

Chapter 1

Basic Cost Concepts

Learning Objectives

- To understand the meaning of different costing terms
- To understand different costing methods
- To have a basic idea of different costing techniques
- To understand the meaning of cost sheet

In order to determine and take a dispassionate view about what lies beneath the surface of accounting figures, a financial analyst has to make use of different management accounting techniques. Cost techniques have a precedence over the other techniques since accounting treatment of cost is often both complex and financially significant. For example, if a firm proposes to increase its output by 10%, is it reasonable to expect total cost to increase by less than 10%, exactly 10% or more than 10%? Such questions are concerned with the cost behavior, i.e. the way costs change with the levels of activity. The answers to these questions are very much pertinent for a management accountant or a financial analyst since they are basic for a firm's projections and profits which ultimately become the basis of all financial decisions. It is, therefore, necessary for a financial analyst to have a reasonably good working knowledge about the basic cost concepts and patterns of cost behavior. All these come within the ambit of cost accounting.

Meaning of Cost Accounting

Previously, cost accounting was merely considered to be a technique for the ascertainment of costs of products or services on the basis of historical data. In course of time, due to competitive nature of the market, it was realized that ascertaining of cost is not so important as controlling costs. Hence, cost accounting started to be considered more as a technique for cost control as compared to cost ascertainment. Due to the technological developments in all fields, cost reduction has also come within the ambit of cost accounting. Cost accounting is, thus, concerned with recording, classifying and summarizing costs for determination of costs of products or services, planning, controlling and reducing such costs and furnishing of information to management for decision making.

According to Charles T. Horngren, cost accounting is a quantitative method that accumulates, classifies, summarizes and interprets information for the following three major purposes:

- Operational planning and control
- Special decisions
- Product decisions

According to the Chartered Institute of Management Accountants, London, cost accounting is the process of accounting for costs from the point at which its expenditure is incurred or committed to the establishment of the ultimate relationship with cost units. In its widest sense, it embraces the preparation of statistical data, the application of cost control methods and the ascertainment of the profitability of the activities carried out or planned.

Cost accounting, thus, provides various information to management for all sorts of decisions. It serves multiple purposes on account of which it is generally indistinguishable from management accounting or so-called internal accounting. Wilmot has summarized the nature of cost accounting as "the analyzing, recording, standardizing, forecasting, comparing, reporting and recommending" and the role of a cost accountant as "a historian, news agent and prophet." As a historian, he should be meticulously accurate and sedulously impartial. As a news agent, he should be up to date, selective and pithy. As a prophet, he should combine knowledge and experience with foresight and courage.

Objectives of Cost Accounting

The main objectives of cost accounting can be summarized as follows:

1. Determining Selling Price

Business enterprises run on a profit-making basis. It is, thus, necessary that revenue should be greater than expenditure incurred in producing goods and services from which the revenue is to be derived. Cost accounting provides various information regarding the cost to make and sell such products or services. Of course, many other factors such as the condition of market, the area of distribution, the quantity which can be supplied etc. are also given due consideration by management before deciding upon the price but the cost plays a dominating role.

2. Determining and Controlling Efficiency

Cost accounting involves a study of various operations used in manufacturing a product or providing a service. The study facilitates measuring the efficiency of an organization as a whole or department-wise as well as devising means of increasing efficiency.

Cost accounting also uses a number of methods, e.g., budgetary control, standard costing etc. for controlling costs. Each item viz. materials, labor and expenses is budgeted at the commencement of a period and actual expenses incurred are compared with budget. This greatly increases the operating efficiency of an enterprise.

3. Facilitating Preparation of Financial and Other Statements

The third objective of cost accounting is to produce statements whenever is required by management. The financial statements are prepared under financial accounting generally once a year or half-year and are spaced too far with respect to time to meet the needs of management. In order to operate a business at a high level of efficiency, it is essential for management to have a frequent review of production, sales and operating results. Cost accounting provides daily, weekly or monthly volumes of units produced and accumulated costs with appropriate analysis. A developed cost accounting system provides immediate information regarding stock of raw materials, work-in-progress and finished goods. This helps in speedy preparation of financial statements.

4. Providing Basis for Operating Policy

Cost accounting helps management to formulate operating policies. These policies may relate to any of the following matters:

- o Determination of a cost-volume-profit relationship
- o Shutting down or operating at a loss
- o Making for or buying from outside suppliers
- o Continuing with the existing plant and machinery or replacing them by improved and economic ones

Concept of Cost

Cost accounting is concerned with cost and therefore is necessary to understand the meaning of term cost in a proper perspective.

In general, cost means the amount of expenditure (actual or notional) incurred on, or attributable to a given thing.

However, the term cost cannot be exactly defined. Its interpretation depends upon the following factors:

- The nature of business or industry
- The context in which it is used

In a business where selling and distribution expenses are quite nominal the cost of an article may be calculated without considering the selling and distribution overheads. At the same time, in a business where the nature of a product requires heavy selling and distribution expenses, the calculation of cost without taking into account the selling and distribution expenses may prove very costly to a business. The cost may be factory cost, office cost, cost of sales and even an item of expense. For example, prime cost includes expenditure on direct materials, direct labor and direct expenses. Money spent on materials is termed as cost of materials just like money spent on labor is called cost of labor and so on. Thus, the use of term cost without understanding the circumstances can be misleading.

Different costs are found for different purposes. The work-in-progress is valued at factory cost while stock of finished goods is valued at office cost. Numerous other examples can be given to show that the term “cost” does not mean the same thing under all circumstances and for all purposes. Many items of cost of production are handled in an optional manner which may give different costs for the same product or job without going against the accepted principles of cost accounting. Depreciation is one of such items. Its amount varies in accordance with the method of depreciation being used. However, endeavor should be, as far as possible, to obtain an accurate cost of a product or service.

Elements of Cost

Following are the three broad elements of cost:

1. Material

The substance from which a product is made is known as material. It may be in a raw or a manufactured state. It can be direct as well as indirect.

a. Direct Material

The material which becomes an integral part of a finished product and which can be conveniently assigned to specific physical unit is termed as direct material. Following are some of the examples of direct material:

- All material or components specifically purchased, produced or requisitioned from stores
- Primary packing material (e.g., carton, wrapping, cardboard, boxes etc.)
- Purchased or partly produced components

Direct material is also described as process material, prime cost material, production material, stores material, constructional material etc.

b. Indirect Material

The material which is used for purposes ancillary to the business and which cannot be conveniently assigned to specific physical units is termed as indirect material. Consumable stores, oil and waste, printing and stationery material etc. are some of the examples of indirect material.

Indirect material may be used in the factory, office or the selling and distribution divisions.

2. Labor

For conversion of materials into finished goods, human effort is needed and such human effort is called labor. Labor can be direct as well as indirect.

a. Direct Labor

The labor which actively and directly takes part in the production of a particular commodity is called direct labor. Direct labor costs are, therefore, specifically and conveniently traceable to specific products.

Direct labor can also be described as process labor, productive labor, operating labor, etc.

b. Indirect Labor

The labor employed for the purpose of carrying out tasks incidental to goods produced or services provided, is indirect labor. Such labor does not alter the construction, composition or condition of the product. It cannot be practically traced to specific units of output. Wages of storekeepers, foremen, timekeepers, directors' fees, salaries of salesmen etc, are examples of indirect labor costs.

Indirect labor may relate to the factory, the office or the selling and distribution divisions.

3. Expenses

Expenses may be direct or indirect.

a. Direct Expenses

These are the expenses that can be directly, conveniently and wholly allocated to specific cost centers or cost units. Examples of such expenses are as follows:

- Hire of some special machinery required for a particular contract
- Cost of defective work incurred in connection with a particular job or contract etc.

Direct expenses are sometimes also described as chargeable expenses.

b. Indirect Expenses

These are the expenses that cannot be directly, conveniently and wholly allocated to cost centers or cost units. Examples of such expenses are rent, lighting, insurance charges etc.

4. Overhead

The term overhead includes indirect material, indirect labor and indirect expenses. Thus, all indirect costs are overheads.

A manufacturing organization can broadly be divided into the following three divisions:

- o Factory or works, where production is done
- o Office and administration, where routine as well as policy matters are decided
- o Selling and distribution, where products are sold and finally dispatched to customers

Overheads may be incurred in a factory or office or selling and distribution divisions. Thus, overheads may be of three types:

d. Factory Overheads

They include the following things:

- Indirect material used in a factory such as lubricants, oil, consumable stores etc.
- Indirect labor such as gatekeeper, timekeeper, works manager's salary etc.
- Indirect expenses such as factory rent, factory insurance, factory lighting etc.

e. Office and Administration Overheads

They include the following things:

- Indirect materials used in an office such as printing and stationery material, brooms and dusters etc.
- Indirect labor such as salaries payable to office manager, office accountant, clerks, etc.
- Indirect expenses such as rent, insurance, lighting of the office

f. Selling and Distribution Overheads

They include the following things:

- Indirect materials used such as packing material, printing and stationery material etc.
- Indirect labor such as salaries of salesmen and sales manager etc.
- Indirect expenses such as rent, insurance, advertising expenses etc.

Elements of Cost

- o Direct material
- o Direct labor
- o Direct expenses
- o Overheads
- o Factory overheads
- o Selling and distribution overheads
- o Office and administration overheads
- o Indirect material
- o Indirect labor
- o Indirect expenses
- o Indirect material
- o Indirect labor
- o Indirect expenses
- o Indirect material
- o Indirect labor
- o Indirect expenses

Components of Total Cost

1. Prime Cost

Prime cost consists of costs of direct materials, direct labors and direct expenses. It is also known as basic, first or flat cost.

2. Factory Cost

Factory cost comprises prime cost and, in addition, works or factory overheads that include costs of indirect materials, indirect labors and indirect expenses incurred in a factory. It is also known as works cost, production or manufacturing cost.

3. Office Cost

Office cost is the sum of office and administration overheads and factory cost. This is also termed as administration cost or the total cost of production.

4. Total Cost

Selling and distribution overheads are added to the total cost of production to get total cost or the cost of sales.

Various components of total cost can be depicted with the help of the table below:

Components of total cost	
Direct material Direct labor Direct expenses	Prime cost or direct cost or first cost
Prime cost plus works overheads	Works or factory cost or production cost or manufacturing cost
Works cost plus office and administration overheads	Office cost or total cost of production
Office cost plus selling and distribution overheads	Cost of sales or total cost

Cost Sheet

Cost sheet is a document that provides for the assembly of an estimated detailed cost in respect of cost centers and cost units. It analyzes and classifies in a tabular form the expenses on different items for a particular period. Additional columns may also be provided to show the cost of a particular unit pertaining to each item of expenditure and the total per unit cost.

Cost sheet may be prepared on the basis of actual data (historical cost sheet) or on the basis of estimated data (estimated cost sheet), depending on the technique employed and the purpose to be achieved.

The techniques of preparing a cost sheet can be understood with the help of the following examples.

Example 1

Following information has been obtained from the records of left center corporation for the period from June 1 to June 30, 1998.

Cost of raw materials on June 1,1998	30,000
Purchase of raw materials during the month	4,50,000
Wages paid	2,30,000
Factory overheads	92,000

Cost of work in progress on June 1, 1998	12,000
Cost of raw materials on June 30, 1998	15,000
Cost of stock of finished goods on June 1, 1998	60,000
Cost of stock of finished goods on June 30, 1998	55,000
Selling and distribution overheads	20,000
Sales	9,00,000
Administration overheads	30,000

Prepare a statement of cost.

Solution

Statement of cost of production of goods manufactured for the period ending on June 30, 1998.

	30,000	
Opening stock of raw materials	4,50,000	
Add-- purchase	-----	
	4,80,000	
	15,000	
Less-- closing stock of raw material		4,65,000
Value of raw materials consumed		2,30,000
Wages		6,59,000
Prime cost		92,000
Factory overheads		7,87,000
		12,000
		7,99,000
Add-- opening stock of work in progress		---
Less-- closing stock of work in progress		7,99,000
Factory cost		30,000
Add-- Administration overhead		8,29,000
Cost of production of goods manufactured		60,000
Add--opening stock of finished goods		8,89,000
Less-- closing stock of finished goods		55,000
Cost of production of goods sold		8,34,000
Add-- selling and distribution overheads		20,000
Cost of sales		8,54,000
Profit		46,000
Sales		9,00,000

Example 2

From the following information, prepare a cost sheet showing the total cost per ton for the period ended on December 31, 1998.

Raw materials	33,000	Rent and taxes (office)	500
Productive wages	35,000	Water supply	1,200
Direct expenses	3,000	Factory insurance	1,100

Unproductive wages	10,500	Office insurance	500
Factory rent and taxes	2,200	Legal expenses	400
Factory lighting	1,500	Rent of warehouse	300
Factory heating	4,400	Depreciation--	
Motive power Haulage	3,000	Plant and machinery	2,000
Director's fees (works)	1,000	Office building	1,000
Directors fees (office)	2,000	Delivery vans	200
Factory cleaning	500	Bad debt	100
Sundry office expenses	200	Advertising	300
Expenses	800	Sales department salaries	1,500
Factory stationery	750	Up keeping of delivery vans	700
Office stationery	900	Bank charges	50
Loose tools written off	600	Commission on sales	1,500

The total output for the period has been 10000 tons.

