

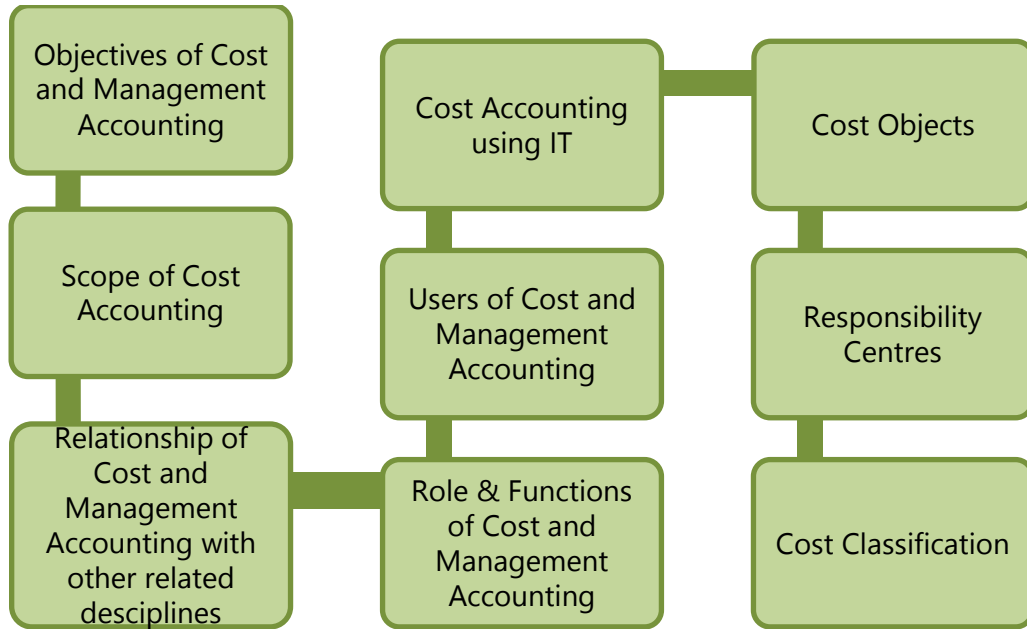
INTRODUCTION TO COST AND MANAGEMENT ACCOUNTING



LEARNING OUTCOMES

- ❑ State the meaning, objective and importance of cost and management accounting.
- ❑ Discuss the functions and role of cost accounting department in an organization.
- ❑ Discuss the essentials of cost and management accounting and to know how a system of cost accounting is installed.
- ❑ Differentiate between cost accounting with financial accounting and management accounting.
- ❑ List the various elements of cost and the way these are classified.
- ❑ Explain the methods of segregating semi-variable costs into fixed and variable cost.
- ❑ Discuss the concept of cost reduction and cost control.
- ❑ Discuss the methods and techniques of costing.
- ❑ Discuss cost accounting with the use of information technology.

CHAPTER OVERVIEW



1.1 INTRODUCTION

Michael E. Porter in his theory of Generic Competitive Strategies has described 'Cost Leadership' as one of the three strategic dimensions (others are 'Product differentiation' and 'Focus or Niche') to achieve competitive advantage in industry. **Cost Leadership implies producing goods or provision of services at lowest cost while maintaining quality** to have better competitive price. In a business environment where each entity is thriving to achieve apex position not only in domestic but global competitive market, it is essential for the entity to fit into any of the three competitive strategic dimensions. Cost Leadership, also in line with the subject Cost and Management Accounting, can be achieved if an entity has a robust cost and management accounting system in place. In this chapter, we will learn various aspects of cost and management accounting and its application in different manufacturing and service environment.

1.1.1 Meaning and Definition

(i) **Cost-** As a noun-The **amount of expenditure** (actual or notional) incurred on or attributable to a specified article, product or activity.

As a verb- To ascertain the cost of a specified thing or activity.

(ii) **Costing-** Costing is defined as "**the technique and process of ascertaining costs**".

According to CIMA "an organisation's costing system is the foundation of the internal financial information system for managers. It provides the information that management needs to plan and control the organisation's activities and to make decisions about the future."

(iii) **Cost Accounting-** Cost Accounting is defined as "**the process of accounting for cost** which begins with the recording of income and expenditure or the bases on which they are calculated and ends with the preparation of periodical statements and reports for ascertaining and controlling costs."

(iv) **Cost Accountancy-** Cost Accountancy has been defined as "**the application of costing and cost accounting principles, methods and techniques** to the science, art and practice of cost control and the ascertainment of profitability. It includes the presentation of information derived there from for the purpose of managerial decision making."

(v) **Management Accounting-** As per CIMA Official Terminology "Management accounting is **the application of the principles of accounting and financial management** to create, protect, preserve and increase value for the stakeholders of for-profit and not-for-profit enterprises in the public and private sectors."

Management accounting is an integral part of management. It assists management by provision of relevant information for planning, organising, controlling, decision making etc.

(vi) **Cost Management-** It is an application of management accounting concepts, methods of collections, analysis and presentation of data to provide the information needed to plan, monitor and control costs.



1.2 OBJECTIVES OF COST ACCOUNTING

The main objectives of cost and management accounting are explained as below:

(i) Ascertainment of Cost: The main objective of cost accounting is accumulation and ascertainment of cost. Costs are **accumulated, assigned and ascertained** for each cost object.

(ii) Determination of Selling Price and Profitability: The cost accounting system helps in determination of selling price and thus profitability of a cost object. Though in a competitive business environment selling prices are determined by external factors but cost accounting system provides a basis for **price fixation and rate negotiation**.

(iii) Cost Control: Maintaining discipline in expenditure is one of the main objective of a good cost accounting system. It ensures that **expenditures are in consonance with predetermined set standard and any variation from these set standards is noted and reported on continuous basis**. To exercise control over cost, following steps are followed:

- (a) *Determination of pre-determined standard or results:* Standard cost or performance targets for a cost object or a cost centre is set before initiation of production or service activity. These are desired cost or result that need to be achieved.
- (b) *Measurement of actual performance:* Actual cost or result of the cost object or cost centre is measured. Performance should be measured in the same manner in which the targets are set i.e. if the targets are set up operation-wise, and then the actual costs should also be collected and measured operation-wise to have a common basis for comparison.
- (c) *Comparison of actual performance with set standard or target:* The actual performance so measured is compared against the set standard and desired target. Any deviation (variance) between the two is noted and reported to the appropriate person or authority.
- (d) *Analysis of variance and action:* The variance in results so noted are further analysed to know the reasons for variance and appropriate action is taken to ensure compliance in future. If necessary, the standards are further amended to take developments into account.

(iv) Cost Reduction: It may be defined "as the achievement of **real and permanent reduction in the unit cost** of goods manufactured or services

rendered without impairing their suitability for the use intended or diminution in the quality of the product."

Cost reduction is an approach of management where cost of an object is believed to be further reduced. No cost is termed as lowest and every possibility of cost reduction is explored. To do cost reduction, the following action is taken:

- (a) Each activity within an entity is segmented to analyse and identify value added and non- value added activities. All non-value added activities are eliminated without affecting the essential characteristics of the product or process. **Value chain Analysis**, a strategic tool, developed by Michael Porter, is one of the method to do value analysis.
- (b) Conducting continuous research and study to know better way to do anything.

The *three-fold assumptions* involved in the definition of cost reduction may be summarised as under:

- (a) There is a saving in unit cost.
- (b) Such saving is of permanent nature.
- (c) The utility and quality of the goods and services remain unaffected, if not improved.

(v) Assisting management in decision making: Cost and Management accounting by providing relevant information, assist management in planning, implementing, measuring, controlling and evaluation of various activities. A robust cost and management accounting system not only provides information internal to industry but external also.

