

ACTIVITY BASED COSTING

Meaning Activity-Based Costing (ABC)

Activity-based costing (ABC) is an accounting method that identifies and assigns costs to overhead activities and then assigns those costs to products. An activity-based costing (ABC) system recognizes the relationship between costs, overhead activities, and manufactured products, and, through this relationship, it assigns indirect costs to products less arbitrarily than traditional methods.

Objectives

- Identify and eliminate those products and services that are unprofitable and lower the prices of those that are overpriced (product and service portfolio aim)
- Or identify and eliminate production or service processes that are ineffective and allocate processing concepts that lead to the very same product at a better yield (process re-engineering aim)

Kaplan and Cooper's ABC

Kaplan and Cooper of Harvard Business School who have developed new accounting methodology in costing to calculate product costs. They classify the costs into two types. They are

- i. Short term variable costs and
- ii. Long term variable costs.

The reason is that all the costs are variable in the long run. But, only variable costs are variable in the short term. Fixed costs i.e. long term variable costs are varying but not immediately.

For example production scheduling costs can be changed in the long term by changing number of runs rather than changing number of units produced.

Under ABC system, some activities are responsible for the determination of cost of a product. They are named cost drivers. A cost driver is an activity which generates cost.

Features or Characteristics of ABC

The features or characteristics of Activity Based Costing are briefly explained below.

1. The total cost is divided into two types i.e. fixed cost and variable cost which is necessary to provide quality information to design a suitable cost system in a manufacturing concern.
2. The proper distinction is made between the cost behavior patterns.
3. The cost behavior patterns are volume related, diversity related, events related and time related.

4. The appropriate cost driver has to be identified for tracing the overhead to a product.
5. The cost drivers dictate the cost behavior pattern.

Implementation of Activity Based Costing

1. Identify the functional areas of organization.
2. Identify the main activities of each functional areas.
3. Allocate common indirect costs to each functional areas on suitable basis.
4. Identify the most suitable cost driver in each activity under functional areas.
5. Preparing the statement of expenditure on activity wise.
6. Compare this statement with the value addition activity wise.
7. Find the activities which are to be eliminated or improved for better performance of the organization.

Cost driver: A cost driver is the unit of an activity that causes the change in activity's cost. cost driver is any factor which causes a change in the cost of an activity.

Cost pool: A cost pool is a grouping of individual costs, typically by department or service center. ... Cost pools are commonly used for the allocation of factory overhead to units of production, as required by several accounting frameworks. They are also used in activity-based costing to allocate costs to activities.

Difference between traditional costing and activity based costing system

Traditional costing system

1. Single or limited number of cost pools or cost centers exist.
2. Overhead costs are first related to the various production and service departments and then to products.
3. Overhead costs are charged to products on a production volume-related basis such as direct labor hours, machine hours etc. As a result, traditional system leads to over- cost high volume products and under-cost low volume products.
4. Since the overhead costs are related to the cost centers or departments a realistic picture of the cost behavior is not portrayed.

5. It assumes simple labor-based production norm and overhead costs are in small proportion because support or servicing functions are less.
6. Only two levels of activity i.e., facility level and unit level are identified.
7. It is simple and inexpensive.

Activity-based Costing System (ABC):

1. Many activity-based cost pools or cost centers are created to reflect different activities.
2. Overhead costs are first related to activities or grouped into cost pools. This costing system assumes that activities are responsible for the incurrence of costs and products create demands for activities.
3. It recognizes that volume is one of many cost drivers and uses multiple cost drivers to assign overhead costs to products. This system improves the accuracy of product cost.
4. It portrays more realistic cost behaviour since the overhead costs are related to cost drivers.
5. It assumes production is automated and computerized and overhead costs constitute a very high proportion of total costs as compare to labour. Overhead costs are more affected by range and complexity of products manufactured.
6. All levels of activities in the manufacturing cost hierarchy i.e., unit level, batch level, product level and facility level are identified.
7. It is a more accurate and reliable system of determination of product costs. It helps to identify non-value-added activity so that they may be weeded out.

TARGET COSTING

Definition

Target costing is defined as "a disciplined process for determining and achieving a full-stream cost at which a proposed product with specified functionality, performance, and quality must be produced in order to generate the desired profitability at the product's anticipated selling price over a specified period of time in the future.

CIMA defines target cost as **“a product cost estimate derived from a competitive market price.”**

Target Cost = Expected selling price – Desired profit

Steps in Target Costing:

Following are the main steps (or stages) involved in target costing:

- (i) To conduct market research in order to see what products are in the market place, what new products the competitors are trying to bring in the market, to ascertain customers' requirement and the price they can afford for the product.
- (ii) Determining the price, margin and cost feasibility. Target price is determined on the basis of market survey, at which the product can be sold. On the selling price a standard margin is determined to finally come to the cost figure (Target Price – Target Profit = Target Cost).
- (iii) To meet margin target by design improvement. If the product designed cannot be produced in the cost range decided, value engineering is used to drive down the product cost to a level, at which target price and margin can be attained.
- (iv) To implement continuous improvement. This is needed to ensure that targeted cost levels are maintained subsequent to design phase. Value engineering technique is applied for reduction of waste, misuse, etc. and for elimination of non-value added costs and processes, etc.

Objectives

- a. To lower the costs of new products so that the required profit level can be ensured.
- b. The new products meet the levels of quality, delivery timing and price required by the market.
- c. To motivate all company employees to achieve the target profit during new product development by making target costing a companywide profit management activity.

For any system to be effective in supporting decision making in an organization, the staff from the relevant departments must come together in order to tap their creativity so as to achieve

goals. In other words, the company requires a non-conflicting and rational system for consensus building and decision-making.

Features of Target Costing:

- The price of the product is determined by market conditions. The company is a price taker rather than a price maker.
- The minimum required profit margin is already included in the target selling price.
- It is part of management strategy to focus on cost reduction and effective cost management.
- Product design, specifications, and customer expectations are already built in while formulating the total selling price.
- The difference between the current cost and the target cost is the “cost reduction,” which management wants to achieve.
- A team is formed to integrate activities such as designing, purchasing, manufacturing, marketing, etc. to find and achieve the target cost.

Advantages of Target Costing:

1. It reinforces top to bottom commitment to process and product innovation to achieve some competitive advantages.
2. It helps to create a company’s market-driven management for designing and manufacturing products that meet the price required for the market success.
3. It uses management control system to support and reinforce manufacturing strategies, and to identify market opportunities that can be converted into real saving to achieve the best value for money rather than simply achieving the lowest cost.
4. Assures that products are better matched to their customers’ needs.
5. Aligns the costs of features with customers’ willingness to pay for them.
6. Reduces the development cycle of a product.
7. Reduces the costs of products significantly.
8. Increases the teamwork among all internal organizations associated with conceiving, marketing, planning, developing, manufacturing, selling, distributing and installing a product.
9. Engages customers and suppliers to design the right product and to more effectively integrate the entire supply chain.

Target Costing Process:

- a. Establishing the target price in the context of market needs and competition;
- b. Establishing the target profit margin;
- c. Determining the allowable cost that must be achieved; this cost should motivate all personnel to achieve;
- d. Calculating the probable cost of current products and processes; and finally,
- e. Establishing the target amount by which current costs must be reduced.

Principles of Target Costing:

According to Hilton, target costing involves seven key principles listed as follows:

1. Price-Led Costing:

Target costing sets the target cost by first determining the price at which a product can be sold in the marketplace. Subtracting the target profit margin from this target price yields the target cost, that is, the cost at which the product must be manufactured. Notice that in a target costing approach, the price is set first, and then the target product cost is determined. This is opposite from the order in which the product cost and selling price are determined under traditional cost-plus pricing.