Solution

Cost sheet for the period ended on December 31, 1998

	\$.	
Raw materials	33,000	
Production wages	35,000	
Direct expenses	3,000	
Prime cost		
Add--works overheads:		71,000
Unproductive wages	10,500	
Factory rent and taxes	7,500	
Factory lighting	2,200	
Factory heating	1,500	
	4,400	
Motive power	3,000	
Haulage	1,000	
Directors' fees (works)	500	
Factory cleaning	800	
Estimating expenses	750	37,050
Factory stationery	600	
Loses tools written off	1,200	
Water supply	1,100	1,08,050
Factory insurance	2,000	
Depreciation of plant and machinery		5,550
Works cost	2,000	
Add-- office overhead	200	1,13,600
Directors' fees (office)	900	
Sundry office expenses	500	4,600
Office stationery	500	
Rent and taxes (office)	400	
Office insurance	1,000	1,18,200
Legal expenses	50	
Depreciation of office building		
Bank charges	300	
	200	

Office cost	100	
Add-- selling and distribution overheads	300	
Rent of warehouse	1,500	
Depreciation on delivery vans	1,500	
Bad debts	700	
Advertising		
Sales department salaries		
Commission on sales		
Upkeep of delivery vans		
Total cost		
Cost per ton $\$. 1,18,200/10,000 = \$. 11.82$		

Classification of Cost

Cost may be classified into different categories depending upon the purpose of classification. Some of the important categories in which the costs are classified are as follows:

1. Fixed, Variable and Semi-Variable Costs

The cost which varies directly in proportion with every increase or decrease in the volume of output or production is known as variable cost. Some of its examples are as follows:

- Wages of laborers
- Cost of direct material
- Power

The cost which does not vary but remains constant within a given period of time and a range of activity inspite of the fluctuations in production is known as fixed cost. Some of its examples are as follows:

- Rent or rates
- Insurance charges
- Management salary

The cost which does not vary proportionately but simultaneously does not remain stationary at all times is known as semi-variable cost. It can also be named as semi-fixed cost. Some of its examples are as follows:

- Depreciation
- Repairs

Fixed costs are sometimes referred to as “period costs” and variable costs as “direct costs” in system of direct costing. Fixed costs can be further classified into:

- Committed fixed costs
- Discretionary fixed costs

Committed fixed costs consist largely of those fixed costs that arise from the possession of plant, equipment and a basic organization structure. For example, once a building is erected and a plant is installed, nothing much can be done to reduce the costs such as depreciation, property taxes, insurance and salaries of the key personnel etc. without impairing an organization’s competence to meet the long-term goals.

Discretionary fixed costs are those which are set at fixed amount for specific time periods by the management in budgeting process. These costs directly reflect the top management policies and have no particular relationship with volume of output. These costs can, therefore, be reduced or entirely eliminated as demanded by the circumstances. Examples of such costs are research and development costs, advertising and sales promotion

costs, donations, management consulting fees etc. These costs are also termed as managed or programmed costs.

In some circumstances, variable costs are classified into the following:

- Discretionary cost
- Engineered cost

The term discretionary costs is generally linked with the class of fixed cost. However, in the circumstances where management has predetermined that the organization would spend a certain percentage of its sales for the items like research, donations, sales promotion etc., discretionary costs will be of a variable character.

Engineered variable costs are those variable costs which are directly related to the production or sales level. These costs exist in those circumstances where specific relationship exists between input and output. For example, in an automobile

industry there may be exact specifications as one radiator, two fan belts, one battery etc. would be required for one car. In a case where more than one car is to be produced, various inputs will have to be increased in the direct proportion of the output.

Thus, an increase in discretionary variable costs is due to the authorization of management whereas an increase in engineered variable costs is due to the volume of output or sales.

2. Product Costs and Period Costs

The costs which are a part of the cost of a product rather than an expense of the period in which they are incurred are called as “product costs.” They are included in inventory values. In financial statements, such costs are treated as assets until the goods they are assigned to are sold. They become an expense at that time. These costs may be fixed as well as variable, e.g., cost of raw materials and direct wages, depreciation on plant and equipment etc.

The costs which are not associated with production are called period costs. They are treated as an expense of the period in which they are incurred. They may also be fixed as well as variable. Such costs include general administration costs, salaries salesmen and commission, depreciation on office facilities etc. They are charged against the revenue of the relevant period. Differences between opinions exist regarding whether certain costs should be considered as product or period costs. Some accountants feel that fixed manufacturing costs are more closely related to the passage of time than to the manufacturing of a product. Thus, according to them variable manufacturing costs are product costs whereas fixed manufacturing and other costs are period costs. However, their view does not seem to have been yet widely accepted.

3. Direct and Indirect Costs

The expenses incurred on material and labor which are economically and easily traceable for a product, service or job are considered as direct costs. In the process of manufacturing of production of articles, materials are purchased, laborers are employed and the wages are paid to them. Certain other expenses are also incurred directly. All of these take an active and direct part in the manufacture of a particular commodity and hence are called direct costs.

The expenses incurred on those items which are not directly chargeable to production are known as indirect costs. For example, salaries of timekeepers, storekeepers and foremen. Also certain expenses incurred for running the administration are the indirect costs. All of these cannot be conveniently allocated to production and hence are called indirect costs.

4. Decision-Making Costs and Accounting Costs

Decision-making costs are special purpose costs that are applicable only in the situation in which they are compiled. They have no universal application. They need not tie into routine-financial accounts. They do not and should not conform the accounting rules. Accounting costs are compiled primarily from financial statements. They have to be altered before they can be used for decision-making. Moreover, they are historical costs

and show what has happened under an existing set of circumstances. Decision-making costs are future costs. They represent what is expected to happen under an assumed set of conditions. For example, accounting costs may show the cost of a product when the operations are manual whereas decision-making cost might be calculated to show the costs when the operations are mechanized.

5. Relevant and Irrelevant Costs

Relevant costs are those which change by managerial decision. Irrelevant costs are those which do not get affected by the decision. For example, if a manufacturer is planning to close down an unprofitable retail sales shop, this will affect the wages payable to the workers of a shop. This is relevant in this connection since they will disappear on closing down of a shop. But prepaid rent of a shop or unrecovered costs of any equipment which will have to be scrapped are irrelevant costs which should be ignored.

6. Shutdown and Sunk Costs

A manufacturer or an organization may have to suspend its operations for a period on account of some temporary difficulties, e.g., shortage of raw material, non-availability of requisite labor etc. During this period, though no work is done yet certain fixed costs, such as rent and insurance of buildings, depreciation, maintenance etc., for the entire plant will have to be incurred. Such costs of the idle plant are known as shutdown costs.

Sunk costs are historical or past costs. These are the costs which have been created by a decision that was made in the past and cannot be changed by any decision that will be made in the future. Investments in plant and machinery, buildings etc. are prime examples of such costs. Since sunk costs cannot be altered by decisions made at the later stage, they are irrelevant for decision-making.

An individual may regret for purchasing or constructing an asset but this action could not be avoided by taking any subsequent action. Of course, an asset can be sold and the cost of the asset will be matched against the proceeds from sale of the asset for the purpose of determining gain or loss. The person may decide to continue to own the asset. In this case, the cost of asset will be matched against the revenue realized over its effective life. However, he/she cannot avoid the cost which has already been incurred by him/her for the acquisition of the asset. It is, as a matter of fact, sunk cost for all present and future decisions.

Example

Jolly Ltd. purchased a machine for \$. 30,000. The machine has an operating life of five years without any scrap value. Soon after making the purchase, management feels that the machine should not have been purchased since it is not yielding the operating advantage originally contemplated. It is expected to result in savings in operating costs of \$. 18,000 over a period of five years. The machine can be sold immediately for \$. 22,000.

To take the decision whether the machine should be sold or be used, the relevant amounts to be compared are \$. 18,000 in cost savings over five years and \$. 22,000 that can be realized in case it is immediately disposed. \$. 30,000 invested in the asset is not relevant since it is same in both the cases. The amount is the sunk cost. Jolly Ltd., therefore, sold

the machinery for \$ 22,000 since it would result in an extra profit of \$ 4,000 as compared to keeping and using it.

7. Controllable and Uncontrollable Costs

Controllable costs are those costs which can be influenced by the ratio or a specified member of the undertaking. The costs that cannot be influenced like this are termed as uncontrollable costs.

A factory is usually divided into a number of responsibility centers, each of which is in charge of a specific level of management. The officer in charge of a particular department can control costs only of those matters which come directly under his control, not of other matters. For example, the expenditure incurred by tool room is controlled by the foreman in charge of that section but the share of the tool room expenditure which is apportioned to a machine shop cannot be controlled by the foreman of that shop. Thus, the difference between controllable and uncontrollable costs is only in relation to a particular individual or level of management. The expenditure which is controllable by an individual may be uncontrollable by another individual.

8. Avoidable or Escapable Costs and Unavoidable or Inescapable Costs

Avoidable costs are those which will be eliminated if a segment of a business (e.g., a product or department) with which they are directly related is discontinued. Unavoidable costs are those which will not be eliminated with the segment. Such costs are merely reallocated if the segment is discontinued. For example, in case a product is discontinued, the salary of a factory manager or factory rent cannot be eliminated. It will simply mean that certain other products will have to absorb a large amount of such overheads. However, the salary of people attached to a product or the bad debts traceable to a product would be eliminated. Certain costs are partly avoidable and partly unavoidable. For example, closing of one department of a store might result in decrease in delivery expenses but not in their altogether elimination.

It is to be noted that only avoidable costs are relevant for deciding whether to continue or eliminate a segment of a business.

9. Imputed or Hypothetical Costs

These are the costs which do not involve cash outlay. They are not included in cost accounts but are important for taking into consideration while making management decisions. For example, interest on capital is ignored in cost accounts though it is considered in financial accounts. In case two projects require unequal outlays of cash, the management should take into consideration the capital to judge the relative profitability of the projects.

10. Differentials, Incremental or Decrement Cost

The difference in total cost between two alternatives is termed as differential cost. In case the choice of an alternative results in an increase in total cost, such increased costs are known as incremental costs. While assessing the profitability of a proposed change, the

incremental costs are matched with incremental revenue. This is explained with the following example:

Example

A company is manufacturing 1,000 units of a product. The present costs and sales data are as follows:

Selling price per unit	\$ 10
Variable cost per unit	\$ 5
Fixed costs	\$ 4,000

The management is considering the following two alternatives:

- i. To accept an export order for another 200 units at \$. 8 per unit. The expenditure of the export order will increase the fixed costs by \$. 500.
- ii. To reduce the production from present 1,000 units to 600 units and buy another 400 units from the market at \$. 6 per unit. This will result in reducing the present fixed costs from \$. 4,000 to \$. 3,000.

Which alternative the management should accept?

Solution

Statement showing profitability under different alternatives is as follows:

Particulars	Present situation			Proposed situations		
	\$.	\$.				
Sales.		10,000		11,600		10,000
Less:	5,000	9,000	6,000	10,500	5,400	8,400
Variable purchase costs	4,000		4,500		3,000	
Fixed costs Profit		1,000	—	1,100	—	1,600

Observations

- i. In the present situation, the company is making a profit of \$. 1,000.
- ii. In the proposed situation (i), the company will make a profit of \$. 1,100. The incremental costs will be \$. 1,500 (i.e. \$. 10,500 - \$. 9,000) and the incremental revenue (sales) will be \$. 1,600. Hence, there is a net gain of \$. 100 under the proposed situation as compared to the existing situation.
- iii. In the proposed situation (ii), the detrimental costs are \$. 600 (i.e. \$. 9,000 to \$. 8,400) as there is no decrease in sales revenue as compared to the present situation. Hence, there is a net gain of \$. 600 as compared to the present situation.

Thus, under proposal (ii), the company makes the maximum profit and therefore it should adopt alternative (ii).

The technique of differential costing which is based on differential cost is useful in planning and decision-making and helps in selecting the best alternative.

In case the choice results in decrease in total costs, this decreased costs will be known as detrimental costs.

11. Out-of-Pocket Costs

Out-of-pocket cost means the present or future cash expenditure regarding a certain decision that will vary depending upon the nature of the decision made. For example, a company has its own trucks for transporting raw materials and finished products from one place to another. It seeks to replace these trucks by keeping public carriers. In making this decision, of course, the depreciation of the trucks is not to be considered but the management should take into account the present expenditure on fuel, salary to drive\$ and maintenance. Such costs are termed as out-of-pocket costs.

12. Opportunity Cost

Opportunity cost refers to an advantage in measurable terms that have foregone on account of not using the facilities in the manner originally planned. For example, if a building is proposed to be utilized for housing a new project plant, the likely revenue which the building could fetch, if rented out, is the opportunity cost which

should be taken into account while evaluating the profitability of the project. Suppose, a manufacturer is confronted with the problem of selecting anyone of the following alternatives:

- a. Selling a semi-finished product at \$. 2 per unit
- b. Introducing it into a further process to make it more refined and valuable

Alternative (b) will prove to be remunerative only when after paying the cost of further processing, the amount realized by the sale of the product is more than \$. 2 per unit. Also, the revenue of \$. 2 per unit is foregone in case alternative (b) is adopted. The term “opportunity cost” refers to this alternative revenue foregone.

13. Traceable, Untraceable or Common Costs

The costs that can be easily identified with a department, process or product are termed as traceable costs. For example, the cost of direct material, direct labor etc. The costs that cannot be identified so are termed as untraceable or common costs. In other words, common costs are the costs incurred collectively for a number of cost centers and are to be suitably apportioned for determining the cost of individual cost centers. For example, overheads incurred for a factory as a whole, combined purchase cost for purchasing several materials in one consignment etc.

Joint cost is a kind of common cost. When two or more products are produced out of one material or process, the cost of such material or process is called joint cost. For example, when cottonseeds and cotton fibers are produced from the same material, the cost incurred till the split-off or separation point will be joint costs.

14. Production, Administration and Selling and Distribution Costs

A business organization performs a number of functions, e.g., production, illustration, selling and distribution, research and development. Costs are to be curtailed for each of these functions. The Chartered Institute of Management accountants, London, has defined each of the above costs as follows:

i. Production Cost

The cost of sequence of operations which begins with supplying materials, labor and services and ends with the primary packing of the product. Thus, it includes the cost of direct material, direct labor, direct expenses and factory overheads.

ii. Administration Cost

The cost of formulating the policy, directing the organization and controlling the operations of an undertaking which is not related directly to a production, selling, distribution, research or development activity or function.

iii. Selling Cost

It is the cost of selling to create and stimulate demand (sometimes termed as marketing) and of securing orders.

iv. Distribution Cost

It is the cost of sequence of operations beginning with making the packed product available for dispatch and ending with making the reconditioned returned empty package, if any, available for reuse.

v. Research Cost

It is the cost of searching for new or improved products, new application of materials, or new or improved methods.

vi. **Development Cost**

The cost of process which begins with the implementation of the decision to produce a new or improved product or employ a new or improved method and ends with the commencement of formal production of that product or by the method.

vii. **Pre-Production Cost**

The part of development cost incurred in making a trial production as preliminary to formal production is called pre-production cost.