1.2.1 Difference between Cost Control and Cost Reduction

Cost Control	Cost Reduction
1. Cost control aims at <i>maintaining</i> the costs in accordance with the established standards.	1. Cost reduction is concerned with <i>reducing</i> costs. It challenges all standards and endeavours to better them continuously
2. Cost control seeks to <i>attain lowest possible cost</i> under existing conditions.	2. Cost reduction recognises no condition as permanent, since a <i>change will result in lower cost</i> .
3. In case of cost control, emphasis is on <i>past and present</i>	3. In case of cost reduction, it is on <i>present and future</i> .

4. Cost control is a preventive function	4. Cost reduction is a <i>corrective</i> function. It operates even when an efficient cost control system exists.
5. Cost control ends when targets are achieved.	5. Cost reduction has no visible end.



1.3 SCOPE OF COST ACCOUNTING

Scope of cost accounting consists of the following functions:

(i) Costing: Costing is the **technique and process of ascertaining costs** of products or services. The cost ascertainment procedure is governed by some cost accounting principles and rules. Generally, cost is ascertained using some arithmetical process.

(ii) Cost Accounting: This is a process of **accounting for cost** which begins with the recording of expenditure and ends with the preparation of periodical statement and reports for ascertaining and controlling cost. Cost Accounting is a formal mechanism of cost ascertainment.

(iii) Cost Analysis: It involves the process of finding out the **factors responsible for variance in actual costs from the budgeted costs** and accordingly fixation of responsibility for cost differences. This also helps in better cost management and strategic decisions.

(iv) Cost Comparisons: Cost accounting also includes comparisons of cost **from alternative courses of action** such as use of different technology for production, cost of making different products and activities, and cost of same product/ service over a period of time.

(v) Cost Control: It involves a **detailed examination of each cost** in the light of advantage received from the incurrance of the cost. Thus, we can state that cost is analyzed to know *whether cost is not exceeding its budgeted cost and whether further cost reduction is possible or not.*

(vi) Cost Reports: This is the ultimate function of cost accounting. These reports are primarily prepared for use by the management at different levels. Cost Reports *helps in planning and control, performance appraisal and managerial decision making.*

(vii) Statutory Compliances: Maintaining cost accounting records as per the rules prescribed by the statute to maintain cost records relating to utilization of

materials, labour and other items of cost as applicable to the production of goods or provision of services as provided in the Act and these rules.

1.4 RELATIONSHIP OF COST AND MANAGEMENT ACCOUNTING WITH OTHER RELATED DISCIPLINES

Cost and Management Accounting as a discipline is interrelated and dependent of other disciplines of accounting.

1.4.1 Cost Accounting with Management Accounting:

As we already studied that though Cost Accounting and Management Accounting is used synonymously but there are few differences. Management Accounting is open ended discipline which enables managers to take informed decision. Management Accounting takes inputs from cost accounts, financial accounts, statistical and operation management tools etc.

Difference between Cost Accounting and Management Accounting

	Basis	Cost Accounting	Management Accounting
(i)	Nature	It records the <i>quantitative</i> aspect only.	It records both <i>qualitative and quantitative</i> aspect.
(ii)	Objective	It <i>records the cost</i> of producing a product and providing a service.	It Provides information to management for <i>planning and co-ordination</i> .
(iii)	Area	It only deals with <i>cost Ascertainment</i> .	It is wider in scope as it <i>includes financial accounting, budgeting, taxation, planning</i> etc.
(iv)	Recording of data	It uses both <i>past and present</i> figures.	It is focused with the <i>projection</i> of figures for <i>future</i> .
(v)	Development	Its development is related to industrial revolution.	It develops in accordance to the need of modern business world.
(vi)	Rules and Regulation	It follows certain principles and procedures for recording costs of different products.	It does not follow any specific rules and regulations.

1.4.2 Cost Accounting with Financial Accounting:

Cost accounting accumulates and ascertain costs for goods sold and inventories. It provides inputs to record costs in financial accounting system.

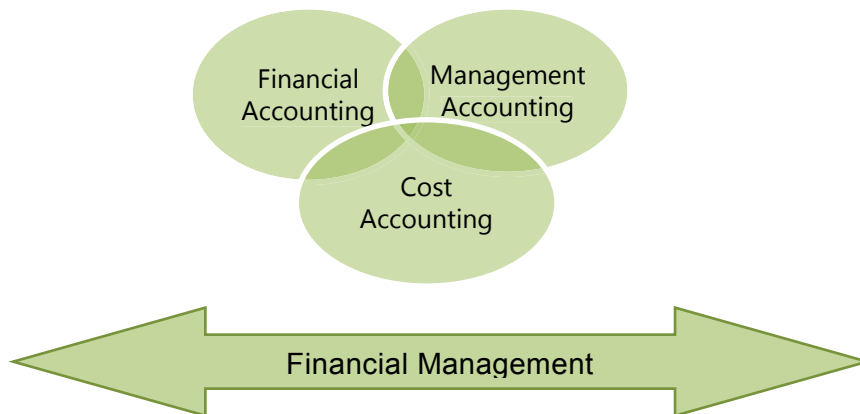
Difference between Financial Accounting and Cost Accounting

	Basis	Financial Accounting	Cost Accounting
(i)	Objective	It provides information about the <i>financial performance</i> of an entity.	Ascertainment of cost for the purpose of <i>cost control and decision making</i> .
(ii)	Nature	It classifies records, present and interprets transactions in monetary terms.	It classifies, costs records, present, and interprets it in a significant manner.
(iii)	Recording of data	It records <i>Historical data</i> .	It makes use of both <i>historical and pre-determined costs</i> .
(iv)	Users of information	The users of financial accounting statements are shareholders, creditors, financial analysts and government and its agencies, etc.	The cost accounting information is generally used by internal management. But some time regulatory authorities also.
(v)	Analysis of cost and profit	It shows profit or loss of the organization either segment wise or as a whole.	It provides the cost details for each cost object i.e. product, process, job, contracts, etc.
(vi)	Time period	Financial Statements are prepared <i>usually for a year</i> .	Reports and statements are prepared <i>as and when required</i> .
(vii)	Presentation of information	A <i>set format</i> is used for presenting financial information.	In general, <i>no set formats</i> for presenting cost information is followed.

1.4.3 Cost and Management Accounting with Financial Management:

Cost and Management Accounting is an **application of financial management**. The techniques of financial management are used for decision making.

The relationship among Cost Accounting, Management Accounting, Financial Accounting and Financial Management can be understood with the help of the following diagram.



1.5 ROLE & FUNCTIONS OF COST AND MANAGEMENT ACCOUNTING

The role of a cost and management accounting system is to:

- Provide relevant information to management for decision making,
- Assist management for planning, measurement, evaluation and controlling of business activities,
- Help in allocation of cost to products and inventories for both external and internal users.

Though the term cost accounting and management accounting is used by various authors synonymously but in actual, **cost accounting is concerned with accumulation and allocation of costs to different cost objects. Whereas, management accounting concerned with provision of information to internal users for decision making.**

The functions of cost and management accounting includes:

- (i) Collection and accumulation of cost for each element of cost.

- (ii) Assigning costs to cost objects to ascertain cost.
- (iii) Cost and management accounting department (whatever nomenclature may be used to denote the department) sets budget and standards for a particular period or activity beforehand and these are compared with the assigned and ascertained cost. Any deviation with the set standards are analysed and reported. All these mechanism is done to control costs.
- (iv) The main function of cost and management accounting is provision of relevant information to the management for decision making. An Information system environment is set up which is popularly known as **management information system (MIS)**. The MIS provides relevant and timely information related to both internal and external to the organisation to enable management at all levels to take decisions. Decisions include cost optimisation, price fixation, implementation of any plan related with product, process, marketing etc.
- (v) The performance of a responsibility centre is measured and evaluated against the set standards. The function of cost and management accounting is to gather data like time taken, wastages, process idleness etc., analyse the data, prepare reports and take necessary actions.



1.6 USERS OF COST AND MANAGEMENT ACCOUNTING

Cost and management accounting information which are generated or collected are used by different stakeholders. The users of the information can be broadly categorised into internal and external to the entity.