2. Focus on the Customer:

To be successful at target costing, management must listen to the company's customers. What products do they want? What features are important? How much are they willing to pay for a certain level of product quality? Management needs to aggressively seek customer feedback, and then products must be designed to satisfy customer demand and be sold at a price they are willing to pay. In short, the target costing approach is market driven.

3. Focus on Product Design:

Design engineering is a key element in target costing. Engineers must design a product from the ground up so that it can be produced at its target cost. This design activity includes specifying the raw materials and components to be used as well as the labour, machinery, and other elements of the production process. In short, a product must be designed for manufacturability.

4. Focus on Process Design:

Every aspect of the production process must be examined to make sure that the product is produced as efficiently as possible. The use of touch labour, technology, global sourcing in procurement and every aspect of the production process must be designed with the product's target cost in mind.

5. Cross-Functional Teams:

Manufacturing a product at or below its target cost requires the involvement of people from many different functions in an organisation: market research, sales, design engineering, procurement, production engineering, production scheduling, material handling and cost management. Individuals from all these diverse areas of expertise can make key contributions to the target costing process. Moreover, a cross-functional team is not a set of specialists who contribute their expertise and then leave; they are responsible for the entire product.

6. Life-Cycle Costs:

In specifying a product's target cost, analysts must be careful to incorporate all of the product's life-cycle costs. These include the costs of product planning and concept design, preliminary design, detailed design and testing, production, distribution and customer service. Traditional cost-accounting systems have tended to focus only on the production phase and have not paid enough attention to the product's other life-cycle costs.

7. Value-Chain Orientation:

Sometimes the projected cost of a new product is above the target cost. Then efforts are made to eliminate non-value-added costs to bring the projected cost down. In some cases, a close look at the company's entire value chain can help managers identify opportunities for cost reduction.

LIFE CYCLE COSTING

Meaning of Life Cycle Costing:

Life cycle costing is a system that tracks and accumulates the actual costs and revenues attributable to cost object from its invention to its abandonment. Life cycle costing involves tracing cost and revenues on a product by product base over several calendar periods.

Life Cycle Cost (LCC) of an item represents the total cost of its ownership, and includes all the costs that will be incurred during the life of the item to acquire it, operate it, support it and finally dispose it. Life Cycle Costing adds all the costs over their life period and enables an evaluation on a common basis for the specified period (usually discounted costs are used).

This enables decisions on acquisition, maintenance, refurbishment or disposal to be made in the light of full cost implications. In essence, Life Cycle Costing is a means of estimating all the costs involved in procuring, operating, maintaining and ultimately disposing a product throughout its life.

Characteristics of Life Cycle Costing:

- a) Product life cycle costing involves tracing of costs and revenues of a product over several calendar periods throughout its life cycle.
- b) b. Product life cycle costing traces research and design and development costs and total magnitude of these costs for each individual product and compared with product revenue.
- c) c. Each phase of the product life-cycle poses different threats and opportunities that may require different strategic actions.
- d) d. Product life cycle may be extended by finding new uses or users or by increasing the consumption of the present users.

Stages of Product Life Cycle Costing:

(i) Market Research:

It will establish what product the customer wants, how much he is prepared to pay for it and how much he will buy.

(ii) Specification:

It will give details such as required life, maximum permissible maintenance costs, manufacturing costs, required delivery date, expected performance of the product.

(iii) Design:

Proper drawings and process schedules are to be defined.

(iv) Prototype Manufacture:

From the drawings a small quantity of the product will be manufactured. These prototypes will be used to develop the product.

(v) Development:

Testing and changing to meet requirements after the initial run. This period of testing and changing is development. When a product is made for the first time, it rarely meets the requirements of the specification and changes have to be made until it meets the requirements.

(vi) Tooling:

Tooling up for production can mean building a production line; building jigs, buying the necessary tools and equipment's requiring a very large initial investment.

(vii) Manufacture:

The manufacture of a product involves the purchase of raw materials and components, the use of labor and manufacturing expenses to make the product.

(viii) Selling

(ix) Distribution

(x) Product support

(xi) Decommissioning:

When a manufacturing product comes to an end, the plant used to build the product must be sold or scrapped.

Benefits of Product Life Cycle Costing:

- (i) It results in earlier action to generate revenue or lower costs than otherwise might be considered. There are a number of factors that need to be managed in order to maximize return in a product.
- (ii) Better decision should follow from a more accurate and realistic assessment of revenues and costs within a particular life cycle stage.
- (iii) It can promote long term rewarding in contrast to short term rewarding.
- (iv) It provides an overall framework for considering total incremental costs over the entire span of a product.

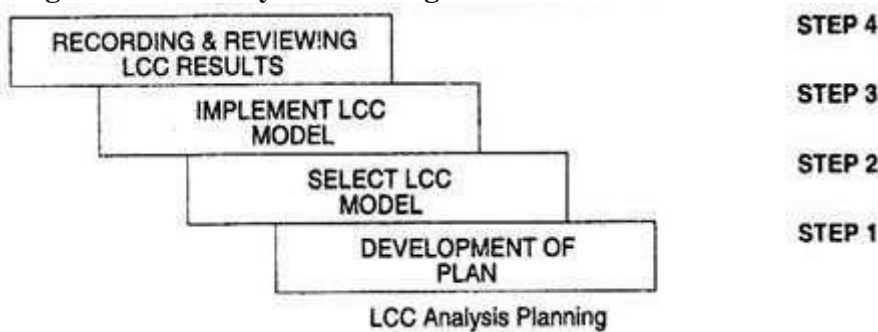
Life Cycle Costing Process:

Life cycle costing is a three-staged process. The first stage is life cost planning stage which includes planning LCC Analysis, Selecting and Developing LCC Model, applying LCC Model and finally recording and reviewing the LCC Results. The Second Stage is Life Cost Analysis Preparation Stage followed by third stage Implementation and Monitoring Life Cost Analysis.

LCC Analysis is a multi-disciplinary activity. An analyst, involved in life cycle costing, should be fully familiar with unique cost elements involved in the life cycle of asset, sources of cost data to be collected and financial principles to be applied.

He should also have clear understanding of methods of assessing the uncertainties associated with cost estimation. Number of iteration may be required to perform to finally achieve the result. All these iterations should be documented in detail to facilitate the interpretations of final result.

Stage 1: LCC Analysis Planning:



The Life Cycle Costing process begins with development of a plan, which addresses the purpose, and scope of the analysis.

The plan should:

i. Define the analysis objectives in terms of outputs required to assist a management decision.

Typical objectives are:

a. Determination of the LCC for an asset in order to assist planning, contracting, budgeting or similar needs.

b. Evaluation of the impact of alternative courses of action on the LCC of an asset (such as design approaches, asset acquisition, support policies or alternative technologies).

c. Identification of cost elements which act as cost drives for the LCC of an asset in order to focus design, development, acquisition or asset support efforts.

ii. Make the detailed schedule with regard to planning of time period for each phase, the operating, technical and maintenance support required for the asset.

iii. Identify any underlying conditions, assumptions, limitations and constraints (such as minimum asset performance, availability requirements or maximum capital cost limitations) that might restrict the range of acceptable options to be evaluated. Identify alternative courses of action to be evaluated.

iv. Identify alternative courses of action to be evaluated. The list of proposed alternatives may be refined as new options are identified or as existing options are found to violate the problem constraints.

v. Provide an estimate of resources required and a reporting schedule for the analysis to ensure that the LCC results will be available to support the decision-making process for which they are required.

Next step in LCC Analysis planning is the selection or development of an LCC model that will satisfy the objectives of the analysis. LCC Model is basically an accounting structure which enables the estimation of an asset components cost.