15. Conversion Cost

The cost of transforming direct materials into finished products excluding direct material cost is known as conversion cost. It is usually taken as an aggregate of total cost of direct labor, direct expenses and factory overheads.

Cost Unit and Cost Center

The technique of costing involves the following:

- Collection and classification of expenditure according to cost elements
- Allocation and apportionment of the expenditure to the cost centers or cost units or both

Cost Unit

While preparing cost accounts, it becomes necessary to select a unit with which expenditure may be identified. The quantity upon which cost can be conveniently allocated is known as a unit of cost or cost unit. The Chartered Institute of Management Accountants, London defines a unit of cost as a unit of quantity of product, service or time in relation to which costs may be ascertained or expressed.

Unit selected should be unambiguous, simple and commonly used. Following are the examples of units of cost:

(i) Brick works	per 1000 bricks made
(ii) Collieries	per ton of coal raised
(iii) Textile mills	per yard or per lb. of cloth manufac- tured or yarn spun
(iv) Electrical companies	per unit of electricity generated
(v) Transport companies	per passenger km.
(vi) Steel mills	per ton of steel made

Cost Center

According to the Chartered Institute of Management Accountants, London, cost center means “a location, person or item of equipment (or group of these) for which costs may be ascertained and used for the purpose of cost control.” Thus, cost center refers to one of the convenient units into which the whole factory or an organization has been appropriately divided for costing purposes. Each such unit consists of a department, a sub-department or an item or equipment or machinery and a person or a group of persons. Sometimes, closely associated departments are combined together and considered as one unit for costing purposes. For example, in a laundry, activities such as collecting, sorting, marking and washing of clothes are performed. Each activity

may be considered as a separate cost center and all costs relating to a particular cost center may be found out separately.

Cost centers may be classified as follows:

- Productive, unproductive and mixed cost centers
- Personal and impersonal cost centers
- Operation and process cost centers

Productive cost centers are those which are actually engaged in making products. Service or unproductive cost centers do not make the products but act as the essential aids for the productive centers. The examples of such service centers are as follows:

- Administration department
- Repairs and maintenance department
- Stores and drawing office department

Mixed costs centers are those which are engaged sometimes on productive and other times on service works. For example, a tool shop serves as a productive cost center when it manufactures dies and jigs to be charged to specific jobs or orders but serves as servicing cost center when it does repairs for the factory.

Impersonal cost center is one which consists of a department, a plant or an item of equipment whereas a personal cost center consists of a person or a group of persons. In case a cost center consists of those machines or persons which carry out the same operation, it is termed as operation cost center. If a cost center consists of a continuous sequence of operations, it is called process cost center.

In case of an operation cost center, cost is analyzed and related to a series of operations in sequence such as in chemical industries, oil refineries and other process industries. The objective of such an analysis is to ascertain the cost of each operation irrespective of its location inside the factory.

Cost Estimation and Cost Ascertainment

Cost estimation is the process of pre-determining the cost of a certain product job or order. Such pre-determination may be required for several purposes. Some of the purposes are as follows:

- Budgeting
- Measurement of performance efficiency
- Preparation of financial statements (valuation of stocks etc.)
- Make or buy decisions
- Fixation of the sale prices of products

Cost ascertainment is the process of determining costs on the basis of actual data. Hence, the computation of historical cost is cost ascertainment while the computation of future costs is cost estimation.

Both cost estimation and cost ascertainment are interrelated and are of immense use to the management. In case a concern has a sound costing system, the ascertained costs will greatly help the management in the process of estimation of rational accurate costs which are necessary for a variety of purposes stated above. Moreover, the ascertained cost may be compared with the pre-determined costs on a continuing basis and proper and timely steps be taken for controlling costs and maximizing profits.

Cost Allocation and Cost Apportionment

Cost allocation and cost apportionment are the two procedures which describe the identification and allotment of costs to cost centers or cost units. Cost allocation refers to the allotment of all the items of cost to cost centers or cost units whereas cost apportionment refers to the allotment of proportions of items of cost to cost centers or cost units. Thus, the former involves the process of charging direct expenditure to cost centers or cost units whereas the latter involves the process of charging indirect expenditure to cost centers or cost units.

For example, the cost of labor engaged in a service department can be charged wholly and directly but the canteen expenses of the factory cannot be charged directly and wholly. Its proportionate share will have to be found out. Charging of costs in the former case will be termed as “allocation of costs” whereas in the latter, it will be termed as “apportionment of costs.”

Cost Reduction and Cost Control

Cost reduction and cost control are two different concepts. Cost control is achieving the cost target as its objective whereas cost reduction is directed to explore the possibilities of improving the targets. Thus, cost control ends when targets are achieved whereas cost reduction has no visible end. It is a continuous process. The difference between the two can be summarized as follows:

- i. Cost control aims at maintaining the costs in accordance with established standards whereas cost reduction is concerned with reducing costs. It changes all standards and endeavors to improve them continuously.
- ii. Cost control seeks to attain the lowest possible cost under existing conditions whereas cost reduction does not recognize any condition as permanent since a change will result in lowering the cost.
- iii. In case of cost control, emphasis is on past and present. In case of cost reduction, emphasis is on the present and future.
- iv. Cost control is a preventive function whereas cost reduction is a correlative function. It operates even when an efficient cost control system exists.

Installation of Costing System

The installation of a costing system requires careful consideration of the following two interrelated aspects:

- Overcoming the practical difficulties while introducing a system
- Main considerations that should govern the installation of such a system

Practical Difficulties

The important difficulties in the installation of a costing system and the suggestions to overcome them are as follows:

a. Lack of Support from Top Management

Often, the costing system is introduced at the behest of the managing director or some other director without taking into confidence other members of the top management team. This results in opposition from various managers as they consider it interference as well as an uncalled check of their activities. They, therefore, resist the additional work involved in the cost accounting system.

This difficulty can be overcome by taking the top management into confidence before installing the system. A sense of cost consciousness has to be instilled in their minds.

b. Resistance from the Staff

The existing financial accounting staff may offer resistance to the system because of a feeling of their being declared redundant under the new system.

This fear can be overcome by explaining the staff that the costing system would not replace but strengthen the existing system. It will open new areas for development which will prove beneficial to them.

c. Non-Cooperation at Other Levels

The foreman and other supervisory staff may resent the additional paper work and may not cooperate in providing the basic data which is essential for the success of the system.

This needs re-orientation and education of employees. They have to be told of the advantages that will accrue to them and to the organization as a whole on account of efficient working of the system.

d. Shortage of Trained Staff

Costing is a specialized job in itself. In the beginning, a qualified staff may not be available. However, this difficulty can be overcome by giving the existing staff requisite training and recruiting additional staff if required.

e. Heavy Costs

The costing system will involve heavy costs unless it has been suitably designed to meet specific requirements. Unnecessary sophistication and formalities should be avoided. The costing office should serve as a useful service department.

Main Considerations

In view of the above difficulties and suggestions, following should be the main considerations while introducing a costing system in a manufacturing organization:

1. Product

The nature of a product determines to a great extent the type of costing system to be adopted. A product requiring high value of material content requires an elaborate system

of materials control. Similarly, a product requiring high value of labor content requires an efficient time keeping and wage systems. The same is true in case of overheads.

2. Organization

The existing organization structure should be distributed as little as possible. It becomes, therefore, necessary to ascertain the size and type of organization before introducing the costing system. The scope of authority of each executive, the sources from which a cost accountant has to derive information and reports to be submitted at various managerial levels should be carefully gone through.

3. Objective

The objectives and information which management wants to achieve and acquire should also be taken care of. For example, if a concern wants to expand its operations, the system of costing should be designed in a way so as to give maximum attention to production aspect. On the other hand, if a concern were not in a position to sell its products, the selling aspect would require greater attention.

4. Technical Details

The system should be introduced after a detailed study of the technical aspects of the business. Efforts should be made to secure the sympathetic assistance and support of the principal members of the supervisory staff and workmen.

5. Informative and Simple

The system should be informative and simple. In this connection, the following points may be noted:

- (i) It should be capable of furnishing the fullest information required regularly and systematically, so that continuous study or check-up of the progress of business is possible.
- (ii) Standard printed forms can be used so as to make the information detailed, clear and intelligible. Over-elaboration which will only complicate matters should be avoided.
- (iii) Full information about departmental outputs, processes and operations should be clearly presented and every item of expenditure should be properly classified.
- (iv) Data, complete and reliable in all respects should be provided in a lucid form so that the measurement of the variations between actual and standard costs is possible.

6. Method of Maintenance of Cost Records

A choice has to be made between integral and non-integral accounting systems. In case of integral accounting system, no separate sets of books are maintained for costing transactions but they are interlocked with financial transactions into one set of books.

In case of non-integral system, separate books are maintained for cost and financial transactions. At the end of the accounting period, the results shown by two sets of books are reconciled. In case of a big business, it will be appropriate to maintain a separate set of books for cost transactions.

7. Elasticity

The costing system should be elastic and capable of adapting to the changing requirements of a business.

It may, therefore, be concluded from the above discussion that costing system introduced in any business will not be a success in case of the following circumstances:

1. If it is unduly complicated and expensive
2. If a cost accountant does not get the cooperation of his/her staff
3. If cost statements cannot be reconciled with financial statements
4. If the results actually achieved are not compared with the expected ones

Methods of Costing

Costing can be defined as the technique and process of ascertaining costs. The principles in every method of costing are same but the methods of analyzing and presenting the costs differ with the nature of business. The methods of job costing are as follows:

1. Job Costing

The system of job costing is used where production is not highly repetitive and in addition consists of distinct jobs so that the material and labor costs can be identified by order number. This method of costing is very common in commercial foundries and drop forging shops and in plants making specialized industrial equipments. In all these cases, an account is opened for each job and all appropriate expenditure is charged thereto.

2. Contract Costing

Contract costing does not in principle differ from job costing. A contract is a big job whereas a job is a small contract. The term is usually applied where large-scale contracts are carried out. In case of ship-builders, printers, building contractors etc., this system of costing is used. Job or contract is also termed as terminal costing.

3. Cost Plus Costing

In contracts where in addition to cost, an agreed sum or percentage to cover overheads and fit is paid to a contractor, the system is termed as cost plus costing. The term cost here includes materials, labor and expenses incurred directly in the process of production. The system is used generally in cases where government happens to be the party to give contract.

4. Batch Costing

This method is employed where orders or jobs are arranged in different batches after taking into account the convenience of producing articles. The unit of cost is a batch or a group of identical products instead of a single job order or contract. This method is particularly suitable for general engineering factories which produce components in convenient economic batches and pharmaceutical industries.

5. Process Costing

If a product passes through different stages, each distinct and well defined, it is desired to know the cost of production at each stage. In order to ascertain the same, process costing is employed under which a separate account is opened for each process.

This system of costing is suitable for the extractive industries, e.g., chemical manufacture, paints, foods, explosives, soap making etc.

6. Operation Costing

Operation costing is a further refinement of process costing. The system is employed in the industries of the following types:

- a. The industry in which mass or repetitive production is carried out
- b. The industry in which articles or components have to be stocked in semi-finished stage to facilitate the execution of special orders, or for the convenience of issue for later operations

The procedure of costing is broadly the same as process costing except that in this case, cost unit is an operation instead of a process. For example, the manufacturing of handles for bicycles involves a number of operations such as those of cutting steel sheets into proper strips molding, machining and finally polishing. The cost to complete these operations may be found out separately.

7. Unit Costing (Output Costing or Single Costing)

In this method, cost per unit of output or production is ascertained and the amount of each element constituting such cost is determined. In case where the products can be expressed in identical quantitative units and where manufacture is continuous, this type of costing is applied. Cost statements or cost sheets are prepared in which various items of expense are classified and the total expenditure is divided by the total quantity produced in order to arrive at per unit cost of production. The method is suitable in industries like brick making, collieries, flour mills, paper mills, cement manufacturing etc.

8. Operating Costing

This system is employed where expenses are incurred for provision of services such as those tendered by bus companies, electricity companies, or railway companies. The total expenses regarding operation are divided by the appropriate units (e.g., in case of bus company, total number of passenger/kms.) and cost per unit of service is calculated.

9. Departmental Costing

The ascertainment of the cost of output of each department separately is the objective of departmental costing. In case where a factory is divided into a number of departments, this method is adopted.

10. Multiple Costing (Composite Costing)

Under this system, the costs of different sections of production are combined after finding out the cost of each and every part manufactured. The system of ascertaining cost in this way is applicable where a product comprises many assailable parts, e.g., motor cars, engines or machine tools, typewriters, radios, cycles etc.

As various components differ from each other in a variety of ways such as price, materials used and manufacturing processes, a separate method of costing is employed in respect of each component. The type of costing where more than one method of costing is employed is called multiple costing.

It is to be noted that basically there are only two methods of costing viz. job costing and process costing. Job costing is employed in cases where expenses are traceable to specific jobs or orders, e.g., house building, ship building etc. In case where it is impossible to trace the prime cost of the items for a particular order because of the reason that their identity gets lost while manufacturing operations, process costing is used. For example, in a refinery where several tons of oil is being produced at the same time, the prime cost of a specific order of 10 tons cannot be traced. The cost can be found out only by finding out the cost per ton of total oil produced and then multiplying it by ten.

It may, therefore, be concluded that the methods of batch contract and cost plus costing are only the variants of job costing whereas the methods of unit, operation and operating costing are the variants of process costing.

Techniques of Costing

Besides the above methods of costing, following are the types of costing techniques which are used by management only for controlling costs and making some important managerial decisions. As a matter of fact, they are not independent methods of cost finding such as job or process costing but are basically costing techniques which can be used as an advantage with any of the methods discussed above.

