58.58$$

---

**Test Yourself 3**

Regression analysis is being used to find the line of best fit (y = a + bx) from ten pairs of data. The calculations have produced the following information: x = 100 y = 900 xy = 25,000 $x^2$ = 3,500 $y^2$ = 29,500 What is the value of 'a' in the equation for the line of best fit (to the nearest whole number)?

**A** 20
**B** 25
**C** 26
**D** 30

---

## 2. Compile budgets and extracts from budgets using information provided. [Learning Outcome b]

A budget is the financial forecast of an organisation. It is prepared in order to forecast future revenues, production targets, inventory and raw materials requirements etc.

### 3.1 Defining a budget

**Definition**

A budget is a quantitative statement for a defined period of time, which may include planned revenues, expenses, assets, liabilities and cash flows. A budget provides a focus for an organisation, aids the coordination of activities and facilitates control. Planning is achieved by means of a fixed master budget, whereas control is generally exercised through the comparison of actual costs with a flexible budget.

**CIMA official terminology**, **2005**

---

A budget is different from a forecast. A forecast only aims to predict what will happen in the future. On the other hand, a budget helps an organisation to plan its objectives for the future and the methodology to achieve these objectives.

Analysis of the definition reveals the following:

1. A budget is prepared and approved before the start of the accounting period (known as the budget period).

**Example**

The budget for the year 20X3 needs to be prepared before the start of 20X3 i.e. by the end of the year 20X2.

---

2. It is all about **planning** for the **future period** and **controlling** the **activities** (and in turn the costs) of an organisation by pursuing management policies. The objective of this overall organisational plan is achieved by means of a master budget. A **master budget** is a statement showing estimation of revenue, costs and **profit** / (**loss**) for the organisation as a whole.

3. It is a **quantitative** / **financial** statement with an **action plan**. In other words, it is a business plan, normally expressed in monetary terms.

4. A budget includes statements showing income, expenditure, cash flow and the capital to be employed.

5. A budget may either be in the form of a fixed master budget or in the form of a flexible budget. A **fixed budget** is devised based on the assumption of a particular capacity level e.g. selling a certain quantity of goods. On the other hand, a **flexible budget** is designed to adjust the cost levels according to changes in the actual level of activity. Flexible budgets are mainly used to exercise control over business activities.

**Example**

A manufacturing company is required to plan the future production in order to estimate the labour and raw material requirements. This information can be obtained from the sales budget.

The territory-wise sales budgets for the year 20X3 based on the estimates of the sales division managers were as follows:

South zone Sales of 20,000 units at a price of Tshs10,000
North zone Sales of 12,500 units at a price of Tshs9,000
East zone Sales of 10,000 units at a price of Tshs9,000
West zone Sales of 8,000 units at a price of Tshs9,000

Total budgeted sales were 50,500 units for the whole organisation.
Hence, the sales budget will look as follows:

| | South zone | North zone | East zone | West zone | Total |
|---|---|---|---|---|---|
| Budgeted units | 20,000 | 12,500 | 10,000 | 8,000 | 50,500 |
| Budgeted selling price | Tshs10,000 | Tshs9,000 | Tshs9,000 | Tshs9,000 | |
| **Total sales** | **200,000,000** | **112,500,000** | **90,000,000** | **72,000,000** | **474,500,000** |

With the help of this sales budget, the production department can prepare its budget for material and labour requirements.

**Test Yourself 4**

Which of the following statements hold true for a flexible budget?

(i) A flexible budget requires clear segregation between fixed and variable costs.
(ii) Under flexible budgeting, budgets can be modified easily for changes in the volume of activity. (iii) Flexible budget changes every year.

**A** Both (i) and (ii)
**B** Both (ii) and (iii)
**C** all of the above
**D** None of the above

We may also prepare a simple sales budget using the budgeted sales demand and the budgeted selling price.

**Example**

The following is the information provided by the sales manager of Colourful Park Ltd for the month of December 20X2:

| | Product Blue | Product Red |
|---|---|---|
| Budgeted sales (in units) | 10,000 | 40,000 |
| Budgeted selling price | Tshs40,000 | Tshs30,000 |

The sales budget of the company may be presented as follows:

**Colourful Park Ltd**
**Sales budget for the month of December, 20X2**

| Products | Budgeted sales | Budgeted sales | Total sales revenue |
|---|---|---|---|
| | Units | per unit Tshs | Tshs |
| Product: blue | 10,000 | 40,000 | 400,000,000 |
| Product: red **Total** | 40,000 | 30,000 | 1,200,000,000 |
| | | | **1,600,000,000** |

A production budget for the period may also be prepared after we prepare a sales budget. Keeping this as a basis, we may predict the quantities of finished goods to be produced to meet the sales demand.

**Example**

**Continuing the above example of Colourful Park Ltd**

A production budget based on the information provided by the sales manager and the store manager is given below:

| | Product Blue | Product Red |
|---|---|---|
| Budgeted sales (refer to the sales budget) | 10,000 (units) | 40,000 (units) |
| Inventory level required as at 31 December 20X2 | 500 | 4,500 |
| Inventory as at 1 December 20X2 | 200 | 2,000 |

The production budget for the year may be presented as follows:

**Colourful Park Ltd**
**Production budget for month of December 20X2**

| | Product Blue Units | Product Red Units |
|---|---|---|
| Budgeted sales | 10,000 | 40,000 |
| Add: closing inventory required | 500 | 4,500 |
| Total requirement | 10,500 | 44,500 |
| Less: opening inventory | 200 | 2,000 |
| **Budgeted production** | 10,300 | 42,500 |

## Test Yourself 5

Mark Trading Co sells two products A and B. The following estimates of sales volume are made for the year 20X3.

| | Ist Quarter | IInd Quarter | IIIrd Quarter | IVth Quarter |
|---|---|---|---|---|
| Product A | 100,000 | 140,000 | 90,000 | 120,000 |
| Product B | 90,000 | 120,000 | 100,000 | 110,000 |

The projected sales price for product A is Tshs10,000 per unit, while that of product B is Tshs20,000 per unit. You are required to prepare a sales budget for the year.

---

**3. Select and justify the choice of the most appropriate methods of budgeting for planning and controlling including motivational considerations, including:**
**i. Bottom-up and top-down approaches**
**ii. Marginal and absorption approaches**
**iii. Activity based costing**
**iv. Zero-based and incremental approaches**
**v. Beyond budgeting approaches.**

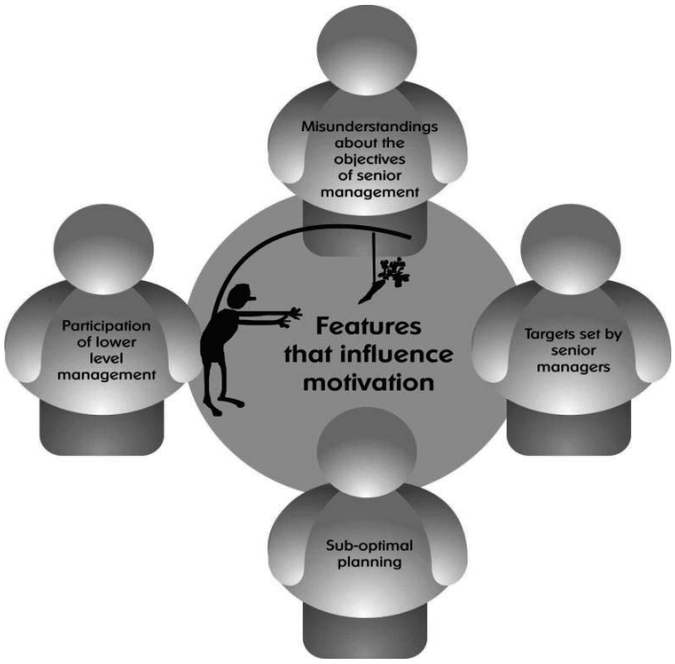
**[Learning Outcome c]**

### 3.1 Motivational considerations in the budgetary planning and control system

The effectiveness of a budgetary planning and control system is dependent on the attitude of those who are responsible for implementing it. A budget influences the behaviour of managers in the following ways:

- One of the objectives of a budget is to motivate. It motivates the people in the organisation to produce their best.
- Higher, but achievable targets motivate the personnel; however, unachievable targets demotivate them.
- Participation of the lower level management while devising the budget and transparency in the budgetary system ensures that they are suitably motivated.

**Diagram 6: Factors in the budgetary planning and control system that influence motivation**



The following are factors in a budgetary planning and control system that influence the motivation of the employees:

**1. Misunderstandings about the objectives of senior management**

A budget is often understood as a cost-cutting exercise. The lower and middle level managers, who prepare budgets, may fear that the upper level management will not approve the budget proposed by them. They will therefore try to cut the costs (and increase the sales target) wherever possible. Due to this, they may dislike the budgetary exercise and may not take the initiative to make it successful.

Also, due to fear of cost-cutting, they may prepare budgets with slack i.e. the managers may try to set the budget targets with a margin. Therefore even if there is cost-cutting, their actual requirement would be fulfilled.

**Example**

A marketing manager knows that the selling and distribution expenses would be 5% more than the previous year. He may ask for a 10% rise so that even if management cut the proposed expenditure to the extent of 5%, and allow only a 5% rise, his actual requirement would be fulfilled.

---

The managers may also make a provision for the following year, by spending extravagantly in the current year.

**Definition**

**Budget slack** is the intentional overestimation of expenses and/or underestimation of revenue in the budgeting process.

---

Those responsible for implementing the budget may overestimate the expenses or underestimate the revenues so that it becomes easier for them to chase the target. As a result, the objective of motivating the subordinates to chase a higher target, and trying to get the best out of them will be of no avail. This is a very important factor influencing the **motivation** of the employees in order for the budget to be a success.

**Example**

Rosy, a sales manager for Pick and Pack Ltd, has targeted the sale of 56,000 units in a year in the budget. In fact, she knows that the potential demand for sales is around 60,000 units. It will be easy for her to chase the target of 56,000 units without working too hard. In this scenario the budget slack is 4,000 units.

---

Budget slack is also known as **budget bias**, as it increases the tendency of overspending in order to show the budgeted expenditure to be realistic. It also ensures that there is a margin for the following year.

**Example**

In Flexible Ltd, the actual requirement for selling and distribution amounts to Tshs5,000,000. While preparing the budget, Jemmy, the manager who is responsible for preparing the budget, estimated an amount of Tshs5,500,000 i.e. he overstated it by Tshs500,000. He would like to spend the whole amount during the budget year, so that he does not need to explain the over-estimation in the budget before the senior management. It will also ensure that he obtains a favourable budget allowance for the following year's budget without much difficulty.

When the reward system is linked to the success of the budget, there are more chances of having slack budgets. When budget slack exists, the budgetary system will fail as a motivation tool, a performance evaluation tool and also as a control system.

---

**2. Targets set by senior managers**

Targets set for the budget affect the behaviour of the personnel. In most cases, the performance of the manager /department is evaluated on the basis of budget targets. No one likes to be labelled a poor performer. Accordingly, when **unachievable targets** are set by senior management, in order to bring out the best from the subordinates, the subordinates will **oppose** the targets. Senior management should consult with their subordinates and try to win their confidence in order for the budget to succeed.

If the targets are **easily achievable**, they will fail to **motivate** the employees to achieve their **full potential**.

Targets should be agreed to by both senior management and subordinates, and should be such that the subordinates are motivated to perform at their best without any reason to believe that the budget is unachievable.

**3. Sub-optimal planning**

When targets are set by individuals and approved by senior managers, there is the possibility that, due to conflicts between the organisational and divisional objectives, the targets will need to be changed. Different limiting factors may restrict an organisation from maximising its goals; therefore care should be taken while devising a budget, to ensure optimum achievement. The objectives should be such that each factor contributing to the organisational performance should be utilised optimally.

**Example**

In Rashco Ltd, the production capacity of the plant is 50,000 units, 3 labour hours are required to produce one unit. The limiting factor is the number of labour hours available, which amounts to a total of 90,000. A maximum 30,000 units can be produced in 90,000 labour hours. It is not possible to utilise the full plant capacity in this case, but the planning should be such that the limiting factor, i.e. the number of labour hours, is utilised optimally.

---

Sub-optimal planning may **demotivate managers**.

**Example**

A purchase manager has set a target of purchasing a huge quantity of raw material in the budget, in order to get a bulk discount. When co-ordinating the purchase manager's budget with the production budget, it was found that the quantity targeted to purchase was much more than the requirement of the production department. The potential requirement of the raw material by the production department was the limiting factor.

Accordingly, it was necessary to modify the purchase budget. This may not be liked by the purchase manager, who may feel demotivated.

---

**4. Participation of lower level of management**

If all those responsible for implementing the budgets are involved in the process of devising the budgets and in budget negotiation, it will help to motivate them. However, if unachievable targets are imposed on them or, during negotiation, their targets are changed without explanation, they will be demotivated.

**Test Yourself 6**

Discuss the consequences of budget bias (budgetary slack) for budgetary planning and control.

**Test Yourself 7**

Which of the following statements are correct?

(i) One of the objectives of a budget is to motivate employees to perform to their full potential.
(ii) Budget slack is the intentional overestimation of expenses or underestimation of revenues.
(iii) When limiting factors apply, objectives of the budget should lead to optimum utilisation of all resources.

**A** (i) and (iii)
**B** (ii) and (iii)
**C** (i) and (ii)
**D** (i), (ii) and (iii)

### 3.2 Impact of budget targets upon motivation

An easily attainable budget target may fail to bring out the best of the employees. A budget target that is very difficult to achieve, on the other hand, can discourage managers from even trying to attain it. Ideally, budget targets should be challenging, yet attainable.

It really is a difficult task to set a budget target. The target should be high enough to motivate the employees to put in their best possible effort, but at the same time it should not be so high that employees cannot achieve it, and therefore become demotivated.

Ideally, the aim to achieve targets as well as the aim to motivate employees should be balanced. Up to this level, there is a potential to increase motivation as well as performance level. Beyond this level, the motivation levels fall sharply as the target becomes unachievable. This is based on the fact that if the target is easy to attain, the budget may fail to achieve its objective of motivating the employees to put in their best effort.

A budget serves multiple functions, e.g. planning, controlling, co-ordinating, motivating etc. All these functions should be taken into consideration while determining the difficulty level of a budget. Planning and co-ordination require that the target should be attainable by the most of the managers, and which is best for the organisational performance as a whole.

However, if a budget is considered to be a motivational tool, then the target set for most of the managers may fail to take the best from them since they might be highly efficient but may lack motivation.

### 3.3 Top-down and bottom-up approaches to budgeting

#### 1. Top-down approach

#### (a) Meaning of top-down approach

In this approach, budgets are prepared in line with the strategic objectives of an organisation. Top management specifies their expectations and objectives and, accordingly, the overall organisational budget and the divisional budgets are prepared. The divisional budgets are therefore components of the overall budget.

This approach enables communication between the top level of management and the other levels. Top management may set high targets in order to motivate the employees to chase them.

As top management makes the guidelines, they will support this approach. In small organisations where top management is aware of all the situations and all the aspects of the business, the top-down approach is highly suitable.

The lower level of management may not like this approach, as they are not involved in the budget process. Hence, this approach is also referred to as the **imposed approach to budgeting**.

**(b) Justifications for the top-down approach**

In the top-down approach, the overall budget is first prepared on the basis of the strategic objectives and then, in line with the overall budget, the budgets of the individual departments are prepared. By adopting this approach, it is therefore possible **to achieve synergy in the working of an organisation. This approach is most suitable to small organisations where superiors have overall knowledge of the working of the organisation.** It is also **suitable in situations where the organisation cannot allow much time or cost for planning.**

**2. Bottom-up approach**

**(a) Meaning of bottom-up approach**

**Definition**

The bottom-up approach is a budgeting system in which all budget holders are given the opportunity to participate in setting their own budgets.

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The opposite of the top-down approach, the bottom-up approach starts with the targets set by lower level management, which are then rolled over to successive stages for review. Once all divisional budgets have been collected, an overall budget for the organisation is prepared. This achieves the co-ordination that is essential for the success of a budgetary system.

This approach to devising a budget allows **greater involvement** of those responsible for the implementation of the budget, and is therefore favoured by them. Due to this reason, it is also referred to as a **participative budget** or a **participative approach to budgeting**.

**(b) Justifications for the bottom-up approach**

The bottom-up approach makes it possible to involve all levels of management in the budgeting process. Since, under this approach, the targets are set by the lower level management, (who are aware of the actual working conditions), the budget is more realistic than one which is prepared by top management (who are not aware of problems at the grassroots level)**. Conflicts** between the objectives of the budget **can be avoided by adopting the bottom-up approach.**

This approach is generally adopted in large and established organisations where the involvement of lower level management is necessary because of the complexity of the budget-setting process.

**3. Budget challenging approach**

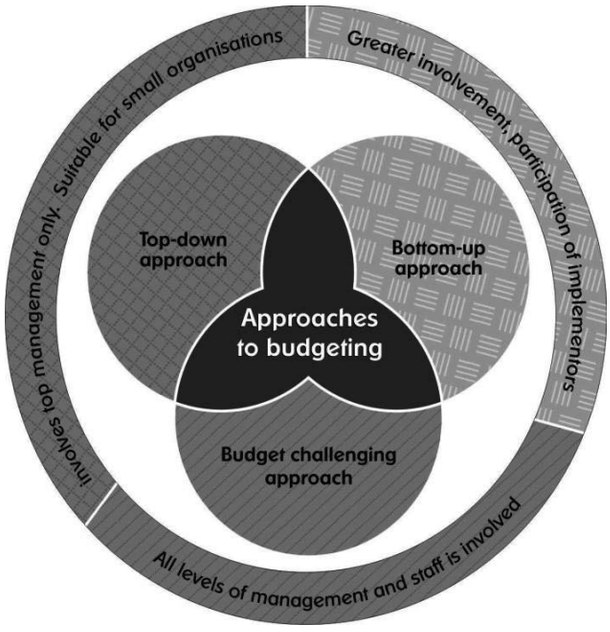
If the budgets are not in line with the corporate objectives, or there is a conflict between the departments, due to overestimation or underestimation (budget slack) etc., it is essential to **modify them**. The procedure of making such modifications is called a **negotiation procedure**. This approach is known as the **budget challenging approach** or **the negotiated approach to budgeting.**

All the functional managers, top managers, accounting staff involved in budgeting, and members of the budget committee should be involved in the negotiation process. If the budgets are modified without consulting all the personnel involved in the process, it may result in demotivating them.

Those who prepared the budget should be informed of the reasons for the modifications. While negotiating, both the lower as well as top level management can inform each other of their problems. Top level management may persuade lower level management to chase targets by explaining the importance behind the targets. At the same time, lower level management can also explain grass root level problems to the top level management. This will result in setting realistic budget targets, which will be motivating as well as achievable.

Once the lower level management commits to the targets through the process of negotiation, they will try their best to achieve those targets.

**Diagram 7: Different approaches to budgeting**




## Test Yourself 8

The top-down approach to budgeting is mostly suitable for which type of organisation?

**A** Large organisation
**B** Small organisation
**C** Not for profit organisation
**D** All of the above

## Test Yourself 9

In a bottom-up approach to budgeting, there is a greater involvement of persons responsible for implementing the budget. This approach encourages:

(i) A participative budget
(ii) A budget with conflicting objectives
(iii) A realistic budget

Which of the above options are correct?

**A** (i) and (ii)
**B** (i) and (iii)
**C** (i), (ii) and (iii)
**D** (ii) and (iii)

### 3.4 Marginal and absorption costing approaches to budgeting

Budgets can be prepared using either absorption costing or marginal costing.

**1. Absorption costing approach to budgeting**

**(a) Meaning**

Absorption costing approach to budgeting values the opening and closing inventories at production costs – 'material cost + labour cost + overheads', and treats the closing inventory as an asset (like financial accounting).

**Example**

Sonato Plc has prepared the following finished goods inventory budget for the months July 20X3 to September 20X3 following the absorption costing approach.

| Month | July | August | September |
|---|---|---|---|
| Closing inventory - units | 2,720 | 2,773 | 2,827 |
| Valuation of closing inventory – Tshs | 2,902,240 (2720 units x Tshs1,067) | 2,958,791 (2773 units x Tshs1,067) | 3,016,409 (2827 units x Tshs1,067) |

**Workings**

| Valuation of cost per unit of finished output | Tshs |
|---|---|
| Material cost (Tshs225 x 2 kg per unit) | 450 |
| Labour cost (Tshs5,000 x 0.07 hours per unit) | 350 |
| Overheads absorbed per unit | 267 |
| **Total cost per unit** | **1,067** |

Included in inventory costs only under absorption costing approach

**(b) Justification of absorption costing budget approach**

This method of budgeting may be preferred by management since it reduces the work of maintaining two sets of accounts for external reporting and internal management reporting purposes. Budgeted income statement under the absorption costing approach will always show a high profit when production is high.