Internal Users

Internal users, which use the cost and management accounting information may include the followings:

- (a) Managers-** The managers use the information
 - (i) to know the cost of a cost object and cost centre
 - (ii) to price for the product or service
 - (iii) to measure and evaluate performance of responsibility centres
 - (iv) to the know the profitability- product-wise, department-wise, customer-wise etc.

- (v) to evaluate the strategic options and to make decisions
- (b) Operational level staffs-** The operational level staffs like supervisors, foreman, team leaders are requiring information
 - (i) to know the objectives and performance goals for them
 - (ii) to know product and service specifications like volume, quality and process etc.
 - (iii) to know the performance parameters against which their performance is measured and evaluated.
 - (iv) to know divisional (responsibility centre) profitability etc.
- (c) Employees-** Employees are concerned with the information related with time and attendance, incentives for work, performance standards etc.

External Users

External users, which use the cost and management accounting information may include the followings:

- (a) Regulatory Authorities-** Regulatory Authorities are concerned with cost accounting data and information *for different purpose which includes tariff determination, providing subsidies, rate fixation* etc. To do this the regulatory bodies require information on the basis of some standards and format in this regard.
- (b) Auditors-** The auditors while conducting audit of financial accounts or for some other special purpose audit like cost audit etc. requires information related with costing and reports reviewed by management etc.
- (c) Shareholders-** Shareholders are concerned with information that effect their investment in the entity. Management communicate the shareholders through periodic communique, annual reports etc. regarding new orders received, product expansion, market share for products etc.
- (d) Creditors and Lenders-** Creditor and lenders are concerned with data and information which affects an entity's ability to serve lenders or creditors. For example, any financial institutions which provides loan to an entity against book debts and stocks are more concerned with regular reporting on net debt position and stock balances.



1.7 ESSENTIALS OF A GOOD COST ACCOUNTING SYSTEM

The essential features, which a good cost accounting system should possess, are as follows:

(a) Informative and simple: Cost accounting system should be tailor-made, practical, simple and capable of meeting the requirements of a business concern. The system of costing should not sacrifice the utility by introducing inaccurate and unnecessary details.

(b) Accurate and authentic: The data to be used by the cost accounting system should be accurate and authenticated; otherwise it may distort the output of the system and a wrong decision may be taken.

(c) Uniformity and consistency: There should be uniformity and consistency in classification, *treatment and reporting of cost data and related information*. This is required for benchmarking and comparability of the results of the system for both horizontal and vertical analysis.

(d) Integrated and inclusive: The cost accounting system should be integrated with other systems like financial accounting, taxation, statistics and operational research etc. to have a complete overview and clarity in results.

(e) Flexible and adaptive: The cost accounting system should be flexible enough to *make necessary amendment and modifications* in the system to incorporate changes in technological, reporting, regulatory and other requirements.

(f) Trust on the system: Management should have trust on the system and its output. For this, an active role of management is required for the development of such a system that reflect a strong conviction in using information for decision making.



1.8 INSTALLATION OF COSTING SYSTEM

As in the case of every other form of activity, it should be considered whether it would be profitable to have a cost accounting system. Management of an organisation needs complete and accurate information to make decisions. A well-established Costing system should provide all relevant information as and when required by management as well as various stakeholders.

Before setting up a system of cost accounting the under mentioned factors should be studied:

- (a) **Objective:** The objective of costing system, for example whether it is being introduced for *fixing prices* or for establishing a system of cost control.
- (b) **Nature of Business or Industry:** The Industry in which business is operating. Every business industry has its own peculiarity and objectives. According to its cost information requirement cost accounting methods are followed. For example, an oil refinery maintains process wise cost accounts to find out cost incurred on a particular process say in crude refinement process etc.
- (c) **Organisational Hierarchy:** Costing system should fulfil the information requirements of different levels of management. *Top management is concerned with the corporate strategy, strategic level management is concerned with marketing strategy, product diversification, product pricing etc. Operational level management needs the information on standard quantity to be consumed, report on idle time etc.*
- (d) **Knowing the product:** Nature of product determines the type of costing system to be implemented. The product which has by-products requires costing system which accounts for by-products as well. In case of perishable or short self- life products, marginal costing is appropriate to know the contribution and minimum price at which products could be sold.
- (e) **Knowing the production process:** A good costing system can never be established without the complete knowledge of the production process. Cost apportionment can be done on the most appropriate and scientific basis if a cost accountant can identify degree of effort or resources consumed in a particular process. This also includes some basic technical know-how and process peculiarity.
- (f) **Information synchronisation:** Establishment of a department or a system requires substantial amount of organisational resources. While drafting a costing system, information needs of various other departments should be taken into account. For example, in a typical business organisation accounts department needs to submit monthly stock statement to its lender bank, quantity wise stock details at the time of filing returns to tax authorities etc.
- (g) **Method of maintenance of cost records:** The manner in which Cost and Financial accounts could be inter-locked into a single integral accounting

system and how the results of separate sets of accounts i.e. cost and financial, could be reconciled by means of control accounts.

- (h) **Statutory compliances and audit:** Records are to be maintained to comply with statutory requirements and applicable cost accounting standards to be followed.
- (i) **Information Attributes:** Information generated from the Costing system should possess all the attributes of information i.e. **complete, accurate, timeliness, relevant** etc. to have an effective management information system (MIS).



1.9 COST ACCOUNTING WITH THE USE OF INFORMATION TECHNOLOGY (IT)

The information technology in a business organisation has become essential for today's business environment. With the expansion of e-commerce and increasing competitive business environment, information technology is becoming an integral part of each activity in an organisation including cost and management accounting. Information technology has changed the cost and management accounting functions dramatically with the introduction of **Enterprise Resource Planning (ERP) system**. Cost accounting and management information system got automated and improved. The new industrial revolution in the form of **digital innovation which is popularly known as Industry 4.0**, has more emphasis on *digitisation and automation of business process to have a better control over cost to maintain market competitiveness*. Cost Accounting system has seen lots of savings in terms of time, money and efforts. The impact of IT in cost accounting may include the followings:

- (i) After the introduction of ERPs, different **functional activities get integrated** and as a consequence a *single entry into the accounting system* provides custom made reports for every purpose and saves an organisation from preparing different sets of documents. Reconciliation process of results of both cost and financial accounting systems become simpler and less sophisticated.
- (ii) A move towards *paperless environment* can be seen where documents like Bill of Material, Material Requisition Note, Goods Received Note, labour utilisation report etc. are no longer required to be prepared in multiple copies, the related department can get *e-copy* from the system.

(iii) Information Technology with the help of internet (including intranet and extranet) helping in **resource procurement and mobilisation**. For example, production department can get materials from the stores without issuing material requisition note physically. Similarly, purchase orders can be initiated to the suppliers with the help of extranet. This enables an entity to shift towards Just-in-Time (JIT) approach of inventory management and production.

(iv) Cost information for a cost centre or cost object is ascertained with accuracy in timely manner. Each cost centre and cost object is codified and all related costs are assigned to the cost objects or cost centres using assigned codes. This automates the cost accumulation and ascertainment process. *The cost information can be customised as per the requirement.* For example, when an entity manufacture or provide services, are able to know information job-wise, batch-wise, process-wise, cost centre wise etc.

(v) Uniformity in preparation of report, budgets and standards can be achieved with the help of IT. ERP software plays an important role in bringing uniformity irrespective of location, currency, language and regulations.

(vi) Cost and revenue variance reports are generated in *real time basis* which enables the management to take control measures immediately.

(vii) IT enables an entity to monitor and analyse each process of manufacturing or service activity closely to eliminate non value added activities.

The above are examples of few areas where Cost Accounting is done with the help of IT.

1.10 COST OBJECTS

Cost object is anything for which a separate measurement of cost is required. Cost object may be a product, a service, a project, a customer, a brand category, an activity, a department or a programme etc.

Examples of cost object are:

Product	Smart phone, Tablet computer, SUV Car, Book etc.
Service	An airline flight from Delhi to Mumbai, Concurrent audit assignment, Utility bill payment facility etc.
Project	Metro Rail project, Road projects etc.
Activity	Quality inspection of materials, Placing of orders etc.