1. Marginal Costing

Marginal costing is a technique of costing in which allocation of expenditure to production is restricted to those expenses which arise as a result of production, e.g., materials, labor, direct expenses and variable overheads. Fixed overheads are excluded in cases where production varies because it may give misleading results. The technique is useful in manufacturing industries with varying levels of output.

2. Direct Costing

The practice of charging all direct costs to operations, processes or products and leaving all indirect costs to be written off against profits in the period in which they arise is termed as direct costing. The technique differs from marginal costing because some fixed costs can be considered as direct costs in appropriate circumstances.

3. Absorption or Full Costing

The practice of charging all costs both variable and fixed to operations, products or processes is termed as absorption costing.

4. Uniform Costing

A technique where standardized principles and methods of cost accounting are employed by a number of different companies and firms is termed as uniform costing. Standardization may extend to the methods of costing, accounting classification including codes, methods of defining costs and charging depreciation, methods of allocating or apportioning overheads to cost centers or cost units. The system, thus, facilitates inter-firm comparisons, establishment of realistic pricing policies, etc.

Systems of Costing

It has already been stated that there are two main methods used to determine costs. These are:

- Job cost method • Process cost method

It is possible to ascertain the costs under each of the above methods by two different ways:

- Historical costing
- Standard costing

Historical Costing

Historical costing can be of the following two types in nature:

- Post costing
- Continuous costing

Post Costing

Post costing means ascertainment of cost after the production is completed. This is done by analyzing the financial accounts at the end of a period in such a way so as to disclose the cost of the units which have been produced.

For instance, if the cost of product A is to be calculated on this basis, one will have to wait till the materials are actually purchased and used, labor actually paid and overhead expenditure actually incurred. This system is used only for ascertaining the costs but not useful for exercising any control over costs, as one comes to know of things after they had taken place. It can serve as

guidance for future production only when conditions in future continue to be the same.

Continuous Costing

In case of this method, cost is ascertained as soon as a job is completed or even when a job is in progress. This is done usually before a job is over or product is made. In the process, actual expenditure on materials and wages and share of overheads are also estimated. Hence, the figure of cost ascertained in this case is not exact. But it has an advantage of providing cost information to the management promptly, thereby enabling it to take necessary corrective action on time. However, it neither provides any standard for judging current efficiency nor does it disclose what the cost of a job ought to have been.

Standard Costing

Standard costing is a system under which the cost of a product is determined in advance on certain pre-determined standards. With reference to the example given in post costing, the cost of product A can be calculated in advance if one is in a position to estimate in advance the material labor and overheads that should be incurred over the product. All this requires an efficient system of cost accounting. However, this system will not be useful if a vigorous system of controlling costs and standard costs are not in force. Standard costing is becoming more and more popular nowadays.

Summary

1. Cost accounting is a quantitative method that accumulates, classifies, summarizes and interprets information for operational planning and control, special decisions and product decisions.
2. Cost may be classified into different categories depending upon the purpose of classification viz. fixed cost, variable cost and semi variable cost.
3. Costing can be defined as the technique and process of ascertaining costs.

Chapter 2

Marginal Costing and Absorption Costing

Learning Objectives

- To understand the meanings of marginal cost and marginal costing
- To distinguish between marginal costing and absorption costing
- To ascertain income under both marginal costing and absorption costing

Introduction

The costs that vary with a decision should only be included in decision analysis. For many decisions that involve relatively small variations from existing practice and/or are for relatively limited periods of time, fixed costs are not relevant to the decision. This is because either fixed costs tend to be impossible to alter in the short term or managers are reluctant to alter them in the short term.

Marginal costing - definition

Marginal costing distinguishes between fixed costs and variable costs as conventionally classified.

The marginal cost of a product – “is its variable cost”. This is normally taken to be; direct labour, direct material, direct expenses and the variable part of overheads.

Marginal costing is formally defined as:

‘the accounting system in which variable costs are charged to cost units and the fixed costs of the period are written-off in full against the aggregate contribution. Its special value is in decision making’. (Terminology.)

The term ‘contribution’ mentioned in the formal definition is the term given to the difference between Sales and Marginal cost. Thus

$$\begin{aligned}\text{MARGINAL COST} &= \text{VARIABLE COST DIRECT LABOUR} \\ &+ \\ &\text{DIRECT MATERIAL} \\ &+ \\ &\text{DIRECT EXPENSE} \\ &+ \\ &\text{VARIABLE OVERHEADS}\end{aligned}$$

CONTRIBUTION SALES - MARGINAL COST

The term marginal cost sometimes refers to the marginal cost per unit and sometimes to the total marginal costs of a department or batch or operation. The meaning is usually clear from the context.

Note

Alternative names for marginal costing are the contribution approach and direct costing. In this lesson, we will study marginal costing as a technique quite distinct from absorption costing.

Theory of Marginal Costing

The theory of marginal costing as set out in “A report on Marginal Costing” published by CIMA, London is as follows:

In relation to a given volume of output, additional output can normally be obtained at less than proportionate cost because within limits, the aggregate of certain items of cost will tend to remain fixed and only the aggregate of the remainder will tend to rise proportionately with an increase in output. Conversely, a decrease in the volume of output will normally be accompanied by less than proportionate fall in the aggregate cost.

The theory of marginal costing may, therefore, be understood in the following two steps:

1. If the volume of output increases, the cost per unit in normal circumstances reduces. Conversely, if an output reduces, the cost per unit increases. If a factory produces 1000 units at a total cost of \$3,000 and if by increasing the output by one unit the cost goes up to \$3,002, the marginal cost of additional output will be \$.2.
2. If an increase in output is more than one, the total increase in cost divided by the total increase in output will give the average marginal cost per unit. If, for example, the output is increased to 1020 units from 1000 units and the total cost to produce these units is \$1,045, the average marginal cost per unit is \$2.25. It can be described as follows:

$$\frac{\text{Additional cost}}{\text{Additional units}} = \frac{\$ 45}{20} = \$2.25$$

The ascertainment of marginal cost is based on the classification and segregation of cost into fixed and variable cost. In order to understand the marginal costing technique, it is essential to understand the meaning of marginal cost.

Marginal cost means the cost of the marginal or last unit produced. It is also defined as the cost of one more or one less unit produced besides existing level of production. In this connection, a unit may mean a single commodity, a dozen, a gross or any other measure of goods.

For example, if a manufacturing firm produces X unit at a cost of \$ 300 and X+1 units at a cost of \$ 320, the cost of an additional unit will be \$ 20 which is marginal cost. Similarly if the production of X-1 units comes down to \$ 280, the cost of marginal unit will be \$ 20 (300–280).

The marginal cost varies directly with the volume of production and marginal cost per unit remains the same. It consists of prime cost, i.e. cost of direct materials, direct labor and all variable overheads. It does not contain any element of fixed cost which is kept separate under marginal cost technique.

Marginal costing may be defined as the technique of presenting cost data wherein variable costs and fixed costs are shown separately for managerial decision-making. It should be clearly understood that marginal costing is not a method of costing like process costing or job costing. Rather it is simply a method or technique of the analysis of cost information for the guidance of management which tries to find out an effect on profit due to changes in the volume of output.

There are different phrases being used for this technique of costing. In UK, marginal costing is a popular phrase whereas in US, it is known as direct costing and is used in place of marginal costing. Variable costing is another name of marginal costing.

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

Contribution may be defined as the profit before the recovery of fixed costs. Thus, contribution goes toward the recovery of fixed cost and profit, and is equal to fixed cost plus profit ($C = F + P$).

In case a firm neither makes profit nor suffers loss, contribution will be just equal to fixed cost ($C = F$). this is known as break even point.

The concept of contribution is very useful in marginal costing. It has a fixed relation with sales. The proportion of contribution to sales is known as P/V ratio which remains the same under given conditions of production and sales.

The principles of marginal costing

The principles of marginal costing are as follows.

- a. For any given period of time, fixed costs will be the same, for any volume of sales and production (provided that the level of activity is within the 'relevant range'). Therefore, by selling an extra item of product or service the following will happen.
 - Revenue will increase by the sales value of the item sold.
 - Costs will increase by the variable cost per unit.
 - Profit will increase by the amount of contribution earned from the extra item.
- b. Similarly, if the volume of sales falls by one item, the profit will fall by the amount of contribution earned from the item.
- c. Profit measurement should therefore be based on an analysis of total contribution. Since fixed costs relate to a period of time, and do not change with increases or decreases in sales volume, it is misleading to charge units of sale with a share of fixed costs.
- d. When a unit of product is made, the extra costs incurred in its manufacture are the variable production costs. Fixed costs are unaffected, and no extra fixed costs are incurred when output is increased.

Features of Marginal Costing

The main features of marginal costing are as follows:

1. **Cost Classification**
The marginal costing technique makes a sharp distinction between variable costs and fixed costs. It is the variable cost on the basis of which production and sales policies are designed by a firm following the marginal costing technique.
2. **Stock/Inventory Valuation**
Under marginal costing, inventory/stock for profit measurement is valued at marginal cost. It is in sharp contrast to the total unit cost under absorption costing method.
3. **Marginal Contribution**
Marginal costing technique makes use of marginal contribution for marking various decisions. Marginal contribution is the difference between sales and marginal cost. It forms the basis for judging the profitability of different products or departments.

Advantages and Disadvantages of Marginal Costing Technique

Advantages

1. Marginal costing is simple to understand.
2. By not charging fixed overhead to cost of production, the effect of varying charges per unit is avoided.
3. It prevents the illogical carry forward in stock valuation of some proportion of current year's fixed overhead.
4. The effects of alternative sales or production policies can be more readily available and assessed, and decisions taken would yield the maximum return to business.
5. It eliminates large balances left in overhead control accounts which indicate the difficulty of ascertaining an accurate overhead recovery rate.
6. Practical cost control is greatly facilitated. By avoiding arbitrary allocation of fixed overhead, efforts can be concentrated on maintaining a uniform and consistent marginal cost. It is useful to various levels of management.

7. It helps in short-term profit planning by breakeven and profitability analysis, both in terms of quantity and graphs. Comparative profitability and performance between two or more products and divisions can easily be assessed and brought to the notice of management for decision making.

Disadvantages

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

Presentation of Cost Data under Marginal Costing and Absorption Costing

Marginal costing is not a method of costing but a technique of presentation of sales and cost data with a view to guide management in decision-making.

The traditional technique popularly known as total cost or absorption costing technique does not make any difference between variable and fixed cost in the calculation of profits. But marginal cost statement very clearly indicates this difference in arriving at the net operational results of a firm.

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

MARGINAL COSTING PRO-FORMA

	£	£
Sales Revenue		xxxxxx
<u>Less Marginal Cost of Sales</u>		
Opening Stock (Valued @ marginal cost)	xxxx	
Add Production Cost (Valued @ marginal cost)	xxxx	
Total Production Cost	xxxx	
Less Closing Stock (Valued @ marginal cost)	(xxx)	
Marginal Cost of Production	xxxx	
Add Selling, Admin & Distribution Cost	xxxx	
Marginal Cost of Sales		(xxxx)
Contribution		xxxxxx
Less Fixed Cost		(xxxx)

Marginal Costing Profit

xxxxx

ABSORPTION COSTING PRO-FORMA

	£	£
Sales Revenue		xxxxx
<u>Less Absorption Cost of Sales</u>		
Opening Stock (Valued @ absorption cost)	xxxx	
Add Production Cost (Valued @ absorption cost)	xxxx	
Total Production Cost	xxxx	
Less Closing Stock (Valued @ absorption cost)	(xxx)	
Absorption Cost of Production	xxxx	
Add Selling, Admin & Distribution Cost	xxxx	
Absorption Cost of Sales		(xxxx)
Un-Adjusted Profit		xxxxx
Fixed Production O/H absorbed	xxxx	
Fixed Production O/H incurred	(xxxx)	
(Under)/Over Absorption		xxxxxx
Adjusted Profit		xxxxxx

Reconciliation Statement for Marginal Costing and Absorption Costing Profit

	\$
Marginal Costing Profit	xx
ADD	xx
(Closing stock – opening Stock) x OAR	
= Absorption Costing Profit	xx

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

Marginal Costing versus Absorption Costing

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

1. Over and Under Absorbed Overheads

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

2. Difference in Stock Valuation

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

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

- a. When there is no opening and closing stocks, there will be no difference in profit.
- b. When opening and closing stocks are same, there will be no difference in profit, provided the fixed cost element in opening and closing stocks are of the same amount.
- c. When closing stock is more than opening stock, the profit under absorption costing will be higher as comparatively a greater portion of fixed cost is included in closing stock and carried over to next period.
- d. When closing stock is less than opening stock, the profit under absorption costing will be less as comparatively a higher amount of fixed cost contained in opening stock is debited during the current period.

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

- a. In absorption costing, items of stock are costed to include a 'fair share' of fixed production overhead, whereas in marginal costing, stocks are valued at variable production cost only. The value of closing stock will be higher in absorption costing than in marginal costing.
- b. As a consequence of carrying forward an element of fixed production overheads in closing stock values, the cost of sales used to determine profit in absorption costing will:
 - i. include some fixed production overhead costs incurred in a previous period but carried forward into opening stock values of the current period;
 - ii. exclude some fixed production overhead costs incurred in the current period by including them in closing stock values.

In contrast marginal costing charges the actual fixed costs of a period in full into the profit and loss account of the period. (Marginal costing is therefore sometimes known as period costing.)

- c. In absorption costing, 'actual' fully absorbed unit costs are reduced by producing in greater quantities, whereas in marginal costing, unit variable costs are unaffected by the volume of production (that is, provided that variable costs per unit remain unaltered at the changed level of production activity). Profit per unit in any period can be affected by the actual volume of production in absorption costing; this is not the case in marginal costing.
- d. In marginal costing, the identification of variable costs and of contribution enables management to use cost information more easily for decision-making purposes (such as in budget decision making). It is easy to decide by how much contribution (and therefore profit) will be affected by changes in sales volume. (Profit would be unaffected by changes in production volume).