**2. Marginal costing approach to budgeting**

**(a) Meaning**

Marginal costing approach to budgeting involves the contribution approach and values inventories at marginal / variable costs. Budgets under marginal costing will calculate the closing inventory costs at 'material cost + labour cost' only. (This may include variable overhead component wherever applicable.)

**Example**

Continuing the above example of Sonato Plc, the company has prepared the following finished goods inventory budget for the months July 20X3 to September 20X3 following the marginal costing approach.

**Workings**

| Month | July | August | September |
|---|---|---|---|
| Closing inventory - units | 2,720 | 2,773 | 2,827 |
| Valuation of closing inventory – Tshs | 2,176,000 (2,720 units x Tshs800) | 2,218,400 (2,773 units x Tshs800) | 2,261,600 (2,827 units x Tshs800) |

| Valuation of cost per unit of finished output | Tshs |
|---|---|
| Material cost (Tshs225 x 2 kg per unit) | 450 |
| Labour cost (Tshs5,000 x 0.07 hours per unit) | 350 |
| **Total cost per unit** | **800** |

Does not include overheads since they are a part of fixed costs

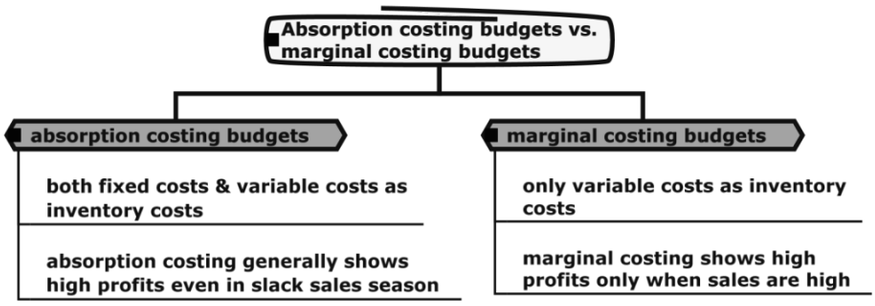
As you can see, the value of closing finished goods inventory is less under marginal costing than under absorption costing.

---

**(b) Justification for marginal costing approach to budgeting**

This method is always preferred for planning, decision-making and control purposes since it depicts a realistic picture of the organisational performance. Budgeted income statement under marginal costing will always show higher profits only if sales are high. Hence, it helps management to make proper decisions for the future. Marginal costing approach is a better tool for management purposes, and hence used extensively by managers.

**SUMMARY**




**3.5 Zero based and incremental approaches to budgeting**

**1. Incremental budget**

Under an incremental budget, the budget of the previous year is taken as a base. This base is then adjusted for changes expected in the budget period for which the budget is prepared.

**(a) Justification for incremental approach to budgeting**

(i) It is a simple, cost and time-saving method of budgeting and therefore widely accepted by the organisations.

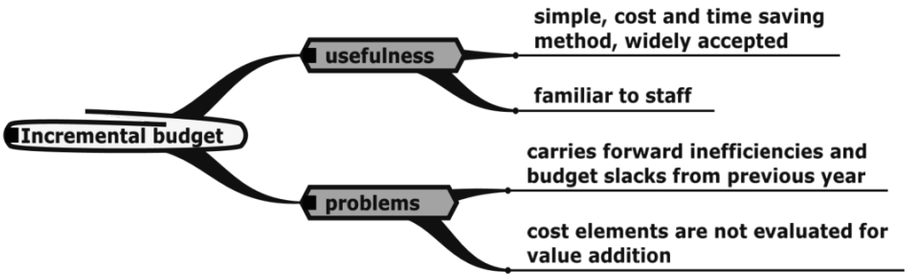
(ii) An organisation's personnel usually prefer this system, as they are given a ready-made base on which to prepare a budget rather than preparing the budget from scratch.

**(b) Problems**

(i) The main disadvantage of this method is that the majority of the previous year's expenditures remain unchanged in the new budget. As a result, the inefficiencies and wastages of the base period are carried forward.

(ii) There is also more chance of budget slack in the case of an incremental budget; as the cost elements are not evaluated for value addition.

**SUMMARY**




### 3.6 Zero-based budget (ZBB)

**Definition**

**A zero-base budget** is a method of budgeting which needs each cost element to be specifically justified, as though the activities to which the budget relates were being undertaken for the first time. Without approval, the budget allowance is zero.

---

In a zero-base budget, the financial planning starts from scratch. This is unlike the budgeting practice for incremental budgeting where an organisation's historical costs are the basis for budget planning. In a zero-base budget, each of the budget proposals needs to be justified in order to be considered.

**1. Justification for the ZBB approach to budgeting**

(a) Goals are more accurately established and alternative means are explicitly considered.
(b) Managers are more involved in a well-structured budget process that encourages communication and consensus.
(c) Priorities amongst activities are better pinpointed.
(d) It focuses attention on value for money and makes explicit the relationship between the input of resources and the output of benefits.
(e) A ZBB results in a more efficient allocation of resources to activities and departments.

**Example**

In a ZBB, the production department may need to justify the labour-hours it needs to utilise to perform a given volume of production. Accordingly, the department may need to produce a greater volume than before with less man-power.

---

(f) A ZBB is a systematic way of challenging the existing situation and compels the organisation to examine alternative activities and existing cost behaviour patterns and expenditure levels.

**2. Problems**

(a) The time and cost of preparing the budget are much higher than for an incremental budget. The paperwork also increases substantially.
(b) Managers may dislike having to justify each minor component of their proposals. This will cause them to oppose a zero-base budget.
(c) The determination of performance measures is difficult.
(d) Budget-holders may try to curtail short-term expenditures which will prove expensive in the long run.

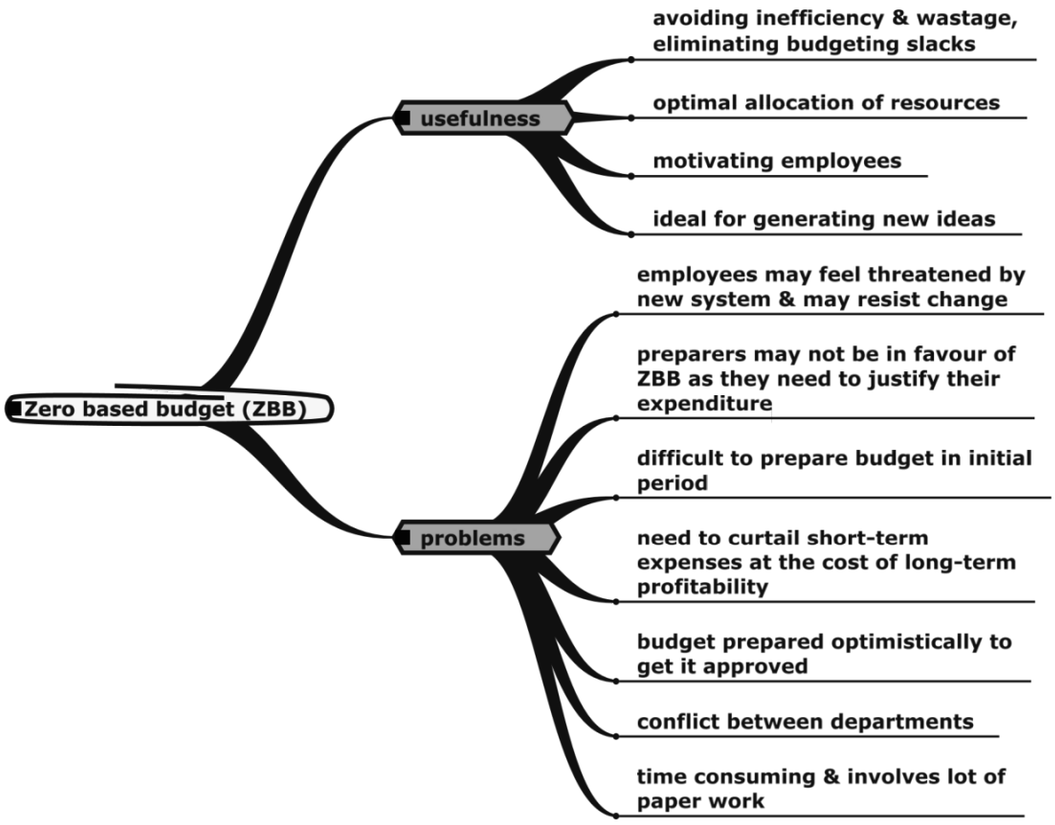
**Example**

Curtailing the maintenance cost of machinery may result in the breakdown of machinery and stoppage of production.

---

(e) It is more likely that the budgets prepared will be optimistic so as to get approval easily even if it is not realistic or achievable.
(f) As allowing cost and allocating resources are a matter of judgement by the person passing the budget, this may result in inter-departmental conflict.
(g) If the ZBB is used for years, there is a possibility that managers will repeat the same arguments to justify the cost elements. In this case, the ZBB would become a mechanical exercise and the benefits of ZBB would be lost.

**SUMMARY**




### 3.7 Activity-based budgeting approach (ABB)

**Definition**

An activity-based budget is a method of budgeting based on an activity framework and utilising cost driver data in the budget-setting and variance feedback processes.

In this type of budget, the targets are determined first, then the activities necessary to meet these targets are identified and only those resources that are necessary to perform these activities are allotted.

Those who are responsible for meeting a particular budget target, i.e. the budget-holders, should have control over the events that affect the performance under their jurisdiction.

**1. Justification for ABC approach to budgeting**

(a) An activity-based budget aims to allocate resources optimally. Only those resources that are critical for an activity are allocated.

(b) An activity-based budget facilitates continuous improvement.

(c) The process of preparing an ABB highlights opportunities for cost reduction and elimination of wasteful activities.

(d) ABB reduces the workload to the minimum level necessary to achieve the organisational objectives.

(e) A traditional budget does not look beyond the organisation and treats the activities of its suppliers or customers as a given condition. In contrast, a successful ABB requires co-ordinating closely with suppliers and meeting the needs of customers and therefore it becomes more effective.

**2. Problems**

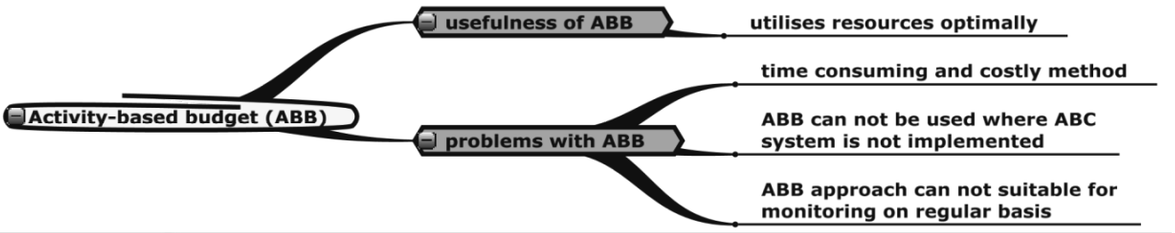
(a) Its implementation is a long-term process. Moreover, it is an expensive method of preparing a budget.

(b) Being a new concept, an activity-based budget is expected to produce initial errors. In addition, the organisation's personnel are likely to be reluctant to implement a new system which is unfamiliar to them. To avoid this, an orientation programme and the involvement of top management are necessary to motivate the personnel.

(c) The ABC system calculates the costs of individual activities and assigns activity costs to the products or services (i.e. the cost objects) on the basis of the activities needed to produce each product or service. Without this information it is not possible to evaluate the activities. Therefore, an ABB cannot be used in an organisation where the ABC system has not yet been adopted.

(d) An activity-based approach may not always be suitable for month-to-month monitoring of actual performance because of short-term fluctuations. However, if the increase in activity lasts for a long period, it is likely that the organisation will need more staff, will have to pay an overtime premium and so on. The inevitable variability in the cost per activity warrants attention to whether resources are being used effectively or not and what levels may be required in the future.

**SUMMARY**




**Test Yourself 10**

Under the marginal costing approach to budgeting, managers get a realistic picture of the future trends and sales forecasts. State whether this statement is true or false.

**A** True
**B** False

## 3.8 Beyond budgeting

**Definition**

Beyond budgeting is an idea that companies need to move beyond budgeting because of the inherent flaws in budgeting especially when used to set contracts. It is argued that a range of techniques, such as rolling forecasts and market related targets, can take the place of traditional budgeting.'

**CIMA Official Terminology, 2005**

Beyond budgeting (BB) approach seeks to break free from the traditional budget preparation routine. BB insists on a participative management of the organisation, and insists on a highly decentralised organisation, i.e. where decision-making and strategy planning are not centralised with the top executive management.

BB entails a sentiment of breaking free from the control and hierarchy of the top management in order to adopt a more adaptive and decentralised model of organisational management. Traditional budgeting traps employees and subordinates in fulfilment of unrealistic targets set by the top level management. This command and control environment does not benefit a company since it ignores customer sentiments and feedback.
BB is a revolutionary approach that seeks to scrap budgeting altogether. It evolved in the post-industrial era in the UK and is now followed across Europe and other parts of the world. There are many organisations like automobile giant Toyota, airline company Southwest Airlines and many more that follow this approach.

**Example**

Toshita is a car manufacturing giant who pioneered the lean movement, has a legendary production system that follows the BB approach. It seeks to continuously improve its products based on customer feedback – both internal and external. It seeks to minimise wastage by adopting an approach that encourages involvement of all employees who are expected to contribute to the production process by making improvisations. No budgets are set and resources are made available on a JIT basis to reduce wastage.

---

**Justification for BB approach**

BB is seen as a better approach to traditional budgeting because of the following reasons:

1. It seeks to give control and decision-making authority to the front-line managers and employees, and hence, seeks to improve customer responsiveness.
2. It empowers and trains the employees to frame strategy and align operational goals with overall organisational goals.
3. Traditional budgets have fixed targets and are not suitable for changes in a dynamic business environment. BB seeks to have relative targets that are achievable with a continuous process of feedback and comparison with the past performance and industry best practices. It extensively involves benchmarking in order to improve organisational performance.
4. Traditional budgeting encourages bureaucracy by having levels of management that decide upon targets at the top level. BB gives this decision-making authority to decentralised teams that interact and are aware of customers and their preferences. Hence, BB sets realistic targets and helps the organisation fulfil customer demands efficiently.
5. Traditional budgeting seeks to command and control whereas BB seeks to empower and coach.

**Test Yourself 11**

Beyond budgeting seeks to abolish traditional budgeting because it encourages bureaucracy, sets unrealistic targets and ignores customer sentiments. State whether this statement is true or false:

**A** True
**B** False

---

**4. Compile, identify and explain the business consequences of a cash budget identifying flows, balances and limits.**

**[Learning outcome d)]**

Cash budget is a detailed estimation of cash flows i.e. cash receipts and disbursements during the budget period. The important objective of the preparation of cash budget is to ensure sufficient cash availability for revenue and capital expenditure. Therefore, it is necessary to co-ordinate the cash budget with other functional budgets. Cash budgets can be prepared monthly, weekly or even daily depending upon the company's requirements. It is prepared by the finance manager based on the cash book, general ledger and cash budget of the previous year.

**Business consequences of cash budget**

**1.** Cash budget helps the management to avoid holding cash in excess of the requirement and make optimum use of the cash by investing the surplus cash, if any, in short term investments.

2. By preparing cash budgets for the period cash deficiencies can be recognised well in advance and important steps can be taken for the temporary arrangement of cash.

3. Cash budget records the receipts and expenses in cash in the current period and hence depicts a more realistic picture of business transactions.

4. Cash budget is a short term financial statement that shows the cash position of a business and helps businessmen gauge the cash generated and cash spent to know whether the business is making profits or losses in the short term. This in turn also helps to know to what extent the business can pay back its loans and creditors.

**Tip**

The following are a few important points that should be considered while preparing the cash budget:

- Consider all cash receipts and payments during the budget period.
- Take into account all functional budgets, including the capital expenditure budget, in order to determine the cash requirement.
- Deduct all anticipated cash payments from all expected cash receipts to determine the net cash flow for the budget period.
- Consider only those transactions that have an effect on the cash balance.

**Example**

Amazing Plc manufactures and sells different kinds of leather bags. The following is the statement of financial position (balance sheet) for the year ended 31 December 20X2.

| **Amazing Plc**<br>**Statement of financial position as at 31 December 20X2** | | |
|---|---|---|
| | **Tshs'000** | **Tshs'000** |
| **Assets** | | |
| **Non-current assets** | | |
| Plant and machinery at cost | 30,000 | |
| Less: Depreciation | (7,500) | |
| | | 22,500 |
| **Current assets** | | |
| Inventory | 30,000 | |
| Receivables | 22,500 | |
| Cash | 52,500 | |
| **Total assets** | | 105,000 |
| **Equity and liabilities** | | **127,500** |
| Capital and reserves | | |
| Share capital (Tshs10,000 each) | | 34,000 |
| Reserves and surplus | | 15,000 |
| **Current liabilities** | | |
| Payables | | 60,000 |
| Proposed dividend | | 18,500 |
| **Total equity and liabilities** | | **127,500** |

The company is planning to prepare a cash budget for the first quarter of 20X3. The following additional information is provided:

(i) Budgeted information for the first quarter (Jan – Mar) of 20X3 is given below:

| | Jan 20X3 Tshs'000 | Feb 20X3 Tshs'000 | Mar 20X3 Tshs'000 |
|---|---|---|---|
| Credit sales | 27,000 | 30,000 | 37,500 |
| Cash sales | 7,500 | 9,000 | 12,000 |
| Credit purchases | 25,500 | 20,500 | 39,000 |

(ii) All credit sales are paid in the month following sales and all trade payables are paid one month in arrears.

(iii) The proposed dividend will be paid in March 20X3.

(iv) The following expenses will be paid:

- Staff salary: Tshs6,750,000 per month.
- Rent of Tshs15,400,000 for the first quarter of 20X3 will be paid in January 20X3.
- Depreciation on the plant and machinery will be provided @10% per annum.

**Required:**

Prepare a cash budget for the first quarter of 20X3.

**Answer**

| **Amazing Plc** | | | |
|---|---|---|---|
| **Cash budget for the period of January to March 20X9** | | | |
| | **Jan 20X3 Tshs'000** | **Feb 20X3 Tshs'000** | **Mar 20X3 Tshs'000** |
| **Receipts** | | | |
| Sales | | | |
| Cash sales | 7,500 | 9,000 | 12,000 |
| Credit sales (Note 1) | 22,500 | 27,000 | 30,000 |
| **Total receipts** | **30,000** | **36,000** | **42,000** |
| **Payments** | | | |
| Payables (Note 2) | 60,000 | 25,500 | 20,500 |
| Proposed dividend | | | 18,500 |
| Staff salary | 6,750 | 6,750 | 6,750 |
| Rent | 15,400 | | |
| **Total payments** | **(82,150)** | **(32,250)** | **(45,750)** |
| **Net cash flow** | (52,150) | 3,750 | (3,750) |
| Add: Opening cash balance **Closing balance** | 52,500 | 350 | 4,100 |
| | **350** | **4,100** | **350** |

**Notes:**

(i) As all credit customers are allowed one month credit, the receivables shown in the SOFP will be collected in January 20X3. The amount against credit sales made in January 20X3 will be received in February and so on.

(ii) Like trade receivables, trade creditors are paid one month in arrears. Therefore, the SOFP payables are paid in January 20X3. Similarly, credit purchases made in January are paid in February and so on.

## Test Yourself 12

Capcor Ltd produces a single product - a gas heater. Management is planning to increase its production and sales during the first half of next year. The following are the plans for the next eight months:

| Month | Production Units | Sales Units |
|---|---|---|
| April | 140 | 140 |
| May | 160 | 160 |
| June | 200 | 160 |
| July | 240 | 200 |
| August | 240 | 240 |
| September | 280 | 260 |
| October | 300 | 280 |
| November | 300 | 320 |
| Selling price | Tshs200,000 | |
| Anticipated increased selling price in December | Tshs220,000 | |
| Wages and other variable costs per unit | Tshs60,000 | |
| Cost of raw materials per unit | Tshs40,000 | |
| Other fixed cost per month | Tshs3,600,000 | |
| Increase in other costs from October onwards | Tshs4,400,000 | |
| Cash sales | 40% | |

Remainder sales are paid in full 2 months after delivery. Material purchased is paid for one month after delivery and held in stock for one month before entering production. Wages, variable and fixed costs are paid in the month in which they are incurred. In July, to cope with demand, a new machine costing Tshs20,000,000 is to be purchased. In June and August, payments of Tshs4,000,000 have to be made for an advertisement campaign. In October, directors plan to pay dividend of Tshs2,000,000.