Stage 2: Life Cost Analysis Preparation:

The Life Cost Analysis is essentially a tool, which can be used to control and manage the ongoing costs of an asset or part thereof. It is based on the LCC Model developed and applied during the Life Cost Planning phase with one important difference: it uses data on real costs.

The preparation of the Life Cost Analysis involves review and development of the LCC Model as a “real-time” or actual cost control mechanism. Estimates of capital costs will be replaced by the actual prices paid. Changes may also be required to the cost breakdown structure and cost elements to reflect the asset components to be monitored and the level of detail required. Targets are set for the operating costs and their frequency of occurrence based initially on the estimates used in the Life Cost Planning phase. However, these targets may change with time as more accurate data is obtained, from the actual asset operating costs or from the operating cost of similar other asset.

Stage 3: Implementing and Monitoring:

Implementation of the Life Cost Analysis involves the continuous monitoring of the actual performance of an asset during its operation and maintenance to identify areas in which cost savings may be made and to provide feedback for future life cost planning activities.

For example, it may be better to replace an expensive building component with a more efficient solution prior to the end of its useful life than to continue with a poor initial decision.

ENVIRONMENTAL COSTING

“Environmental accounting is the identification, measurement and allocation of environmental cost, the integration of these environmental costs into business decisions, and the subsequent communication of the information to a company’s stakeholders” identification involves a board of the impact of corporate products, services and activities on all corporate stakeholders.

Stakeholders

A stakeholder is either an individual, group or organization who is impacted by the outcome of a project. They have an interest in the success of the project, and can be within or outside the organization that is sponsoring the project.

Controlling environmental costs

Water

you have probably never thought about it but businesses actually pay for water twice – first, to buy it and second, to dispose of it. If savings are to be made in terms of reduced water bills, it is important for organizations to identify where water is used and how consumption can be decreased.

Energy

Often, energy costs can be reduced significantly at very little cost. Environmental management accounts may help to identify inefficiencies and wasteful practices and, therefore, opportunities for cost savings.

Transport and travel

Again, environmental management accounting can often help to identify savings in terms of business travel and transport of goods and materials. At a simple level, a business can invest in more fuel-efficient vehicles, for example.

Consumables and raw materials

these costs are usually easy to identify and discussions with senior managers may help to identify where savings can be made. For example, toner cartridges for printers could be refilled rather than replaced.

Methods of accounting for environment costing

Input/outflow analysis: This technique records material inflows and balances this with outflows on the basis that, what comes in, must go out. So, if 100kg of materials have been bought and only 80kg of materials have been produced, for example, then the 20kg difference must be accounted for in some way. It may be, for example, that 10% of it has been sold as scrap and 90% of it is waste. By accounting for outputs in this way, both in terms of physical quantities

and, at the end of the process, in monetary terms too, businesses are forced to focus on environmental costs.

Flow cost accounting: This technique uses not only material flows but also the organizational structure. It makes material flows transparent by looking at the physical quantities involved, their costs and their value. It divides the material flows into three categories: material, system and delivery and disposal. The values and costs of each of these three flows are then calculated. The aim of flow cost accounting is to reduce the quantity of materials which, as well as having a positive effect on the environment, should have a positive effect on a business' total costs in the long run.

Activity-based costing: ABC allocates internal costs to cost centers and cost drivers on the basis of the activities that give rise to the costs. In an environmental accounting context, it distinguishes between environment-related costs, which can be attributed to joint cost centers, and environment-driven costs, which tend to be hidden on general overheads.

Lifecycle costing: Within the context of environmental accounting, lifecycle costing is a technique which requires the full environmental consequences, and, therefore, costs, arising from production of a product to be taken account across its whole lifecycle, literally 'from cradle to grave'.

DECISION MAKING TECHNIQUES

Relevant cost analysis

Marginal Cost: Marginal cost refers to the increase or decrease in the cost of producing one more unit or serving one more customer.

Marginal costing: Marginal costing is the ascertainment of marginal cost and the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable cost.

Differential costing: Differential costs are the increase or decrease in total costs that result from producing additional or fewer units or from the adoption of an alternative course of action.

According to the Institute of Cost and Management Accountant, London, differential cost may be defined as “the increase or decrease in total cost or the change in specific elements of cost that result from any variation in operations”.

Input costs: Input cost is the set of costs incurred to create a product or service. Examples of these costs are direct materials, direct labor, and factory overhead. All other costs incurred by a business are related to general and administrative activities.

Opportunity costs: Opportunity costs represent the benefits an individual, investor or business misses out on when choosing one alternative over another.

Sunk Cost: A sunk cost is a cost that has already been incurred and cannot be recovered. A sunk cost differs from future costs that a business may face, such as decisions about inventory purchase costs or product pricing. Sunk costs (past costs) are excluded from future business decisions because the cost will be the same regardless of the outcome of a decision.

Conversion cost: Conversion costs is a term used in cost accounting that represents the combination of direct labor costs and manufacturing overhead costs. ... Expressed another way, conversion costs are the manufacturing or production costs necessary to convert raw materials into products.

Relevant and irrelevant cost

Relevant and irrelevant costs refer to a classification of costs. It is important in the context of managerial decision-making. Costs that are affected by a decision are relevant costs and those costs that are not affected are irrelevant costs. As irrelevant costs are not affected by a decision, they are ignored in decision making.

Relevant cost: A relevant cost is any cost that will be different among various alternatives. Decisions apply to future, relevant costs are the future costs rather than the historical costs. Relevant cost describes avoidable costs that are incurred to implement decisions.

Irrelevant cost: Irrelevant costs are costs which are independent of the various decisions or alternatives. They are not considered in making a decision. Irrelevant costs may be classified into two categories viz. sunk costs and costs which are same for different alternatives.

Differential costing

According to the Institute of Cost and Management Accountant, London, differential cost may be defined as “the increase or decrease in total cost or the change in specific elements of cost that result from any variation in operations”.

Characteristics of Differential Cost:

- Differential cost analysis is not made within the accounting records rather it is made outside the accounting records, Differential costs may, however, be incorporated in the flexible budgets because they budget costs at various levels of activity.
- The data used for differential cost analysis are cost, revenue and investments involved in the decision-making problem.
- Differential costs do not find a place in the accounting records. These can be determined from the analysis of routine accounting records.
- The total cost figures are considered for differential costing and not the cost per unit.
- Total differential costs are considered in differential cost analysis. Cost per unit is not taken into consideration.
- Total differential revenues are compared with total differential costs before advocating an alternate course of action. A change in course of action is recommended only if differential revenues exceed differential costs.
- The changes in costs are measured from a common base point which may be a present course of action or present level of production.
- For making a choice among the various alternatives, the alternative which gives the maximum difference between the incremental revenue and incremental cost is recommended to be adopted.
- The differences are measured from a common base-point.

Difference between Marginal Costing and Differential Costing:

	Differential Costing	Marginal Costing
i.	It is a costing technique used for decision-making purpose with the use of differential revenue and differential cost.	It is a technique used in ascertaining the marginal cost and effect on changes in profit due to changes in volume.
ii.	The differential costing can be applied in varied alternative proposals hence the scope is wider.	The scope of marginal costing is comparatively lesser.
iii.	The differential costing uses the accounting information and it can only be part of accounting system.	The marginal costing system can be included into accounting system.
iv.	The main analytical tools used in differential costing are, incremental/ decremental cost, incremental revenue and incremental/decremental profit.	In marginal costing, the main analytical tools are, P/V ratio, Break-even point, contribution, CVP analysis etc.
v.	It is not possible to ascertain exactly the differential cost and sometimes it is used in conjunction with costs and opportunity cost.	The marginal cost can be calculated exactly by adding variable overheads to prime cost.
vi.	The differential costing can be used for short-term, medium-term and long-term decision-making.	The marginal costing is mainly used for short-term and medium-term decision-making.