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

- i. production volume; and
 - ii. sales volume;
- is not easily seen, because behaviour is not analysed and incremental costs are not used in the calculation of actual profit.

Limitations of Absorption Costing

The following are the criticisms against absorption costing:

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

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

Summary

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

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

Questions

1. Is marginal costing and absorption costing same?
2. What is presentation of cost data? Answer with suitable example.

Chapter 3 – Breakeven Analysis

Learning Objectives

- To describe as to how the concepts of fixed and variable costs are used in C-V-P analysis
- To segregate semi-variable expenses in C-V-P analysis
- To identify the limiting assumptions of C-V-P analysis
- To work out the breakeven analysis, contribution analysis and margin of safety
- To understand how to draw a breakeven chart
- To compute breakeven point

Introduction

In this lesson, we will discuss in detail the highlights associated with cost function and cost relations with the production and distribution system of an economic entity.

To assist planning and decision making, management should know not only the budgeted profit, but also:

- the output and sales level at which there would neither profit nor loss (break-even point)
- the amount by which actual sales can fall below the budgeted sales level, without a loss being incurred (the margin of safety)

MARGINAL COSTS, CONTRIBUTION AND PROFIT

A marginal cost is another term for a variable cost. The term ‘marginal cost’ is usually applied to the variable cost of a unit of product or service, whereas the term ‘variable cost’ is more commonly applied to resource costs, such as the cost of materials and labour hours.

Marginal costing is a form of management accounting based on the distinction between:

- a. the marginal costs of making selling goods or services, and
- b. fixed costs, which should be the same for a given period of time, regardless of the level of activity in the period.

Suppose that a firm makes and sells a single product that has a marginal cost of £5 per unit and that sells for £9 per unit. For every additional unit of the product that is made and sold, the firm will incur an extra cost of £5 and receive income of £9. The net gain will be £4 per additional unit. This net gain per unit, the difference between the sales price per unit and the marginal cost per unit, is called contribution.

Contribution is a term meaning ‘making a contribution towards covering fixed costs and making a profit’. Before a firm can make a profit in any period, it must first of all cover its fixed costs. Breakeven is where total sales revenue for a period just covers fixed costs, leaving neither profit nor loss. For every unit sold in excess of the breakeven point, profit will increase by the amount of the contribution per unit.

C-V-P analysis is broadly known as cost-volume-profit analysis. Specifically speaking, we all are concerned with in-depth analysis and application of CVP in practical world of industry management.

Cost-Volume-Profit (C-V-P) Relationship

We have observed that in marginal costing, marginal cost varies directly with the volume of production or output. On the other hand, fixed cost remains unaltered regardless of the volume of output within the scale of production already fixed by management. In case if cost behavior is related to sales income, it shows cost-

volume-profit relationship. In net effect, if volume is changed, variable cost varies as per the change in volume. In this case, selling price remains fixed, fixed remains fixed and then there is a change in profit.

Being a manager, you constantly strive to relate these elements in order to achieve the maximum profit. Apart from profit projection, the concept of Cost-Volume-Profit (CVP) is relevant to virtually all decision-making areas, particularly in the short run.

The relationship among cost, revenue and profit at different levels may be expressed in graphs such as breakeven charts, profit volume graphs, or in various statement forms.

Profit depends on a large number of factors, most important of which are the cost of manufacturing and the volume of sales. Both these factors are interdependent. Volume of sales depends upon the volume of production and market forces which in turn is related to costs. Management has no control over market. In order to achieve certain level of profitability, it has to exercise control and management of costs, mainly variable cost. This is because fixed cost is a non-controllable cost. But then, cost is based on the following factors:

- Volume of production
- Product mix
- Internal efficiency and the productivity of the factors of production
- Methods of production and technology
- Size of batches
- Size of plant

Thus, one can say that cost-volume-profit analysis furnishes the complete picture of the profit structure. This enables management to distinguish among the effect of sales, fluctuations in volume and the results of changes in price of product/services.

In other words, CVP is a management accounting tool that expresses relationship among sale volume, cost and profit. CVP can be used in the form of a graph or an equation. Cost-volume- profit analysis can answer a number of analytical questions. Some of the questions are as follows:

1. What is the breakeven revenue of an organization?
2. How much revenue does an organization need to achieve a budgeted profit?
3. What level of price change affects the achievement of budgeted profit?
4. What is the effect of cost changes on the profitability of an operation?

Cost-volume-profit analysis can also answer many other “what if” type of questions. Cost-volume-profit analysis is one of the important techniques of cost and management accounting. Although it is a simple yet a powerful tool for planning of profits and therefore, of commercial operations. It provides an answer to “what if” theme by telling the volume required to produce.

Following are the three approaches to a CVP analysis:

- Cost and revenue equations
- Contribution margin
- Profit graph

Objectives of Cost-Volume-Profit Analysis

1. In order to forecast profits accurately, it is essential to ascertain the relationship between cost and profit on one hand and volume on the other.
2. Cost-volume-profit analysis is helpful in setting up flexible budget which indicates cost at various levels of activities.

3. Cost-volume-profit analysis assist in evaluating performance for the purpose of control.
4. Such analysis may assist management in formulating pricing policies by projecting the effect of different price structures on cost and profit.

Assumptions and Terminology

Following are the assumptions on which the theory of CVP is based:

1. The changes in the level of various revenue and costs arise only because of the changes in the number of product (or service) units produced and sold, e.g., the number of television sets produced and sold by Sigma Corporation. The number of output (units) to be sold is the only revenue and cost driver. Just as a cost driver is any factor that affects costs, a revenue driver is any factor that affects revenue.
2. Total costs can be divided into a fixed component and a component that is variable with respect to the level of output. Variable costs include the following:
 - o Direct materials
 - o Direct labor
 - o Direct chargeable expenses

Variable overheads include the following:

- o Variable part of factory overheads
 - o Administration overheads
 - o Selling and distribution overheads
3. There is linear relationship between revenue and cost.
 4. When put in a graph, the behavior of total revenue and cost is linear (straight line), i.e. $Y = mx + C$ holds good which is the equation of a straight line.
 5. The unit selling price, unit variable costs and fixed costs are constant.
 6. The theory of CVP is based upon the production of a single product. However, of late, management accountants are functioning to give a theoretical and a practical approach to multi-product CVP analysis.
 7. The analysis either covers a single product or assumes that the sales mix sold in case of multiple products will remain constant as the level of total units sold changes.
 8. All revenue and cost can be added and compared without taking into account the time value of money.
 9. The theory of CVP is based on the technology that remains constant.
 10. The theory of price elasticity is not taken into consideration.

Many companies, and divisions and sub-divisions of companies in industries such as airlines, automobiles, chemicals, plastics and semiconductors have found the simple CVP relationships to be helpful in the following areas:

- Strategic and long-range planning decisions
- Decisions about product features and pricing

In real world, simple assumptions described above may not hold good. The theory of CVP can be tailored for individual industries depending upon the nature and peculiarities of the same.

For example, predicting total revenue and total cost may require multiple revenue drivers and multiple cost drivers. Some of the multiple revenue drivers are as follows:

- Number of output units
- Number of customer visits made for sales
- Number of advertisements placed

Some of the multiple cost drivers are as follows:

- Number of units produced
- Number of batches in which units are produced

Managers and management accountants, however, should always assess whether the simplified CVP relationships generate sufficiently accurate information for predictions of how total revenue and total cost would behave. However, one may come across different complex situations to which the theory of CVP would rightly be applicable in order to help managers to take appropriate decisions under different situations.

Limitations of Cost-Volume Profit Analysis

The CVP analysis is generally made under certain limitations and with certain assumed conditions, some of which may not occur in practice. Following are the main limitations and assumptions in the cost-volume-profit analysis:

1. It is assumed that the production facilities anticipated for the purpose of cost-volume-profit analysis do not undergo any change. Such analysis gives misleading results if expansion or reduction of capacity takes place.
2. In case where a variety of products with varying margins of profit are manufactured, it is difficult to forecast with reasonable accuracy the volume of sales mix which would optimize the profit.
3. The analysis will be correct only if input price and selling price remain fairly constant which in reality is difficulty to find. Thus, if a cost reduction program is undertaken or selling price is changed, the relationship between cost and profit will not be accurately depicted.
4. In cost-volume-profit analysis, it is assumed that variable costs are perfectly and completely variable at all levels of activity and fixed cost remains constant throughout the range of volume being considered. However, such situations may not arise in practical situations.
5. It is assumed that the changes in opening and closing inventories are not significant, though sometimes they may be significant.
6. Inventories are valued at variable cost and fixed cost is treated as period cost. Therefore, closing stock carried over to the next financial year does not contain any component of fixed cost. Inventory should be valued at full cost in reality.

Sensitivity Analysis or What If Analysis and Uncertainty

Sensitivity analysis is relatively a new term in management accounting. It is a “what if” technique that managers use to examine how a result will change if the original predicted data are not achieved or if an underlying assumption changes.

In the context of CVP analysis, sensitivity analysis answers the following questions:

- a. What will be the operating income if units sold decrease by 15% from original prediction?
- b. What will be the operating income if variable cost per unit increases by 20%?

The sensitivity of operating income to various possible outcomes broadens the perspective of management regarding what might actually occur before making cost commitments.

A spreadsheet can be used to conduct CVP-based sensitivity analysis in a systematic and efficient way. With the help of a spreadsheet, this analysis can be easily conducted to examine the effect and interaction of changes in selling prices, variable cost per unit, fixed costs and target operating incomes.

Example

Following is the spreadsheet of ABC Ltd.,

Statement showing CVP Analysis for Dolphy Software Ltd.

		Revenue required at \$. 200 Selling Price per unit to earn Operating Income of			
Fixed cost	Variable cost per unit	0	1,000	1,500	2,000
2,000	100	4,000	6,000	7,000	8,000
	120	5,000	7,500	8,750	10,000
	140	6,667	10,000	11,667	13,333
2,500	100	5,000	7,000	8,000	9,000
	120	6,250	8,750	10,000	11,250
	140	8,333	11,667	13,333	15,000
3,000	100	6,000	8,000	9,000	10,000
	120	7,500	10,000	11,250	12,500
	140	10,000	13,333	15,000	16,667

From the above example, one can immediately see the revenue that needs to be generated to reach a particular operating income level, given alternative levels of fixed costs and variable costs per unit. For example, revenue of \$. 6,000 (30 units @ \$. 200 each) is required to earn an operating income of \$. 1,000 if fixed cost is \$. 2,000 and variable cost per unit is \$. 100. You can also use exhibit 3-4 to assess what revenue the company needs to breakeven (earn operating income of Re. 0) if, for example, one of the following changes takes place:

- The booth rental at the ABC convention raises to \$. 3,000 (thus increasing fixed cost to \$. 3,000)
- The software suppliers raise their price to \$. 140 per unit (thus increasing variable costs to \$. 140)

An aspect of sensitivity analysis is the margin of safety which is the amount of budgeted revenue over and above breakeven revenue. The margin of safety is sales quantity minus breakeven quantity. It is expressed in units. The margin of safety answers the “what if” questions, e.g., if budgeted revenue are above breakeven and start dropping, how far can they fall below budget before the breakeven point is reached? Such a fall could be due to competitor’s better product, poorly executed marketing programs and so on.

Assume you have fixed cost of \$. 2,000, selling price of \$. 200 and variable cost per unit of \$. 120. For 40 units sold, the budgeted point from this set of assumptions is 25 units ($\$. 2,000 \div \$. 80$) or \$. 5,000 ($\$. 200 \times 25$). Hence, the margin of safety is \$. 3,000 ($\$. 8,000 - 5,000$) or 15 ($40 - 25$) units.

Sensitivity analysis is an approach to recognizing uncertainty, i.e. the possibility that an actual amount will deviate from an expected amount.

Marginal Cost Equations and Breakeven Analysis

From the marginal cost statements, one might have observed the following:

$$\text{Sales} - \text{Marginal cost} = \text{Contribution} \dots\dots(1)$$

$$\text{Fixed cost} + \text{Profit} = \text{Contribution} \dots\dots(2)$$

By combining these two equations, we get the fundamental marginal cost equation as follows:

$$\text{Sales} - \text{Marginal cost} = \text{Fixed cost} + \text{Profit} \dots\dots(3)$$

This fundamental marginal cost equation plays a vital role in profit projection and has a wider application in managerial decision-making problems.

The sales and marginal costs vary directly with the number of units sold or produced. So, the difference between sales and marginal cost, i.e. contribution, will bear a relation to sales and the ratio of contribution to sales remains constant at all levels. This is profit volume or P/V ratio. Thus,

$$\text{P/V Ratio (or C/S Ratio)} = \frac{\text{Contribution (c)}}{\text{Sales (s)}} \dots\dots(4)$$

It is expressed in terms of percentage, i.e. P/V ratio is equal to $(C/S) \times 100$.

Or, Contribution = Sales $\times$ P/V ratio $\dots\dots(5)$

Or, Sales = $\frac{\text{Contribution}}{\text{P/V ratio}} \dots\dots(6)$

The above-mentioned marginal cost equations can be applied to the following heads:

1. Contribution

Contribution is the difference between sales and marginal or variable costs. It contributes toward fixed cost and profit. The concept of contribution helps in deciding breakeven point, profitability of products, departments etc. to perform the following activities:

- Selecting product mix or sales mix for profit maximization
- Fixing selling prices under different circumstances such as trade depression, export sales, price discrimination etc.

2. Profit Volume Ratio (P/V Ratio), its Improvement and Application

The ratio of contribution to sales is P/V ratio or C/S ratio. It is the contribution per rupee of sales and since the fixed cost remains constant in short term period, P/V ratio will also measure the rate of change of profit due to change in volume of sales. The P/V ratio may be expressed as follows:

$$\text{P/V ratio} = \frac{\text{Sales} - \text{Marginal cost of sales}}{\text{Sales}} = \frac{\text{Contribution}}{\text{Sales}} = \frac{\text{Changes in contribution}}{\text{Changes in sales}} = \frac{\text{Change in profit}}{\text{Change in sales}}$$

A fundamental property of marginal costing system is that P/V ratio remains constant at different levels of activity.