On 1 June, the firm expects to have Tshs4,000,000 in the bank.

**Required:**

Determine the cash position that will appear over the next six months from June

## 5. Calculate and explain the working capital and cash cycles of a business. [Learning Outcome e]

### 5.1 Working capital

#### 1. Meaning of working capital

Any business needs cash and other assets which can be converted into cash within a short duration. These funds are needed to settle payables arising on account of purchases of materials, services, and on account of wages. The capital that the company invests in such **net assets** is **working capital.**

## Definition

Net working capital is the amount of **current assets** minus **current liabilities** of a business.

Current assets are those assets which are expected **to be realised** (converted into cash) **within 12 months** of the SOFP date. Current liabilities are the liabilities which are expected **to be paid within 12 months** of the **SOFP date**. These current assets and liabilities fluctuate regularly throughout the course of day-to-day business operations.

**Example**

Inventories, trade receivables and trade payables may change every day. In this sense, net working capital is the capital that is required in the **day-to-day working** of an organisation. That is why it is called **"working capital"**.

Typically, the following are the **current assets** and **current liabilities** which constitute working capital:

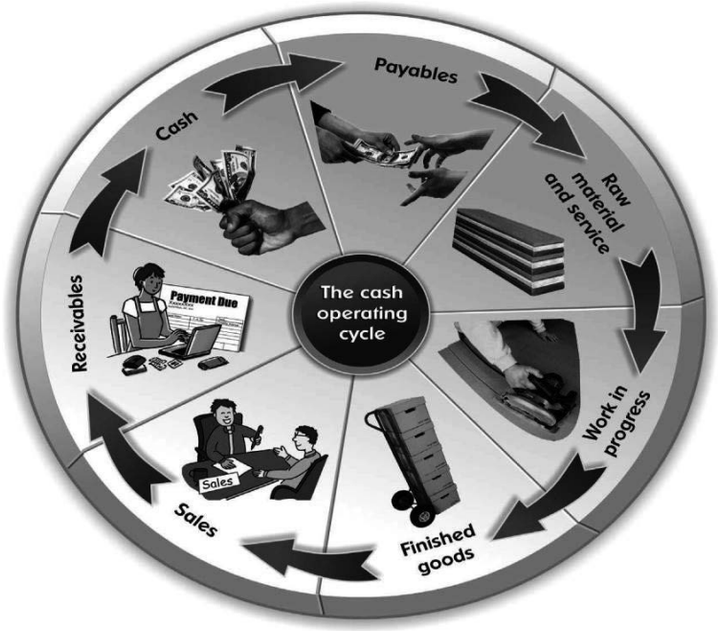
| Current liabilities | Current assets |
|---|---|
| Trade payables | Cash and bank balances |
| Current tax liability | Inventories of raw materials, work in progress and finished goods |
| Dividends payable | Trade receivables |
| Short-term loans | Marketable financial assets |
| Long-term loans i.e. the part maturing within twelve months | Advances to suppliers |
| Other liabilities payable within 12 months | Other assets realisable within 12 months |

### 5.2 Cash conversion cycle

A company invests money in raw materials and services from suppliers and converts the material into finished goods. It sells the finished goods to customers who may request periods of credit. Eventually the company collects amounts receivable from customers and pays the dues of suppliers and again, purchases new materials and services.

Assuming that these activities happen one after another, they can be illustrated in the following cycle:

**Diagram 8: Cash operating cycle**




**Tip**

This cycle is also referred as **cash to cash cycle** as it starts from **cash and ends at cash.**

### 5.3 The cash operating cycle

Also known as the working capital cycle or cash conversion cycle, the cash operating cycle refers to the length of time which elapses between paying for raw materials and receiving cash from sales. In a manufacturing business the working capital cycle is equal to:

| |
|---|
| The average time raw materials remain in inventory<br>**Add**: The time taken to produce the goods<br>**Add**: The time finished goods remain in inventory after production is completed<br>**Add**: The time taken by customers to pay for the goods<br>**Less**: The period of credit taken from suppliers |

**The longer the cash conversion cycle, the higher the investment in working capital will be.**

The financial manager seeks to make this cycle as short as possible. In other words, the time which elapses between paying for raw materials and receiving cash from sales should be minimised so as to minimise the total investment in working capital.

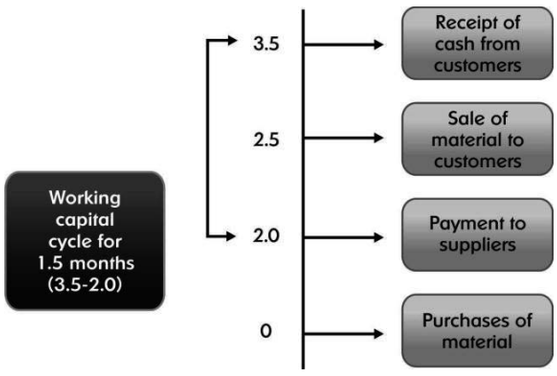
**Example**

A company provides the following details:

| | Months |
|---|---|
| Average time the raw material remains in inventory | 1.5 |
| **Less:** Credit period allowed by suppliers | (2.0) |
| Time taken to convert raw material into finished goods | 1.0 |
| Average time the finished goods remain in inventory | Negligible |
| Credit period allowed to customers | 1.0 |
| **Cash cycle period** | **1.5** |

This can be represented diagrammatically as follows:

**Diagram 9: Working Capital Cycle for 1.5 months**




The cash operating cycle is a critical measure of the overall cash requirement for working capital. As cash is the critical factor affecting the working capital cycle, companies need to use the cash operating cycle.

**Example**

Mart and Sons decides to increase the credit period offered to its customers from 30 days to 45 days while the supplier wants the payment to be made in 60 days. The company buys inventory on 10 March and its holding period is 1 month. The WIP holding period is 1.5 months. The finished goods remain in inventory for a period of 15 days.

**Woking capital cycle**

| | Days |
|---|---|
| Average time raw material remains in inventory | 30 |
| **Add:** Time taken to produce the goods | 45 |
| **Add:** Holding period of finished goods | 15 |
| **Add:** Credit period for the customers | 45 |
| **Less:** Period of credit in the case of suppliers | (60) |
| **Working capital cycle** | **75** |

The above working capital cycle indicates a cash conversion cycle of 75 days, which points out that Mart and Sons, is collecting the receivables before it has to make payments to its suppliers.

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**Test Yourself 13**

Slow collection of debts shows:

(i) Collection in equal instalments
(ii) Decrease in working capital
(iii) Increase in working capital
(iv) A fundamental problem with the company's operations

**A** (i) and (iii)
**B** (iii) and (iv)
**C** (i) and (ii)
**D** (i) and (iv)

---

**The longer the cash operating cycle, the higher the investment in working capital.**

**Example**

The following information is disclosed by Universe Ltd. Assuming that 80% of the sales and purchases are on credit, calculate the length of an operating cycle and analyse it.

| | Budgeted Tshs | Actual Tshs |
|---|---|---|
| Sales | 300,000 | 280,000 |
| Purchases | 180,000 | 175,000 |
| Receivables | 45,000 | 43,500 |
| Payables | 31,000 | 32,250 |
| **Inventory** Raw | | |
| materials | 20,000 | 15,000 |
| Work-in-process (stage of completion is 75%) | 10,000 | 7,000 |
| Finished goods | 16,000 | 17,000 |
| Profit on sales | 25% | 22% |

**Length of cash operating cycle = Inventory holding period + Receivables collection period – Payables payment period**

**Budgeted**: Length of cash operating cycle = 99 days + 68 days – 79 days = **88 days**

**Actual**: Length of cash operating cycle = 83 days + 71 days – 84 days = **70 days**

Analysis of the length of the cash operating cycle shows that the investment in working capital has decreased.

**Workings**

**W1 Inventory holding period**

Ratios are given for understanding only. In the examination, you may not be asked to calculate various ratios

| | Budgeted | | Actual | |
|---|---|---|---|---|
| Raw materials holding period = Raw materials / Credit purchases x 100 | 20,000/(180,000 x 80%) x 365 = | 51 days | 15,000/(175,000 x 80%) x 365 = | 39 days |
| Work-in-process holding period Work - in - process / = Cost of goods sold x 100 | 10,000/(225,000 x 75%) x 365 = | 22 days | 7,000/(218,400 x 75%) x 365 = | 16 days |
| Finished goods holding period = Finished goods / Cost of goods sold x 100 | 16,000/225,000 x 365 = | 26 days | 17,000/218,400 x 365 = | 28 days |
| | | **99 days** | | **83 days** |

Where,

Cost of goods sold = Sales – Gross profit
Budgeted: Tshs300,000 – 25% of Tshs300,000 = Tshs225,000
Actual: Tshs280,000 – 22% of Tshs280,000 = Tshs218,400

**W2 Receivables collection period**

| | Budgeted | | Actual | |
|---|---|---|---|---|
| Receivables collection period = Receivables / Credit sales x 365 | 45,000/(300,000 x 80%) x 365 = | 68 days | 43,500/(280,000 x 80%) x 365 = | 71 days |

**W2 Payables payment period**

| | Budgeted | | Actual | |
|---|---|---|---|---|
| Payables payment period = Payables / Credit purchases x 365 | 31,000/(180,000 x 80%) x 365 = | 79 days | 32,250/(175,000 x 80%) x 365 = | 84 days |

## Answer to Test Yourself

**Answer to TY 1**

| Year | Price level index | Total adjusted cost (Tshs'000) |
|---|---|---|
| 20W8 | 20,000,000 x 100/100 | 20,000 |
| 20W9 | 22,000,000 x 100/105 | 20,952 |
| 20X0 | 23,500,000 x 100/110 | 21,364 |
| 20X1 | 24,150,000 x 100/113 | 21,372 |
| 20X2 | 25,200,000 x 100/116 | 21,724 |
| 20X3 | 26,000,000 x 100/120 | 21,667 |

**Answer to TY 2**

The correct option is **D.**

Time series analysis is one of the quantitative techniques of forecasting that aims to understand the trend of the data collected in regular intervals over a period of time, to make forecasts.

Seasonal variation is a component of time series, which indicates the regular and predictable fluctuations within a year or period of less than a year, quarterly, monthly or weekly.

Time series analysis has substantial advantages over other methods of analysis. Time series analysis is a useful tool to determine changes in values and the slope and direction of changes over a period of time.

**Answer to TY 3**

The correct option is **C**.

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

$$= \frac{10\ (25{,}000) - (100)(900)}{10\ (3{,}500) - (100)^2}$$

$$= \frac{160{,}000}{25{,}000}$$

$$= 6.40$$

$$a = \Sigma y/n - b\Sigma x/n = 900/10 - 6.4(100)$$

$$a = 90 - 64 = 26$$

**Answer to TY 4**

The correct answer is **A**.

A flexible budget can change according to a change in the volume of output. Also, while preparing flexible budgets it is essential to identify each item of cost differently in order to know how it would respond to volume changes. Hence, there is a need to classify costs as fixed and variable.

**Answer to TY 5**

**Mark Trading Co**

The sales budget (Tshs'000) for the year 20X3:

| | **Ist Quarter (Tshs,000)** | **IInd Quarter (Tshs,000)** | **IIIrd Quarter (Tshs,000)** | **IVth Quarter (Tshs,000)** | **Total (Tshs,000)** |
|---|---|---|---|---|---|
| Product A | 1,000,000 *(100,000 x 10,000) | 1,400,000 | 900,000 | 1,200,000 | 4,500,000 |
| Product B | 1,800,000 *(90,000 x 20,000) | 2,400,000 | 2,000,000 | 2,200,000 | 8,400,000 |
| **Total sales** | 2,800,000 | 3,800,000 | 2,900,000 | 3,400,000 | 12,900,000 |

**Note: * The calculations for the quarterly sales are similarly done for all the other quarters' sales.**

**Answer to TY 6**

**Budget Slack (budget bias)**

Budget slack is intentional overestimation of the expenses and/or underestimation of revenues in the budget so that it is easier for managers to chase the target set by the budget.

A budget acts as a control tool. In a budgetary system, actual results are compared with the budgeted figures. If the difference is significant, it is investigated and corrective action is taken.

Due to budget slack, the actual figures may not show a significant difference, as the budgeted figures have been adjusted. As a result, it becomes difficult to take corrective action.

There is also the possibility that people may spend more to protect the overestimations in the budget so that in the future they can maintain the slack. This attitude makes it difficult to control costs because the budget is taken as the basis for controlling costs.

Budget slack damages the objective of motivating the employees to reduce costs and remove inefficiencies.

Budget slack results in overspending as the cost for a particular level of activity might be higher than necessary.

**Answer to TY 7**

The correct option is **C**.

Budgets help employees use their full potential in achieving entity objectives. Budget slack deliberately underestimates revenues and overestimates expenses in order to motivate employees by giving them comfortable targets. Limiting factors are a hindrance to achieving optimum performance and hence optimum utilisation of limited resources is necessary to ensure the maximum possible profits.

**Answer to TY 8**

The correct option is **B.**

In the top-down approach, the budgets are first prepared by the top management in order to meet the overall objective of the organisation, and then, on that basis individual department budgets are prepared. Hence, the top-down approach is mostly suitable for small organisations where the superiors or top management have overall knowledge of the working of the organisation.

**Answer to TY 9**

The correct option is **C**.

A bottom-up budget suitable for large, established organisations encourages a participative and realistic budget that avoids conflicting objectives.

**Answer to TY 10**

The correct option is **A**.

Marginal costing considers only variable costs as relevant costs and hence managers prefer this approach over absorption costing.

**Answer to TY 11**

The correct option is **A**.

BB seeks to do away with the traditional budgeting approach since budgets are unrealistic, encourage bureaucracy and keep management away from customer sentiments and expectations.

**Answer to TY 12**

Cash sales are 40% of the sales made in the month of sales. The remaining 60% are received two months after the month of sale. Purchases are made in the month prior to entering production but, because a month's credit is taken, the payment to creditors is in the same month as production. After considering all cash flows, the net cash flow for each of the six months shows that, in the first three months, Capcor Ltd has a negative cash flow, and a negative cash balance for the February to May period.

| Month | Production | Sales | Selling price/unit Tshs'000 | Total Sales Tshs'000 |
|---|---|---|---|---|
| April | 140 | 140 | 200 | 28,000 |
| May | 160 | 160 | 200 | 32,000 |
| June | 200 | 160 | 200 | 32,000 |
| July | 240 | 200 | 200 | 40,000 |
| August | 240 | 240 | 200 | 48,000 |
| September | 280 | 260 | 200 | 52,000 |
| October | 300 | 280 | 200 | 56,000 |
| November | 300 | 320 | 200 | 64,000 |

| **Capcor Ltd** | | | | | | |
|---|---|---|---|---|---|---|
| **Cash budget for the period of June to November** | | | | | | |
| | **June** | **July** | **August** | **September** | **October** | **November** |
| | **Tshs'000** | **Tshs'000** | **Tshs'000** | **Tshs'000** | **Tshs'000** | **Tshs'000** |
| **Receipts** | | | | | | |
| Receipts from cash sales | 12,800[1] | 16,000 | 19,200 | 20,800 | 22,400 | 25,600 |
| Receipts from debtors | 16,800[2] | 19,200 | 19,200 | 24,000 | 28,800 | 31,200 |
| **Total receipts (A)** | **29,600** | **35,200** | **38,400** | **44,800** | **51,200** | **56,800** |
| **Payments** | | | | | | |
| Payment to creditors | 8,000[3] | 9,600 | 9,600 | 11,200 | 12,000 | 12,000 |
| Variable costs | 12,000[4] | 14,400 | 14,400 | 16,800 | 18,000 | 18,000 |
| Fixed costs | 3,600 | 3,600 | 3,600 | 3,600 | 4,400[5] | 4,400 |
| Advertising | 4,000 | | 4,000 | | | |
| Capital expenditure | | 20,000 | | | | |
| Dividend | | | | | 2,000 | |
| **Total payments (B)** | **27,600** | **47,600** | **31,600** | **31,600** | **36,400** | **34,400** |
| Net cash surplus (deficit) in month (A-B) | 2,000 | (12,400) | 6,800 | 13,200 | 14,800 | 22,400 |
| **Add:** Opening cash balance | 4000 | 6,000 | (6,400) | 400 | 13,600 | 28,400 |
| **Closing cash balance** | **6,000** | **(6,400)** | **400** | **13,600** | **28,400** | **50,800** |

**Notes:**

1. 40% of the monthly sales are cash sales, hence 40% of Tshs32,000,000 is 12,800 and so on for the rest of the months from July to November.
2. Credit sales are 60% of the monthly sales and debtors are given a credit period of 2 months. Hence cash received from debtors of April in the month of June is 60% of 28,000,000 = Tshs16,800,000 and so on for the months of July (cash received from debtors of May) till November.
3. Payment to creditors is made in the month of the production itself, hence for June it will be 200 units x Tshs40,000 per unit = Tshs8,000,000 and so on for July till November.
4. Variable costs are calculated by multiplying the per unit costs by the production units of each month.
5. Fixed costs have increased from October (according to the given information).

**Answer to TY 13**

The correct option is **B**.

Funds tied up in inventory or money that customers still owe to the organisation cannot be used to pay off any of its liabilities. Hence, slow collection of debts will show up as an increase in the working capital and may signal an underlying problem in the company's operations.

## Self-Examination Questions

**Question 1**

Blackberry Ltd exports wheat every year in January, April, July and October to European countries.

Given below is the data regarding the value of wheat exported during the last four years on a quarterly basis in Tshs million. For this data, determine the seasonal variations using the multiplicative model of trend series.

| (Wheat in Tshs million) | | | | |
|---|---|---|---|---|
| **Year** | **January** | **April** | **July** | **October** |
| 20W9 | 150,000 | 250,000 | 250,000 | 150,000 |
| 20X0 | 350,000 | 250,000 | 450,000 | 350,000 |
| 20X1 | 650,000 | 750,000 | 850,000 | 850,000 |
| 20X2 | 450,000 | 550,000 | 550,000 | 650,000 |

**Question 2**

High5 Ltd has provided the annual sales data as below. Determine the seasonal variations using the additive model, assuming a four yearly cycle.

| **Year** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sales units (million)** | 40 | 42 | 46 | 44 | 50 | 48 | 54 | 52 | 56 | 60 |

**Question 3**

Budget slack in the budgeting process means:

(i) Intentional overestimation of expenses
(ii) Intentional underestimation of expenses
(iii) Intentional overestimation of revenue
(iv) Intentional underestimation of revenue

The correct option is

**A** (i) and (iii)
**B** (ii) and (iv)
**C** (i) and (iv)
**D** (ii) and (iii)

**Question 4**

Which of the following is not an advantage of the participative approach to budgeting?

**A** To obtain employees' commitment to achieve the budget targets.
**B** To set a realistic target.
**C** To encourage communication of problems at the grass roots level by employees.
**D** To encourage negotiation for cutting down budget targets.

**Question 5**

If the budget targets are set high, employees will:

**A** Get motivated to achieve the budget targets
**B** Get de-motivated that the targets are unachievable
**C** Make the best possible efforts
**D** Become happy as they can earn more incentives

**Question 6**

Jim is the owner of a small scale factory producing rice. He usually prepares budgets for sales department, purchase department, production department and administration department based on the established strategic goals. And then, in line with the overall budget, the budgets of the individual departments are communicated.

(a) Which of the following approach is being adopted by Jim?

**A** Top down approach
**B** Bottom-up participative approach
**C** Communicative approach
**D** Departmental budgeting approach

(b) If, instead of Jim preparing departmental budgets, individual departments are given opportunity of preparing their own budgets, which of the following approach is being adopted?

**A** Top down approach
**B** Bottom-up participative approach
**C** Communicative approach
**D** Departmental budgeting approach

(c) Sales department has targeted the annual sales of 50,000 kg rice in the sales budget. Sales manager is aware that the potential demand for rice is around 60,000 kg. It will be easy for them to hunt the budgeted target without working too hard. The budget slack for sales department is _____ kg.