Process	Refinement of crudes in oil refineries, melting of billets or ingots in rolling mills etc.
Department	Production department, Finance & Accounts, Safety etc.

1.10.1 Cost Units

It is a unit of product, service or time (or combination of these) in relation to which costs may be ascertained or expressed.

We may for instance determine the cost per ton of steel, per ton-kilometre of a transport service or cost per machine hour. Sometime, a single order or a contract constitutes a cost unit. A batch which consists of a group of identical items and maintains its identity through one or more stages of production may also be considered as a cost unit.

Cost units are usually the units of physical measurement like number, weight, area, volume, length, time and value.

A few typical examples of cost units are given below:

Industry or Product	Cost Unit Basis
Automobile	Number
Cement	Ton/ per bag etc.
Chemicals	Litre, gallon, kilogram, ton etc.
Power	Kilo-watt hour (kWh)
Steel	Ton
Transport	Passenger- kilometer
Gas	Cubic feet

Some examples from the CIMA terminology are as follows:

Industry Sector	Cost unit
Brewing	Barrel
Brick-making	1,000 bricks
Coal mining	Tonne/ton
Electricity	Kilowatt-hour (kWh)

Engineering	Contract, job
Oil	Barrel, tonne, litre
Hotel/Catering	Room/meal
Professional services	Chargeable hour, job, contract
Education	Course, enrolled student, successful student
Hospitals	Patient day

Activity	Cost unit
Credit control	Accounts maintained
Selling	Customer call, value of sales, orders taken
Materials storage/handling	Requisition unit issued/received, material movement, value issued/received
Personnel administration	Personnel record

1.10.2 Cost Driver

A Cost driver is a factor or variable which effect level of cost. Generally, it is an **activity which is responsible for cost incurrence**. Level of activity or volume of production is the example of a cost driver. An activity may be an event, task, or unit of work etc.

CIMA Official terminology defines cost driver as *“Factor influencing the level of cost. Often used in the context of ABC to denote the factor which links activity resource consumption to product outputs, for example the number of purchase orders would be a cost driver for procurement cost.”*

Examples of cost drivers are number of machines setting ups, number of purchase orders, hours spent on product inspection, number of tests performed etc.



1.11 RESPONSIBILITY CENTRES

With the growth of an organisation, its functions, organisational structure and other related functions are also growing in terms of volume and complexity. To have a better control over the organisation, management delegates its

responsibility and authority to various departments or persons. These departments or persons are known as **responsibility centres** and are held responsible for performance in terms of expenditure, revenue, profitability and return on investment. Performance of these responsibility centres are measured against some set standards (input-output ratio, budgets etc.) and evaluated against organisational goal and performance targets. *There are four types of responsibility centres:*

- (i) Cost Centres
- (ii) Revenue Centres
- (iii) Profit Centres
- (iv) Investment Centres

(i) Cost Centres: The responsibility centre which is held accountable for *incurrence of costs* which are under its control. The performance of this responsibility centre is measured against pre-determined standards or budgets. The cost centres are of two types:

(a) Standard Cost Centre and (b) Discretionary Cost Centre

(a) Standards Cost Centres: Cost Centre where *output is measurable and input required for the output can be specified*. Based on a well-established study, an estimate of standard units of input to produce a unit of output is set. The actual cost for inputs is compared with the standard cost. Any deviation (variance) in cost is measured and analysed into controllable and uncontrollable cost. The manager of the cost centre is supposed to comply with the standard and held responsible for adverse cost variances. The input-output ratio for a standard cost centre is clearly identifiable.

(b) Discretionary Cost Centre: The cost centre *whose output cannot be measured in financial terms, thus input-output ratio cannot be defined*. The cost of input is compared with allocated budget for the activity. Example of discretionary cost centres are Research & Development department, Advertisement department where output of these department cannot be measured with certainty and correlated with cost incurred on inputs.

(ii) Revenue Centres: The responsibility centres which are accountable for *generation of revenue for the entity*. Sales Department for example, is the responsible for achievement of sales target and revenue generation. Though, revenue centres does not have control on expenditures it incurs but some time

expenditures related with selling activities like commission to sales person etc. are incurred by revenue centres.

(iii) Profit Centres: These are the responsibility centres which have *both responsibility of generation of revenue and incurrence of expenditures*. Since, managers of profit centres are accountable for both costs as well as revenue, profitability is the basis for measurement of performance of these responsibility centres. Examples of profit centres are decentralised branches of an organisation.

(iv) Investment Centres: These are the responsibility centres which are *not only responsible for profitability but also has the authority to make capital investment decisions*. The performance of these responsibility centres are measured on the basis of Return on Investment (ROI) besides profit. Examples of investment centres are Maharatna, Navratna and Miniratna companies of Public Sector Undertakings of Central Government.

1.12 LIMITATIONS OF COST ACCOUNTING

Like other branches of accounting, cost accounting is also having certain limitations. The limitations of cost accounting are as follows:

- 1. Expensive:** It is expensive because analysis, allocation and absorption of overheads require considerable amount of additional work, and hence additional money.
- 2. Requirement of Reconciliation:** The results shown by cost accounts differ from those shown by financial accounts. Thus Preparation of reconciliation statements is necessary to verify their accuracy.
- 3. Duplication of Work:** It involves duplication of work as organization has to maintain two sets of accounts i.e. Financial Account and Cost Account.
- 4. Inefficiency:** Costing system itself does not control costs but its usage does.

1.13 CLASSIFICATION OF COSTS

It means the grouping of costs according to their common characteristics. The important ways of classification of costs are:

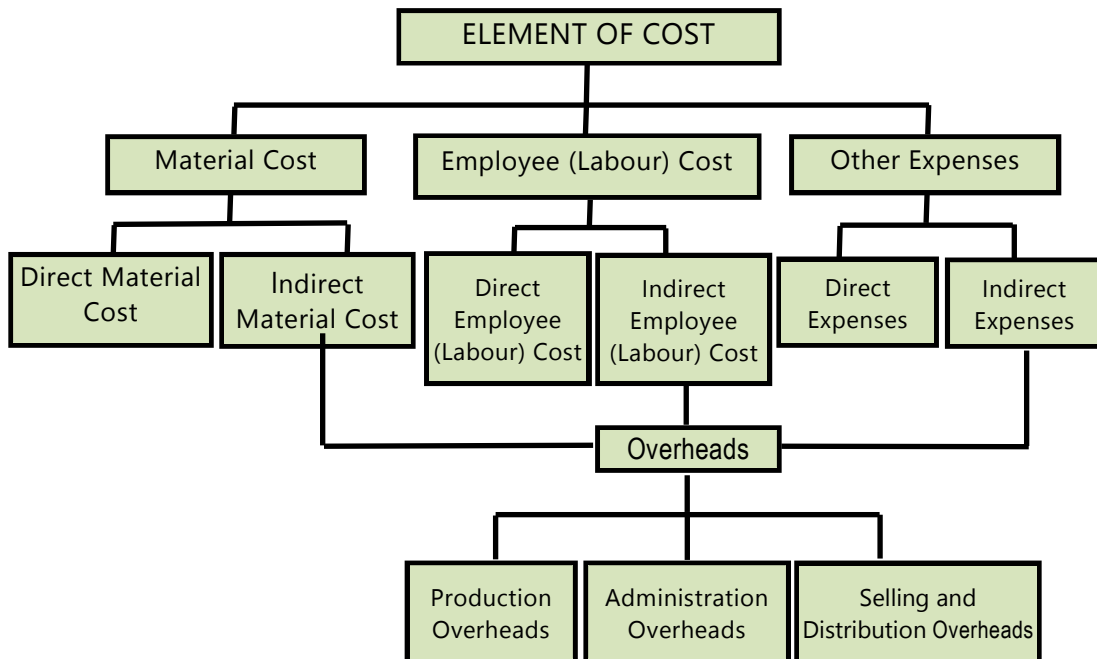
- (i) By Nature or Element
- (ii) By Functions

- (iii) By Variability or Behaviour
- (iv) By Controllability
- (v) By Normality
- (vi) By Costs for Managerial Decision Making

1.13.1 By Nature or Element

This type of classification is useful to determine the total cost.