Practical application of marginal costing

Accept or reject decision:

There are times when a customer places a special order for a large volume at lower prices than that usually charged by the business. In this event, the business should properly decide whether to **accept or reject** the special order.

Make-or-buy decision

A make-or-buy decision is the act of choosing between manufacturing a product in-house or purchasing it from an external supplier. Make-or-buy decision is also referred to as the outsourcing decision.

In a make-or-buy decision, the most important factors to consider are part of quantitative analysis, such as the associated costs of production, and whether the business can produce at required levels.

Level of activity planning

Marginal costing and differential cost analysis may be of great help to the management in planning the level of activity. Maximum contribution at a particular level of activity will show the position of maximum profitability.

Purchasing or leasing

Sometimes management is required to take decision whether a particular assets is to be purchased or may be taken on lease basis. In this caese the total cost of the two alternatives is to be compared in order to calculate the annual savings or extra cost involved if the assets is purchased as compared to leasing.

Cost volume profit analysis

Absorption costing

Absorption costing is a cost accounting method for valuing inventory. Absorption costing includes or “absorbs” all the costs of manufacturing a product including both fixed and variable costs. That means that all costs including direct, like material costs, and indirect, like overhead costs, are included in the price of inventory. Absorption costing gives a much more comprehensive and accurate view on how much it really costs to produce your inventory than the variable costing method.

Advantages of Absorption Costing:

1. It will show correct profit calculation in case where production is done to have sales in future (e.g., seasonal sales) as compared to variable costing.
2. It helps to conform with accrual and matching concepts which require matching cost with revenue for a particular period.
3. It has been recognized by various bodies as FASB (USA), ASG (UK), ASB (India) for the purpose of preparing external reports and for valuation of inventory.
4. It avoids the separation of costs into fixed and variable elements which cannot be done easily and accurately.
5. It discloses inefficient or efficient utilization of production resources by indicating under-absorption or over-absorption of factory overheads.
6. It helps to make the managers more responsible for the costs and services provided to their centers/departments due to correct allocation and apportionment of fixed factory overheads.
7. It helps to calculate gross profit and net profit separately in income statement.

Disadvantages of Absorption Costing:

1. Difficulty in Comparison and Control of Cost:

Absorption costing is dependent on level of output; so different unit costs are obtained for different levels of output. An increase in the volume of output normally results in reduced unit cost and a reduction in output results in an increased cost per unit due to the existence of fixed expenses. This makes comparison and control of cost difficult.

2. Not Helpful in Managerial Decisions:

Absorption costing is not very helpful in taking managerial decisions such as selection of suitable product mix, whether to buy or manufacture, whether to accept the export order or not,

choice of alternatives, the minimum price to be fixed during the depression, number of units to be sold to earn a desired profit etc.

3. Cost Vitiating because of Fixed Cost included in Inventory Valuation:

In absorption costing, a portion of fixed cost is carried forward to the next period because closing stock is valued at cost of production which is inclusive of fixed cost.

4. Fixed Cost Inclusion in Cost not justified:

Many accountants argue that fixed manufacturing, administration and selling and distribution overheads are period costs and do not produce future benefits and, therefore, should not be included in the cost of product.

5. Apportionment of Fixed Overheads by Arbitrary Methods:

The validity of product costs under this technique depends on correct apportionment of overhead costs. But in practice many overhead costs are apportioned by using arbitrary methods which ultimately make the product costs inaccurate and unreliable.

6. Not Helpful for Preparation of Flexible Budget:

In absorption costing no distinction is made between fixed and variable costs. It is not possible to prepare a flexible budget without making this distinction.

MARGINAL COSTING

Definition: Marginal Costing is a costing technique wherein the marginal cost, i.e. variable cost is charged to units of cost, while the fixed cost for the period is completely written off against the contribution.

Characteristics of Marginal Costing

- **Classification into Fixed and Variable Cost:** Costs are bifurcated, on the basis of variability into fixed cost and variable costs. In the same way, semi variable cost is separated.
- **Valuation of Stock:** While valuing the finished goods and work in progress, only variable cost are taken into account. However, the variable selling and distribution overheads are not included in the valuation of inventory.
- **Determination of Price:** The prices are determined on the basis of marginal cost and marginal contribution.
- **Profitability:** The ascertainment of departmental and product's profitability is based on the contribution margin.

Facts Concerning Marginal Costing

- **Cost Ascertainment:** The basis for ascertaining cost in marginal costing is the nature of cost, which gives an idea of the cost behavior that has a great impact on the profitability of the firm.
- **Special technique:** It is not a unique method of costing, like contract costing, process costing, and batch costing. But, marginal costing is a different type of technique, used by the managers for the purpose of decision making. It provides a basis for understanding cost data so as to gauge the profitability of various products, processes and cost centers.
- **Decision Making:** It has a great role to play, in the field of decision making, as the changes in the level of activity pose a serious problem to the management of the undertaking.

Advantages and Benefits of Marginal Costing

1. **Cost control:** Marginal costing makes it easier to determine and control costs of production. By avoiding the arbitrary allocation of fixed overhead costs, management can concentrate on achieving and maintaining a uniform and consistent marginal cost.
2. **Simplicity:** Marginal costing is simple to understand and operate and it can be combined with other forms of costing (e.g. budgetary costing and standard costing) without much difficulty.
3. **Elimination of cost variance per unit:** Since fixed overheads are not charged to the cost of production in marginal costing, units have a standard cost.
4. **Short-term profit planning:** Marginal costing can help in short-term profit planning and is easily demonstrated with break-even charts and profit graphs. Comparative

profitability can be easily assessed and brought to the notice of the management for decision-making.

5. **Accurate overhead recovery rate:** This method of costing eliminates large balances left in overhead control accounts, which makes it easier to ascertain an accurate overhead recovery rate.
6. **Maximum return to the business:** With marginal costing, the effects of alternative sales or production policies are more readily appreciated and assessed, ensuring that the decisions taken will yield the maximum return to the business

Disadvantages and Limitations of Marginal Costing

1. **Classifying costs:** It is very difficult to separate all costs into fixed and variable costs clearly, since all costs are variable in the long run. Hence such classification sometimes may give misleading results. Furthermore, in a firm with many different kinds of products, marginal costing can prove less useful.
2. **Accurately representing profits:** Since the closing stock consists only of variable costs and ignores fixed costs (which could be considerable), this gives a distorted picture of profits to shareholders.
3. **Semi-variable costs:** Semi-variable costs are either excluded or incorrectly analyzed, leading to distortions.
4. **Recovery of overheads:** With marginal costing, there is often the problem of under or over-recovery of overheads, since variable costs are apportioned on an estimated basis and not on actual value.
5. **External reporting:** Marginal costing cannot be used in external reports, which must have a complete view of all indirect and overhead costs.
6. **Increasing costs:** Since it is based on historical data, marginal costing can give an inaccurate picture in the presence of increasing costs or increasing production.

Differences between marginal costing and absorption costing

BASIS FOR COMPARISON	MARGINAL COSTING	ABSORPTION COSTING
Meaning	A decision making technique for ascertaining the total cost of production is known as Marginal Costing.	Apportionment of total costs to the cost center in order to determine the total cost of production is known as Absorption Costing.
Cost Recognition	The variable cost is considered as product cost while fixed cost is considered as period costs.	Both fixed and variable cost is considered as product cost.
Classification of Overheads	Fixed and Variable	Production, Administration and Selling & Distribution
Profitability	Profitability is measured by Profit Volume Ratio.	Due to the inclusion of fixed cost, profitability gets affected.
Cost per unit	Variances in the opening and closing stock does not influence the cost per unit of output.	Variances in the opening and closing stock affects the cost per unit.
Highlights	Contribution per unit	Net Profit per unit
Cost data	Presented to outline total contribution of each product.	Presented in conventional way.