**A** 50,000 kg
**B** 60,000 kg
**C** 10,000 kg
**D** 110,000 kg

**Question 7**

Prepare the quarterly production budget for Gega Plc for year ended 20X2 with the help of the following information:

| | 1st Quarter | 2nd Quarter | 3rd Quarter | 4th Quarter |
|---|---|---|---|---|
| Opening inventory (units) | 200 | - | - | - |
| Desired closing inventory (units) | 300 | 350 | 400 | 450 |
| Budgeted sales (units) | 700 | 850 | 1000 | 1150 |

**Question 8**

Managing working capital refers to:

**A** Obtaining finance from another source whenever necessary.
**B** Minimising the possibilities of interest rate risk and foreign exchange risk.
**C** Maintaining a sufficient amount of money to finance the day to day activities of an organisation.
**D** Engaging in tax planning activities.

## Answers to Self-Examination Questions

**Answer to SEQ 1**

| Year | Month | Actual Tshs million | Four quarter moving total | Four quarter moving average | Centred moving average (CMA) | Percentage of actual to CMA |
|---|---|---|---|---|---|---|
| 20W9 | January | 150,000 | | | | |
| | | | | | | |
| | April | 250,000 | | | | |
| | | | 800,000 | 200,000 | | |
| | July | 250,000 | | | 225,000 | 111% |
| | | | 1,000,000 | 250,000 | | |
| | October | 150,000 | | | 250,000 | 60% |
| | | | 1,000,000 | 250,000 | | |
| 20X0 | January | 350,000 | | | 275,000 | 127% |
| | | | 1,200,000 | 300,000 | | |
| | April | 250,000 | | | 325,000 | 77% |
| | | | 1,400,000 | 350,000 | | |
| | July | 450,000 | | | 387,500 | 116% |
| | | | 1,700,000 | 425,000 | | |
| | October | 350,000 | | | 487,500 | 72% |
| | | | 2,200,000 | 550,000 | | |
| 20X1 | January | 650,000 | | | 600,000 | 108% |
| | | | 2,600,000 | 650,000 | | |
| | April | 750,000 | | | 712,500 | 105% |
| | | | 3,100,000 | 775,000 | | |
| | July | 850,000 | | | 750,000 | 113% |
| | | | 2,900,000 | 725,000 | | |
| | October | 850,000 | | | 700,000 | 121% |
| | | | 2,700,000 | 675,000 | | |
| 20X2 | January | 450,000 | | | 637,500 | 71% |
| | | | 2,400,000 | 600,000 | | |
| | April | 550,000 | | | 575,000 | 96% |
| | | | 2,200,000 | 550,000 | | |
| | July | 550,000 | | | | |
| | | | | | | |
| | October | 650,000 | | | | |

**Answer to SEQ 2**

| Year | Sales units (million) Y | 4 year Moving average | Centred moving average T | Seasonal variations Y – T |
|---|---|---|---|---|
| 1 | 40 | | | |
| | | | | |
| 2 | 42 | | | |
| | | 43.00 | | |
| 3 | 46 | | 44.25 | 1.75 |
| | | 45.50 | | |
| 4 | 44 | | 46.25 | (2.25) |
| | | 47.00 | | |
| 5 | 50 | | 48.00 | 2.00 |
| | | 49.00 | | |
| 6 | 48 | | 50.00 | (2.00) |
| | | 51.00 | | |
| 7 | 54 | | 51.75 | 2.25 |
| | | 52.50 | | |
| 8 | 52 | | 54.0 | (2.00) |
| | | 55.50 | | |
| 9 | 56 | | | |
| | | | | |
| 10 | 60 | | | |

**Answer to SEQ 3**

The correct option is **C.**

Budget slack is the intentional overestimation of expenses and/or underestimation of revenue in the budgeting process.

**Answer to SEQ 4**

The correct option is **D.**

Under the participative approach to budgeting, targets are negotiated in consultation with the employees, to set a realistic target, and not to cut down the budget targets to make them easily achievable.

**Answer to SEQ 5**

The correct option is **B.**

If the budget targets are set high, the employees will get de-motivated that targets are unachievable. Hence, the targets should not be too high that they are very difficult to achieve. The budget targets should be challenging but at the same time, they should be attainable.

**Answer to SEQ 6**

(a) The correct option is **A**.

In the top-down approach the budgets are prepared by the top management in line with the strategic objectives of the organisation

(b) The correct option is **B**.

The bottom-up participative approach is driven by involving lower-level employees in the budget development process.

(c) The correct option is **C**.

Budget slack is intentional overestimation of the expenses and/or underestimation of revenues in the budget so that it is easier for managers to chase the target set by the budget

**Answer to SEQ 7**

| **Gega Plc**<br>**Production budget for the year ended 31 December 20X2** | | | | |
|---|---|---|---|---|
| | **1st Quarter** | **2nd Quarter** | **3rd Quarter** | **4th Quarter** |
| | **Units** | **Units** | **Units** | **Units** |
| Budgeted sales | 700 | 850 | 1000 | 1150 |
| **Add:** Budgeted closing inventory | 300 | 350 | 400 | 450 |
| **Total requirement** | **1000** | **1200** | **1400** | **1600** |
| **Less**: Opening inventory | 200 | 300 | 350 | 400 |
| **Required production** | **800** | **900** | **1050** | **1200** |

**Answer to SEQ 8**

The correct option is **C**.

Managing working capital refers to ensuring the existence of a sufficient level of working capital, to meet the cost of an organisation's operating requirements until the time it receives payments from its customers.

Setting pre-determined inventory levels is an integral part of the perpetual inventory system. These levels are set according to the distinct requirements of an organisation. Consequently defining the levels of inventory differs from organisation to organisation.

# 7

# PERFORMANCE MEASUREMENT AND MANAGEMENT

## Get Through Intro

Businesses always aim at earning profits, maintaining these profits in the long run and even increasing them over a period of time. This can happen only when the performance of a business is consistent.

Performance management precisely aims at monitoring and evaluating business performance based on various parameters like human and financial aspects. It aims at making the business more productive and efficient in order to increase profitability and revenues.

This Study Guide explains the various features of an effective performance management system and control system and also the various financial and non-financial measures of performance.

As an accountant, you will require a thorough understanding of these measures in order to check and correct the financial health of the organisation you work for. It will also help you to take decisions on how to improve organisational efficiency.

## Learning Outcomes

a) State and explain the key characteristics of an effective performance management system.
b) Identify and explain appropriate performance measures of a financial and non-financial nature that support achievement of entity objectives.
c) Calculate, explain and comment upon both price and volume effects of variances from standards or budgets and other variations from key performance measures and their implications for management.
d) State how control systems can be used to support effective performance management.
e) Calculate and explain the differences between reported income using marginal costing and absorption costing approaches.

**1. State and explain the key characteristics of an effective performance management system.**

**[Learning Outcome a]**

**Definition**

Performance management system is a set of activities that helps efficient and effective functioning of a business.

Evaluating financial performance, employee performance and management performance are some of the main parameters included in the performance management of an organisation.

Performance management can be effective, and can lead to an overall increase in profits, employee motivation and better management only when it possesses the following essential characteristics:

**1. Clear goals**

An organisation's goals should be achievable and clearly set out by taking into consideration the company's corporate strategy and objectives. There should be an alignment and clarity regarding long term and short term goals. Moreover, goals should be measureable and timely with appropriate support available to achieve these goals. Performance management can be effective only when the organisation has clearly set out its expectations.

**Example**

Tobita Plc is an automobile spares manufacturing company. It has set a goal of achieving sales of 1,000 spare parts in the quarter ending September 20X3. It has also prepared a detailed "desired sales worksheet", wherein it has specifically laid out target sales for each type of spare part manufactured.

When the goals are clearly set, the management can work towards achieving this sales target by taking appropriate measures.

**2. Motivating and training employees**

After setting clear goals to be achieved by the organisation, it is imperative to inculcate a sense of belonging in the employees regarding the overall organisational strategy. Employees should be continuously motivated to perform well and should feel ownership towards organisational goals. Incentives should be provided for good performance and productivity of employees. Managers should resort to extrinsic as well as intrinsic motivational factors in order to boost productivity.

Training should be provided when motivational activities do not boost performance. Also, training should be an on-going process so that employees also get a chance to learn something new and remain motivated to perform.

**Example**

**Continuing the above example of Tobita Plc**

Sales managers should set clear target sales for each sales team. Tobita Plc operates in 3 regions and each region should generate sales as per the demand in those areas. Region 1 has a maximum demand of 500 spares, region 2 has a maximum demand of 300 spares and region 3 has a demand of 400 spares.

Managers should motivate the sales teams of regions 1 and 3 to generate maximum sales so that the target of selling 1,000 spares is met to the extent of 900 spares sales.

In case sales teams are not able to perform well, then proper training should be imparted to increase sales. A survey of customer demands and satisfaction levels can also be carried out, so that reasons for low sales may be identified and eliminated.

**3. Good leadership**

Leaders should encourage and communicate the organisational goals in a manner that will motivate employees to perform effectively. A performance management system provides a framework to effectively manage all organisational activities. Good leaders can help effective implementation of a performance management system by setting clear expectations and communicating them well to the workforce.

**Example**

**Continuing the above example of Tobita Plc**

If in region 1 the sales team is not clear about the sales quantity to be achieved, then it is the responsibility of the sales manager to communicate it properly to the sales team. In this case, the sales team should aim at achieving the maximum demand i.e. 500 spares, so that the target sales are achieved. The sales manager should set clear goals for the team so that the team may attempt to achieve them. The sales manager should also provide the team with resources such as previous sales reports of the area, customer expectations from the product and marketing collaterals necessary to improve sales.

**4. Feedback and evaluation**

Employees should be provided with continuous feedback from managers regarding their performance, and problem areas where corrective action is required. Managers should set clear expectations so that employees are comfortable and know the desired performance standards well. Managers should try and provide all possible resources to improve the performance of subordinates. This will increase overall performance and profitability of the organisation.

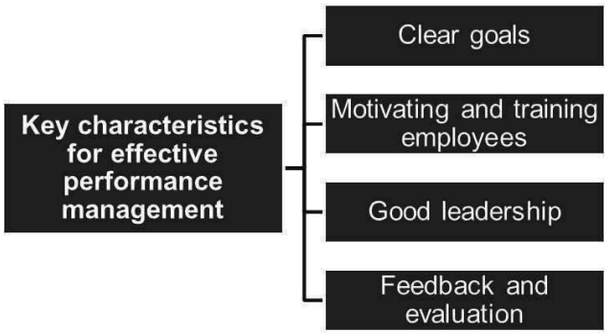
Evaluation of the work should also be done by measuring the employee's contribution to work and assigning values, for example, for quantity of sales made, number of customers serviced etc. Evaluation of work should also be done based on other parameters such as work quality, willingness to work extra time in cases of emergency and helping others at their work whenever required.

**Example**

**Continuing the above example of Tobita Plc**

If in region 2 the sales demand is low and the sales team is not performing well, then the manager needs to provide proper feedback on the performance of the sales team. This feedback should be constructive and should motivate them to improve sales in region 2. Sales can be improved by conducting a survey of the region and collecting information on competitors, substitutes available, customer demands etc.

**Diagram 1: Key characteristics for effective performance management**



**Test Yourself 1**

Which of the following statements is true for a performance management system?

(i) It helps management in setting the goals of an organisation
(ii) It aids the decision-making process
(iii) It helps improve efficiency and effective functioning of an organisation
(iv) It helps improve the organisational structure

**A** (i), (ii) and (iv)
**B** (i) and (ii)
**C** (i), (ii) and (iii)
**D** All of the above

**2. Identify and explain appropriate performance measures of a financial and non-financial nature that support achievement of entity objectives.**

**[Learning Outcome b]**

Performance management entails the use of various performance measures that help management in the assessment of the financial performance of an organisation.

**Tip**

Ratio analysis is a powerful tool for measuring financial performance.

Financial statements are used by management, suppliers, investors and others to judge the operating performance and financial position of a firm. Users further identify the financial strengths and weaknesses of the firm with the help of financial analysis.

Financial analysis is the process of identifying relationships between the items of the statement of financial position (SOFP) and the statement of profit or loss (SOPL) to evaluate the financial performance of the firm.

The **measurement and evaluation of financial performance** are central to control the affairs of an organisation. Performance measurement can be sub-divided into financial measures and non-financial measures.

### 2.1 Financial performance indicators (FPI)

Financial performance indicators are the tools used by financial analysts for making decisions regarding credit and investments. This method utilises the data found in financial statements to determine a company's standing. Analysts will compare the company's ratios to its past performance, as well as to industry statistics to determine risks, trends and to identify any peculiarities. This analytical tool facilitates inter-company as well as intra- company comparisons.

These can be used for analysing profitability, liquidity and risk in both manufacturing and service businesses.

#### 1. Profitability Indicators

The profitability ratios gauge an organisation's operating success over a given period of time. The management of an organisation is usually keen to measure its operating efficiency. Again, the owners/ shareholders invest their funds in the expectation of reasonable returns. The operating efficiency of a firm and its ability to ensure ample returns to its owners/ shareholders depends basically on the profits earned by it. The profitability ratios of an organisation are discussed below.

#### (a) Gross profit margin ratio

Gross profit margin ratio indicates how efficiently the materials and labour are used by management in order to produce a product at a lower cost. A high gross profit margin is a sign of good management. A higher percentage shows better control over the costs and reasonable profit on sales.

Gross profit margin ratio = (Gross profit / Sales) x 100

Where,
Gross profit = Sales – Cost of goods sold

**(b) Operating profit ratio**

Operating profit is an income of the company that is generated from its own operations. It excludes income from investment in other businesses. The operating profit margin ratio measures the operating efficiency and pricing efficiency through cost control. A company with a high operating profit margin ratio has higher gross profit and lower fixed costs. This provides management with more flexibility while determining prices. Investors can measure the quality of the company's operations looking at the operating profit margin ratio over the period of time and comparing it with other competitors within the industry.

$$\text{Operating profit margin ratio} = \frac{\text{Opearting profit}}{\text{Net sales}}$$

Where,

Operating profit (income) = Gross profit – Operating expenses

**(c) Net profit margin ratio**

Net profit margin ratio shows the relationship between net profit and sales. It indicates the efficiency of management in manufacturing, administering and selling the product. Analysing the net profit margin ratio over time shows the variation in profits from year to year due to abnormal conditions or expenses. A high ratio shows a higher ability of the firm to survive in the face of falling selling prices, rising costs or declining demand for the product.

$$\text{Net profit margin ratio} = \frac{\text{Net profit}}{\text{Sales}}$$

Where,
Net profit = Gross profit – Operating expenses, interest and taxes

**(d) Expenses ratio**

Expense ratio calculates the percentage of sales that have been consumed by cost of goods sold or other operating expenses. A high expense ratio is unfavourable since it indicates that expenses are more as compared to income.

Cost of goods sold ratio = (Cost of goods sold / Net sales) x 100

$$\text{Operating expenses ratio} = \frac{(\text{Administrative expenses} + \text{Selling expenses})}{\text{Net sales}} \times 100$$

Administrative expenses ratio = (Administrative expenses / Net sales) x 100

Selling expenses ratio = (Selling expenses / Net sales) x 100

$$\text{Operating ratio} = \frac{(\text{Cost of goods sold} + \text{Operating expenses})}{\text{Net sales}} \times 100$$

Financial expenses ratio = (Financial expenses / Net sales) x 100

**(e) Return on capital employed (Return on investment)**

Return on investment (ROI) is a significant ratio which shows the percentage of return on long term finance invested in a company. In other words, it tells the equity shareholders whether the investment made in the business is worthwhile. The higher this ratio, the more efficiently the business is being managed to generate profits from the available resources.

The capital employed in the business is the total funds employed in net assets.
Net assets = Total fixed assets + Current assets - Current liabilities excluding bank loans

$$\text{Return on capital employed} = \frac{\text{Earning before interest and taxes (EBIT)}}{\text{Average total capital employed}} \times 100$$

**(f) Return on shareholder's equity**

Return on equity (ROE) measures how much the shareholders earned on their investment by comparing net income to the average shareholder's equity. A high percentage indicates effective utilisation of equity and better return on owner's investment.

$$\text{Return on shareholder's equity} = \frac{\text{(Net profit after taxes - Preference dividend)}}{\text{Average shareholder's equity or net worth}} \times 100$$

Where,
Shareholder's equity or net worth = Paid up share capital + Share premium + Reserves and surplus – Accumulated losses

**OR**

Net worth = (Total assets – Total liabilities)

**(g) Earnings per share**

The earnings per share (EPS) ratio is widely used to measure the profitability of the shareholder's investment. It shows the per-share earning power of the company. Often, investors compare the EPS of the company with the industry average and with the EPS of other companies before taking investment decisions.

$$\text{Earning per share} = \frac{\text{Net profit available to equity holders}}{\text{Number of ordinary shares outstanding}}$$

**(h) Price earnings ratio**

Price earnings ratio (P/E ratio) compares current market price of each share with the per-share earnings in order to assess the company's performance. It reflects investors' expectations about the increase in the firm's earnings. A high P/E ratio indicates that investors are expecting higher growth in future compared to companies with low P/E ratio. It is more useful to compare one company's P/E ratio with that of the other companies in the same industry or the market in general and with the company's own P/E ratio of preceding years.

Price earnings ratio = (Market price per share / EPS) x 100

**(i) Dividends per share**

The dividends per share (DPS) ratio is similar to the EPS showing the actual earnings distributed to shareholders by way of dividends. The ratio indicates how consistent a company is in paying dividend to its shareholders.

$$\text{Dividends per share} = \frac{\text{Dividends paid to equity holders}}{\text{Number of ordinary shares outstanding}}$$

**2. Liquidity Indicators**

Liquidity ratios measure the ability of a firm to meet its short-term obligations and reflect the short-term financial strength/solvency of an organisation. The liquidity indicators of an organisation are current ratio, acid-test ratio or liquid ratio, net working capital ratio etc. which are explained below.

**(a) Current ratio**

Current ratio measures the short-term solvency of a firm. It shows the availability of current assets for each Tanzanian shilling of current liability. The higher the current ratio, the higher is the amount of current assets in relation to current liabilities and the greater is the company's ability to meet its current obligations. If a current ratio is 2 to 1 or more, the company is generally considered to have good short-term financial strength.

If the current ratio is less than 1 (current liabilities exceed current assets), the company may face difficulties in meeting its short-term obligations.

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

Where,
Current assets = Receivables + Inventories + Cash + Bank + Marketable securities + Prepaid expenses + All other assets that can be converted into cash within a year
Current liabilities = Payables + Bank overdraft + Accrued expenses + Short-term bank loan + Income-tax liability + Other obligations maturing within a year

**(b) Acid-test ratio / quick ratio**

Quick ratio determines the relationship between quick or liquid assets and current liabilities. Liquid assets are those assets that can be easily and immediately converted into cash without a loss of value. A quick ratio of 1 or more represents a satisfactory current financial position of the firm.

Acid-test ratio / quick ratio = Quick assets / Current liabilities

Where,
Quick assets = Current assets – Inventories

**(c) Net working capital ratio**

Net working capital (NWC) ratio is sometimes used to measure the company's liquidity position. It indicates the amount of funds tied up in inventory. It is an important ratio as it keeps track of the inventory levels. High NWC ratio indicates that the business has large amount of inventory on hand. A high ratio is not favourable since it may affect potential sales opportunities.

$$\text{Net working capital ratio} = \frac{\text{Net working capital}}{\text{Net assets}}$$

Where,

Net working capital = Total current assets – Total current liabilities

**3. Activity ratios**

Activity ratios help analyse how efficiently the assets of a company are being used in generating revenue. These ratios are called turnover ratios since they help in measuring the speed with which an organisation converts its assets into revenues. Thus in simple words, activity ratios show a relationship between sales and assets. The activity ratios include inventory turnover ratio, asset turnover ratio, receivables turnover ratio etc.
which are discussed as follows.

**(a) Inventory turnover**

Inventory turnover ratio determines the efficiency of the organisation in producing and selling its product. It shows the number of times the inventory was sold or replaced during the given period. Companies generally compare this ratio with the industry average. A high ratio indicates strong sales or ineffective buying and a low ratio indicates poor sales and excess inventory.

The inventory turnover ratio is expressed with reference to the cost of sales and is calculated as:

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average inventory}} \text{ (times p.a)}$$

Where,

$$\text{Average inventory} = \frac{\text{Beginning inventory} + \text{Ending inventory}}{2}$$

**(b) Asset Turnover**

Asset turnover ratio shows the efficiency of an organisation in using the available assets in order to generate sales. It, in a way, indicates the pricing strategy of the firm. A firm with a high profit margin tends to have a low asset turnover ratio and vice versa. Thus a low asset turnover ratio indicates inefficient utilisation or obsolescence of fixed assets, which may be caused by excess capacity or improper supply of raw materials.