A change in fixed cost does not affect P/V ratio. The concept of P/V ratio helps in determining the following:

- Breakeven point
- Profit at any volume of sales
- Sales volume required to earn a desired quantum of profit
- Profitability of products
- Processes or departments

The contribution can be increased by increasing the sales price or by reduction of variable costs. Thus, P/V ratio can be improved by the following:

- Increasing selling price
- Reducing marginal costs by effectively utilizing men, machines, materials and other services
- Selling more profitable products, thereby increasing the overall P/V ratio

3. Breakeven Point

Breakeven point is the volume of sales or production where there is neither profit nor loss. Thus, we can say that:

Contribution = Fixed cost

Now, breakeven point can be easily calculated with the help of fundamental marginal cost equation, P/V ratio or contribution per unit.

a. Using Marginal Costing Equation

$S \text{ (sales)} - V \text{ (variable cost)} = F \text{ (fixed cost)} + P \text{ (profit)}$ At BEP $P = 0$, BEP $S - V = F$

By multiplying both the sides by S and rearranging them, one gets the following equation:

$$S \text{ BEP} = F.S/S-V$$

b. Using P/V Ratio

$$\text{Sales } S \text{ BEP} = \frac{\text{Contribution at BEP}}{P/V \text{ ratio}} = \frac{\text{Fixed cost}}{P/V \text{ ratio}}$$

Thus, if sales is \$. 2,000, marginal cost \$. 1,200 and fixed cost \$. 400, then:

$$\text{Breakeven point} = \frac{400 \times 2000}{2000 - 1200} = \$. 1000$$

$$\text{Similarly, } \frac{P/V \text{ ratio}}{800} = 2000 - 1200 = 0.4 \text{ or } 40\%$$

$$\text{So, breakeven sales} = \$. 400 / .4 = \$. 1000$$

c. Using Contribution per unit

$$\text{Breakeven point} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = 100 \text{ units or } \$. 1000$$

4. Margin of Safety (MOS)

Every enterprise tries to know how much above they are from the breakeven point. This is technically called margin of safety. It is calculated as the difference between sales or production units at the selected activity and the breakeven sales or production.

Margin of safety is the difference between the total sales (actual or projected) and the breakeven sales. It may be expressed in monetary terms (value) or as a number of units (volume). It can be expressed as profit / P/V ratio. A large margin of safety indicates the soundness and financial strength of business.

Margin of safety can be improved by lowering fixed and variable costs, increasing volume of sales or selling price and changing product mix, so as to improve contribution and overall P/V ratio.

$$\text{Margin of safety} = \text{Sales at selected activity} - \text{Sales at BEP} = \frac{\text{Profit at selected activity}}{P/V \text{ ratio}}$$

$$\text{Margin of safety is also presented in ratio or percentage as follows: } \frac{\text{Margin of safety (sales)} \times 100 \%}{\text{Sales at selected activity}}$$

The size of margin of safety is an extremely valuable guide to the strength of a business. If it is large, there can be substantial falling of sales and yet a profit can be made. On the other hand, if margin is small, any loss of sales may be a serious matter. If margin of safety is unsatisfactory, possible steps to rectify the causes of mismanagement of commercial activities as listed below can be undertaken.

- a. Increasing the selling price-- It may be possible for a company to have higher margin of safety in order to strengthen the financial health of the business. It should be able to influence price, provided the demand is elastic. Otherwise, the same quantity will not be sold.
- b. Reducing fixed costs
- c. Reducing variable costs
- d. Substitution of existing product(s) by more profitable lines
- e. Increase in the volume of output
- e. Modernization of production facilities and the introduction of the most cost effective technology

Problem 1

A company earned a profit of \$. 30,000 during the year 2000-01. Marginal cost and selling price of a product are \$. 8 and \$. 10 per unit respectively. Find out the margin of safety.

Solution

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V ratio}}$$

$$\text{P/V ratio} = \frac{\text{Contribution} \times 100}{\text{Sales}}$$

Problem 2

A company producing a single article sells it at \$. 10 each. The marginal cost of production is \$. 6 each and fixed cost is \$. 400 per annum. You are required to calculate the following:

- Profits for annual sales of 1 unit, 50 units, 100 units and 400 units
- P/V ratio
- Breakeven sales
- Sales to earn a profit of \$. 500
- Profit at sales of \$. 3,000
- New breakeven point if sales price is reduced by 10%
- Margin of safety at sales of 400 units

Solution Marginal Cost Statement

Particulars	Amount	Amount	Amount	Amount
Units produced	1	50	100	400
Sales (units * 10)	10	500	1000	4000
Variable cost	6	300	600	2400
Contribution (sales- VC)	4	200	400	1600
Fixed cost	400	400	400	400
Profit (Contribution – FC)	-396	-200	0	1200

$$\text{Profit Volume Ratio (PVR)} = \text{Contribution/Sales} \times 100 = 0.4 \text{ or } 40\%$$

$$\text{Breakeven sales (\$.)} = \text{Fixed cost} / \text{PVR} = 400 / 40 \times 100 = \$1,000$$

$$\text{Sales at BEP} = \text{Contribution at BEP} / \text{PVR} = 100 \text{ units}$$

Sales at profit \$. 500

Contribution at profit \$. 500 = Fixed cost + Profit = \$. 900

Sales = Contribution/PVR = $900/.4 = \$ 2,250$ (or 225 units)

Profit at sales \$. 3,000

Contribution at sale \$. 3,000 = Sales x P/V ratio = $3000 \times 0.4 = \$ 1,200$

Profit = Contribution – Fixed cost = $\$ 1,200 - \$ 400 = \$ 800$

New P/V ratio = $\$ 9 - \$ 6/\$ 9 = 1/3$

Sales at BEP = Fixed cost/PV ratio = $\frac{\$ 400}{1/3} = \$ 1,200$

Margin of safety (at 400 units) = $4000 - 1000/4000 \times 100 = 75\%$

(Actual sales – BEP sales/Actual sales * 100)

Breakeven Analysis-- Graphical Presentation

Apart from marginal cost equations, it is found that breakeven chart and profit graphs are useful graphic presentations of this cost-volume-profit relationship.

Breakeven chart is a device which shows the relationship between sales volume, marginal costs and fixed costs, and profit or loss at different levels of activity. Such a chart also shows the effect of change of one factor on other factors and exhibits the rate of profit and margin of safety at different levels. A breakeven chart contains, inter alia, total sales line, total cost line and the point of intersection called breakeven point. It is popularly called breakeven chart because it shows clearly breakeven point (a point where there is no profit or no loss).

Profit graph is a development of simple breakeven chart and shows clearly profit at different volumes of sales.

Construction of a Breakeven Chart

The construction of a breakeven chart involves the drawing of fixed cost line, total cost line and sales line as follows:

1. Select a scale for production on horizontal axis and a scale for costs and sales on vertical axis.
2. Plot fixed cost on vertical axis and draw fixed cost line passing through this point parallel to horizontal axis.
3. Plot variable costs for some activity levels starting from the fixed cost line and join these points. This will give total cost line. Alternatively, obtain total cost at different levels, plot the points starting from horizontal axis and draw total cost line.
4. Plot the maximum or any other sales volume and draw sales line by joining zero and the point so obtained.

Uses of Breakeven Chart

A breakeven chart can be used to show the effect of changes in any of the following profit factors:

- Volume of sales
- Variable expenses
- Fixed expenses
- Selling price

Problem

A company produces a single article and sells it at \$. 10 each. The marginal cost of production is \$. 6 each and total fixed cost of the concern is \$. 400 per annum.

Construct a breakeven chart and show the following:

- Breakeven point
- Margin of safety at sale of \$. 1,500
- Angle of incidence
- Increase in selling price if breakeven point is reduced to 80 units

Solution

A breakeven chart can be prepared by obtaining the information at these levels:

Output units	40	80	120	200
	\$.	\$.	\$.	\$.
Sales	400	800	1,200	2,000
Fixed cost	400	400	400	400
Variable cost	240	480	720	1,200
Total cost	640	880	1,120	1,600

Fixed cost line, total cost line and sales line are drawn one after another following the usual procedure described herein:

This chart clearly shows the breakeven point, margin of safety and angle of incidence.

- a. Breakeven point-- Breakeven point is the point at which sales line and total cost line intersect. Here, B is breakeven point equivalent to sale of \$. 1,000 or 100 units.
- b. Margin of safety-- Margin of safety is the difference between sales or units of production and breakeven point. Thus, margin of safety at M is sales of (\$. 1,500 - \$. 1,000), i.e. \$. 500 or 50 units.
- c. Angle of incidence-- Angle of incidence is the angle formed by sales line and total cost line at breakeven point. A large angle of incidence shows a high rate of profit being made. It should be noted that the angle of incidence is universally denoted by data. Larger the angle, higher the profitability indicated by the angle of incidence.
- d. At 80 units, total cost (from the table) = \$. 880. Hence, selling price for breakeven at 80 units = $\frac{880}{80} = \$ 11$ per unit. Increase in selling price is Re. 1 or 10% over the original selling price of \$. 10 per unit.

Limitations and Uses of Breakeven Charts

A simple breakeven chart gives correct result as long as variable cost per unit, total fixed cost and sales price remain constant. In practice, all these factors may change and the original breakeven chart may give misleading results.

But then, if a company sells different products having different percentages of profit to turnover, the original combined breakeven chart fails to give a clear picture when the sales mix changes. In this case, it may be necessary to draw up a breakeven chart for each product or a group of products. A breakeven chart does not take into account capital employed which is a very important factor to measure the overall efficiency of business. Fixed costs may increase at some level whereas variable costs may sometimes start to decline. For example, with the help of quantity discount on materials purchased, the sales price may be reduced to sell the

additional units produced etc. These changes may result in more than one breakeven point, or may indicate higher profit at lower volumes or lower profit at still higher levels of sales.

Nevertheless, a breakeven chart is used by management as an efficient tool in marginal costing, i.e. in forecasting, decision-making, long term profit planning and maintaining profitability. The margin of safety shows the soundness of business whereas the fixed cost line shows the degree of mechanization. The angle of incidence is an indicator of plant efficiency and profitability of the product or division under consideration. It also helps a monopolist to make price discrimination for maximization of profit.

Multiple Product Situations

In real life, most of the firms turn out many products. Here also, there is no problem with regard to the calculation of BE point. However, the assumption has to be made that the sales mix remains constant. This is defined as the relative proportion of each product's sale to total sales. It could be expressed as a ratio such as 2:4:6, or as a percentage as 20%, 40%, 60%.

The calculation of breakeven point in a multi-product firm follows the same pattern as in a single product firm. While the numerator will be the same fixed costs, the denominator now will be weighted average contribution margin. The modified formula is as follows:

$$\text{Breakeven point (in units)} = \frac{\text{Fixed costs}}{\text{Weighted average contribution margin per unit}}$$

One should always remember that weights are assigned in proportion to the relative sales of all products. Here, it will be the contribution margin of each product multiplied by its quantity.

Breakeven Point in Sales Revenue

Here also, numerator is the same fixed costs. The denominator now will be weighted average contribution margin ratio which is also called weighted average P/V ratio. The modified formula is as follows:

$$\text{B.E. point (in revenue)} = \frac{\text{Fixed cost}}{\text{Weighted average P/V ratio}}$$

Problem Ahmedabad Company Ltd. manufactures and sells four types of products under the brand name Ambience, Luxury, Comfort and Lavish. The sales mix in value comprises the following:

Brand name	Percentage
Ambience	33 1/3
Luxury	41 2/3
Comfort	16 2/3
Lavish	8 1/3

	100

The total budgeted sales (100%) are \$. 6,00,000 per month.

The operating costs are:

Ambience	60% of selling price	Luxury
Luxury	68% of selling price	Comfort

Comfort 80% of selling price Lavish
Lavish 40% of selling price
The fixed costs are \$. 1,59,000 per month.

- a. Calculate the breakeven point for the products on an overall basis.
- b. It has been proposed to change the sales mix as follows, with the sales per month remaining at \$. 6,00,000:

Brand Name	Percentage
Ambience	25
Luxury	40
Comfort	30
Lavish	05

	100

Assuming that this proposal is implemented, calculate the new breakeven point.

Solution

- a. Computation of the Breakeven Point on Overall Basis
- b. Computation of the New Breakeven Point

Profit Graph

Profit graph is an improvement of a simple breakeven chart. It clearly exhibits the relationship of profit to volume of sales. The construction of a profit graph is relatively easy and the procedure involves the following:

1. Selecting a scale for the sales on horizontal axis and another scale for profit and fixed costs or loss on vertical axis. The area above horizontal axis is called profit area and the one below it is called loss area.
2. Plotting the profits of corresponding sales and joining them. This is profit line.

Summary

1. Fixed and variable cost classification helps in CVP analysis. Marginal cost is also useful for such analysis.
2. Breakeven point is the incidental study of CVP. It is the point of no profit and no loss. At this specific level of operation, it covers total costs, including variable and fixed overheads.
3. Breakeven chart is the graphical representation of cost structure of business.
4. Profit/Volume (P/V) ratio shows the relationship between contribution and value/volume of sales. It is usually expressed as terms of percentage and is a valuable tool for the profitability of business.
5. Margin of safety is the difference between sales or units of production and breakeven point. The size of margin of safety is an extremely valuable guide to the financial strength of a business.

Questions

1. Discuss the concept of fixed and variable cost.
2. CVP analysis is a useful technique for managerial decision-making. Discuss.
3. CVP analysis has no limitation. Discuss.
4. What is a breakeven chart?
5. What questions can a breakeven chart answer to?
6. Provide a formula to determine the breakeven point of a single product, multi-product and different divisions and subdivisions of an organization.
7. What are the disadvantages of using breakeven analysis?

