

ACCOUNTING FOR MANAGERIAL DECISIONS

MASTER OF COMMERCE

Semester I

Paper III

STUDY MATERIAL

2015 Admission onwards



**UNIVERSITY OF CALICUT
SCHOOL OF DISTANCE EDUCATION
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SYLLABUS

MC1C3 ACCOUNTING FOR MANAGERIAL DECISIONS

Objective: Enable the students to know the applications of accounting tools, techniques and concepts in managerial decision making process.

Module – 1 : Management Accounting: Nature, Scope and functions- Role of Management Accountant- Cost Concepts and Classification- Variable Costing and Absorption Costing- Emerging Costing Approaches – Life cycle costing- Quality costing- Kaizen costing- Throughput costing- Back flush costing- Activity Based Costing- Introduction- Concepts- Cost drivers and cost pools- steps to develop ABC System- ABC System and Corporate Strategy.

Module - 2 : Capital Investment Process- Investment Appraisal Methods- Payback period- ARR- Time adjusted methods- Discounted payback period- Net Present Value method- IRR- PI- TV method- Capital Rationing- Risk Analysis- Decision Tree approach- Sensitivity Analysis- Other statistical methods.

Module – 3 : CVP Analysis and Decision Making: Managerial application of CVP analysis- Make or Buy Decision- Alternative Methods of production- Buy or Lease decision- Shut down or continue- Repair or replace- Accepting bulk orders for idle capacity utilization- Pricing under different situation- Suitable product mix- Key factor etc.

Module – 4 : Cost of Capital : Concept- Relevance- Elements of cost of capital- Cost of Equity- Cost of Debt- Cost of Retained Earnings- Calculation of Weighted Average Cost of Capital- Cost control and cost reduction techniques- Value Engineering.

Module – 5 : Performance Measurement : Financial and Non-financial Measurement- Performance- Return on Investment- Residual Income- EVA- Concept- Measurement- Balanced Score Card- Concept- Objectives- Multiple Score Card measures- New horizons in Managerial Control- Transfer Pricing- Responsibility Accounting- Performance Budgeting- ZBB- Social Cost Benefit Analysis.

(Theory : 40% and Problems : 60%)

Books for reference:

1. Cost and Management Accounting- by SP Jain and KL Narang. (Kalyani)
2. Management Accounting and Financial control- by SN Maheswari. (Sulthanchand and Sons)
3. Advanced Management Accounting- by Ravi M Kishore. (Taxman)

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UNIT-1

INTRODUCTION

Evolution of Management Accounting

The evolution of Joint Stock Company from of organization has resulted in large scale production and expansion of ownership. The increase in size and complexity of business and the application of sophisticated modern technology have resulted in the separation of ownership and management. The modern managers need meaningful and timely data for their primary function-decision making. Though the financial accounting conveys meaningful information to the outsiders, (eg., Shareholders, creditors etc.), it fails to communicate valuable and varied information to the management. Financial accounting furnishes a good deal of factual information, but not of much use in the current management perspective. Today management can no longer afford to wait up to the end of a year to know the results of the day-to-day transactions. The effect of each business transaction should be made available on a routine basis. The approach has changed the role of accounting from a mere device of recording to a powerful tool of forecasting, budgeting, budgetary control etc. This changing dimension of accounting has led to the development of the technique of "Management Accounting".

Meaning:

Management Accounting can be referred to as "a system of accounting for management", which provides necessary information to the management for discharge of its functions. These functions include planning, organizing, directing, controlling and decision making. Management accounting assists the management to carry out these functions more efficiently in a systematic manner.

Definition:

Some of the important definitions of management accounting are:

The Institute of Chartered Accountants of England and Wales : "Any form of accounting which enables a business to be conducted more efficiently can be regarded as management accounting."

Robert N. Anthony: "Management accounting is concerned with accounting information that is useful to management."

The Institute of Chartered Accountants of India: "Such of its techniques and procedures by which accounting mainly seeks to aid the management collectively."

In short, management accounting can be defined in simple words as "accounting for effective management."

Nature or Characteristics of Management Accounting:

1. Forecasting: It helps in planning for the future course of action.
2. Internal accounting: It is concerned with the provision of information to the management to make better decisions.
3. Quantitative and qualitative information: It deals with both quantitative as well as qualitative information.
4. Techniques and concepts: It uses special techniques and concepts to make the accounting data more useful (eg: Marginal Costing, Cost-Volume-Profit Analysis etc.)
5. Multi-disciplinary: It is a combination of several disciplines such as financial accounting, cost accounting, operations research, statistics, economics etc.
6. Cause and Effect Analysis: It attempts to test the "cause" and "effect" relationship of different variables. For eg: if there is a loss, the reasons for the loss are looked in to.
7. No fixed norms: It has no fixed set of rules and formats like that of financial accounting. The analysis of data depends upon the purpose and person using it.