It shows how much revenue is generated by a Tshs worth of assets and is calculated as:

$$\text{Asset Turnover} = \frac{\text{Sales revenue}}{\text{Total assets}} \text{ (times p.a)}$$

Where,

Total assets = Current assets + Non-current assets

This ratio can be further split to calculate

$$\text{Non - current Asset Turnover} = \frac{\text{Sales revenue}}{\text{Non - current assets}} \text{ (times p.a)}$$

$$\text{Current Asset Turnover} = \frac{\text{Sales revenue}}{\text{Current assets}} \text{ (times p.a )}$$

**(c) Receivables turnover ratio**

This ratio shows **how long an organisation takes to collect payments from its customers**. This ratio indicates the number of times the receivables "turn over" each year. The higher the receivables turnover ratio, the better the **efficiency of the credit management** in the organisation is. This ratio can be calculated as follows:

$$\text{Receivables turnover} = \frac{\text{Credit sales}}{\text{Average receivable s}} \text{ (times p.a.)}$$

This ratio helps the management to analyse and compare (with competitors), its **relationship with its customers and cash management systems**.

The average number of days for which the customers remain outstanding is called the average collection period.

**Average collection period**

The average collection period reflects the **number of days it takes for a customer to pay**. It is calculated as follows:

$$\text{Average collection period} = \frac{\text{Receivables}}{\text{Credit sales}} \times 365 \text{ days}$$

This ratio can also be calculated using average receivables. In that case, it reflects the number of days it takes for the average customer to pay up.

**(d) Payables turnover ratio**

This ratio shows **how long the organisation takes to pay its suppliers**.

This ratio can be calculated as follows:

$$\text{Payables turnover} = \frac{\text{Credit purchases}}{\text{Average payables}} \text{ (times p.a.)}$$

**(e) Average payment period**

The average payment period reflects the **number of days it takes for a company to settle its bills**. It is calculated as:

$$\text{Average payment period} = \frac{\text{Payables}}{\text{Credit purchases}} \times 365 \text{ days}$$

This ratio can also be calculated using average payables. In that case it reflects the average number of days it takes for a company to settle its bills.

**4. Gearing ratios**

'Gearing' refers to the proportion of assets invested in a business that is **funded or financed by the borrowing**. Gearing ratios help determine the **stability** of the company and the **ability** of the company to repay its long-term debts.

**(a) Capital gearing ratio**

Capital gearing ratio is an important measure of the company's risk and stability because it expresses the relationship between a **company's borrowings and its own funds**. A **high capital gearing ratio** means **more borrowed funds**. The higher the ratio, the more vulnerable the position of shareholders with regard to profits available for distribution.

It is calculated as:

$$\text{Capital gearing ratio} = \frac{\text{Total long- term debt}}{\text{Shareholders' funds}}$$

**Where,**

**Total long-term debt** includes debentures, preference shares and other long-term borrowings with a maturity period of more than one year.

Shareholders' funds include equity share capital and reserves. Note that preference shares are counted as debt and not as shareholders' funds.

**(b) Operational gearing**

Operational gearing refers to the **effect of fixed costs** on the relationship between operating profits and sales.

Operational gearing can be calculated in several ways. Companies with high fixed costs will show high operational gearing and their earnings will therefore be very sensitive to changes in sales.

$$\text{Operational gearing 1} = \frac{\text{Fixed operating costs}}{\text{Variable operating costs}}$$

This ratio shows fixed costs as a proportion of variable costs.

$$\text{Operational gearing 2} = \frac{\text{Fixed operating costs}}{\text{Total operating costs}}$$

This ratio shows what proportion of total operating costs is represented by fixed costs.

$$\text{Operational gearing 3} = \frac{\text{Contribution}}{\text{PBIT}}$$

This ratio is used to show the impact a percentage change in sales will have on profit before interest and tax (PBIT). If this ratio is 1.5 it means that a 1% increase in sales will lead to a 1.5% increase in PBIT.

$$\text{Operational gearing} = \frac{\%\text{ change in PBIT}}{\%\text{ change in sales}}$$

**(c) Interest cover**

This indicates how many times **the profit covers the interest charge**. It measures whether or not the profits are sufficient to pay the interest and other finance costs. It reflects the ability of the organisation to repay its debt.

The company is in a better position to honour its interest commitments when it has a higher interest cover ratio.

It is calculated as:

$$\text{Interest cover} = \frac{\text{Profit before interest and tax}}{\text{Interest expense}}$$

**Test Yourself 2**

The following information is available from the financial statements of Bright Co.

| | **20X3 (Tshs'000)** |
|---|---|
| Current assets | |
| Inventory | 310,000 |
| Trade receivables | 440,000 |
| Cash | 93,250 |
| **Total current assets** | **843,250** |
| Current liabilities | |
| Trade payables | 313,500 |
| Bank overdraft | 66,500 |
| **Total current liabilities** | **380,000** |

**Required:**

Calculate current ratio and quick ratio to help in assessing the liquidity position of Bright Co.

**2.2 Non-financial performance indicators**

The non-financial measures of performance include the measures of quality and customer satisfaction and measures of internal performance.

Non-financial performance indicators include both quantitative and qualitative measures and focuses on critical success factors of non-financial nature. However, the critical success factor varies from one type of business entity to another, and they also vary according to the 'level' of performance reporting i.e. strategic or operational.

**"….if the senior managers place too much emphasis on managing by financial numbers, the organisation's long term viability becomes threatened" - Professor R.S. Kaplan**

The focus of the non-financial performance indicators (NFPIs) varies from one kind of organisation to another, and at the same time they will also vary according to the level of performance reporting, strategic or operational.

**Example**

Market share for a particular product is the strategic level of performance indicators. On the other hand, employee turnover rate, customer satisfaction reports, etc. are the operational level performance measures.

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Non-financial performance indicators are needed because all possible performance dimensions cannot be measured in terms of money.

The strategic and operational performance dimensions and the appropriate performance measures for each of the dimensions are enumerated as follows:

| Performance dimensions | Performance hierarchy | Appropriate performance measures |
|---|---|---|
| Competitiveness | Strategic | Relative market share, sales growth, measures of customer base |
| Flexibility | Operational | Flexibility towards volume of production/sales or service, specification, speed of delivery, etc. |
| Quality of service | Operational | Responsiveness, competence, easy access, reliability, etc. |
| Resource utilisation | Operational | Productivity, efficiency, etc. |
| Innovation | Operational | Performance of the innovation process, performance of individual innovations, etc. |

Amongst the stated non-financial performance measures some are quantifiable whereas the others are not quantifiable (Rather, they are qualitative measures).

**Example**

The performance measures like relative market share, sales growth, productivity, etc. are quantitative measures and the performance measures like flexibility towards volume of production, flexibility towards specification, flexibility towards speed of delivery, responsiveness, etc. are qualitative measures.

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**3. Calculate, explain and comment upon both price and volume effects of variances from standards or budgets and other variations from key performance measures and their implications for management.**

**[Learning Outcome c]**

Performance measurement and management is incomplete without the evaluation of organisational performance. Variance analysis is at the core of this evaluation process. Any deviation from the set performance standards leads to a variance from the expected / desired performance expectations.

Variance means the difference between the actual and the standard/budgeted (or historical) data of both the cost and the revenue components. Variance will take place, if in any given production period the actual costs vary from the standard costs. For example, if the price paid for material bought during a given production period, differed from the standard (expected) price for that material, a material price variance will arise.

In the same way if the amount of material actually used went beyond the standard (expected) usage, a material usage variance would arise. Variance analysis helps management to understand the present costs and then to control future costs.

Variances draw the management's attention to the fact that everything has not gone according to plan or budget. Variances bring to light problems that may exist, and they help to direct management's attention to them. If management is aware that there have been departures from standards (expectations) they will be in a position to take action to correct them. Significant adverse variances will, if left unchecked, have an adverse effect on profitability. If favourable variance arises, they too should be investigated. It is possible that a favourable variance can arise due to some unidentified factor that could in the future be used to improve the business.

Variances can be split into two types: variances showing an effect of:

- price difference; and / or
- volume difference

**3.1 Cost related variances**

**1. When cost per unit is different**

Cost related variances are calculated by deducting actual costs from budgeted costs. When the cost per unit is different from the actual or budgeted cost and the volume of production remains the same:

| Variance for production costs = Budgeted costs – Actual costs |
|---|

The following example shows the calculation of variance.

**Example**

Saturn Inc has prepared a budget for the production of 2,000 annual units, at per unit cost of Tshs100,000. The actual costs incurred for 2,000 units were Tshs220,000,000.

Variance for production costs = Budgeted costs – Actual costs
= (2,000 units x Tshs100,000) - Tshs220,000
= Tshs200,000,000 - Tshs220,000,000
= (Tshs20,000,000)

Actual costs are higher than budgeted costs.

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Volume of budgeted production and actual production (in units) doesn't always remain the same.

**2. When the volume of production is different**

When, along with the per unit cost, the volume of production is also different, the variance can be calculated by deducting actual costs from the budgeted costs of actual production. If actual volume of production is different from the original / budgeted volume of production, flexed budgets should be used for comparison. Flexed budget costs are the budgeted costs for actual production. According to flexed budget, variance is calculated by comparing actual costs with the budgeted costs of actual production. The following formulae are used for calculating variance.

Production cost variance = Budgeted costs for actual production – Actual costs
Budgeted costs for actual production = Actual production units x Per unit budgeted costs

$$\text{Per unit budgeted costs} = \frac{\text{Total budgeted costs}}{\text{Budgeted units}}$$

**Example**

Venus Plc's production budget shows a total cost of Tshs500,000,000 for 25,000 units. At the end of the year, Venus produces 28,000 units for Tshs550,000,000.

Here, the actual cost is more than the budgeted cost, but we cannot immediately conclude that it is a negative variance, as the volume of production has also changed. Here, flexed budget should be used for comparison.

$$\text{Per unit budgeted cost} = \frac{\text{Total budgeted costs}}{\text{Budgeted units}}$$

$$= \text{Tshs500,000,000} / 25{,}000 \text{ units}$$

$$= \text{Tshs20,000}$$

Budgeted costs for actual production = Actual production units x per unit budgeted costs
= 28,000 units x Tshs20,000
= Tshs560,000,000

Production cost variance = Budgeted costs for actual production – Actual costs
= Tshs560,000,000 - Tshs550,000,000
= Tshs10,000,000

Actual costs are lower than budgeted costs of actual production. It is positive variance.

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**3.2 Revenue related variances**

For sales revenue related variances, the actual amount is compared with the historical / budgeted amount. Sales variance is used to evaluate the performance of a sales function, and analyse the business's results in order to understand market conditions.

One of the reasons below, apply for variations in actual sales from planned sales:

- the volume sold varies from the planned amount(sales volume variance), or
- price actually realised vary from the planned one (sales price variance)

Both circumstances could also concurrently contribute to the variance.

**1. Difference in selling price per unit**

When the volume of sales remains the same, but the selling price per unit varies from the budgeted price, the sales revenue variance can be calculated using the following formula:

| Sales revenue variance = Actual sales – Budgeted sales |
|---|

If the actual sales are more than the budgeted sales, it is said to be positive variance, as there is an increase in actual profit than what was expected.

**Example**

Pluto Corp sold goods of 5,000 units at Tshs120,000 per unit. The expected sales revenue on 5,000 units was Tshs620,000,000.

Sales revenue variance = Actual sales – Budgeted sales
= (Tshs5,000 units x Tshs120,000) - Tshs620,000,000
= Tshs600,000,000 - Tshs620,000,000
= (Tshs20,000,000)

Actual revenue is lower than expected. It is a negative variance which could decrease the profit.

---

**2. Difference in sold units / sales volume**

When the actual sales volume and the selling price vary from the planned figures, the sales revenue variance can be calculated using the following formula:

Sales revenue variance = Actual sales revenue – Budgeted sales revenue for actual sold units
Budgeted sales revenue for actual sales = Actual sales (in units) x Per unit selling price (of budget)

$$\text{Budgeted per unit selling price} = \frac{\text{Total budgeted sales revenue}}{\text{Budgeted units}}$$

**Example**

Neptune Co.'s extract of the budgeted SOPL (Statement of profit and loss) is as follows:

| | **Tshs'000** |
|---|---|
| Sales (10,000 units) | 1,000,000 |
| Less: Cost of sales | (800,000) |
| Gross profit | 200,000 |

Actual sales were 9,000 units at Tshs102,000 per unit.

$$\text{Budgeted per unit selling price} = \frac{\text{Total budgeted sales revenue}}{\text{Budgeted units}}$$

$$= \frac{\text{Tshs } 1,000,000,000}{10,000 \text{ units}}$$

= Tshs100,000

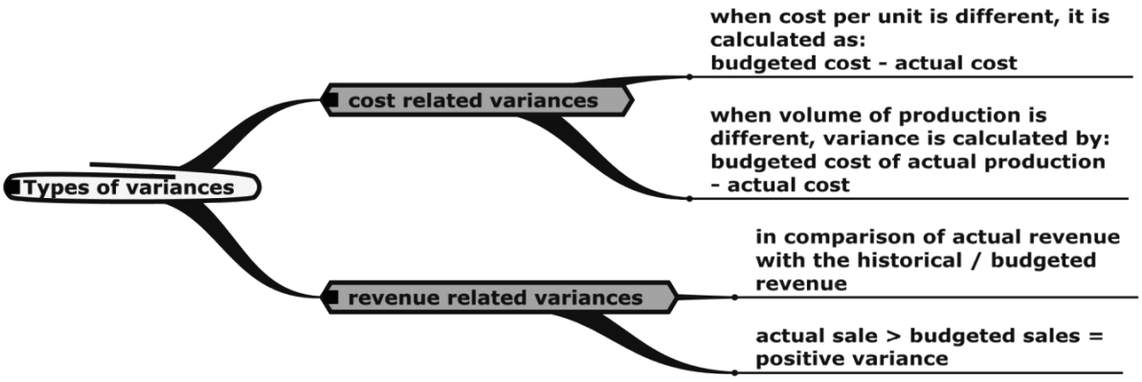
Budgeted sales revenue for actual sales = Actual sales (in units) x Per unit selling price
= 9,000 units x Tshs100,000
= Tshs900,000,000

Sales revenue variance = Actual sales revenue – Budgeted sales revenue for actual units sold
= (9,000 units x Tshs102,000) - Tshs900,000,000
= Tshs918,000,000 - Tshs900,000,000
= Tshs18,000,000

**Tip**

**For price variances**: compare the actual price with the standard price for actual quantity. **For quantity or volume variances**: compare the actual quantity with the standard quantity for standard price.

**SUMMARY**




**Test Yourself 3**

Galaxy Inc has prepared a budget for the production of 2,000 annual units. The expected time per unit is 6 labour hours. The standard wages per labour hour is Tshs6,800. Galaxy has produced 1,940 units with a total of 13,000 labour hours. The actual labour wages were Tshs6,750 per hour.

The flexed budget costs for direct labour is Tshs_____.

**A** 87,750,000
**B** 79,152,000
**C** 81,600,000
**D** 81,000,000

---

**3.3 Management implications of variances from performance measures**

The above variances lead to action from management to correct these variances. Overcoming variances and suggesting corrective action is the responsibility of management.

Variances can arise either due to factors within the control of managers or due to factors outside their control. The factors are hence either controllable or uncontrollable. Variances arising due to controllable factors require corrective action by the responsibility centre managers to control costs or increase revenues. Generally, costs can be controlled easily by managers, but revenues are dependent on customer behaviour and preferences.

Certain costs are rendered uncontrollable due to certain management decisions. E.g. when an asset is purchased in a particular accounting period, its depreciation expense for the entire useful life occurring in the subsequent accounting periods is an uncontrollable cost. It will occur in any case and cannot be controlled.

Another factor that renders a cost uncontrollable is the hierarchy in management. E.g. costs approved and incurred by top management, like purchase costs of a particular raw material, are uncontrollable at middle and lower management levels.

In order to deal with variances, management prepares control reports to identify and correct variances from budgeted figures.

Control reports are prepared from an analysis of the comparison between the actual data and the budgeted data. It mainly explains the causes of the variances and recommends suitable control action. The main purpose of preparing such reports is to focus on performance effectiveness and areas which needs improvements.

There is no specific format of control reports as they are prepared for internal purpose. Control reports should be prepared in such a way that they enable management to exercise control by comparison. The following is an example of prime cost expenditure control report:

**Example**

To,
The management of _____ Co

Date: 11 May 20X3

Sub: Prime cost control report for the month of April 20X3

| Elements of cost | Budget Tshs'000 | Actual Tshs'000 | Variance Tshs'000 | Comment |
|---|---|---|---|---|
| Materials | 10,000 | 15,000 | (5,000) | Due to scarcity of materials, the purchase price has drastically increased during the last month. |
| Labour | 14,000 | 18,000 | (4,000) | Recruitment of two semi-skilled labourers |
| Direct variable overheads | 6,000 | 3,500 | 2,500 | Variable overhead absorption rate needs to be revised. |

Such reports might include an additional column stating percentage of variances.

The following is another example of control report:

**Example**

To,
The management of _____ Co

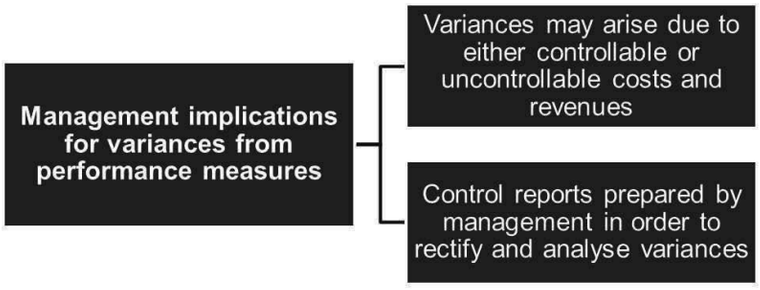
Date: 11 May 20X3

**Sub:** causes of variance and recommended action

| | Variance Tshs'000 | Cause of variance | Recommended action / corrective action |
|---|---|---|---|
| Sales volume variance | (5,000) | Poor market prediction | To conduct a pre survey in accordance with market to enable making the right volume estimation |
| Labour rate variance | (4,000) | Increase in wage rate | Increase selling price per unit to maintain contribution margin |

Control reports can be prepared timely e.g. weekly, monthly, fortnightly or yearly depending on the management requirements and company policies.

**Diagram 2: Management implications for variances from performance measures**




**Test Yourself 4**

Variances in costs and revenues can be overcome by managers by:

**A** Analysing whether costs are controllable or uncontrollable
**B** Analysing whether uncontrollable costs can be controlled by management intervention
**C** Study of control reports to identify reasons for the variances
**D** All of the above

**4. State how control systems can be used to support effective performance management.**
**[Learning Outcome D]**


**Control** is a function aimed at promoting efficiency or assuring the implementation of a policy or safeguarding against possible deviations from the set procedures.

It is:

- The power to influence people's behaviour or the course of events
- Restricting or permitting certain activities only
- A means of limiting something
- The ability to direct an individual or an event

The process of control has three stages: **Implementation, collection** and **comparison**.

- **Implementation**: The decisions made are acted upon.
- **Collection:** Data is collected that is relevant to the decision made.
- **Comparison:** The data collected in the step above is evaluated and compared with the expected results.

Management then assesses the achievements and considers if any corrective action is required.

When applied to high level planning, control is referred to as **management control.** Detailed or operational planning is controlled by **operational control.**

**Management control systems** (MCS) help managers achieve the goals of an organisation in an effective manner. These systems encompass performance evaluation of all kinds of resources like human, financial, physical and organisational. Control systems are implemented both at management as well as operational level. Control systems support performance management by continuously monitoring resource performance and providing feedback for improvement. We may outline the various features of the management and operational control procedures to understand how control systems support an effective performance management system.

### 4.1 Management control


**Management control** means monitoring the efficient and effective use of the resources employed by an organisation to achieve the desired goals.

**Important features of management control that support effective performance management:**

**1. Sets the performance benchmark**

Standards, goals, guidelines and objectives serve as performance benchmarks. Performance has to be assessed in the light of all these.


The management of the company sets a benchmark that it should attain a 20% return on investment made during the year.

**2. Efficient use of resources**

Control should ensure the efficient use of **"4Ms"**: **M**en, **M**aterials, **M**achines and **M**oney. Assessing performance for all these parameters provides an assurance regarding optimum resource utilisation.


The labour productivity has to be a minimum of 10 units of products per day. If any worker produces less than this, his employment may be terminated or he may be given extra training to improve.

**3. Review**

The **actual results should be compared to the expected results** to ensure that the plans are being met. Feedback is an extremely important step, and reviews provide opportunities for improvement.


Analyse whether the desired level of output and profit was achieved during the year. If not, then the organisation should investigate the reasons for this and either come up with better ways to manufacture or employ more skilled labourers so that the output increases.