8. Define contribution margin.
9. Explain-- Margin of safety shows the financial strength of a business.

Quick quiz

1. What is the formula for calculating the breakeven point in terms of the number of units required to break even?
2. Give the formula which uses the C/S ratio to calculate the breakeven point.
3. What is the margin of safety?
4. What do the axes of a breakeven chart represent?
5. Give three uses of breakeven charts.
6. What is a profit/volume chart?
7. What does the horizontal axis of the PN chart represent?
8. What are the limitations of breakeven charts and CVP analysis?

Answers to quick quiz

1. Breakeven point (units) = Total fixed costs/Contribution per unit
2. Sales value at breakeven point = Total Fixed Cost divide by C/S ratio
3. The margin of safety is the difference in units between the budgeted sales volume and the breakeven sales volume.
4. The vertical axis represents money (costs and revenue) and the horizontal axis represents the level of activity (production and sales).
5. Breakeven charts are used as follows.
 - o To plan the production of a company's products
 - o To market a company's products
 - o To give a visual display of breakeven arithmetic
6. The profit/volume chart is a variation of the breakeven chart which provides a simple illustration of the relationship of costs and profit to sales.
7. 'V' on the horizontal axis is volume or value of sales.
8.
 - o A breakeven chart can only apply to a single product or a single mix of a group of products.
 - o A breakeven chart may be time-consuming to prepare.
 - o It assumes fixed costs are constant at all levels of output.
 - o It assumes that variable costs are the same per unit at all levels of output.
 - o It assumes that sales prices are constant at all levels of output.
 - o It assumes production and sales are the same (stock levels are ignored).
 - o It ignores the uncertainty in the estimates of fixed costs and variable cost per unit.

Chapter 4

Standard Cost

Learning Objectives

- To understand the meaning of standard costing, its meaning and definition
- To learn its advantages and limitations
- To learn how to set of standards and determinations
- To learn how to revise standards

Introduction

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

Meaning of Standard

When you want to measure some thing, you must take some parameter or yardstick for measuring. We can call this as standard. What are your daily expenses? An average of \$50! If you have been spending this much for so many days, then this is your daily standard expense.

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

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

Definition

The CIMA, London has defined standard cost as “a predetermined cost which is calculated from managements standards of efficient operations and the relevant necessary expenditure.” They are the predetermined costs on technical estimate of material labor and overhead for a selected period of time and for a prescribed set of working conditions. In other words, a standard cost is a planned cost for a unit of product or service rendered.

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

Advantages

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

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

Limitations of Standard Costing

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

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

Setting Standards

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

Various Elements which Influence the Setting of Standards

Setting Standards for Direct Materials

There are several basic principles which ought to be appreciated in setting standards for direct materials. Generally, when you want to purchase some material what are the factors you consider. If material is used for a product, it is known as direct material. On the other hand, if the material cost cannot be assigned to the manufacturing of the product, it will be called indirect material. Therefore, it involves two things:

- Quality of material
- Price of the material

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

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

- Cost of materials
- Ordering cost
- Carrying cost

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

Setting Direct Labor Cost

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

- Standard labor time for producing
- Labor rate per hour

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

- Skilled labor
- Semi-skilled labor

- Unskilled labor

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

Setting Standards of Overheads

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

- Determination of overheads
- Determination of labor hours or units manufactured
- Calculating overheads rate by dividing A by B

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

Determination of Standard Costs

How should the ideal standards for better controlling be determined?

1. Determination of Cost Center

According to J. Betty, “A cost center is a department or part of a department or an item of equipment or machinery or a person or a group of persons in respect of which costs are accumulated, and one where control can be exercised.” Cost centers are necessary for determining the costs. If the whole factory is engaged in manufacturing a product, the factory will be a cost center. In fact, a cost center describes the product while cost is accumulated. Cost centers enable the determination of costs and fixation of responsibility. A cost center relating to a person is called personnel cost center, and a cost center relating to products and equipments is called impersonal cost center.

2. Current Standards

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

3. Ideal Standard

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

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

4. Basic Standards

A basic standard may be defined as a standard which is established for use for an indefinite period which may a long period. Basic standard is established for a long period and is not adjusted to the preset conditions. The same standard remains in force for a long period. These standards are revised only on the changes in specification of material and technology productions. It is indeed just like a number against which subsequent process changes can be measured. Basic standard enables the measurement of changes in costs. For example, if the basic cost for material is Rs. 20 per unit and the current price is Rs. 25 per unit, it will show an increase of 25% in the cost of materials. The changes in manufacturing costs can be measured by taking basic standard, as a base standard cannot serve as a tool for cost control purpose because the standard is not revised for a long time. The deviation between standard cost and actual cost cannot be used as a yardstick for measuring efficiency.

5. Normal Standards

As per terminology, normal standard has been defined as a standard which, it is anticipated, can be attained over a future period of time, preferably long enough to cover one trade cycle. This standard is based on the conditions which will cover a future period of five years, concerning one trade cycle. If a normal cycle of ups and downs in sales and production is 10 years, then standard will be set on average sales and production which will cover all the years. The standard attempts to cover variance in the production from one time to another time. An average is taken from the periods of recession and depression. The normal standard concept is theoretical and cannot be used for cost control purpose. Normal standard can be properly applied for absorption of overhead cost over a long period of time.

6. Organization for Standard Costing

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

7. Accounting System

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

Revision of Standards

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

Standards may need to be changed to accommodate changes in the organization or its environment. When there is a sudden change in economic circumstances, technology or production methods, the standard cost will no longer be accurate. Standards that are out of date will not act as effective feed forward or feedback control tools. They will not help us to predict the inputs required nor help us to evaluate the efficiency of a particular department. If standards are continually not being achieved and large deviations or variances from the standard are reported, they should be carefully reviewed. Also, changes in the physical productive capacity of the organization or in material prices and wage rates may indicate that standards need to be revised. In practice, changing standards frequently is an expensive operation and can cause confusion. For this reason, standard cost revisions are usually made only once a year. At times of rapid price inflation, many managers have felt that the high level of inflation forced them to change price and wage rate standards continually. This, however, leads to reduction in value of the standard as a yardstick. At the other extreme is the adoption of basic standard which will remain unchanged for many years. They provide a constant base for comparison, but this is hardly satisfactory when there is technological change in working procedures and conditions.

Summary

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

Chapter 5

Variance Analysis

A variance is the difference between an actual result and an expected result. The process by which the total difference between standard and actual results is analysed is known as variance analysis. When actual results are better than the expected results, we have a favourable variance (F). If, on the other hand, actual results are worse than expected results, we have an adverse (A).

I will use this example throughout this Exercise:

<u>Standard cost of Product A</u>	\$
Materials (5kgs x \$10 per kg)	50
Labour (4hrs x \$5 per hr)	20
Variable o/hds (4 hrs x \$2 per hr)	8
Fixed o/hds (4 hrs x \$6 per hr)	<u>24</u>
	102

Budgeted results

Production:	1,200 units
Sales:	1,000 units
Selling price:	\$150 per unit

ACTUAL Results

Production:	1,000 units
Sales:	900 units
Materials:	4,850 kgs, \$46,075
Labour:	4,200 hrs, \$21,210
Variable o/hds:	\$9,450
Fixed o/hds:	\$25,000
Selling price:	\$140 per unit

1. Variable cost variances

Direct material variances

The direct material total variance is the difference between what the output actually cost and what it should have cost, in terms of material.

From the example above the material total variance is given by:

	\$
1,000 units should have cost (x \$50)	50,000
But did cost	46,075
Direct material total variance	3, 925 (F)

It can be divided into two sub-variances

The direct material price variance

This is the difference between what the actual quantity of material used did cost and what it should have cost.

	\$
4,850 kgs should have cost (x \$10)	48,500

But did cost	46,075
Direct material price variance	2,425 (F)

The direct material usage variance

This is the difference between how much material should have been used for the number of units actually produced and how much material was used, valued at standard cost

1,000 units should have used (x 5 kgs)	5,000 kgs
But did use	4,850 kgs
Variance in kgs	150 kgs (F)
Valued at standard cost per kg	x \$10
Direct material usage variance in \$	\$1,500 (F)

The direct material price variance is calculated on material purchases in the period if closing stocks of raw materials are valued at standard cost or material used if closing stocks of raw materials are valued at actual cost (FIFO).

Direct labour total variance

The direct labour total variance is the difference between what the output should have cost and what it did cost, in terms of labour.

	\$
1,000 units should have cost (x \$20)	20,000
But did cost	21,210
Direct material price variance	1,210 (A)

Direct labour rate variance

This is the difference between what the actual number of hours worked should have cost and what it did cost.

4200hrs should have cost (4200hrs x \$5)	\$21000
But did cost	\$21210
Direct labour rate variance	\$210(A)

The direct labour efficiency variance

The is the difference between how many hours should have been worked for the number of units actually produced and how many hours were worked, valued at the standard rate per hour.

	\$
1,000 units should have taken (x 4 hrs)	4,000 hrs
But did take	4,200 hrs
Variance in hrs	200 hrs
Valued at standard rate per hour	x \$5
Direct labour efficiency variance	\$1,000 (A)

When idle time occurs the efficiency variance is based on hours actually worked (not hours paid for) and an idle time variance (hours of idle time x standard rate per hour) is calculated.

2. Variable production overhead total variances

The variable production overhead total variance is the difference between what the output should have cost and what it did cost, in terms of variable production overhead.

	\$
1,000 units should have cost (x \$8)	8,000
But did cost	9,450
Variable production o/hd expenditure variance	1,450 (A)

The variable production overhead expenditure variance

This is the difference between what the variable production overhead did cost and what it should have cost

	\$
4,200 hrs should have cost (x \$2)	8,400
But did cost	9,450
Variable production o/hd expenditure variance	1,050 (A)

The variable production overhead efficiency variance

This is the same as the direct labour efficiency variance in hours, valued at the variable production overhead rate per hour.

Labour efficiency variance in hours	200 hrs (A)
Valued @ standard rate per hour	x \$2
Variable production o/hd efficiency variance	\$400 (A)

3. Fixed production overhead variances

The total fixed production variance is an attempt to explain the under- or over-absorbed fixed production overhead.

$$\text{Remember that overhead absorption rate} = \frac{\text{Budgeted fixed production overhead}}{\text{Budgeted level of activity}}$$

If either the numerator or the denominator or both are incorrect then we will have under- or over-absorbed production overhead.

- If actual expenditure $\pm$ budgeted expenditure (numerator incorrect) » expenditure variance
- If actual production / hours of activity » budgeted production / hours of activity (denominator incorrect) » volume variance.
- The workforce may have been working at a more or less efficient rate than standard to produce a given output » volume efficiency variance (similar to the variable production overhead efficiency variance).
- Regardless of the level of efficiency, the total number of hours worked could have been more or less than was originally budgeted (employees may have worked a lot of overtime or there may have been a strike and so actual hours worked were less than budgeted) » volume capacity variance.

4. The fixed production overhead variances are calculated as follows:

Fixed production overhead variance

This is the difference between fixed production overhead incurred and fixed production overhead absorbed (= the under- or over-absorbed fixed production overhead)

	\$
Overhead incurred	25,000
Overhead absorbed (1,000 units x \$24)	24,000
Overhead variance	1,000 (A)

Fixed production overhead expenditure variance

This is the difference between the budgeted fixed production overhead expenditure and actual fixed production overhead expenditure

	\$
Budgeted overhead (1,200 x \$24)	28,800
Actual overhead	25,000
Expenditure variance	3,800 (F)

Fixed production overhead volume variance

This is the difference between actual and budgeted production volume multiplied by the standard absorption rate per unit.

	\$
Actual production at std rate (1,000 x \$24)	24,000
Budgeted production at std rate (1,200 x \$24)	28,800
	4,800 (A)

Fixed production overhead volume efficiency variance

This is the difference between the number of hours that actual production should have taken, and the number of hours actually worked (usually the labour efficiency variance), multiplied by the standard absorption rate per hour.

Labour efficiency variance in hours	200 hrs (A)
Valued @ standard rate per hour	x \$6
Volume efficiency variance	\$1,200 (A)

Fixed production overhead volume capacity variance

This is the difference between budgeted hours of work and the actual hours worked, multiplied by the standard absorption rate per hour

Budgeted hours (1,200 x 4)	4,800 hrs
----------------------------	-----------

Actual hours	4,200 hrs
Variance in hrs	600 hrs (A)
x standard rate per hour	x \$6
	\$3,600 (A)

KEY.

The fixed overhead volume capacity variance is unlike the other variances in that an excess of actual hours over budgeted hours results in a favourable variance and not an adverse variance as it does when considering labour efficiency, variable overhead efficiency and fixed overhead volume efficiency. Working more hours than budgeted produces an over absorption of fixed overheads, which is a favourable variance.

**Sales
variances**

5. Selling price variance

The selling price variance is a measure of the effect on expected profit of a different selling price to standard selling price. It is calculated as the difference between what the sales revenue should have been for the actual quantity sold, and what it was.

	\$
Revenue from 900 units should have been (x \$150)	135,000
But was (x \$140)	126,000
Selling price variance	9,000 (A)

Sales volume variance

The sales volume variance is the difference between the actual units sold and the budgeted quantity, valued at the standard profit per unit. In other words it measures the increase or decrease in standard profit as a result of the sales volume being higher or lower than budgeted.

Budgeted sales volume	1,000 units
Actual sales volume	900 units
Variance in units	100 units (A)
x standard margin per unit (x \$ (150 – 102))	x \$48
Sales volume variance	\$4,800 (A)

KEY.

Don't forget to value the sales volume variance at standard contribution marginal costing is in use.

Operating Statement

**Operating
statements**

The most common presentation of the reconciliation between budgeted and actual profit is as follows.