Cost volume profit analysis

It is an analysis presenting the impact of cost and volume on profits. Commonly called as CVP Analysis, a manager can find out the level of sales where the company will be in a no-profit-no-loss situation with this analysis. This situation is called break-even point. In a similar fashion, CVP analysis can also explain the no. of units of sales required to achieve a particular targeted operating income.

Break-Even Analysis

A break-even analysis is a financial tool which helps you to determine at what stage your company, or a new service or a product, will be profitable. In other words, it's a financial

calculation for determining the number of products or services a company should sell to cover its costs (particularly fixed costs). Break-even is a situation where you are neither making money nor losing money, but all your costs have been covered.

ASSUMPTIONS OF BREAK EVEN ANALYSIS

1. The total costs may be classified into fixed and variable costs. It ignores semi-variable cost.
2. The cost and revenue functions remain linear.
3. The price of the product is assumed to be constant.
4. The volume of sales and volume of production are equal.
5. The fixed costs remain constant over the volume under consideration.
6. It assumes constant rate of increase in variable cost.
7. It assumes constant technology and no improvement in labour efficiency.
8. The price of the product is assumed to be constant.
9. The factor price remains unaltered.
10. Changes in input prices are ruled out.
11. In the case of multi-product firm, the product mix is stable.

Advantages of break-even analysis

- (i) It helps in the determination of selling price which will give the desired profits.
- (ii) It helps in the fixation of sales volume to cover a given return on capital employed.
- (iii) It helps in forecasting costs and profit as a result of change in volume.
- (iv) It gives suggestions for shift in sales mix.
- (v) It helps in making inter-firm comparison of profitability.
- (vi) It helps in determination of costs and revenue at various levels of output.
- (vii) It is an aid in management decision-making (e.g., make or buy, introducing a product etc.), forecasting, long-term planning and maintaining profitability.

(viii) It reveals business strength and profit earning capacity of a concern without much difficulty and effort.

Limitations of Break-Even Analysis:

1. In the break-even analysis, we keep everything constant. The selling price is assumed to be constant and the cost function is linear. In practice, it will not be so.
2. In the break-even analysis since we keep the function constant, we project the future with the help of past functions. This is not correct.
3. The assumption that the cost-revenue-output relationship is linear is true only over a small range of output. It is not an effective tool for long-range use.
7. The simple form of a break-even chart makes no provisions for taxes, particularly corporate income tax.
6. Apportionment of fixed cost over a variety of products poses a problem.
7. It assumes that the business conditions may not change which is not true.
8. It assumes that production and sales quantities are equal and there will be no change in opening and closing stock of finished product, these do not hold good in practice.

Profit volume ratio

Profit-volume ratio indicates the relationship between contribution and sales and is usually expressed in percentage.

The ratio shows the amount of contribution per rupee of sales. Since, in the short-term, fixed cost does not change, the profit-volume ratio also measures the rate of change of profit due to change in the volume of sales.

Formulas

$$P/V \text{ Ratio} = \text{Contribution}/\text{Sales}$$

$$P/V \text{ Ratio} = \text{Sales} - \text{Variable cost}/\text{Sales}$$

$$P/V \text{ Ratio} = \text{Fixed Cost} + \text{Profit}/\text{Sales}$$

$$P/V \text{ Ratio} = \text{Change in profit or Contribution}/\text{Change in Sales}$$

Uses of profit volume ratio

$$\left[\text{Sales} = \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{P/V Ratio}} \right]$$

(iv) It helps in determining the required selling price per unit

$$\left[\text{Selling price per unit} = \frac{\text{Variable cost}}{(1 - \text{P/V ratio})} \right]$$

(v) It helps in determining the variable cost for any volume of sales

$$[\text{Variable cost} = \text{Sales} \times (1 - \text{P/V ratio})]$$

How to improve the profit volume ratio

(i) Increasing the selling price per unit

(ii) Reducing the variable or marginal cost.

(iii) Changing the sales mixture and selling more profitable products for which the P/V ratio is higher.

Contribution

The differences between selling price and variable cost is called as contribution

1. Contribution = sales - variable cost

2. Contribution = fixed cost + profit

Break-even point

Break-even point is a point where the total cost is equal to total total revenue. It is a point of no profit and no loss. It is also known as the volume of operation where profit begins

Formula.

BEP (units) = Fixed cost / contribution per unit

BEP (value) = Fixed cost / PV ratio

BEP (value) = Fixed cost / contribution * Sales

Margin of safety

The excess of actual sales over BEP is called the margin of safety. A company whose volume is just equal to BEP is making no profit or no loss. The margin of safety at BEP is therefore, equal to zero.

Formula

1. Margin of safety=Actual sales-BEP

2. Margin of safety=Profit/PV Ratio

How to improve margin of safety

1. Control and reduce fixed cost
2. Control and reduce variable cost
3. Increase in selling price
4. Increase in sales volume
5. Improve contribution by changing the sales mix

Angle of incidence and Break-Even Chart:

In geometric optics, the angle of incidence is the angle between a ray incident on a surface and the line perpendicular to the surface at the point of incidence, called the normal. The ray can be formed by any wave: optical, acoustic, microwave, X-ray and so on. In the figure below, the line representing a ray makes an angle θ with the normal (dotted line). The angle of incidence at which light is first totally internally reflected is known as the critical angle. The angle of reflection and angle of refraction are other angles related to beams.

A Break-Even Chart is constructed on a graph paper. Activity or volume of production is plotted on the 'X' axis, whereas cost and revenue are plotted on the 'Y' axis.

Again, 'X' axis may be represented in the following manner, such as:

- (i) Volume—the units;
- (ii) Sales value;
- (iii) Standard Hours; and
- (iv) Percentage level of activity.

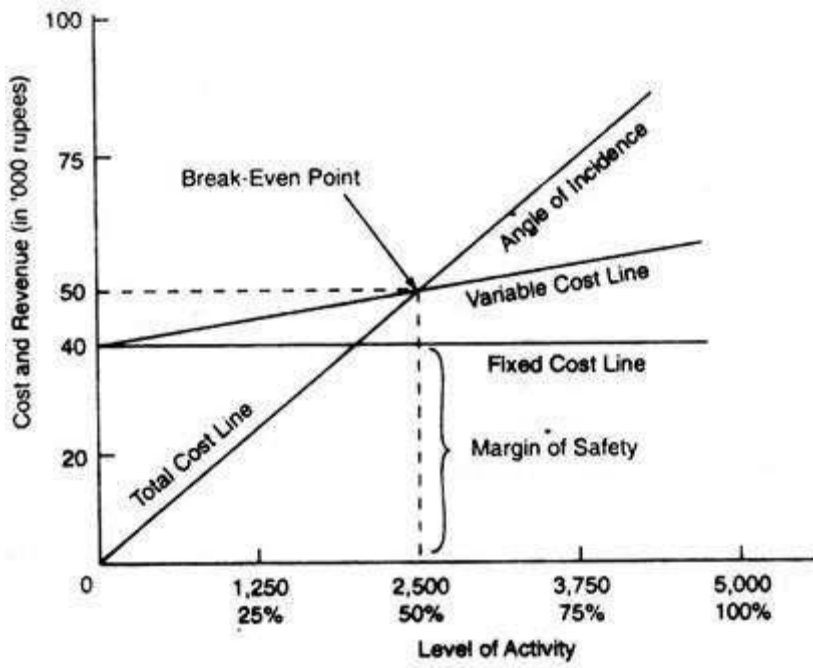


Fig. 8.2 : Break-Even Chart

RISK AND UNCERTAINTY IN DECISION MAKING

Capital budgeting is a process of evaluating investments and huge expenses in order to obtain the best returns on investment.