A diagram as given below shows the elements of cost described as under:



- (i) **Direct Materials:** Materials which are present in the finished product (cost object) or can be economically identified in the product are called direct materials. For example, cloth in dress making; materials purchased for a specific job etc. However, in some cases a material may be direct but it is treated as indirect, because it is used in small quantities, it is not economically feasible to identify that quantity and those materials which are used for purposes ancillary to the business.
- (ii) **Direct Labour:** Labour which can be economically identified or attributed wholly to a cost object is called direct labour. For example, employee engaged on the actual production of the product or in carrying out the necessary operations for converting the raw materials into finished product.

- (iii) **Direct Expenses:** It includes *all expenses other than direct material or direct labour* which are specially incurred for a particular cost object and can be identified in an economically feasible way. For example, hire charges for some special machinery, cost of defective work.
- (iv) **Indirect Materials:** Materials which do not normally form part of the finished product (cost object) are known as indirect materials. These are —
- Stores used for maintaining machines and buildings (lubricants, cotton waste, bricks etc.)
 - Stores used by service departments like power house, boiler house, canteen etc.
- (v) **Indirect Labour:** Labour costs which cannot be allocated but can be apportioned to or absorbed by cost units or cost centres is known as indirect labour. Examples of indirect employees includes foreman and supervisors; maintenance workers; etc.
- (vi) **Indirect Expenses:** Expenses other than direct expenses are known as indirect expenses, that cannot be directly, conveniently and wholly allocated to cost centres. Factory rent and rates, insurance of plant and machinery, power, light, heating, repairing, telephone etc., are some examples of indirect expenses.
- (vii) **Overheads:** It is the aggregate of indirect material costs, indirect labour costs and indirect expenses. The main groups into which overheads may be subdivided are the following:
- **Production or Works Overheads:** Indirect expenses which are incurred in the factory and for the running of the factory. E.g.: rent, power etc.
 - **Administration Overheads:** Indirect expenses related to management and administration of business. E.g.: office rent, lighting, telephone etc.
 - **Selling Overheads:** Indirect expense incurred for marketing of a commodity. E.g.: Advertisement expenses, commission to sales persons etc.
 - **Distribution Overheads:** Indirect expense incurred for despatch of the goods E.g.: warehouse charges, packing(secondary) and loading charges.

1.13.2 By Functions

Under this classification, costs are divided according to the function for which they have been incurred. It includes the following:

- (i) Direct Material Cost
- (ii) Direct Employee (labour) Cost
- (iii) Direct Expenses
- (iv) Production/ Manufacturing Overheads
- (v) Administration Overheads
- (vi) Selling Overheads
- (vii) Distribution Overheads
- (viii) Research and Development costs etc.

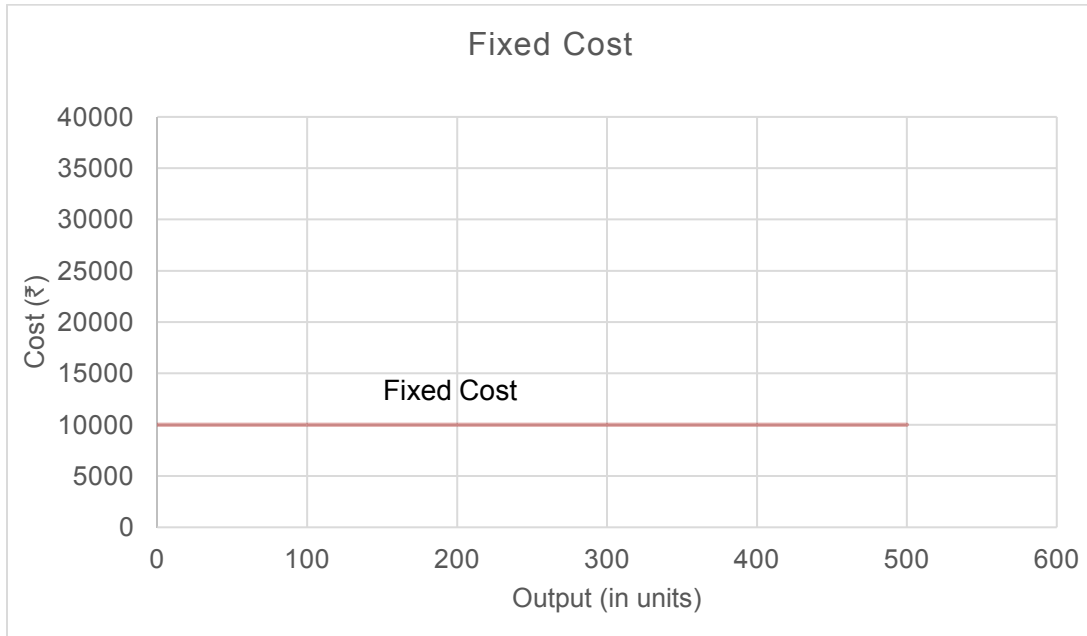
Direct Materials	}	Factory Overheads	Prime Cost
Direct Employees (Labours)			
Direct Expenses			
Indirect Material	}	Administration Overheads	Factory Cost or Works Cost
Indirect Labour			
Indirect Expenses	}	Selling and Distribution Overheads	Cost of Goods Sold
			Cost of Sales

1.13.3 By Variability or Behaviour

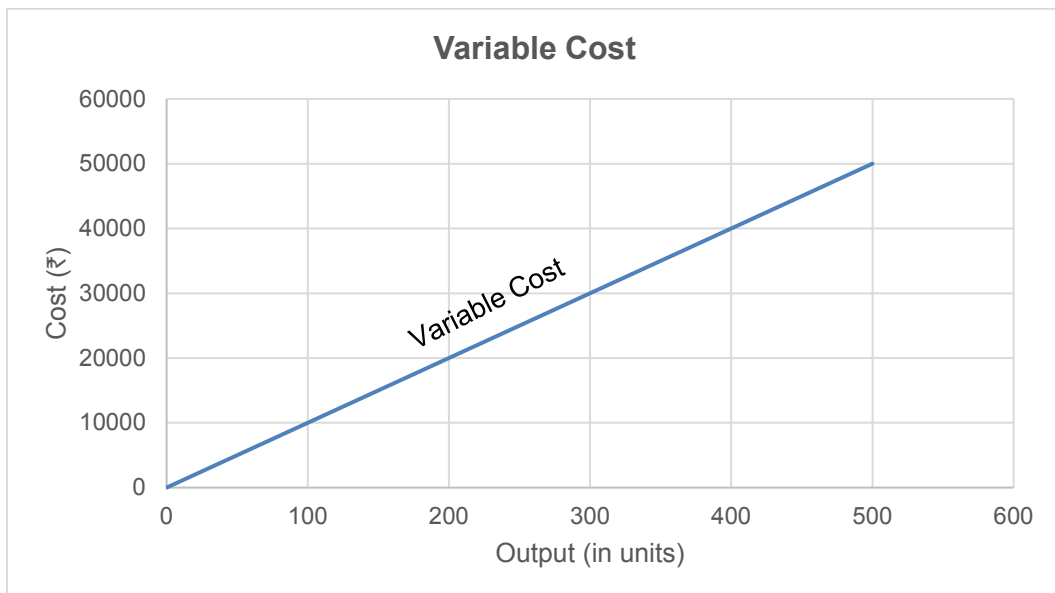
According to this classification costs are classified into three group viz., fixed, variable and semi-variable.

- (a) Fixed costs**– These are the costs which are incurred for a period, and which, within certain output and turnover limits, tend to be unaffected by fluctuations in the levels of activity (output or turnover). *They do not tend to increase or decrease with the changes in output.* For example, rent,

insurance of factory building etc., remain the same for different levels of production.