**4. Corrective action**

If the results are not **in line with the expectations**, management will need to decide on corrective action.


If each employee does not produce 10 units per day, management has decided to run a training program for the employees. Once the training is over the employees will be given another two weeks to improve. If they do not improve in this period they will be either dismissed or demoted.

### 4.2 Operational control


**Operational control** is to monitor the individual detailed tasks to ensure the attainment of the short term goals.

**Important features of operational control that support effective performance management**

1. **Detailed plans at the lowest level** ensuring that individuals are given practicable tasks that they are able to achieve and that are in line with both strategic plans and management control parameters. This will ensure effective performance at the lowest levels of operation, thereby increasing productivity.


The desired annual output for an organisation may be fixed at 12,000 units and to achieve this, labour is divided into 10 teams and each team is given the task of producing 1,200 units per annum.

2. Plans that are **task specific** and relate to the **immediate period**. This gives clear performance objectives to operational level employees and ensures that overall targets are met.


The long term goal of producing 1,200 units of output per annum for each team is converted into a short term goal of producing 100 units per month.

**3.** Plans are **updated frequently.** Updating is required in order to accommodate any unforeseen difficulties.

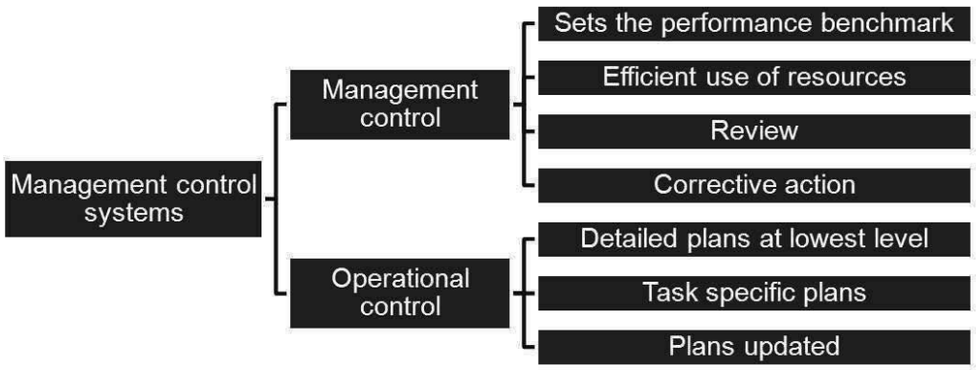
**Example**

Suppose the pre-determined target of 100 units per month does not seem feasible and is compromising quality, a revised target of producing 80 units is set with minimum damage to quality.

Management control systems use many techniques in order to effectively conduct performance management. Some of these are budgeting, balanced scorecard approach, benchmarking, JIT, activity based costing, Kaizen costing, target costing, total quality management etc.

We have studied budgeting and activity based costing in Study Guide 6 – Forecasting and Budgeting. There will be a detailed study of the other techniques in Paper B5 –Performance Management.

**Diagram 3: Management control systems**




**Test Yourself 5**

Management control systems encompass performance evaluation of which resources?

**A** Human
**B** Physical
**C** Financial
**D** All of the above

**5. Calculate and explain the differences between reported income using marginal costing and absorption costing approaches.**

**[Learning Outcome e]**

Marginal and absorption costing approaches are the two primary costing methods used to report income. Absorption costing approach values production and inventories at total production costs consisting of material cost, labour cost and overheads. Marginal costing on the other hand values production and inventories only at the variable production costs consisting of material cost, labour costs and variable overheads if any. The differences between the reported income under these two methods of costing arise mainly because of the differences in the valuation of inventories.

Whereas absorption costing method reports higher profits than marginal costing when production is high, marginal costing method reports higher profits than absorption costing method when sales are high. Managers prefer marginal costing approach to absorption costing for decision-making purposes since it depicts a more realistic picture of sales and profits.

We have studied in detail about differences in reported financial results. Under marginal and absorption costing in Study Guide 4, Learning Outcome 1

**Differences between reported income using marginal costing and absorption costing**

The costs included in the inventory are carried forward to subsequent periods of operation and are charged to the statement of profit or loss as expenditure in the year in which the inventories are sold. Ultimately the difference in the profits derived under the two methods is because of the difference in the valuation of the closing inventory. In other words, the difference is attributable to the amount of fixed production overheads included in inventory valuation under absorption costing and not included under marginal costing.

If inventory levels increase then absorption costing profits will be higher than marginal costing profits. On the contrary, if inventory levels reduce, then marginal costing profits will be higher than absorption costing profits.

**Reconciling the profits under absorption and marginal costing**

The profits reported under the two costing methods will differ if there is any change in the inventory levels between the beginning and the end of a period. Depending upon whether inventory levels are increasing or decreasing, the profit figure of absorption costing will be different from marginal costing. If the inventory levels remain constant, then there will be no differences in the profit according to the two methods.

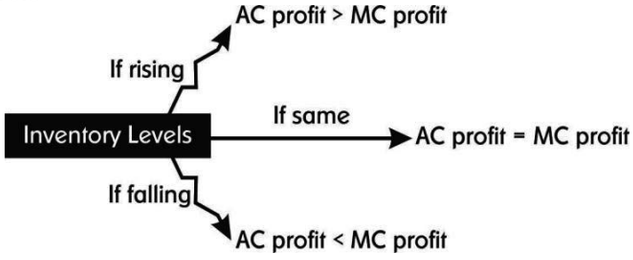
**Situation 1**

**Increase in inventory levels:** Absorption costing will report higher profits than marginal costing.
This is because some of the fixed costs of production incurred during the period are carried forward to the inventory account and used against sales in the following period.

**Situation 2**

**Decrease in inventory levels:** Marginal costing will report higher profits than absorption costing.
This is because some of the fixed costs of production incurred during the period which had been carried forward in opening inventory is released and also incorporated in cost of sales.

**Diagram 4: Inventory Levels**




**Statement of reconciliation**

| From MC to AC profits | From AC to MC profits |
|---|---|
| Profits under marginal costing | Profits under absorption costing |
| **Add:**<br>Difference in valuation of inventory<br>when **opening inventory** is **less** than **closing inventory** | **Deduct:**<br>Difference in valuation of inventory<br>when **opening inventory** is **less** than **closing inventory** |
| Or | Or |
| **Deduct:**<br>Difference in valuation of inventory<br>when **opening inventory** is **more** than **closing inventory** | **Add:**<br>Difference in valuation of inventory<br>when **opening inventory** is **more** than **closing inventory** |
| **Profits under absorption costing** | **Profits under marginal costing** |

## Example

The difference in the profits under marginal and absorption costing is the result of different methods of valuation of inventories under the two methods. We will first calculate the difference in the units of the opening and closing inventories.

Calculation of difference in opening and closing inventories (figures are imaginary)

| | January 20X3 units | February 20X3 units |
|---|---|---|
| Opening inventory | 1,000 | 6,000 |
| **Less:** Closing inventory | 6,000 | 3,000 |
| Difference in inventory | 5,000 | 3,000 |

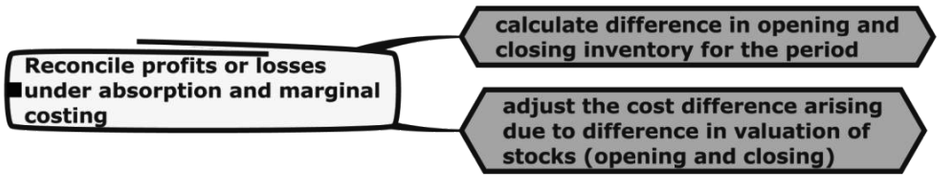
The major difference in the valuation of inventories is due to the fact that marginal costing does not consider the **fixed production costs of Tshs5,000** (assumed) to be included in inventory. Therefore the inventories under marginal costing are valued at a price of Tshs5,000 less than under absorption costing.

| | January 20X3 Tshs million | February 20X3 Tshs million |
|---|---|---|
| Profit under marginal costing (assumed) | 412 | 374 |
| Adjust for fixed overheads in inventory | | |
| **Add:** the difference in valuation when the opening inventory is less than the closing inventory 5,000 units x Tshs5,000 (increase) | 25 | |
| **Less:** the difference in valuation when the opening inventory is greater than the closing inventory 3,000 units x Tshs5,000 (decrease) | | (15) |
| **Profits under absorption costing** | **437** | **359** |

However, the differences in profit caused by adoption of the two different methods of costing can only occur in the **short term when inventory levels fluctuate**. If the inventory level remains constant, then there will be no differences in profit between the two methods. In the long run, the total profit under both the methods will be the same.

This is because all the costs included in the inventory (and as a result unable to be charged to the statement of comprehensive income) will eventually be charged to the statement of profit or loss. It is simply the timing of the sales that causes the differences in profit from period to period.

**SUMMARY**




## Test Yourself 6

(i) If there are more sale units than production units, then the marginal costing profit will be more than the absorption costing profit.
(ii) If there are fewer sale units than production units, then the marginal costing profit will be less than the absorption costing profit.
(iii) Selling units and production units do not make any difference to costing profit.
(iv) The difference between marginal costing profit and absorption costing profit is a result of inventory valuation.

Which of these statements is/are incorrect?

**A** Statements (i), (ii) and (iii)
**B** Statements (i)
**C** Statements (iii)
**D** All of the above

## Answer to Test Yourself

**Answer to TY 1**

The correct option is **C**.

Performance management systems help improve efficiency and effective functioning of an organisation by evaluating employee performance, financial performance and management performance.

**Answer to TY 2**

1. **Current ratio** is the ratio of total current assets to total current liabilities. The higher the current ratio, the greater the short-term solvency of an organisation.

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$= \frac{\text{Tshs843,250,000}}{\text{Tshs380,000,000}}$$

$$= 2.22 : 1$$

This implies that Bright Co has Tshs2.22 worth of current assets for each Tshs1 worth of current liabilities. In other words, the current assets of Bright Co are more than double its current liabilities. This means that Bright Co has enough current assets to convert into cash to pay its current liabilities.

In addition, Bright Co has a high proportion of assets in the form of trade receivables which are considered to be more liquid than inventory, because converting inventory into cash may take a long time as it depends on sale of the inventory. On the contrary, a trade receivable can be converted into money quickly provided the receivables are not doubtful.

2. **Quick ratio** is the ratio of total quick assets to total current liabilities. Quick assets are calculated by excluding inventory as inventory cannot be turned into cash as and when required. The higher the quick ratio, the better to cash flow of an organisation.

$$\text{Quick ratio} = \frac{\text{Quick assets}}{\text{Current liabilities}}$$

$$= \frac{\text{Tshs843,250,000 - Tshs310,000,000}}{\text{Tshs380,000,000}}$$

$$= \frac{\text{Tshs533,250,000}}{\text{Tshs380,000,000}}$$

$$= 1.4 : 1$$

This reflects that Bright Co has Tshs1.4 worth of quick assets for each Tshs1 worth of current liabilities. This means that Bright Co has sufficient assets to quickly convert into cash, if its current liabilities fall due. The quick ratio of Bright Co can be considered satisfactory as it is not below 1.

Hence the analysis of both ratios indicates that Bright Co has a strong liquidity position and sound short-term solvency.

**Answer to TY 3**

The correct option is **B.**

Flexed budget direct labour costs = Actual units x Budgeted hour per unit x Budgeted wages per hour
= 1,940 units x 6 hour/unit x Tshs6,800
= Tshs79,152,000

**Answer to TY 4**

The correct option is **D**.

Variances are controlled by management analysing controllable and uncontrollable costs, using management intervention to control costs and a study of control reports to identify exact causes of variances in order to take corrective action.

**Answer to TY 5**

The correct option is **D**.

Management control systems evaluate the overall performance of an organisation to include all the resources like human, physical and financial.

**Answer to TY 6**

The correct option is **C**.

**Selling and production units make a difference to costing profit as follows:**

If production exceeds sales, AC profit is greater than MC profit. On the other hand if sales exceed production, MC profit is greater than AC profit.

## Self-Examination Questions

**Question 1**

Fashion Ltd has estimated costs to be Tshs600,000,000 for the production of 15,000 units. The actual production was 13,800 units and the total cost was Tshs580,000,000.

The variance for the cost is _____. (A – negative or adverse variance and F – positive / favourable variance)

**A** 20,000,000 (A)
**B** 20,000,000 (F)
**C** 28,000,000 (F)
**D** 28,000,000 (A)

**Question 2**
Smart Inc sold 10,000 units at Tshs350,000,000. The variance of sales is Tshs30,000,000 (F).

If the estimated sales volume is 11,000 units, the estimated selling price per unit will be Tshs_____.

**A** Tshs40,000
**B** Tshs32,000
**C** Tshs38,000
**D** None of the above

**Question 3**

Gorgeous Co has estimated the selling cost to be Tshs2,000 per unit. The budgeted sales were 12,000 units. The actual selling costs were Tshs26,000,000 on the sale of 12,000 units.

The variance is _____.

**A** 7.67% adverse
**B** 7.67% favourable
**C** 8.33% adverse
**D** 8.33% favourable

**Question 4**

The actual direct labour cost of Elegant Corp was Tshs50,000,000. The budgeted cost was Tshs8,000 per hour. Budgeted labour hours and actual labour hours were 6,000 and 5,800 respectively.

The direct labour variance comparing the actual with the flexed budget is Tshs_____.

**A** Tshs2,000,000 favourable
**B** Tshs3,600,000 favourable
**C** Tshs1,600,000 favourable
**D** Tshs3,600,000 adverse

**Question 5**

Calculate ROI and RI from the following data:

| | **Project S Tshs'000** | **Project M Tshs'000** |
|---|---|---|
| Total operating assets | 100,000 | 80,000 |
| Revenue | 107,000 | 90,000 |
| Expenses | 82,000 | 68,900 |

(a) The minimum rate of return on investments for the same firm is 12.5%
(b) The corporate taxation rate is 35%
(c) Interest payable on 10% debentures worth Tshs50,000,000 in project S, and interest payable on an 11% loan worth Tshs10,000,000 in project M

**Question 6**

Performance management systems possess certain characteristics that make them effective and help management improve the overall profitability and productivity of an organisation. These key characteristics include:

**A** A clear goal set by top management and alignment of all short term goals with these goals
**B** A definite appraisal system to monitor and reward employees to improve performance
**C** A training mechanism that will provide support to non-performing employees
**D** All of the above

**Question 7**

Management control systems are designed to aid managers in identifying non-performing employees and designing their training modules. State whether this statement is true or false.

**A** True
**B** False

**Question 8**

Rose Ltd produces 20,000 units by the end of the year. The following statistics are available:

- Closing inventory 2,000 units
- Total fixed production costs Tshs100 million
- Marginal costing profit Tshs50 million

The amount of absorption costing profit will be:

**A** Tshs50 million
**B** Tshs70 million
**C** Tshs40 million
**D** Tshs60 million

## Answer to Self-Examination Questions

**Answer to SEQ 1**

The correct option is **D.**

$$\text{Per unit budgeted cost} = \frac{\text{Total budgeted costs}}{\text{Budgeted units}}$$

$$= \frac{\text{Tshs600,000,000}}{\text{15,000 units}}$$

= Tshs40,000

Variance = Standard cost of actual production – Actual cost of actual production
= (13,800 units x Tshs40,000) - Tshs580,000,000
= Tshs552,000,000 - Tshs580,000,000
= Tshs28,000,000 (A)

**Answer to SEQ 2**

The correct option is **B.**

Variance = Actual revenue of actual sales – Standard revenue of actual sales
Tshs30,000,000 = Tshs350,000,000 – (10,000 units x Standard selling price)
Tshs30,000,000 = Tshs350,000,000 – (10,000 units x Standard selling price)
Tshs320,000,000 = 10,000 units x Standard selling price

Standard selling price = Tshs320,000,000/10,000 units = **Tshs32,000**

**Answer to SEQ 3**

The correct option is **C.**

Variance = Budgeted costs – Actual costs
= (12,000 units x Tshs2,000) - Tshs26,000,000
= Tshs24,000,000 - Tshs26,000,000
= Tshs2,000 adverse

Percent of adverse variance

$$= \frac{\text{Tshs2,000,000}}{\text{Tshs24,000}} \times 100$$

**= 8.33% adverse**

**Answer to SEQ 4**

The correct option is **D.**

Tshs3,600,000 adverse

Direct labour variance comparing the actual with the flexed budget

Variance = Standard cost of actual production – Actual cost of actual production
= (5,800 hours x Tshs8,000) - Tshs50,000,000
= 46,400,000 - Tshs50,000,000
= Tshs3,600,000 adverse

**Answer to SEQ 5**

**SOPL**

| Details | Project S Tshs'000 | Project M Tshs'000 |
|---|---|---|
| Revenue | 107,000 | 90,000 |
| **Less:** Operating expenses (without interest) | (82,000) | (68,900) |
| **EBIT** | **25,000** | **21,100** |
| **Less:** Interest on debentures | (5,000) | (1,100) |
| **EBT** | **20,000** | **20,000** |
| **Less:** Taxation @35% **Net operating profit** | (7,000) | (7,000) |
| | **13,000** | **13,000** |

$$ROI = \frac{EBIT}{\text{Total asset employed}} \times 100$$

| For division S | For division M |
|---|---|
| $ROI = \frac{Tshs5,000,000}{Tshs100,000,000} \times 100$ | $ROI = \frac{Tshs21,100,000}{Tshs80,000,000} \times 100$ |
| = 25% | = 26.4% |

RI = Net operating income – Charge on investment

| **For division S** | **For division M** |
|---|---|
| = Tshs13,000,000 – (Tshs100,000,000 x 12.5%)<br>= Tshs13,000,000 - Tshs12,500,000<br>= 500,000 | = 13,000,000 – (80,000,000 x 12.5%)<br>= Tshs13,000,000 - Tshs10,000,000<br>= Tshs3,000,000 |

**Conclusion**

According to ROI and RI, division M is more profitable.

**Answer to SEQ 6**

The correct option is **D**.

Performance management systems possess all the characteristics of clear goal setting, employee performance appraisal and a proper training mechanism to boost productivity and improve performance.

**Answer to SEQ 7**

The correct option is **B**.

The statement is false. Management control systems are designed to support management in the overall performance management of the organisation, and encompass human, physical, financial and organisational resources. Appraisal of employee performance and designing training modules for them is only a small part of
the performance management system.

**Answer to SEQ 8**

The correct option is **D**.

Marginal costing profit = Absorption costing profit – [(Closing inventory) x (Fixed production costs/Production units)]

Tshs50 million = Absorption costing profit – [(2,000 units) x (Tshs100 million/20,000 units)]

Absorption costing profit = Tshs50 million + (2,000 units x Tshs5,000)
= Tshs60 million

# 8

# INFORMATION, INFORMATION TECHNOLOGY AND INFORMATION SYSTEMS

## Get Through Intro

Data and information form the basis of any management decision-making process. Knowledge is the further analysis and evaluation of information using human mind and intelligence. The maintenance and security of these is of prime importance to any business / organisation. A cluster of systems that are in place to store, manipulateand create data and information in any organisation is called information systems.

Using new age technology, information systems can be maintained and used efficiently to procure fast and accurate results and analysis. Moreover, information technology also helps build a security framework for the organisational databases.

This Study Guide will introduce you to the various types of information technology that support information systems and various information systems that support managers, employees and executives to enable smooth functioning of their tasks.It also analysesthe threats to data and ways to manage data security. An accountant is at the core of data assimilation and analysis since he processes transactions and records them in the system together with other data relating to the day-to-day functioning of an organisation.

## Learning Outcomes

a) Explain and distinguish the nature of data, information and knowledge.
b) Identify and explain the main information technologies that support modern information systems.
c) Identify and explain the main information systems used by entities including business process systems, transactions processing systems, management information systems, decision-support systems and executive information systems.
d) Identify and explain the main risks to the reliability of data and information and how these may be managed and controlled operationally and through management of systems and technology including development of new systems.

## 1. Explain and distinguish the nature of data, information and knowledge.

**[Learning Outcome a]**

The words data, information and knowledge are often used interchangeably. This may lead to their confusion. However, they are not synonyms. Data is defined as raw facts while information is processed data.

**Definition**

**Data** is raw (unprocessed) information. It consists of facts, events and transactions.

**Definition**

**'Information'** is the meaningful summarisation of data. Technically, information is data processed in a way that makes it purposeful.

**Definition**

Knowledge is the interpretation of information in the context of the subject matter for which information is collected. Knowledge is largely influenced by human understanding, beliefs and expectations.