Risk and uncertainty

Risk refers to a situation where the probability distribution of the cash flows of an investment proposal is known. Whereas uncertainty refers to a situation where the probability distribution of the cash flows of an investment proposal is not known due to some historical data.

BASIS FOR COMPARISON	RISK	UNCERTAINTY
Meaning	The probability of winning or losing something worthy is known as risk.	Uncertainty implies a situation where the future events are not known.
Ascertainment	It can be measured	It cannot be measured.
Outcome	Chances of outcomes are known.	The outcome is unknown.
Control	Controllable	Uncontrollable
Minimization	Yes	No
Probabilities	Assigned	Not assigned

Risk evaluation approaches

1. Sensitivity techniques
2. Decision tree analysis

1. Sensitivity techniques

The technique used to determine how independent variable values will impact a particular dependent variable under a given set of assumptions is defined as sensitive analysis. It's usage will depend on one or more input variables within the specific boundaries, such as the effect that changes in interest rates will have on a bond's price.

Advantages of Sensitivity techniques

- They help in decision making
- It helps in assessing the riskiness of a strategy.
- Helps in identifying how dependent the output is on a particular input value. Analyses if the dependency in turn helps in assessing the risk associated.
- Helps in taking informed and appropriate decisions
- The key application of sensitivity analysis is to indicate the sensitivity of simulation to uncertainties in the input values of the model.

Disadvantages of Sensitivity techniques

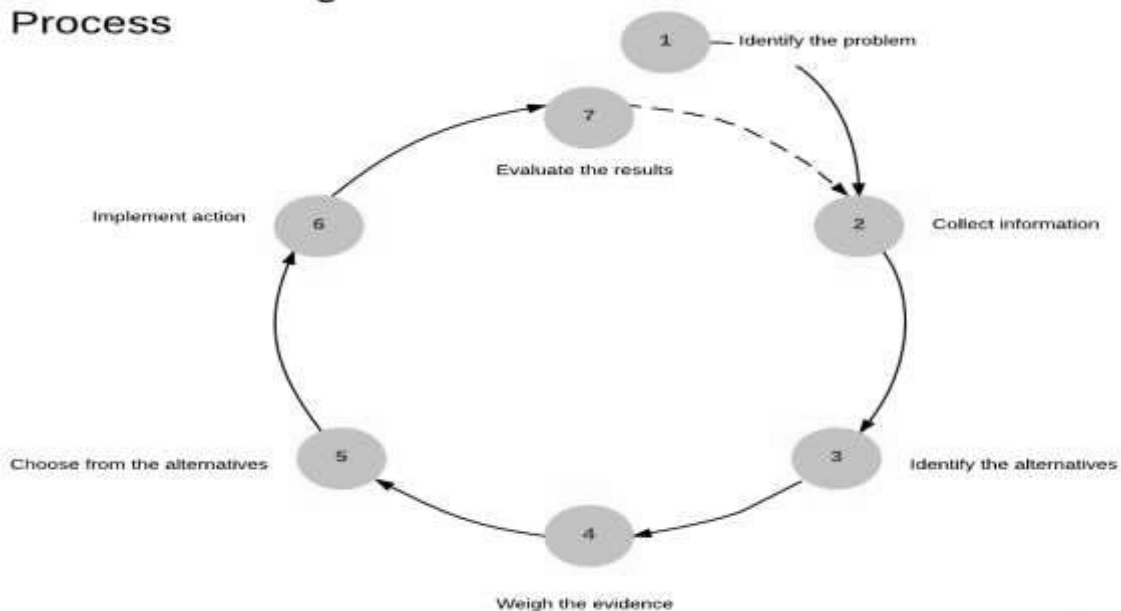
1. It does not provide clear cut results. The terms optimistic and pessimistic could mean different things to different people.
2. It fails to focus on the interrelationship between underlying variables. For example sales volume may be related to price and cost but we analyse each variable differently.

2. Decision tree analysis

A decision tree is a graphic representation of the relationship between a present division and future event, future decision and their consequences. The sequence of event is mapped out over time in a format resembling branches of a tree and hence the analysis is known as decision tree analysis.

Steps involve in decision tree analysis

Decision Making Process



UNIT-3

BUDGETING AND CONTROL

Budget:

A formal statement of the financial resources set aside for carrying out specific activities in a given period of time.

- It helps to co-ordinate the activities of the organization.

An example would be an advertising budget or sales force budget.

Meaning:

Budgetary control is the process of determining various actual results with budgeted figures for the enterprise for the future period and standards set then comparing the budgeted figures with the actual performance for calculating variances, if any. First of all, budgets are prepared and then actual results are recorded.

Definitions:

“According to Brown and Howard, “Budgetary control is a system of controlling costs which includes the preparation of budgets, coordinating the departments and establishing responsibilities, comparing actual performance with the budgeted and acting upon results to achieve maximum profitability.”

Objectives of Budgetary Control:

1. Planning:

Budgeting ensures effective planning by setting up of budgets.

2. Coordination:

Budgets are helpful in coordination of business activities.

3. Efficiency and Economy:

Effective budgetary control results in cost control and cost reduction.

4. Increase in Profitability:

Costs are controlled with help of budgets and profits targeted are achieved.

5. Anticipation of Future Capital Expenditure:

Estimated increases in sales necessitating higher production capacity provides advance warning for the possible capital expenditure in near future.

6. Control:

Controlling function is made to be effective as the control is centralised while budgets are prepared and implemented.

7. Deviations:

Ascertainments of deviations are essential to fix responsibility and correct the deviations as far as possible.

Essentials of Budgetary Control:

1. Organization for Budgetary Control:

The proper organization is essential for the successful preparation, maintenance and administration of budgets. A Budgetary Committee is formed, which comprises the departmental heads of various departments. All the functional heads are entrusted with the responsibility of ensuring proper implementation of their respective departmental budgets.

2. Budget Centers:

A budget center is that part of the organization for which the budget is prepared. A budget centre may be a department, section of a department or any other part of the department. The establishment of budget centers is essential for covering all parts of the organization. The budget centers are also necessary for cost control purposes. The appraisal performance of different parts of the organization becomes easy when different centers are established.

3. Budget Manual:

A budget manual is a document which spells out the duties and also the responsibilities of various executives concerned with the budgets. It specifies the relations amongst various functionaries.

4. Budget Officer:

The Chief Executive, who is at the top of the organization, appoints some person as Budget Officer. The budget officer is empowered to scrutinize the budgets prepared by different functional heads and to make changes in them, if the situations so demand. The actual performance of different departments is communicated to the Budget Officer. He determines the deviations in the budgets and the actual performance and takes necessary steps to rectify the deficiencies, if any.

5. Budget Committee:

In small-scale concerns the accountant is made responsible for preparation and implementation of budgets. In large-scale concerns a committee known as Budget Committee is formed. The heads of all the important departments are made members of this committee. The Committee is responsible for preparation and execution of budgets. The members of this committee put up the case of their respective departments and help the committee to take collective decisions if necessary. The Budget Officer acts as convener of this committee.

6. Budget Period:

A budget period is the length of time for which a budget is prepared and employed. The budget period depends upon a number of factors. It may be different for different industries or even it may be different in the same industry or business.

7. Determination of Key Factor:

The budgets are prepared for all functional areas. These budgets are interdependent and inter-related. A proper co-ordination among different budgets is necessary for making the budgetary control a success. The constraints on some budgets may have an effect on other budgets too. A factor which influences all other budgets is known as Key Factor or Principal Factor.