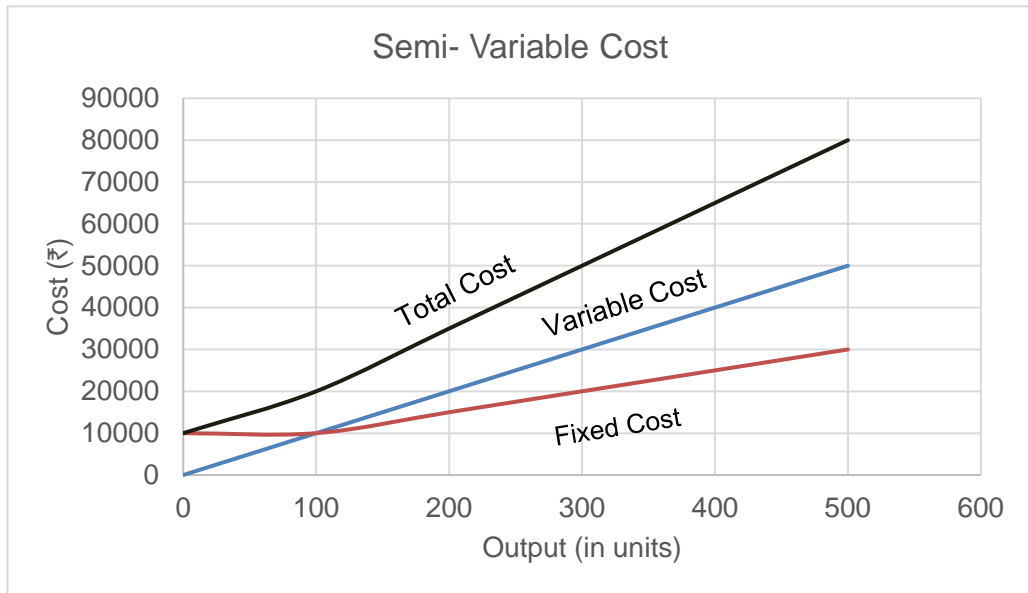


(b) Variable Costs– These costs tend to vary with the volume of activity. Any increase in the activity results in an increase in the variable cost and vice-versa. For example, cost of direct labour, etc.



- (c) **Semi-variable costs**– These costs contain both fixed and variable components and are thus partly affected by fluctuations in the level of activity. Examples of semi variable costs are telephone bills, gas and electricity etc. Such costs are depicted graphically as follows:

1.13.3.1 Methods of segregating Semi-variable costs into fixed and variable costs



The segregation of semi-variable costs into fixed and variable costs can be carried out by using the following methods:

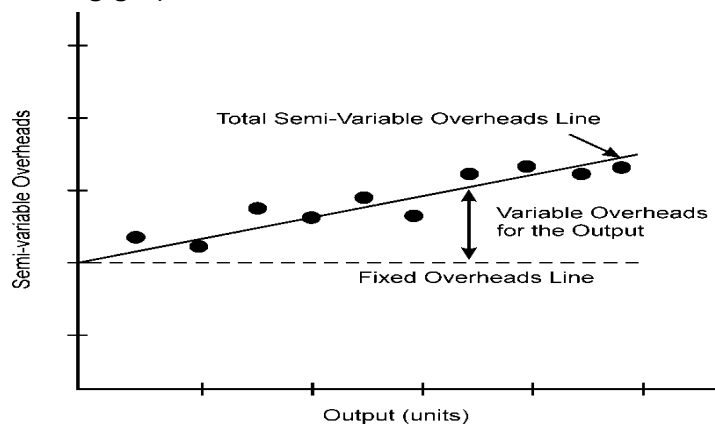
- Graphical method
- High points and low points method
- Analytical method
- Comparison by period or level of activity method
- Least squares method

(a) Graphical Method: Under this method, the following steps are followed:

- A large number of observations regarding the total costs at different levels of output are plotted on a graph with the output on the X-axis
- The total cost is plotted on the Y-axis.

- iii. Then, by judgment, a line of “best-fit”, which passes through all or most of the points, is drawn.
- iv. The point at which this line cuts the Y-axis indicates the total fixed cost component in the total cost.
- v. If a line is drawn at this point parallel to the X-axis, this indicates the fixed cost.
- vi. The variable cost, at any level of output, is derived by deducting this fixed cost element from the total cost.

The following graph illustrates this:



- (b) **High points and Low Points Method:** Under this method difference between the total cost at highest and lowest volume is divided by the difference between the sales value at the highest and lowest volume. The quotient thus obtained gives us the rate of variable cost in relation to sales value.

ILLUSTRATION 1: (Segregation of fixed cost and variable cost)

	Sales value	Total cost
	(₹)	(₹)
At the Highest volume	1,40,000	72,000
At the Lowest volume	<u>80,000</u>	<u>60,000</u>
	<u>60,000</u>	<u>12,000</u>

Thus, Variable Cost (₹ 12,000/₹ 60,000)

= $1/5$ or 20% of sales value = ₹ 28,000 (at highest volume)

Fixed Cost ₹ 72,000 – ₹ 28,000 i.e., (20% of ₹ 1,40,000) = ₹ 44,000.

Alternatively, ₹ 60,000 – ₹ 16,000 (20% of ₹ 80,000) = ₹ 44,000.

- (c) **Analytical Method:** Under this method an experienced cost accountant tries to judge empirically what proportion of the semi-variable cost would be variable and what would be fixed. The degree of variability is ascertained for each item of semi-variable expenses. For example, some semi-variable expenses may vary to the extent of 20% while others may vary to the extent of 80%. Although it is very difficult to estimate the extent of variability of an expense, the method is easy to apply. (Go through the following illustration for clarity).

ILLUSTRATION 2: (Segregation of fixed cost and variable cost)

Suppose, last month the total semi-variable expenses amounted to ₹ 3,000. If the degree of variability is assumed to be 70%, then variable cost = 70% of ₹ 3,000 = ₹ 2,100. Fixed cost = ₹ 3,000 – ₹ 2,100 = ₹ 900. Now in the future months, the fixed cost will remain constant, but the variable cost will vary according to the change in production volume. Thus, if in the next month production increases by 50%, the total semi-variable expenses will be: Fixed cost of ₹ 900, plus variable cost viz., ₹ 3,150 i.e., (₹ 2,100 (V.C.) plus 50% increase of V.C. i.e., ₹ 1,050) i.e., ₹ 4,050.

- (d) **Comparison by period or level of activity method:** Under this method, the variable overhead may be determined by comparing two levels of output with the amount of expenses at those levels. Since the fixed element does not change, the variable element may be ascertained with the help of the following formula.

$$\frac{\text{Change in the amount of expense}}{\text{Change in the quantity of output}}$$

Suppose the following information is available:

	Production Units	Semi-variable expenses
		(₹)
January	100	260
February	<u>140</u>	<u>300</u>
Difference	<u>40</u>	<u>40</u>

The variable cost:

$$\frac{\text{Change in Semi-variable expenses}}{\text{Change in production volume}} = \frac{\text{₹ 40}}{40 \text{ units}} = \text{₹ 1/unit}$$

Thus, in January, the variable cost will be $100 \times \text{₹ 1} = \text{₹ 100}$ and the fixed cost element will be $(\text{₹ 260} - \text{₹ 100})$ or ₹ 160 . In February, the variable cost will be $140 \times \text{₹ 1} = \text{₹ 140}$ whereas the fixed cost element will remain the same, i.e., ₹ 160 .

- (e) **Least Square Method:** This is the best method to segregate semi-variable costs into its fixed and variable components. This is a statistical method and is based on finding out a line of best fit for a number of observations.

The method uses the linear equation $y = mx + c$, where

'm' represents the variable element of cost per unit, 'c' represents the total fixed cost, 'y' represents the total cost, 'x' represents the volume of output.

The total cost is thus split into its fixed and variable elements by solving this equation.