**Diagram 1: Data and information**


**Example**

Data is collected by a company selling water filters through a survey conducted on the usage of water filters in the area. This data will help them estimate the sales in the area. In this survey the data, information and knowledge will constitute:

**Data**

- The number of people using water filters.
- The number of models of each brand used.
- The number of complaints for each brand.

**Information**

- A statement showing users and non-users of water filters and hence the quality of potable water supplied.
- A comparative statement depicting the most popular brand. An analysis highlighting the performance of each brand.

**Knowledge**

- An understanding of the degree of willingness of people towards using water filters
- A report that highlights the use of water filters by people in the area and its reasons
- Brand-wise report filters that justify selection of some brands over others

Information has **meaning**, while data does not. Knowledge depicts an understanding of the information in the context of the purpose of data / information collection. One person's information may be another's data depending on whether the data is relevant to the recipient.

**Example**

The information on the number of customers serviced by the company in the quarter is data for the manager as it does not help him plan the future profits unless he also knows the sales price and profit margins earned. However, it is information for the person who accounts this data on a regular basis for reporting to the management. The same facts can be converted to knowledge when used by an accountant to study customer behaviour in specific quarters of the year.

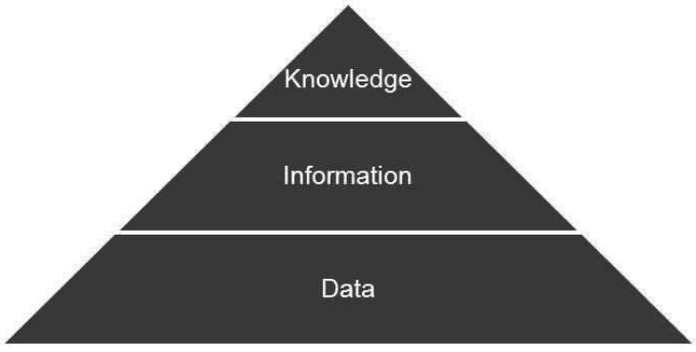
Data is **unstructured, lacks context** and may not be relevant to the recipient. When data is correctly organised, filtered and presented with context it can become information because it then has **"value" to the recipient.** Knowledge is processed information, which in turn is processed data. Knowledge is always achieved through proper learning, understanding and thinking of the person using the information.

Knowledge is information processed by the human brain based on the relevance of the information for decision making. Data and information are very basic in terms of facts and figures but knowledge is application of these facts to solve an organisational problem of decision-making amongst alternatives.

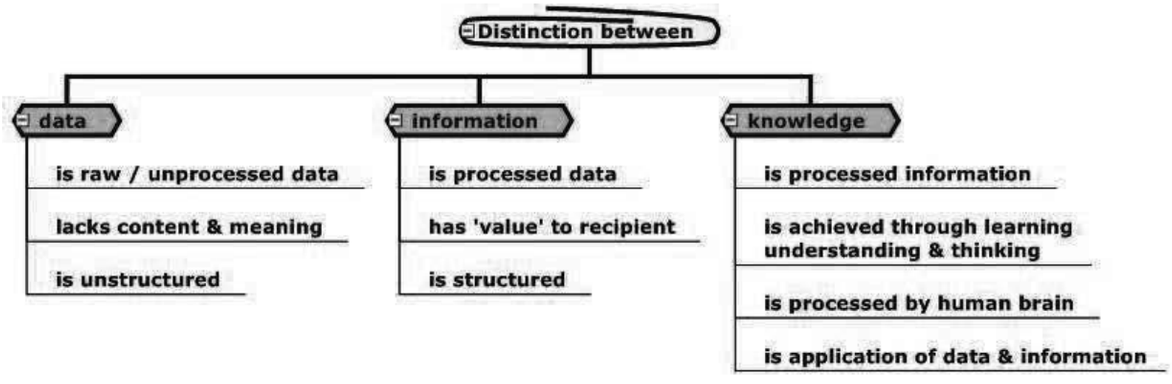
**Example**

The number of states in the USA and the population of cattle in the USA is raw data. It is unstructured and hence is not of much use. However, when brought together, we can analyse the states with a high cattle population and ascertain the states with a high potential for beef supplies. If government intends to improve beef supplies, they will further apply this information, to ascertain the reasons behind certain states having a high population and others having a low population of cattle. Based on this input corrective action can be planned.

**Diagram2: Data, information and knowledge**




**SUMMARY**




Information is:

**A** Summarisation of data.
**B** Sorting of data.
**C** Interpretation of data. **D** All of the above.

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Knowledge is:

**A** Interpretation of data
**B** Application of information and data in a meaningful manner using human brain
**C** Classification of data and raw facts **D** Collection of information

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**2. Identify and explain the main information technologies that support modern information systems.**

**[Learning Outcome b]**


Information Technology (IT) can be defined as the term used to label the subject area in which technology is used to transfer and process information quickly and efficiently to users.

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In a business context it deals with the aspect of managing and processing information for organisations.


Information Systems (IS) is a method of communicating information in written form, graphical or via the electronic method. IS can be a subset or a component of IT within an organisation. It represents a set of practices that have been installed to ensure that the right information is available to the right user at the right time.

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**2.1 Information systems v/s information technology**

Information systems are a group of components used to store, retrieve, process and collect data and information for management purposes.

Computer hardware and software are widely used to store, retrieve and process information. Computers are an integral part of information systems, and act as huge databases for storing the data of an organization, important for management purposes. Information systems also aid planning, decision-making, control and operations. Organisations widely use information systems for the smooth functioning of the business.


Aqira's Apparels uses information systems in order to send web based designs to its customers abroad and receives orders from them through the web. It also processes their billing and receipts through wire transfers carried out via internet banking.

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Information technology is the application of computers to achieve all the above mentioned tasks.

**2.2 Information technology that supports information systems** generally includes the following:

Information technology that supports information systems consists of computers and its peripherals that make information processing easy. Computers mainly consist of hardware, software and transmission systems that enable data transfers. All these systems provide a robust framework that makes information systems work in a smooth flow.

**1. Computer hardware**


The term Computer hardware covers the physical constituents of a computer.

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Think about piano, in a piano the keys are the hardware and the scroll of music is the software.

A computer consists of several parts. Broadly we call them **hardware and software**. Hardware refers to the tangible whereas software refers to the intangible components.


Monitor, Printer, keyboard, mouse, disk drive, and mother board are examples of hardware.
Word processor and spread sheet are examples of software

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**2. Software components of a computer**


Software is a collection of logically arranged instructions to perform a desired task. The term software includes systems software e.g. operating system and applications software e.g. word processors.

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Software is a collection of instructions or data. It is used to operate and control the computer.

**Software is divided into two parts:**

- **Operating System:** it contains system software and various utilities. The computer operates on the basis of instructions provided by the system software. The operating system provides the user interface or human computer interface (HCI), which allows the user to manage and control the computer.

- **Application software:** it helps the user to perform a specific task e.g. editing a document or making calculations on a spread sheet. Application software is unable to function without an operating system.

**(a) Operating system**


An operating system contains the fundamental set of instructions required to operate and manage a computer. Operating systems allow the user to interact with the computer hardware with the help of the computer software.

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The operating system is the most important program running on a computer. It performs the basic tasks required to operate a computer, for example, it sends input for processing, displays output on the VDU and keeps track of files and directories on the hard disk. It manages all the other programs running on the computer.

**(b) Application software**


Application software performs specific functions for the user. They were developed to provide functionality that is not provided by the operating system.

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Application software is a computer program which is used to perform a specific task. The task performed by application software is not related with the functioning of the computer. It runs on the top of the operating system as it cannot function without it.


Microsoft Office Word 2003, Microsoft Office Excel 2003, Microsoft Office PowerPoint 2003, Microsoft Office Access 2003, Internet Explorer 7.0 are examples of Application software

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When two or more application software are bundled together to satisfy a specific business need, it is termed as an **Application Package**. Application packages are created to satisfy a particular purpose or industry.


An application package to create illustrations will include a drawing program, a page setting program and a colour matching program.

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Applications can be entirely developed according to the requirements of the user (built from scratch), or the user can purchase the application software already available in the market (off the shelf). The off the shelf package is built on tested technology and best practices. Off the shelf software can be tweaked to suit the needs of the user. It is comparatively cheap to buy and implement.

A **General Purpose Package** is a bundle of application software, which is capable of performing a variety of simple tasks e.g. word processing software. A General Purpose Package is developed using the off the shelf approach. Microsoft Office 2003 and Open Office are examples of general purpose packages.

**Integrated software** combines the features of several applications software into one program. Integrated software allows a group of applications to work together and share data. It incorporates the commonly used functions of several programs into one program. iWork® (successor of AppleWorks®) and Microsoft Works® are examples of integrated software. Integrated software for the finance function of a company will refer to a bundle of several application software. For easy functioning, this bundle will look like one software package. An example of an integrated software package would be a software which would work with a back up application software to automatically create a back up of data at a remote location.

**3. Computer Networks**

Computers when connected with each other form a **computer** network. A computer network is a channel of exchanging (transmitting and receiving) information from one source to another. Computer networks allow the users to access files stored on other computers. This helps in improving the efficiency of available resources.

The two main types of networks are:
- LAN (Local area network)
- WAN (Wide area network)

**(a) Local area network (LAN)**


LAN is a data communication network connecting several computers. It facilitates exchange of data and information within a localised computer network, usually a building

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The characteristics of LAN are:

- setting a LAN network is economical.
- all the computers are connected with the network. They can exchange data and information from other computers' connected to the network.
- the physical area covered by LAN is small, usually 02-05 kilometres.

**(b) Wide area network (WAN)**

Wide area network, is a network which links computers operating in a **broad area** e.g. cross metropolitan or regional.
The **internet** is a WAN, connecting computers from all over the world.

**(c) Differences between LAN and WAN**

- The geographical area covered by a **WAN** is much **bigger** than that by a LAN.
- WAN has more computers and terminals than a LAN.
- A WAN may link two or more than two LAN's.
- Since a WAN has more users than a LAN, it needs a larger file server. WAN uses **telecommunication lines** to send data.

**Test Yourself 3**

What is a computer network?

**A** It is the network used, only to connect the telephone lines for transferring data.
**B** A computer network is a channel of exchanging (transmitting and receiving) information from one source to another.
**C** A computer network divides a computer in two parts.
**D** A computer network is not capable in improving the efficiency of available resources.

**4. Client-server network**

**Definition**

Client-server network, is a network where one computer (server) offers a service and the other computers in the network approach it to obtain the service as and when they require it.

A client-server arrangement separates a client (user) from a server, and is almost always implemented over a computer network. A client-server network establishes interactions between two computer programs in which the client program makes a service request and the server fulfils the request. This allows the client's devices to share files, information and programs on the server. Although the client-server idea can be used by programs within a single computer, it is a more important idea in a network. In a network, the client-server model provides a convenient way to interconnect programs that are distributed across different locations. **Online transactions** using the client-server model are very common. For example, when you check your bank account over the internet, a client program in your computer forwards your request to a server program at the bank. That program may, in turn, forward the request to its own client program which sends a request to a database server at another bank computer to retrieve your account transactions. The transactions are returned to the bank data client who, in turn, transfers this information to the client in your personal computer. Your computer displays the information for you. Most businesses nowadays use the client-server model. The distinction between clientserver network computing and centralised mainframe computing has almost disappeared as mainframes and their applications have also turned to the client-server model and become part of network computing.

**Example**

Think about a Multi-user database. The server has the database. The clients approach the server whenever they need any information from it.

A client with only input and output devices is known as a **terminal**. A terminal is incapable of processing or storing data. The server to which a terminal is connected receives, processes and stores data for the terminal. The output device of the terminal receives the output from the server and displays it to the user.

**5. Computer communication**

Computers in a network communicate with each other. They exchange resources and send information for example, through emails. Such communication among computers requires transfer of data. Hence, we need to know how two computers interact with each other.

**Internet, intranet and extranet**

The internet enables computers all over the world to connect to each other. This connectivity enables information and resources to be shared between people and companies. The term intranet refers to an **internal network** that functions like a **private internet** for use by an organisation. If access to an intranet is extended to people outside the organisation, this is called an extranet. In other words, an extranet is a type of private internet that isn't entirely internal but an extended intranet.

There are firms which provide **virtual private network** (VPN) services to organisations. These firms have developed advanced applications to provide their clients with secure, high-performance, fully managed VPNs on privately owned networks. A private internet is protected by a firewall and can be extended to the public internet so that clients can make use of the expanded reach of the internet while benefiting from the privacy and security of a private network. VPN services are available at varying speeds depending on location. Companies requiring applications such as customer relationship management (CRM), supply chain management (SCM) and enterprise resource planning (ERP) will find these speedy and secure services suitable. These services have a worldwide reach and are available at a reasonable cost.

**6. Databases and data warehouses**

A database is a huge store of data that is collected for use by organisational resources and customers at large. Databases generally present data in a sorted manner so that it is useful for organisational management. Management always retrieves useful data and information from databases for the purposes of planning, decision-making and control.

**Example**

Greater Altitude is a company that organises treks. It uses its database, which contains details of all its tours till date, for planning its future treks. The database provides them with information on the most popular destinations, the un-explored destinations and places of special interest for trekkers. This helps them plan and decide upon their next treks for the coming year.

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Data warehouses are a refined repository of information, where information is stored in a readily usable format for managers / users at large. Data warehouses are used for reporting and data analysis function. These are more useful for executive management decision making, like comparative analysis and trending reports.

**3. Identify and explain the main information systems used by entities including business process systems, transactions processing systems, management information systems, decision-support systems and executive information systems.**

**[Learning Outcome c]**

**3.1 Business process system**

**1. Meaning of business processes**

An organisation can be thought of as being a collection of people working towards achieving a shared objective and purpose. In addition it can also be described as being a resource processing machine. By this what ismeant is that an organisation will take resources such as labour, money, materials etc. and through itsprocesses convert them into usable products / services.

The processes of an organisation represent how an organisation controls / wants its work to be done. More specifically as Davenport states they are “a specific ordering of work activities across time and space, with a beginning, an end, and clearly identified inputs and outputs”. For instance ordering raw materials from a supplier would be an example of a process for a manufacturing organisation.

Business processes therefore then become sets of logically related tasks that use an organisation’s resources to provide the goods / services its customers want and will enable the organisation to achieve its objectives. For instance developing and marketing a new product would be examples of business processes for a FMCG (fast moving consumer goods organisation).

**A business process is a set of procedures and practices which collectively realise a business objective or policy goal, normally within the context of the organisation. The flow or sequence of actions usually defines the functional roles and relationships.**

The types of business processes are as follows:

- **Management processes** are carried out by top management which defines the organisation’s objectives. Management processes consist of corporate governance or strategic management and provide direction and support to the organisation. For example, the preparation of a performance budget involves determining the organisation’s performance goals. It also involves assessing and arranging for the infrastructure, capital, manpower and facilities needed to achieve the goals.

- **Supporting processes** are functions such as purchasing, accounting, inventory management, recruitment and IT support.

- **Operational processes** are a set of activities relating to receiving raw materials and components and converting them into finished products or services. These activities are also referred to as production activities. Production activities are preceded by the preparation of a production plan which is again an extension of the organisational goal relating to the production function.

Support processes and operational processes are monitored by management through the management control mechanism. For example, inventory management processes which ensure that sufficient inputs are procured to produce the required output quantity and meet sales targets. These support processes are part of the value chain.

These procedures and practices are known as ‘organisational processes’. These are also referred to as ‘business processes’. Nevertheless, both these terms convey the same meaning.

For the convenience of the organisation, the responsibilities for managing processes are divided among managers looking after corporate business processes and managers looking after functional activities.

**Example**

The sales department of an airline has the responsibility to book flights for customers.

Hence the sales department will need call centre staff to:

- talk to customers,
- take bookings and collect payments.

However a separate team may look after internet bookings via the company’s website.

The call centre and the website are 2 separate business processes for the company.

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These processes are designed to help organisations conduct their daily activities effectively. They are also designed to ensure that the organisation delivers quality products and services to its customers at the desired speed. These processes also have to meet the expectations of stakeholders and other categories of associates such as suppliers, contractors and employees of the organisation.

**2. Business process management systems**

Business process management systems are integrated software solutions or packages that help organisations to set and control the processes that will drive their business. Common examples include ERP systems such as SAP and PeopleSoft.

Setting up an effective business process management system involves an organisation:

- identifying where its critical decisions are being made
- identifying the processes that lead up to and control these decisions finding ways to automate and control these decisions

Therefore as more and more organisations begin purchasing and implementing the same systems to automate and control their processes, the more and more alike their processes or way of working will become. However achieving such a competitive advantage is not an easy task.

**3.2 Transaction processing systems**

Transaction processing systems (TPS) were the first type of information systems. As their names suggests the purpose of TPS is to **record and process the routine transactions** of an organisation.


A transaction is a business activity or exchange that occurs between an organisation and an external party. Transactions can also occur between the different divisions of an organisation


In a furniture store, a transaction occurs when a customer buys a dining table.

These transactions were recorded on paper before the time of computers. Today many TPS are on-line, meaning that the transaction is actually recorded as it happens.


At a supermarket, purchases of customers are automatically entered into the TPS at the time payment is made at the check-out counter.

TPS for organisations not only keep an official record of transactions they also serve as the **data source for other systems** of the organisation such as:

- Customer billing systems;
- Vendor payment systems and
- Inventory control


One Tree is an organisation that specialises in selling different types of lumber to construction companies. Whenever an order of lumber leaves the organisation's premises, its TPS records the payment details such as the amount / type of lumber bought. This information is then used to automatically update the organisation's record of inventory (amount of stock physically at the premises).

**Characteristics of transaction processing systems**

1. A TPS records internal and external transactions for a company. It is a warehouse of data that is frequently accessed by other systems.
2. A TPS performs routine and repetitive tasks. It is mostly used by lower-level managers to make operational decisions.
3. Transactions can be recorded in batch mode or online. In a batch mode, the files are updated periodically, whereas in an online mode, each transaction is recorded as it occurs.
4. There are six steps in processing a transaction. They are: data entry, data validation, data processing and revalidation, storage, output generation, and query support.
5. A TPS supports different tasks by imposing a set of rules and guidelines that specify how to record, process, and store a given transaction. There are many uses of transaction processing systems in our everyday lives, such as for making a purchase at a retail store, depositing or withdrawing money at a bank, or registering for classes at a university. Almost all organisations, regardless of the industry in which they operate, have a manual or automated TPS.
6. A TPS is the data life-line for a company because it is the source of data for other information systems, such as MIS and DSS (Decision Support Systems). Hence, if the TPS shuts down, the consequences can be serious for the organisation.
7. A TPS is also the main link between the organisation and external parties, such as customers, suppliers, distributors, and regulatory agencies.
8. TPS exists for the various functional areas in an organisation, such as finance, accounting, manufacturing, production, human resources, marketing, quality control, engineering, and research and development.

### 3.3 Management information systems

The term management information system (MIS) made its first appearance in the US navy in a report on the use of computers to construct a single integrated system to manage all navy's resources. Today, MIS is taken to mean computer-based systems. Used broadly, an MIS is considered to be a system which satisfies all the information needs of managers. An MIS is the system of providing information to people who make choices about the allocation of valuable resources in a timely, accurate and complete manner at a minimum of cognitive and economic cost for acquisition, processing, storage and retrieval.

**Definition**

**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 and control as well as decision making and its various aspects such as analysis and modelling.

Historically, accounting systems have been the most organised and developed part of any information system, but an MIS extends beyond accounting information. It is used to pull together all the organisation's resources to equip all levels of management from every part of the organisation with the necessary information. This enables timely and effective decision making at all three levels of planning for which management is responsible.

**Example**

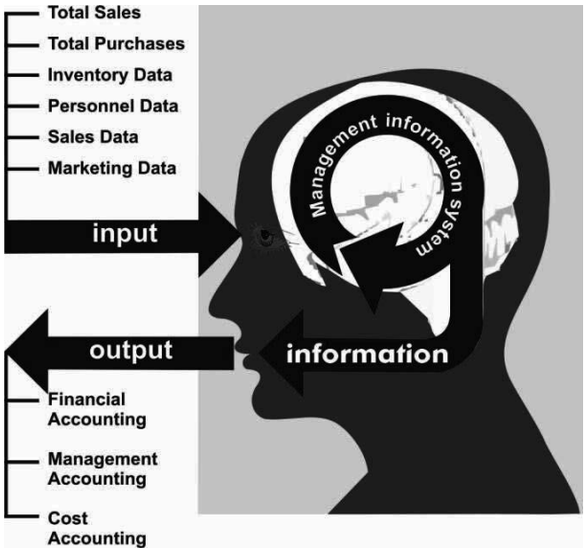
The employee details in an organisation are recorded in a number of different files. Organisations today increasingly follow the system of creating a database of information which will practically fulfil any information request. MIS of an organisation is equipped with abilities to extract any information pertaining to an employee from the database thus prepared.