Advantages of Budgetary Control:

- 1. Maximization of Profits:** The budgetary control aims at the maximization of profits of the enterprise. To achieve this aim, a proper planning and coordination of different functions is undertaken. There is a proper control over various capital and revenue expenditures. The resources are put to the best possible use.
- 2. Co-ordination:** The working of different departments and sectors is properly coordinated. The budgets of different departments have a bearing on one another. The co-ordination of various executives and subordinates is necessary for achieving budgeted targets.
- 3. Specific Aims:** The plans, policies and goals are decided by the top management. All efforts are put together to reach the common goal, of the organization. Every department is given a target to be achieved. The efforts are directed towards achieving some specific aims. If there is no definite aim then the efforts will be wasted in pursuing different aims.
- 4. Tool for Measuring Performance:** By providing targets to various departments, budgetary control provides a tool for measuring managerial performance. The budgeted targets are compared to actual results and deviations are determined. The performance of each department is reported to the top management. This system enables the introduction of management by exception.
- 5. Economy:** The planning of expenditure will be systematic and there will be economy in spending. The finances will be put to optimum use. The benefits derived for the concern will ultimately extend to industry and then to national economy. The national resources will be used economically and wastage will be eliminated.
- 6. Determining Weaknesses:** The deviations in budgeted and actual performance will enable the determination of weak spots. Efforts are concentrated on those aspects where performance is less than the stipulated.
- 7. Corrective Action:** The management will be able to take corrective measures whenever there is a discrepancy in performance. The deviations will be regularly reported so that necessary action is taken at the earliest. In the absence of a budgetary control system the deviations can be determined only at the end of the financial period.
- 8. Consciousness:** It creates budget consciousness among the employees. By fixing targets for the employees, they are made conscious of their responsibility. Everybody knows what he is expected to do and he continues with his work uninterrupted.
- 9. Reduces Costs:** In the present day competitive world budgetary control has a significant role to play. Every businessman tries to reduce the cost of production for increasing sales. He tries to have those combinations of products where profitability is more.
- 10. Introduction of Incentive Schemes:** Budgetary control system also enables the introduction of incentive schemes of remuneration. The comparison of budgeted and actual performance will enable the use of such schemes.

Limitations of Budgetary Control:

1. Uncertain Future:

The budgets are prepared for the future period. Despite best estimates made for the future, the predictions may not always come true. The future is always uncertain and the situation which is presumed to prevail in future may change. The change in future conditions upsets the budgets

which have to be prepared on the basis of certain assumptions. The future uncertainties reduce the utility of budgetary control system.

2. Budgetary Revision Required:

Budgets are prepared on the assumptions that certain conditions will prevail. Because of future uncertainties, assumed conditions may not prevail necessitating the revision of budgetary targets. The frequent revision of targets will reduce the value of budgets and revisions involve huge expenditures too.

3. Discourage Efficient Persons:

Under budgetary control system the targets are given to every person in the organization. The common tendency of people is to achieve the targets only. There may be some efficient persons who can exceed the targets but they will also feel contented by reaching the targets. So budgets may serve as constraints on managerial initiatives.

4. Problem of Co-ordination:

The success of budgetary control depends upon the co-ordination among different departments. The performance of one department affects the results of other departments. To overcome the problem of coordination a Budgetary Officer is needed. Every concern cannot afford to appoint a Budgetary Officer. The lack of co-ordination among different departments results in poor performance.

5. Conflict among Different Departments:

Budgetary control may lead to conflicts among functional departments. Every departmental head worries for his department goals without thinking of business goal. Every department tries to get maximum allocation of funds and this raises a conflict among different departments.

6. Depends Upon Support of Top Management:

Budgetary control system depends upon the support of top management. The management should be enthusiastic for the success of this system and should give full support for it. If at any time there is a lack of support from top management then this system will collapse.

Types of budgets

The following classification of budgets are generally in use.

- 1. Classification according to flexibility factor**
- 2. Classification on the basis of functions.**

Classification according to flexibility factor

Fixed budget

A fixed budget is a budget that does not change or flex when sales or some other activity increases or decreases. A fixed budget is also referred to as a static budget.

Flexible budget

A flexible budget is a budget that adjusts or flexes with changes in volume or activity. The flexible budget is more sophisticated and useful than a static budget.

Differences between fixed and flexible budget

BASIS FOR COMPARISON	FIXED BUDGET	FLEXIBLE BUDGET
Meaning	The budget designed to remain constant, regardless of the activity level reached is Fixed Budget.	The budget designed to change with the change in the activity levels is Flexible Budget.
Nature	Static	Dynamic
Activity Level	Only one	Multiple
Performance Evaluation	Comparison between actual and budgeted levels cannot be done accurately, if there is a distinction in their activity levels.	It provides a good base for making a comparison between the actual and budgeted levels.
Rigidity	Fixed Budget cannot be modified as per the actual volume.	Flexible budget can be easily modified in accordance with the activity level attained.
Estimates	Based on assumption	Realistic and Practical

Functional classification of budget

1. **Sales Budget.** This is a forecast of total sales, classified according to groups of products, salesmen and geographical locations.
2. **Selling and Distribution Cost Budget.** This is a forecast based on sales, productive capacity and requirements of inventories, etc.
3. **Introduction Cost Budget.** This is related to the cost of production, including direct materials cost, and direct cost and expenses- fixed variable and semi- variable.

4. **Purchase Budget.** Correlated with sales forecast and production planning, it deals with purchase that is required for planned production. Purchase would include both direct and indirect materials and goods.
5. **Personnel Budget.** This has reference to the utilization of men and would include labor employed in productive activity. This would be split up between direct and indirect labor.
6. **Research Budget.** This relates to improvement in the quality of the product or research for new products.
7. **Cash Budget.** This is a sum total of the requirements of cash in respect of various functional budgets as well as anticipated cash receipts.
8. **Plant Utilization Budget.** This is intended to cover the plant and machinery requirements to meet the budgeted production during the period. Schedules will be produced showing the available load in each department expressed in standard -hours or units.
9. **Office and Administration Budget.** This budget represents costs of all administrative expenses, such as managing director's salary, staff salaries and expenses of office management like lighting and cleaning.
10. **Capital Budget.** This is a forecast of outlay of fixed assets as also of the sources of capital budget. It may differ from that of other budgets as such expenditure is frequently planned a number of years in advance.
11. **Master Budget.** This ultimate integration of separate, budgets by the accountant provides the Master Budget, which includes estimated profit and loss account for the future period, and an estimated Balance Sheet at the end thereof.

Cash budget

A cash budget is an estimation of the cash inflows and outflows for a business over a specific period of time. This budget is used to assess whether the entity has sufficient cash to operate.

Companies use sales and production forecasts to create a cash budget, along with assumptions about necessary spending and accounts receivable. If a company does not have enough liquidity to operate, it must raise more capital by issuing stock or by taking on debt.

STANDARD COSTING

Standard costing is a technique which uses standards for costs and revenues for the purpose of control through variance analysis. Standard is a predetermined measurable quantity set in defined conditions against which actual performance can be compared, usually for an element of work, operation or activity.

Objectives of Standard Costing:

- (a) To provide a formal basis for assessing performance and efficiency.
- (b) To control costs by establishing standards and analysis of variances.
- (c) To enable the principle of 'management by exception' to be practised at the detailed, operational level.

(d) To assist in setting budgets.

(e) The standard costs are readily available substitutes for actual average unit costs and can be used for stock and work-in-progress valuations, profit planning and decision making and as a basis of pricing where 'cost-plus' systems are used.