ILLUSTRATION 3: (Segregation of fixed cost and variable cost)

	<i>Level of activity</i>	
Capacity %	60%	80%
Volume (Labour hours) or 'x'	150	200
Semi-variable expenses (maintenance of plant) or 'y'	₹ 1,200	₹ 1,275

Substituting the values of 'x' and 'y' in the equation, $y = mx + c$, at both the levels of activity, we get

$$1,200 = 150 m + c$$

$$1,275 = 200 m + c$$

On solving the above equations, we get the value of 'c'

Fixed cost or 'c' = ₹ 975 and Variable cost or 'm' = ₹ 1.50 per labour hour.

1.13.4 By Controllability

Costs here may be classified into controllable and uncontrollable costs.

- (a) **Controllable Costs:** - Cost that can be controlled, typically by a cost, profit or investment centre manager is called controllable cost. Controllable costs incurred in a particular responsibility centre can be influenced by the action of the executive heading that responsibility centre. For example, direct costs comprising direct labour, direct material, direct expenses and some of the overheads are generally controllable by the shop level management.
- (b) **Uncontrollable Costs** - Costs which cannot be influenced by the action of a specified member of an undertaking are known as uncontrollable costs. For example, expenditure incurred by, say, the tool room is controllable by the foreman in-charge of that section but the share of the tool-room expenditure which is apportioned to a machine shop is not to be controlled by the machine shop foreman.

Distinction between Controllable Cost and Uncontrollable Cost: The distinction between controllable and uncontrollable costs is not very sharp and is sometimes left to individual judgement. In fact, no cost is uncontrollable; it is only in relation to a particular individual that we may specify a particular cost to be either controllable or uncontrollable.

1.13.5 By Normality

According to this basis cost may be categorised as follows:

- (a) **Normal Cost** - It is the cost which is normally incurred at a given level of output under the conditions in which that level of output is normally attained.
- (b) **Abnormal Cost** - It is the cost which is not normally incurred at a given level of output in the conditions in which that level of output is normally attained. **It is charged to Costing Profit and loss Account.**

1.13.6 By Costs for Managerial Decision Making

According to this basis cost may be categorised as follows:

- (a) **Pre-determined Cost** - A cost which is *computed in advance before production or operations start*, on the basis of specification of all the factors affecting cost, is known as a pre-determined cost.

- (b) **Standard Cost** -A pre-determined cost, which is calculated from managements 'expected standard of efficient operation' and the relevant necessary expenditure. It may be used as a basis for price fixation and for cost control through variance analysis.
- (c) **Marginal Cost** -The amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit.
- (d) **Estimated Cost** - Kohler defines estimated cost as "the expected cost of manufacture, or acquisition, often in terms of a unit of product computed on the basis of information available in advance of actual production or purchase". Estimated costs are **prospective costs** since they refer to prediction of costs.
- (e) **Differential Cost** - (Incremental and decremental costs). It represents the change (increase or decrease) in total cost (variable as well as fixed) due to change in activity level, technology, process or method of production, etc. For example, if any change is proposed in the existing level or in the existing method of production, the increase or decrease in total cost or in specific elements of cost as a result of this decision will be known as incremental cost or decremental cost.
- (f) **Imputed Costs** - These costs are **notional costs** which do not involve any cash outlay. Interest on capital, the payment for which is not actually made, is an example of imputed cost. *These costs are similar to opportunity costs.*
- (g) **Capitalized Costs** -These are costs which are initially recorded as assets and subsequently treated as expenses. Example, installation expenses on the erection of a machine are added to the cost of a machine.
- (h) **Product Costs** - These are the costs which are associated with the *purchase and sale of goods* (in the case of merchandise inventory). In the production scenario, such costs are associated with the *acquisition and conversion of materials and all other manufacturing inputs into finished product* for sale. Hence, under marginal costing, variable manufacturing costs and under absorption costing, total manufacturing costs (variable and fixed) constitute inventoriable or product costs.
- (i) **Opportunity Cost** - This cost refers to the value of sacrifice made or *benefit of opportunity foregone in accepting an alternative course of action*. For example, a firm financing its expansion plan by withdrawing money from its

bank deposits. In such a case the loss of interest on the bank deposit is the opportunity cost for carrying out the expansion plan.

- (j) **Out-of-pocket Cost** - It is that portion of total cost, which involves *cash outflow*. This cost concept is a short-run concept and is used in decisions relating to fixation of selling price in recession, make or buy, etc. Out-of-pocket costs can be avoided or saved if a particular proposal under consideration is not accepted.
- (k) **Shut down Costs** - Those costs, which continue to be, incurred even when a plant is temporarily shut-down *e.g.* rent, rates, depreciation, etc. These costs cannot be eliminated with the closure of the plant. In other words, *all fixed costs, which cannot be avoided during the temporary closure of a plant, will be known as shut down costs.*
- (l) **Sunk Costs** - *Historical costs incurred in the past* are known as sunk costs. They play no role in decision making in the current period. For example, in the case of a decision relating to the replacement of a machine, the written down value of the existing machine is a sunk cost and therefore, not considered.
- (m) **Absolute Cost** - These costs refer to the *cost of any product, process or unit in its totality*. When costs are presented in a statement form, various cost components may be shown in absolute amount or as a percentage of total cost or as per unit cost or all together. Here the costs depicted in absolute amount may be called absolute costs and are base costs on which further analysis and decisions are based.
- (n) **Discretionary Costs** – Such costs are *not tied to a clear cause and effect* relationship between inputs and outputs. They usually arise from periodic decisions regarding the maximum outlay to be incurred. Examples include advertising, public relations, executive training etc.
- (o) **Period Costs** - These are the costs, which are not assigned to the products but are *charged as expenses against the revenue of the period in which they are incurred*. All non-manufacturing costs such as general & administrative expenses, selling and distribution expenses are recognised as period costs.
- (p) **Engineered Costs** - These are costs that result specifically from a *clear cause and effect relationship between inputs and outputs*. The relationship is usually personally observable. Examples of inputs are direct material costs, direct labour costs etc. Examples of output are cars, computers etc.

- (q) **Explicit Costs** - These costs are also known as out of pocket costs and refer to *costs involving immediate payment of cash*. Salaries, wages, postage and telegram, printing and stationery, interest on loan etc. are some examples of explicit costs involving immediate cash payment.
- (r) **Implicit Costs** - These costs do not involve any immediate cash payment. They *are not recorded in the books of account*. They are also known as economic costs.

1.14 METHODS OF COSTING

Different industries follow different methods of costing because of the differences in the nature of their work. The various methods of costing are as follows:

Methods	Description
Single or Output Costing	Here the cost of a product is ascertained, the product being the only one produce like bricks, coals, etc.
Batch Costing	It is the extension of job costing. A batch may represent a number of small orders passed through the factory in batch. Each batch here is treated as a unit of cost and thus separately costed. Here cost per unit is determined by dividing the cost of the batch by the number of units produced in the batch.
Job Costing	In this method of costing, cost of each job is ascertained separately. It is suitable in all cases where work is undertaken on receiving a customer's order like a printing press, motor workshop, etc.
Contract Costing	Here the cost of each contract is ascertained separately. It is suitable for firms engaged in the construction of bridges, roads, buildings etc.
Process Costing	Here the cost of completing each stage of work is ascertained, like cost of making pulp and cost of making paper from pulp. In mechanical operations, the cost of each operation may be ascertained separately; the name given is operation costing.
Operating Costing	It is used in the case of concerns rendering services like transport, supply of water, retail trade etc.

Multiple Costing	It is a combination of two or more methods of costing outlined above. Suppose a firm manufactures bicycles including its components; the parts will be costed by the system of job or batch costing but the cost of assembling the bicycle will be computed by the Single or output costing method. The whole system of costing is known as multiple costing.
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The following table summarises the various methods of costing applied in different industries:

Nature of Output	Method	Cost	Examples of Industries
A Series of Processes	Process costing or Operation Costing	For each process	Sugar
Construction of building	Contract Costing	For each contract	Real estate
Similar units of a Single Product, produced by Single Process	Unit or output or Single Costing	For the entire activity, but averaged for the output	Cold Drinks
Rendering of Services	Operating Costing	For all services	Hospitals
Customer Specifications: single Unit	Job Costing	For each order/assignment/job	Advertising
Consisting of multiple varieties of activities and processes	Multiple Costing	Combination of any method	Car Assembly



1.15 TECHNIQUES OF COSTING

For ascertaining cost, following types of costing are usually used.