	\$		\$		
Budgeted profit before sales and admin costs				X	
Sales variances - price	X				
- volume				X	
					X
Actual sales minus standard cost of sales				X	
Cost variances		\$		\$	
(F) (A)					
Material price		X			
Material usage etc		—			X
	X		X	X	
Sales and administration costs		X			
Actual profit				X	

Variances in a standard marginal costing system

- No fixed overhead volume variance
- Sales volume variances are valued at standard contribution margin (not standard profit margin)

Reasons, interdependence and significance

6. Reasons for variances

Material price

- (F) – unforeseen discounts received, greater care taken in purchasing, change in material standard
- (A)– price increase, careless purchasing, change in material standard.

Material usage

- (F) – material used of higher quality than standard, more effective use made of material
- (A) – defective material, excessive waste, theft, stricter quality control

Labour rate

- (F) – use of workers at rate of pay lower than standard
- (A) – wage rate increase

Idle time

- Machine breakdown, non-availability of material, illness

Labour efficiency

- (F) – output produced more quickly than expected because of work motivation, better quality of equipment or materials
- (A) – lost time in excess of standard allowed, output lower than standard set because of deliberate restriction, lack of training, sub-standard material used.

Overhead expenditure

- (F) – savings in cost incurred, more economical use of services.
- (A) – increase in cost of services used, excessive use of services, change in type of services used

Overhead volume

- (F) – production greater than budgeted
- (A) – production less than budgeted

7. Interdependence between variances

The cause of one (adverse) variance may be wholly or partly explained by the cause of another (favourable) variance.

- Material price or material usage and labour efficiency
- Labour rate and material usage
- Sales price and sales volume

8. The significance of variances

The decision as to whether or not a variance is so significant that it should be investigated should take a number of factors into account.

- The type of standard being used
- Interdependence between variances
- Controllability
- Materiality

9. Materials mix and yield variances

The materials usage variance can be subdivided into a materials mix variance and a materials yield variance if the proportion of materials in a mix is changeable and controllable.

The mix variance indicates the effect on costs of changing the mix of material inputs.

The yield variance indicates the effect on costs of material inputs yielding more or less than expected.

Standard input to produce 1 unit of product X:

	\$
Material A 20 kgs x \$10	200
Material B 30 kgs x \$5	150
	350

In period 3, 13 units of product X were produced from 250 kgs of material A and 350 kgs of material B.

Solution 1: individual prices per kg as variance valuation cases

Mix Variance

Standard mix of actual use:	A: $\frac{2}{5} \times (250+350)$	Kgs
	B: $\frac{3}{5} \times (250+350)$	240
		360
		600
		===

	A	B
Mix should have been	240 kgs	360 kgs
But was	250 kgs	350 kgs

Mix variance in kgs	10 kgs (A)	10 kgs (F)
x standard cost per kg	x \$10	x \$5
Mix variance in \$	\$100 (A)	\$50 (F)
	=====	====
	50 (A)	

Total mix variance in quantity is always zero.

Yield variance

	A	B
13 units of product X should have used	260 kgs	390 kgs
but actual input in standard mix was	240 kgs	360 kgs
Yield variance in kgs	20 kgs (F)	30 kgs (F)
x standard cost per kg	x \$10	x \$5
	\$200 (F)	\$150 (F)
	=====	=====
	\$350 (F)	
	=====	

Solution 2: budgeted weighted average price per unit of input as variance valuation base.

Therefore, Budgeted weighted average price = \$350/50 = \$7 per kg

• Mix variance

A	B	
13 units of product X should have used	260 kgs	390 kgs
but did use	250 kgs	350 kgs
Usage variance in kgs	10 kgs (F)	40 kgs (F)
x individual price per kg - budgeted		
weighted average price per kg		
\$ (10 - 7)	x \$3	
\$ (5 - 7)		x (\$2)
	\$30 (F)	\$80 (A)
	===	===
	\$50 (A)	
	===	

• Yield variance

A	B		
Usage variance in kgs		10 kg (F)	40 kg (F)
x budgeted weighted average			
Price per kg		x \$7	x \$7
		\$70 (F)	\$ 280 (F)
		===	=====
		\$350 (F)	
		=====	

10. Sales mix and quantity variances

The sales volume variance can be subdivided into a mix variance if the proportions of products sold are controllable.

Sales mix variance

This variance indicates the effect on profit of changing the mix of actual sales from the standard mix.

It can be calculated in one of two ways.

- The difference between the actual total quantity sold in the standard mix and the actual quantities sold, valued at the standard margin per unit.
- The difference between actual sales and budgeted sales, valued at (standard profit per unit – budgeted weighted average profit per unit)

Sales quantity variance

This variance indicates the effect on profit of selling a different total quantity from the budgeted total quantity.

It can be calculated in one of two ways.

- The difference between actual sales volume in the standard mix and budgeted sales valued at the standard margin per unit.
- The difference between actual sales volume and budgeted sales valued at the budgeted weighted average profit per unit.

KEY.

With all variance calculations, from the most basic (such as variable cost variances) to the more complex (such as mix and yield / mix and quantity variances), it is vital that you do not simply learn formulae. You must understand what your calculations are supposed to show.

VARIANCES ANALYSIS PRACTICE QUESTIONS

Question 1

Standard Cost for Product RBT

	£
Materials (10kg x £8 per kg)	80
Labour (5hrs x £6 per hr)	30
Variable O/Hds (5hrs x £8 per hr)	40
Fixed O/Hds (5hrs x £9 per hr)	<u>45</u>
	195

Budgeted Results

Production	10000 units
Sales	7500 units
Selling Price	£300 per unit

Actual Results

Production	8000 units
Sales	6000 units
Materials	85000 kg Cost £700000
Labour	36000 hrs Cost £330900
Variable O/Hds	£400000
Fixed O/Hds	£500000
Selling Price	£260 per unit

Calculate

- a. Material total variance
- b. Material price variance
- c. Material usage variance
- d. Labour total variance
- e. Labour rate variance
- f. Labour efficiency variance
- g. Variable overhead total variance and all sub- variances
- h. Fixed Production overhead total Variance and all sub-variances
- i. Selling price variance
- j. Sales volume variance

Question 2

Standard Cost for Product TUH

	£
Materials (10kg x £8 per kg)	80
Labour (5hrs x £6 per hr) –	30
Variable O/Hds (5hrs x £8 per hr)	40
Fixed O/Hds (5hrs x £9 per hr)	<u>45</u>
	195

Budgeted Results

Production	11000 units
Sales	7500 units
Selling Price	£300 per unit

Actual Results

Production	9000 units
Sales	7000 units
Materials	85000 kg Cost £700000
Labour	36000 hrs Cost £330900
Variable O/Hds	£410000
Fixed O/Hds	£520000
Selling Price	£260 per unit

Calculate

- a. Material total variance
- b. Material price variance
- c. Material usage variance
- d. Labour total variance
- e. Labour rate variance
- f. Labour efficiency variance
- g. Variable overhead total variance and all sub- variances
- h. Fixed Production overhead total Variance and all sub-variances
- i. Selling price variance
- j. Sales volume variance

Question 3

Standard Cost for Product TD

	£
Materials (10kg x £5 per kg)	50
Labour (5hrs x £6 per hr) –	30
Variable O/Hds (5hrs x £8 per hr)	40
Fixed O/Hds (5hrs x £9 per hr)	<u>45</u>
	165

Budgeted Results

Production	8000 units
Sales	7500 units
Selling Price	£300 per unit

Actual Results

Production	11000 units
Sales	10000 units
Materials	85000 kg Cost £700000
Labour	36000 hrs Cost £330900
Variable O/Hds	£400000
Fixed O/Hds	£500000
Selling Price	£320 per unit

Calculate

- Material total variance
- Material price variance
- Material usage variance
- Labour total variance
- Labour rate variance
- Labour efficiency variance
- Variable overhead total variance and all sub- variances
- Fixed Production overhead total Variance and all sub-variances
- Selling price variance
- Sales volume variance

Question 4

Standard Cost for Product WXYZ

	£
Materials (4kg x £8 per kg)	32
Labour (5hrs x £10 per hr) –	50
Variable O/Hds (5hrs x £8 per hr)	40
Fixed O/Hds (5hrs x £6 per hr)	<u>30</u>
	152

Budgeted Results

Production	10000 units
Sales	7500 units
Selling Price	£300 per unit

Actual Results

Production	8000 units
Sales	6000 units
Materials	85000 kg Cost £700000
Labour	36000 hrs Cost £330900
Variable O/Hds	£400000
Fixed O/Hds	£500000
Selling Price	£260 per unit

Calculate

- Material total variance
- Material price variance
- Material usage variance
- Labour total variance
- Labour rate variance
- Labour efficiency variance
- Variable overhead total variance and all sub- variances
- Fixed Production overhead total Variance and all sub-variances
- Selling price variance
- Sales volume variance

Question 5

Standard Cost for Product RTY

	£
Materials (10kg x £8 per kg)	80
Labour (5hrs x £6 per hr) –	30
Variable O/Hds (5hrs x £8 per hr)	40
Fixed O/Hds (5hrs x £9 per hr)	<u>45</u>
	195

Budgeted Results

Production	13000 units
Sales	10000 units
Selling Price	£300 per unit

Actual Results

Production	12000 units
Sales	9000 units
Materials	90000 kg Cost £750000
Labour	40000 hrs Cost £350000
Variable O/Hds	£500000
Fixed O/Hds	£600000
Selling Price	£350 per unit

Calculate

- Material total variance
- Material price variance
- Material usage variance

- d. Labour total variance
- e. Labour rate variance
- f. Labour efficiency variance
- g. Variable overhead total variance and all sub- variances
- h. Fixed Production overhead total Variance and all sub-variances
- i. Selling price variance
- j. Sales volume variance

Question 6

Standard Cost for Product RED

	£
Materials (10kg x £7 per kg)	70
Labour (5hrs x £6 per hr) ↯	30
Variable O/Hds (5hrs x £8 per hr)	40
Fixed O/Hds (5hrs x £9 per hr)	<u>45</u>
	185

Budgeted Results

Production	10500 units
Sales	7800 units
Selling Price	£310 per unit

Actual Results

Production	8500 units
Sales	6200 units
Materials	87000 kg Cost £700000
Labour	36000 hrs Cost £330900
Variable O/Hds	£400000
Fixed O/Hds	£550000
Selling Price	£270 per unit

Calculate

- a. Material total variance
- b. Material price variance
- c. Material usage variance
- d. Labour total variance
- e. Labour rate variance
- f. Labour efficiency variance
- g. Variable overhead total variance and all sub- variances
- h. Fixed Production overhead total Variance and all sub-variances
- i. Selling price variance
- j. Sales volume variance

Question 7

Standard Cost for Product BUZZ

	£
Materials (3kg x £8 per kg)	24
Labour (5hrs x £10 per hr) ↯	50
Variable O/Hds (5hrs x £9 per hr)	45

Fixed O/Hds (5hrs x £10 per hr)	<u>50</u>
	169

Budgeted Results

Production	10000 units
Sales	7500 units
Selling Price	£300 per unit

Actual Results

Production	8000 units
Sales	6000 units
Materials	85000 kg Cost £700000
Labour	36000 hrs Cost £330900
Variable O/Hds	£400000
Fixed O/Hds	£500000
Selling Price	£260 per unit

Calculate

- Material total variance
- Material price variance
- Material usage variance
- Labour total variance
- Labour rate variance
- Labour efficiency variance
- Variable overhead total variance and all sub- variances
- Fixed Production overhead total Variance and all sub-variances
- Selling price variance
- Sales volume variance

Question 8

Standard Cost for Product RST

	£
Materials (10kg x £20per kg)	200
Labour (5hrs x £16 per hr) –	80
Variable O/Hds (5hrs x £8 per hr)	40
Fixed O/Hds (5hrs x £9 per hr)	<u>45</u>
	365

Budgeted Results

Production	1000 units
Sales	7500 units
Selling Price	£800 per unit

Actual Results

Production	8000 units
Sales	6000 units
Materials	85000 kg Cost £700000
Labour	36000 hrs Cost £330900
Variable O/Hds	£400000

Fixed O/Hds	£500000
Selling Price	£260 per unit

Calculate

- Material total variance
- Material price variance
- Material usage variance
- Labour total variance
- Labour rate variance
- Labour efficiency variance
- Variable overhead total variance and all sub- variances
- Fixed Production overhead total Variance and all sub-variances
- Selling price variance
- Sales volume variance

Question 9

Standard Cost for Product FGT

	£
Materials (10kg x £8 per kg)	80
Labour (5hrs x £6 per hr) –	30
Variable O/Hds (5hrs x £8 per hr)	40
Fixed O/Hds (5hrs x £9 per hr)	<u>45</u>
	195

Budgeted Results

Production	10000 units
Sales	7500 units
Selling Price	£300 per unit

Actual Results

Production	13000 units
Sales	6000 units
Materials	85000 kg Cost £700000
Labour	36000 hrs Cost £330900
Variable O/Hds	£400000
Fixed O/Hds	£500000
Selling Price	£260 per unit

Calculate

- Material total variance
- Material price variance
- Material usage variance
- Labour total variance
- Labour rate variance
- Labour efficiency variance
- Variable overhead total variance and all sub- variances
- Fixed Production overhead total Variance and all sub-variances
- Selling price variance

- j. Sales volume variance

Question 10

Standard Cost for Product White Diamond

	£
Materials (7kg x £9 per kg)	63
Labour (6hrs x £9 per hr) –	54
Variable O/Hds (6hrs x £6 per hr)	36
Fixed O/Hds (6hrs x £7 per hr)	<u>42</u>
	195

Budgeted Results

Production	12500 units
Sales	8500 units
Selling Price	£500 per unit

Actual Results

Production	15000 units
Sales	8000 units
Materials	8750 kg Cost £85000
Labour	5200hrs Cost £52900
Variable O/Hds	£25500
Fixed O/Hds	£84000
Selling Price	£600 per unit

- a. Material total variance
- b. Material price variance
- c. Material usage variance
- d. Labour total variance
- e. Labour rate variance
- f. Labour efficiency variance
- g. Variable overhead total variance and all sub- variances
- h. Fixed Production overhead total Variance and all sub-variances
- i. Selling price variance
- j. Sales volume variance