Scope of Management Accounting

The management accounting is a wide and broad-based subject, which includes a variety of aspects of business operation. The following areas of specialization reveal its scope:

1. **Financial Accounting:** It is the basic accounting device which relates the recording of transactions in the books, ledger postings, balancing and drafting of trial balance prior to the preparation of Profit and Loss Account and Balance Sheet. A well designed financial accounting is essential for the smooth operation of management accounting.
2. **Cost Accounting:** Costing is the technique and process of ascertaining costs. Cost accounting system provides necessary tools such as standard costing, budgetary control, marginal costing, inventory control etc. for carrying out the management accounting functions efficiently.
3. **Budgeting and Forecasting:** Both budgeting and forecasting are useful for management accountant in planning various activities.
4. **Interim Reporting:** This refers to reporting of financial results by means of weekly, monthly, quarterly or half yearly statements to the management.
5. **Statistical Methods:** Statistical tools such as graphs, charts, diagrams, regression analysis, time series etc., are used to make the information more impressive and intelligible.
6. **Interpretation of Data:** Analysis and interpretation of financial statements are important part of management accounting.
7. **Internal Audit:** A system of internal control by establishing internal audit coverage for all operating units. It also fixes responsibility of different individuals.
8. **Tax Planning:** Tax liabilities are calculated with the help of income statements. Management accounting includes tax planning also.
9. **Operations Research:** Operation research techniques like Linear programming, Decision Tree Analysis. Network Analysis etc also help the management in solving business problems.
10. **Break-Even Analysis:** It helps the management to find out the no profit – no loss point and also the probable amount of profit at different levels of activity.

Functions of Management Accounting

1. **Planning and forecasting:** Planning and forecasting are essential for achieving business objectives. Management accounting provides necessary data for forecasting.
2. **Modification of Data:** It modifies the accounting data by rearranging in such a way that it suits the requirements of the management.
3. **Analysis and Interpretation:** The accounting data is analyzed and interpreted meaningfully for effective planning and decision making.
4. **Serves as a Means of Communication:** Management Accounting establishes communication with in different levels of management and with the outside world.
5. **Facilitates Managerial Control:** It enables all accounting efforts to be directed towards the attainment of goals efficiently by controlling the operations of the company. Standards of deviations are assessed and proper control exercised.
6. **Use of Qualitative Information:** Management accounting uses qualitative information also to assist the management in decision making process Engineering records, case studies, special surveys etc., are used in purpose.
7. **Decision-making:** Management accounting supplies analytical information regarding various alternatives and selection is made easy.

8. Co-ordination: It is the essence of managerial activity. The targets and performances of different departments are co-ordinated and communicated to the management at proper intervals.

Inter relationship with other subjects:

Management Accounting, Financial Accounting and Cost Accounting are complementary and are necessary for running the concern efficiently. Now let us study the interrelationship between these subjects by looking into the differences between them. The major points of distinction between financial accounting and management accounting are:-

Items	Financial Accounting	Management Accounting
1. Object	Records transactions, assess profitability by drafting final accounts	Assists management of formulating policies and plans
2. Nature of data	Historical nature	Future plans & policies
3. Scope	Ascertain profit or loss and financial position, Limited scope	Covers cost accounting, financial accounting, budgetary control etc. Broader scope.
4. Flexibility	Rigid on rules and regulations	Free and flexible, No hard and fast rules.
5. Compulsion	More or less compulsory for every business	Voluntary, not compulsory to install this accounting system.
6. Periodicity of reporting	Accounts are prepared for a longer period, say, one year.	No specific period for which accounts are prepared
7. Precision	Actual figures are recorded. Hence accuracy and precision maintained	No emphasis given to actual figures. Projections and estimates are used.
8. Use	Useful to outsiders like shareholders, investors, bankers etc.	Internal use only for different levels of management.
9. Coverage	Covers the whole range of business activity	Considers only parts of business activity like departments, cost centres etc.
10. Publication	Profit & Loss A/c and Balance Sheet are published for the benefit of the outsiders.	Accounts statements, reports etc., are for internal use only, hence not published.
11. Audit	Audit is compulsory in certain cases.	Cannot be audited
12. Speed	Slow and time consuming	Reporting and follow up activities are done very quickly.

Relationship between Management Accounting and Cost Accounting:

Management accounting and Cost accounting are two important branches of accounting. They are closely interrelated. Cost accounting is the process of accounting for costs. It is not a mere tool for cost ascertainment and cost recording, it is also a good tool for cost control, ascertainment of profitability and for management decision-making.