(f) To assist in assigning responsibility for nonstandard performance in order to correct deficiencies or to capitalize on benefits.

(g) To motivate staff and management.

(h) To provide a basis for estimating.

(i) To provide guidance on possible ways of improving performance.

Criticism on Standard Costing:

(a) A lot of input data is required which can be expensive.

(b) Standard costing is usually confined to organizations whose processes or jobs are repetitive.

(c) Unless standards are accurately set any performance evaluation will be meaningless.

(d) Uncertainty in standard costing can be caused by inflation, technological change, economic and political factors etc. Standards, therefore, need to be continually updated and revised.

(e) It may be difficult to set standards at a level which both motivates the workforce and achieves the corporate goals.

(f) The maintenance of the cost data base is expensive.

(g) The research evidence shows that overly elaborate variances are imperfectly understood by line managers and thus they are likely to be ineffective for control purposes.

(h) Virtually all aspects of setting standards involves forecasting and subjective judgments with inherent possibilities of error and argument.

(i) The usefulness of a number of variances relating to overheads, sales margins, mix and yield is questionable.

Difference between Standard Costing and Budgetary Control

BASIS FOR COMPARISON	STANDARD COSTING	BUDGETARY CONTROL
Meaning	The costing method in which evaluation of performance and activity is done by making a comparison between actual and standard costs, is Standard Costing.	Budgetary Control is the system in which budgets are prepared and continuous comparisons are made between the actual and budgeted figures to achieve the desired result.
Basis	Determined on the basis of data related to production.	Budgets are prepared on the basis of management's plans.
Range	It is limited to cost details.	It includes cost and financial data.
Concept	Unit Concept	Total Concept
Scope	Narrow	Wide
Reporting of Variances	Yes	No
Effect of temporary changes in conditions	The short term changes will not influence the standard costs.	The short term changes will be shown in the budgeted costs.
Comparison	Actual costs and standard cost of actual output	Actual figures and budgeted figures
Applicability	Manufacturing concerns	All business concerns

Analysis of Variance

Analysis of variance (ANOVA) is an analysis tool used in statistics that splits an observed aggregate variability found inside a data set into two parts: systematic factors and random factors. The systematic factors have a statistical influence on the given data set, while the random factors do not. Analysts use the ANOVA test to determine the influence that independent variables have on the dependent variable in a regression study.

This may be defined as ‘the resolution into constituent parts and the explanation of variance’.

Types of Variance

Variance Components



Direct Material Variance

Direct material variance shows the difference between the actual cost of material of actual units and standard cost of material of standard units. It is also the total of material price variance, material quantity variance. If there is favorable material quantity variance and unfavorable material price variance or vice-versa, direct material cost may be either favorable or unfavorable because it is total of material price and material quantity variance.

Labour variance: Labor variance shows the variance of labor cost. It is the difference between standard cost of labor for actual production and the actual cost of labor for actual production.

Overhead Variance : Overhead Variance shows the variance of all indirect cost. It is the difference between standard cost of overhead for actual output and actual cost of overhead for actual output.

Materials price variance : In managerial accounting, variance means deviation of actual costs from standard costs. Materials price variance is the result of deviation of actual price paid for materials from what has been set as standard. Direct materials price and quantity standards are set

after keeping in mind the current market prices and anticipated changes in materials prices in near future

Formula

The formula of direct materials price variance is given below:

$$\text{Direct materials price variance} = (\text{Actual quantity purchased} \times \text{Actual rate}) - (\text{Actual quantity purchased} \times \text{Standard rate})$$

Reasons of direct materials price variance:

1. **Order size:** Some suppliers allow discount on large orders. The materials purchased in large quantities may reduce the the unit price and a favorable price variance may occur.
2. **Rise in price:** The rise in the general price level may increase the input costs of the vendor and as a result vendor may increase the price of the materials. The rise in price is very common reason of an unfavorable variance.
3. **Urgent needs:** If production department does not indicate the need of materials on time, the purchasing department may have to order on urgent basis that may increase the price of materials and other expenses associated with the order.
4. **Quality:** A favorable price variance may be the result of purchasing low quality materials and an unfavorable variance may be the result of purchasing high quality materials.
5. **Inefficient standard setting:** Inefficiencies in terms of forecasting and environmental scanning during standard setting process can be a reason of huge variances.
6. **Transportation:** Transportation is a part of total direct materials cost. Any change in the transportation expenses can change the total and per unit cost of direct materials available for use and can become the reason of favorable or unfavorable direct materials price variance.
7. **The role of just in time manufacturing:** A company that operates under just in time (JIT) manufacturing system may have to face shortage of direct materials due to a sudden increase in demand for the product. The orders in rush normally increase the costs. In that case company will have to either accept an unfavorable materials price variance or lost sales.
8. **Inefficient or unreliable suppliers:** A deviation from standard material costs may be the result of inefficient or unreliable vendors. For example, if suppliers of raw materials are unable to meet the demand, the company may have to look for another supplier who may be more costly.

Direct Material Usage Variance

Direct material usage variance is otherwise called as Direct Material Quantity variance. It is a part of direct material cost variance

Causes for Direct Material Usage Variance.

1. Negligence in use of materials.
2. More wastage of materials by untrained workers.
3. Adopting defective or wrong or improper production process.
4. Loss due to pilferage.
5. Use of material mix other than the standard mix.
6. using of poor or bad quality of materials.
7. Carelessness and inefficiency of workers.
8. More or less yield from materials than the standard set.
9. Lack of skill of the employees leads to more consumption of materials.
10. Defective production necessitating the use of additional materials.
11. Improper condition of Plant and Equipment.
12. Defects in machinery during the process of production.
13. Bad maintenance and upkeep of plant lead to more scraping materials.
14. Frequent changes in product design.

Material mix variance.

Material mix variance is a part of direct material usage variance. If only one type of material is used for production, there is no need of calculating direct material mix variance. Whenever two or more types of materials are used for production, direct material mix variance should be calculated.

Formula

$$\text{MMV} = \text{SP} (\text{RSQ} - \text{AQ})$$

Where,

- MMV = Material Mix Variance
- SP = Standard Price
- RSQ = Revised Standard Quantity
- AQ = Actual Quantity

The following formula is used to calculate Revised Standard Quantity.i.e.,

- $\text{RSQ} = (\text{SQ of each material} / \text{Total SQ}) \times \text{Total AQ}$

Material yield variance

Direct Material Yield Variance is a measure of cost differential between output that should have been produced for the given level of input and the level of output actually achieved during a period.

Formula

$$\text{MYV} = (\text{Actual Yield} - \text{Standard Yield}) \times \text{Standard Material Cost Per Unit}$$

Labor cost variance

Direct labor cost variance is the difference between the standard cost for actual production and the actual cost in production. There are two kinds of labor variances. Labor Rate Variance is the difference between the standard cost and the actual cost paid for the actual number of hours.

Labor rate variance

The labor rate variance measures the difference between the actual and expected cost of labor. It is calculated as the difference between the actual labor rate paid and the standard rate, multiplied by the number of actual hours worked. The formula is:

$$(\text{Actual rate} - \text{Standard rate}) \times \text{Actual hours worked} = \text{Labor rate variance}$$

Labor efficiency variance

The difference between actual time incurred to manufacture a certain number of units and the time allowed by standards to manufacture that number of units multiplied by standard direct labor rate is called direct labor efficiency variance or direct labor quantity variance.

Labor mix variance

Exactly analogous to material mix variance is the labor mix variance. It arises when due to shortage of a particular labor grade or some other particular reason; there is a difference between the composition of actual gang of labor & the composition of standard gang.

Labor idle time variance

Labor idle time variance. The difference between the number of hours budgeted for work and the number of paid hours not spent working (idle time).