Techniques	Description
Uniform Costing	<p>When a number of firms in an industry agree among themselves to follow the same system of costing in detail, adopting common terminology for various items and processes they are said to follow a system of uniform costing.</p> <p>Advantages of such a system are that</p> <ol style="list-style-type: none"> A comparison of the performance of each of the firms can be made with that of another, or with the average performance in the industry. Under such a system it is also possible to determine the cost of production of goods which is true for the industry as a whole. It is found useful when tax-relief or protection is sought from the Government.
Marginal Costing	<p>It is defined as the ascertainment of marginal cost by differentiating between fixed and variable costs. It is used to ascertain effect of changes in volume or type of output on profit.</p>
Standard Costing and Variance Analysis	<p>It is the name given to the technique whereby <i>standard costs are pre-determined and subsequently compared with the recorded actual costs</i>. It is thus a technique of cost ascertainment and cost control. This technique may be used in conjunction with any method of costing. However, it is especially suitable where the manufacturing method involves production of standardised goods of repetitive nature.</p>
Historical Costing	<p>It is the ascertainment of costs after they have been incurred. This type of costing has limited utility.</p> <ul style="list-style-type: none"> <i>Post Costing</i>: It means ascertainment of cost after production is completed. <i>Continuous costing</i>: Cost is ascertained as soon as the job is completed or even when the job is in progress.
Absorption Costing	<p>It is the practice of charging all costs, both variable and fixed to operations, processes or products. This differs from marginal costing where fixed costs are excluded.</p>

SUMMARY

- ◆ **Cost:** The amount of expenditure (actual or notional) incurred on or attributable to a specified article, product or activity. (*as a noun*)
- ◆ To ascertain the cost of a specified thing or activity. (*as a verb*)
- ◆ **Costing:** Costing is the technique and process of ascertaining costs.
- ◆ **Cost Accounting:** The process of accounting for cost which begins with the recording of income and expenditure or the bases on which they are calculated and ends with the preparation of periodical statements and reports for ascertaining and controlling costs.
- ◆ **Cost Accountancy:** Cost Accountancy has been defined as "the application of costing and cost accounting principles, methods and techniques to the science, art and practice of cost control and the ascertainment of profitability. It includes the presentation of information derived there from for the purpose of managerial decision making."
- ◆ **Management Accounting:** As per CIMA Official Terminology "Management accounting is the application of the principles of accounting and financial management to create, protect, preserve and increase value for the stakeholders of for-profit and not-for-profit enterprises in the public and private sectors."
- ◆ **Cost Management:** It is an application of management accounting concepts, methods of collections, analysis and presentation of data to provide the information needed to plan, monitor and control costs.
- ◆ **Cost Control:** Maintaining discipline in expenditure is one of the main objective of a good cost and management accounting system. It ensures that expenditures are in consonance with predetermined set standard and any variation from these set standards is noted and reported on continuous basis.
- ◆ **Cost Reduction:** It may be defined "as the achievement of real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their suitability for the use intended or diminution in the quality of the product."

- ◆ **Cost Objects:** Cost object is anything for which a separate measurement of cost is required. Cost object may be a product, a service, a project, a customer, a brand category, an activity, a department or a programme etc.
- ◆ **Cost Units:** It is a unit of product, service or time (or combination of these) in relation to which costs may be ascertained or expressed.
- ◆ **Cost Drivers:** A Cost driver is a factor or variable which effect level of cost. Generally, it is an activity which is responsible for cost incurrence. Level of activity or volume of production is the example of a cost driver. An activity may be an event, task, or unit of work etc.
- ◆ **Responsibility Centres:** To have a better control over the organisation, management delegates its responsibility and authority to various departments or persons. These departments or persons are known as responsibility centres and are held responsible for performance in terms of expenditure, revenue, profitability and return on investment.
- ◆ **Cost Centres:** The responsibility centre which is held accountable for incurrence of costs which are under its control. The performance of this responsibility centre is measured against pre-determined standards or budgets.
- ◆ **Revenue Centres:** The responsibility centres which are accountable for generation of revenue for the entity.
- ◆ **Profit Centres:** These are the responsibility centres which have both responsibility of generation of revenue and incurrence of expenditures. Since, managers of profit centres are accountable for both costs as well as revenue, profitability is the basis for measurement of performance of these responsibility centres.
- ◆ **Investment Centres:** These are the responsibility centres which are not only responsible for profitability but also has the authority to make capital investment decisions. The performance of these responsibility centres are measured on the basis of Return on Investment (ROI) besides profit.

TEST YOUR KNOWLEDGE

MCQs based Questions

- _____ is anything for which a separate measurement is required.
 - Cost unit
 - Cost object
 - Cost driver
 - Cost centre
- Which of the following is true about Cost control:
 - It is a corrective function
 - It challenges the set standards
 - It ends when targets achieved
 - It is concerned with future
- Cost units used in power sector is:
 - Kilo meter (K.M)
 - Kilowatt-hour (kWh)
 - Number of electric points
 - Number of hours
- Processes Costing method is suitable for
 - Transport sector
 - Chemical industries
 - Dam construction
 - Furniture making
- Distinction between direct cost and indirect cost is an example of _____ classification
 - By Element
 - By Function
 - By Controllability

- (d) By Variability
6. The advantage of using IT in Cost Accounting does not include:
- (a) Integration of various functions
 - (b) Stock needs to be reconciled with Goods Received Note
 - (c) Reduction in multicity of documents
 - (d) Customised reports can be prepared.
7. A taxi provider charges minimum ₹80 thereafter ₹12 per kilometer of distance travelled, the behaviour of conveyance cost is:
- (a) Fixed Cost
 - (b) Semi-variable Cost
 - (c) Variable Cost
 - (d) Administrative cost.
8. A Ltd. has three production department and each department has two machines, which of the following cannot be treated as cost centre for cost allocation:
- (a) Machines under the production department
 - (b) Production departments
 - (c) Both Production department and machines
 - (d) A Ltd.
9. Which of the following is an example of functional classification of cost:
- (a) Direct Material Cost
 - (b) Fixed Cost
 - (c) Administrative Overheads
 - (d) Indirect Overheads.
10. Ticket counter in a Railway Station is an example of
- (a) Cost Centre
 - (b) Revenue Centre
 - (c) Profit Centre
 - (d) Investment Centre

Theoretical Questions

1. DESCRIBE the main objectives of introduction of a Cost and Management Accounting System in a manufacturing organization
2. WHAT is meant by cost centre?
3. DISCUSS cost classification based on variability and controllability.
4. DISCUSS the essential features of a good cost accounting system?
5. DESCRIBE the factors which are to be considered before installing a system of cost accounting.
6. DISCUSS the four different methods of costing alongwith their applicability to concerned industry?
7. STATE the method of costing and the suggestive unit of cost for the following industries:

(a) Transport	(b) Power	(c) Hotel
(d) Hospital	(e) Steel	(f) Coal
(g) Bicycles	(h) Bridge Construction	(i) Interior Decoration
(j) Advertising	(k) Furniture	(l) Brick-works

ANSWERS/ SOLUTIONS

Answers to the MCQs based Questions

1. (b) 2. (c) 3. (b) 4. (b) 5. (a) 6. (b)
 7. (b) 8. (d) 9. (c) 10. (b)

Answers to the Theoretical Questions

1. Please refer paragraph 1.2
2. Please refer paragraph 1.11
3. Please refer paragraph 1.13
4. Please refer paragraph 1.7
5. Please refer paragraph 1.8
6. Please refer paragraph 1.14
7. Please refer paragraph 1.14 & 1.10