In case the management wants the information of an employee relating to his age, remaining years of service, date of joining, his salary structure or his leave record then the MIS has the capability to extract all this information from the different locations in the database.

The role of management information systems (MIS) is **to generate a regular series of reports** for the managers and executives of an organisation. These reports will contain the necessary information that this group requires to make **strategic / managerial decisions** and **monitor the progress** of an organisation.

MIS will typically take raw data from TPS as their inputs. MIS will then perform **calculations and / or data comparisons** on this information to generate its outputs (reports). The reports generated will fall into one of three broad categories: summary, detailed and exception. Summary records provide a summarisation of all of an organisation's various transactions.

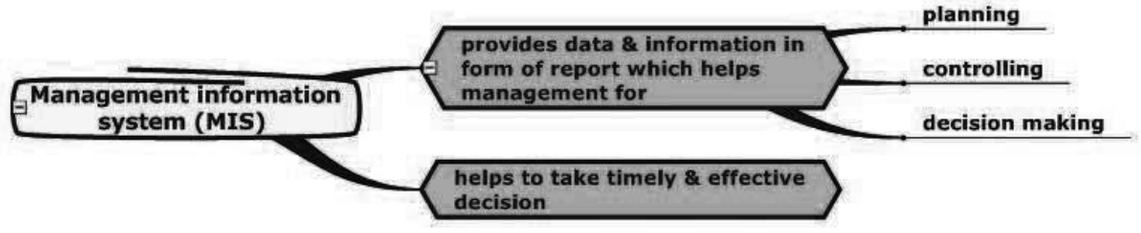
**Diagram 3: Functioning of an MIS**




**An MIS may include**

- **Accounting records:** bill books, purchase order book, cash book.
- **Financial statements:** statement of comprehensive income, statement of financial position **Inventory data:** stores ledger, dispatch notes
- **Production schedules:** specifying the daily and weekly output targets to be achieved
- **HR (Personnel) records:** employees' personnel files, time sheets
- **Marketing data:** including market trends and customer expectations
- **Processed information:** to be used by management in the attainment of the organisational objectives

**SUMMARY**




In brief, MIS can be defined as a system to convert data from internal and external sources into information and communicate that information in an appropriate form, to managers at all levels in all functions to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible.

**3.4 Decision support systems**

Decision support systems (DSS) are specifically engineered to support the decision-making function. DSS is a business intelligence system that is capable of processing huge amounts of data. It supports managers by

analysing what-if scenarios in various situations like make-or-buy, selling price decisions and marketing plans etc. An intelligently designed computerised DSS can help compile useful information from unstructured databases to form business models and help solve decision-making problems.

DSS are generally capable of analysing and processing large collections of data in data warehouses, through "data mining", which uses predictive tools that map correlations and help bring together similar and related groups.

**Example**

In a decision-making situation of make-or-buy, a DSS will help a production manager to decide whether to produce a product in-house or to buy it from outside. The DSS will be supplied by various inputs like raw material availability, costs, overheads required and market prices to buy the product from an outside supplier. The DSS will compare the market prices with the total costs of production and present an analysis of profits from sale of the product under both the options. This will help the manager compare profits under both options and decide whether to make or buy.

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Using the data mining function and capabilities of DSS to analyse and process complex business data, it can be used for forecasting future trends, sales forecasts and pricing decisions as well. DSS also supports study of social networks, micro-blogging websites and fraud detection.

Depending upon the orientation of the DSS, it may be classified as data-driven, model driven, communication driven, document-driven or knowledge driven. Google search engine is one of the best examples of communication-driven DSS. It helps users to data mine and use information for their purposes.

Components of a DSS include:
- Databases
- User interface
- User criterion or decision-making model

A DSS generates information like sales forecasts, inventory reports and projected revenue and sales and comparative reports comparing sales, production and profits of two or more periods.

**3.5 Executive information systems**

An executive information system (EIS) is one of the types of management information system, which is intended to **enable and support** the **information and decision-making needs** of higher level management (senior executives) **by providing easy access** to internal and external information which is **relevant for meeting the strategic goals** of the organisation.

EIS provides a variety of internal and external information to top managers in a highly summarised and convenient form. Nowadays, these systems are becoming an important tool for top-level control in many organisations. As the name suggests, EIS helps an executive to spot a problem, an opportunity, or a trend.

The emphasis of EIS is on graphical displays and easy-to-use user interfaces. They offer strong reporting and drill-down capabilities.

Usually, it is considered to be a specific form of decision support system (DSS).

The objective of decision support systems (DSS) is to help management / executives make decisions institutions with high levels of uncertainty. DSS comprise of a set of tools and techniques that will allow the decision makers of an organisation to run various "what if" scenarios. It is particularly helpful for decision makers who would like to compare what the potential outcomes of a number of different strategies would be.A common example of a very basic DSS is a spreadsheet.

The only difference between DSS and EIS is that DSS are primarily used by middle and lower level managers to plan future operations, whereas EIS mostly serve the control needs of higher level management.

**Characteristics of executive information systems**

The characteristics can be summarised as below:

1. EIS provides access to a variety of databases, both internal and external, through a uniform interface.
2. It provides prompt and easy access to information reflecting the key success factors of the company and of its units.
3. These systems primarily assist top management in revealing either a problem or an opportunity. Forecasters and middle managers can consequently use a DSS to suggest a solution to a problem.
4. EIS allows executives to see both summarised and detailed level data. One can display summarised data reflecting the overall status of their enterprise. EIS offers the capability to drill down into the data. It means it can display highly summarised data, then drill down to the detail level. Drill-down capabilities provide users with the flexibility to trace problem areas directly to the source.
5. Presentation of information through colour graphics or video allows an EIS user to understand key factors and performance trends in the areas of sales, purchases, production, and finance at a glance.
6. Through EIS, both current status and projections can be made available.
7. An EIS allows easy modification and tailoring to the preferences of the particular users or group of users. One can search, sort, and filter information using pre-programmed controls.
8. Access to the data lies at the core of an EIS. EIS may work on the data mining principle, as DSS do, or they may be given access to the actual corporate databases / data warehouses.
9. EIS can exist either on individual workplaces or on servers.


Business process systems are:

**A** Designed to support the decision-making function
**B** Designed to promote business efficiency
**C** Designed to cater to needs of executives
**D** Designed to produce management reports

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Which information system serves as a data source for other systems?

**A** Transaction processing systems
**B** Decision support systems
**C** Business process systems
**D** Management information systems

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**4. Identify and explain the main risks to the reliability of data and information and how these may be managed and controlled operationally and through management of systems and technology including development of new systems.**

**[Learning Outcome d]**

Data and information can be considered reliable when they have attributes such as accuracy, completeness, clarity and consistency.

**4.1 Risks that affect reliability of data:**

Risks that affect the reliability of data include the following:

**1. Inaccuracy**

Inaccurate information can lead to poor and misguided decision making. However, information only needs to be accurate for the purpose. Pointless accuracy affects clarity and timeliness.


The commercial manager of Bright Pumps wants to plan the number of pumps to be manufactured in the next year. For this it picked up data on the number of pumps sold in the last five years from a private market research company, instead of the 'chamber of commerce' which is a regulatory body having this data. As the data may be inaccurate the decisions made by the manager using this data will also be incorrect.

**2. Incomplete**

Decisions based on incomplete or inadequate information can turn out to be bad decisions. At times decision making becomes impossible on the basis of incomplete information.


The decision to sell soft drinks based on incomplete data about the demography of the region can turn out to be disastrous if the youth population in the region, who are the major customers for soft drinks, is only 20%.

**3. Non-clarity**

If the information is not clear and easy to understand its recipient will not be able to use it effectively.


Territory-wise sales can be better presented in a pie-chart whereas year-wise sales can be better presented by means of a bar-chart.

**4. Irrelevant information**

Irrelevant information will cloud the issue and annoy the reader. The provider of the information should ensure that they understand the purpose and supply only that necessary to fulfill it.


The information was requested for the sales of product A in the month of August. Howeverthe information supplied described the attributes of product A, its market penetration, and concluded with therequested sales.

The first two paragraphs were not necessary to the recipient in this instance.

The extra details supplied wasted the readers' and the preparers' time unnecessarily as the reader's onlyinterest was to know the sales for the month of August

**5. Loss of data**

An organisation may lose data because of an accident or a breach in security.

In these circumstances the organisation uses back-up to restore the data

**6. Data corruption**

Data can get corrupted i.e. when an **unintentional change** in the data takes place which makes the **data unfit for use**. There are several reasons due to which data may get corrupted such as use of incompatible hardware, dust or improper shut down of computer due to sudden power failure.

An organisation can avoid data corruption from these reasons by providing proper maintenance to the computer hardware and software.

Data can also be intentionally corrupted due to **hacking, viruses and other attacks on the security of the data stored.** These factors highly affect the reliability of data since they render data useless, and at times meaningless, in terms of its use.

In organisations that rely heavily on computers and information technology to store and process data, the main risks also arise from **computer crimes, abuse and above all, from human error**. Human error alone can cause heavy damage to data reliability.


Ingrid Plc is a financial consulting firm that stores all the data relating to its clients' investments and earnings, in separate files. If the systems get hacked and all the data is leaked to outsiders then the clients' trust will be breached. Moreover, the operators accessing the data may make unauthorised changes to it, making the data redundant for use. It is also possible that due to human error, some investment values are recorded wrongly, which will again depict a wrong picture of the clients' investment earnings in the data.

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Some of the major risks and threats include viruses, trojan horse, logic bombs, data thefts, phishing and malware. All these are potentially destructive for any data and information. Other threats to data are the threats from natural calamities like floods, fire, earthquakes etc. that can physically damage data servers and other peripherals of a computer system.

### 4.2 Measures to manage and control risks operationally and through management of systems and technology including development of new systems

The measures that can be taken in order to manage systems and information to reduce risks to data reliability are listed below:

**1. Physical access control measures**

**(a) Security guards:** security guards will ensure that no storage device is carried in or out of the office premises without **proper authentication**. This will ensure that no electronic files belonging to the organisation are exchanged without the permission of an appropriate authority.

**(b) By segregating areas of work:** the management can segregate an area on the **basis of department functions, projects or both**. No person working in one function or project (e.g. Finance or Project XY07) can visit a place where the work of other department or project is being carried out (e.g. Marketing or Project AB06). This will ensure that only the people who are working on a particular project or department have access to information in that particular department or project.

**(c) Careful selection of employees:** the organisation must conduct a **reference check** for the employees recruited. The organisation must ensure that no person with a dubious background or inappropriate experience is recruited.

**(d) Division of work:** the organisation must ensure the work is divided is between individuals. This can be done by dividing the responsibilities of doing and accepting a task between different persons.

**(e) Job rotation:** by rotating the jobs of employees at **random intervals**, an organisation can make it uncertain for an employee to plan a breach of security.

**(f) Issue of access cards:** the organisation can install doors with **electronic locks** in various rooms in the organisation. These doors will act as entry and exit points to move in and out of a room. The organisation can issue access cards to employees to open doors for visiting any room in an organisation. These access cards will prevent employees from visiting a room in the organisation without proper authorisation.

**(g) Issue of Personal Identification Number:** the organisation can issue Personal Identification Numbers (PIN) to employees. Along with access cards, the employees will have to enter the PIN allotted to them to open the door. This will **prevent** a person from obtaining **unauthorised access by stealing access cards**. The organisation can use a magnetic strip card or smart card system to allow access to various parts of the building.

**(h) CCTV:** the organisation can install closed circuit televisions to monitor the movement of employees.

**(i) Bolting:** to prevent any theft of computer or computer peripherals, the organisation can secure the equipment to the desk.

**(j) Biometric devices:** the organisation can install an eye or finger scanner to detect authorised personnel and grant access to a room or computer.

**(k) Burglar alarms or motion detectors:** burglar alarms or motion detectors can be installed to detect any suspicious movement in office premises.

**(l) Numbering of devices:** the computer and various peripherals must be numbered and a record must be maintained by the staff of the organisation. This will enable **identification** of the organisation's computers and computer peripherals and any theft will be detected quickly.

**(m) By disabling use of external storage device on the office computers:** a user must be allowed to use an external storage device only after obtaining **permission**. Moreover every file received by an organisation through an incoming e-mail or external storage device must be scanned with an **anti-virus program**.

**(n) Careful selection of place to store data:** the organisation must store data at a secure place. Only authorised personnel, after proper verification, must be allowed to physically access the data. All external storage devices must be kept under lock and key.

**2. Electronic access control measures**

**(a) Implementation of firewalls:** the system designed to prevent unauthorised access to or from a private network to a public network (e.g. internet) is called a Firewall. Firewalls also restrict any unauthorised access to the internal network (office network) from a computer which is part of the internal network. By restricting any unauthorised access to office network, companies are able to **prevent** any damage or **undesired sharing** of their **computer resources** (e.g. data, printers).

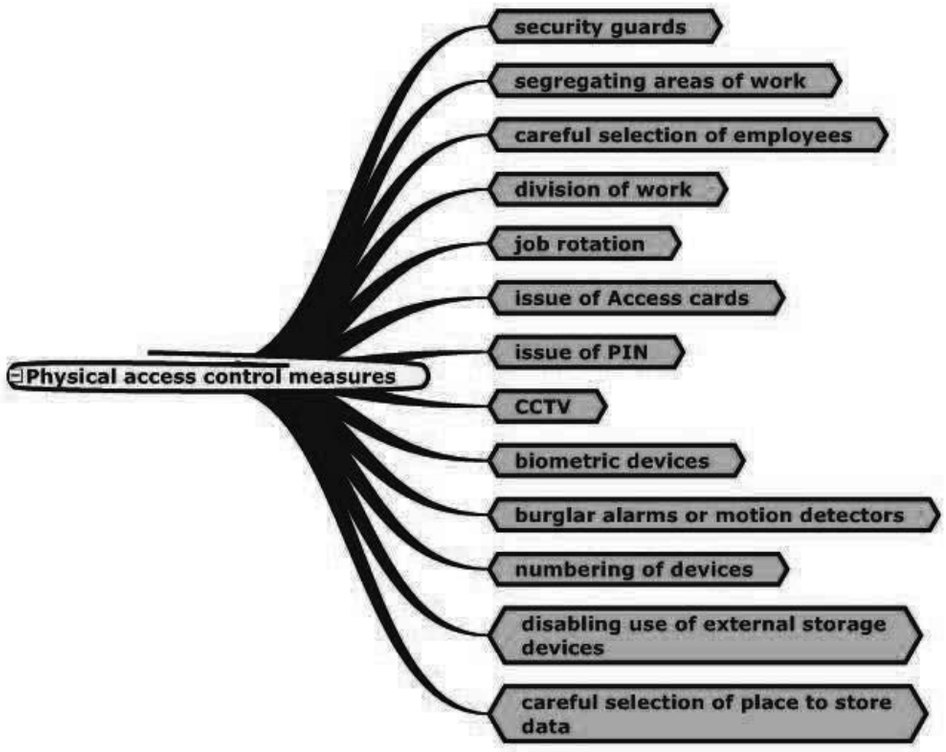
**(b) Periodic checking for viruses:** all the network's computers must be periodically checked to ensure that they are not infected with any virus. This can be done by using an **anti-virus** and **spyware** to scan the computer at regular intervals.

**(c) By encrypting the data:** under this the user sends the data to another computer in an encrypted form. The receiving user has a **key** (provided by the sender) through which he can **decrypt** the data into the original form. This ensures that even though an unauthorised user may be able to record the data being transferred, he will be unable to understand the data.

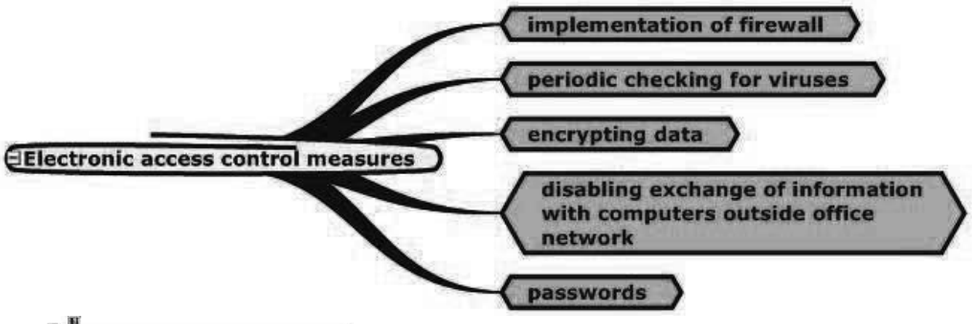
**(d) By disabling exchange of information with computers outside the office network** e.g. revoking the user's right to send any email outside the office network. The user must obtain permission in advance to use any external storage device such as a USB drive or CD-ROM.

**(e) Passwords:** when the user powers on a computer connected within the network, the user has to enter a user name (explained later) and a corresponding password to log into (explained later) the computer.

**SUMMARY**




**SUMMARY**




## Test Yourself 6

Which of the following attributes allow data to be considered reliable?

**A** Accuracy
**B** Completeness
**C** Clarity
**D** All of the above

## Test Yourself 7

Data risks can be managed by restricting data access of employees strictly to relevant data and using encryption techniques.

**A** True
**B** False

## Test Yourself 8

Which of the following is not a physical access control for protection of information?

**A** Security guards
**B** Implementation of passwords
**C** Job rotation
**D** Segregating area of work

## Answer to Test Yourself

**Answer to TY 1**

The correct option is **D**.

Information is summarisation, sorting, interpretation and all the processes that lead to converting it into a usable form.

**Answer to TY 2**

The correct option is **B**.

Knowledge is application of information and involves human involvement in order to present and use it in a meaningful manner.

**Answer to TY 3**

The correct option is **B.**

A computer network is a channel of exchanging (transmitting and receiving) information from one source to another.

**Answer to TY 4**

The correct option is **B**.

Business process systems are designed to increase business efficiency. DSS is designed to support decision making, EIS is designed to cater to needs of executives and MIS generates management reports.

**Answer to TY 5**

The correct option is **A**.

Transaction processing systems keep a record of all the transactions in an organisation and hence act as source of data for other systems as well.

**Answer to TY 6**

The correct option is **D**.

Reliability of data and information depends on all the factors such as accuracy, completeness and clarity.

**Answer to TY 7**

The correct option is **A**.

Data risks can be reduced by use of data encryption techniques and restriction to data access.

**Answer to TY 8**

The correct option is **B**.

The implementation of a password is an electronic access control measure.

## Self-Examination Questions

**Question 1**

_____ is raw facts and figures that are processed into _____.

**A** Information and data
**B** Data and details
**C** Information and records
**D** Data and information

**Question 2**

Data is:

**A** Unprocessed information
**B** Processed information
**C** Unused information
**D** Used information

**Question 3**

A management information system extends beyond the accounting function to include:

**A** Information for only sales department
**B** Information for all levels of management
**C** Information for executives of the organisation
**D** Information for decision-making of managers

**Question 4**

An executive information system is tailored to assist executives in deciding strategy. List the characteristics of an EIS that helps to plan strategy and assess the opportunities and threats.

## Answers to Self-Examination Questions

**Answer to SEQ 1**

The correct option is **D**.

When data is correctly organised, filtered and presented with context it becomes information.

**Answer to SEQ 2**

The correct option is **A**.

Data is raw facts and hence unprocessed information.

**Answer to SEQ 3**

An MIS is a system that generates information for all levels of management. Information required exclusively for executives is generated by an EIS, whereas DSS generates information for decision-making.

**Answer to SEQ 4**

Executive information system is a type of management information system, which is intended to **enable and support** the **information and decision-making needs** of higher level management (senior executives) **by providing easy access** to internal and external information which is **relevant for meeting the strategic goals** of the organisation.

The distinctive characteristics of an EIS that enable strategy planning and assessment of threats and opportunities are listed below.

1. It provides prompt and easy access to information reflecting the key success factors of the company and of its units.
2. These systems primarily assist top management in revealing either a problem or an opportunity. Forecasters and middle managers can consequently use a DSS to suggest a solution to a problem.
3. EIS allows executives to see both summarised and detailed level data. One can display summarised data reflecting the overall status of their enterprise. EIS offers the capability to drill down into the data. It means it can display highly summarised data, then drill down to the detail level. Drill-down capabilities provide users with the flexibility to trace problem areas directly to the source.
4. Presentation of information through colour graphics or video allows an EIS user to understand key factors and performance trends in the areas of sales, purchases, production, and finance at a glance.
5. Through EIS, both current status and projections can be made available.