The following table shows the main points of distinction between the two:

Sl. No.	Item	Cost Accounting	Management Accounting
1.	Object	To record cost of producing a product or rendering a service	To provide information to the management for planning and coordinating the activities.
2.	Scope	Narrow scope. Deals with cost ascertainment	Wide scope. Includes financial accounting, cost accounting, budgeting, tax planning etc.
3.	Principles	Certain principles and procedures are followed.	No specific rules and procedures followed.
4.	Nature	Uses mainly past and present figures	Projections of figures for future.
5.	Data used	Only quantitative data (figures) are used	Both quantitative and qualitative information are used.

Role and Position of Management Accountant

Management accountant is a person responsible for the supply of accounting information to the management. He may be known as financial controller, financial advisor, chief accounts officer etc. The organizational status or position of a management accountant varies from concern to concern. His position in the organization determines his function as line function of staff function. If he participates in planning and execution of policies, he is equal to other functional managers and his position will be a line function. But in most of the industries management accountant performs only staff functions. That is supplies information and gives his views about the data and leaves the final decision making to functional departmental heads. In America his position is more or less a combination of line and staff functions. In any case, it can be concluded that he plays a significant role in the decision making process and he is associated according to the needs and requirements of the organization.

Functions of Management Accountant

The Financial Executives Institute, America has specified his function as follows:

1. **Planning for control:** Management accountant establishes co-ordinates and maintains an integrated plan for the control of operation. Such a plan would provide cost standards, expense budgets, sales forecasts, capital investment programs, profit planning etc.
2. **Reporting:** Management accountant measures performance against given plans, and standards. The results of operations are interpreted and reported to all levels of management.
3. **Evaluating:** He should evaluate various policies and programs and check their effectiveness to attain the objectives of the organization.
4. **Administration of Tax:** Management accountants are expected to report to Government agencies as required under different laws and to supervise matters relating to taxes.
5. **Protection of Assets:** The protection of business assets is another function assigned to the management accountants. It is performed through internal control, auditing and assuring proper insurance coverage of assets.
6. **Appraisal of External Effects:** He has to continuously appraise economic and social forces and government influences and interpret their effect upon business.

Try yourself:

1. "Management Accounting is accounting for effective management". Explain the statement.
2. Explain Management Accounting. What are the functions of Management Accounting?
3. What are the differences between Management Accounting and Financial Accounting?
4. Distinguish between Management Accounting and Cost Accounting.
5. Explain the role of Management Accountant in an organization.

UNIT-TWO

COST CONCEPTS AND CLASSIFICATION

CONCEPT OF COST

The term cost has a wide variety of meanings. Some use the word 'price' for cost, though cost is not the same as price. In management terminology, cost refers to expenditures and not price. Some important definitions of cost are given below to make the concept clear:

According to the British Institute of Cost and Works Accountants "Cost is the amount of expenditure (actual or notional) incurred on or attributable to a given thing."

W.M. Harper: "Cost is the value of economic resources used as a result of producing or doing the thing costed."

Raymond J. Chambers: The term cost is used in three different senses- 1) the expected cost of a particular action, 2) the cost of something purchased, and 3) the cost of attaining some end, i.e., the sacrifices actually made to attain it.

The Institute of Cost and Management Accountants (ICMA), England: "Costing is the technique and process of ascertaining costs." Costing relates to the ascertainment of cost of a product produced or service rendered.

ICMA, England defines cost accounting as "the process of accounting for cost from the point at which expenditure is incurred or committed to the establishment of its ultimate relationship with cost centres and cost units." Thus cost accounting is a formal accounting procedure to ascertain cost of production.

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

Cost accountancy is thus a wide term which includes both costing and cost accounting. Its main purposes are cost control and ascertainment of profitability. It is an important tool of managerial decision-making.

CLASSIFICATION OF COST

Classification of cost is the process of grouping costs according to their common characteristics.

Classification is done on the following bases:

1. On the basis of elements of cost
2. On the basis of function
3. On the basis of behavior or variability
4. Classification for managerial decisions and control.

1. Classification by Nature or Elements of Cost

Under this head cost can be broadly classified as : a) Direct costs and b) Indirect Costs

- a) **Direct Costs:** Direct Costs are the costs which can be easily identified with and allocated to a particular product. Such costs are treated as the cost of the unit produced. For eg. Cost of raw materials, labour and other direct expenses incurred for the production of a particular job, product or process.

b) Direct costs can be further classified in to:

- i) **Direct Material:** all those materials specifically consumed for the production of the unit, including all primary packing materials.
- ii) **Direct Labour:** Wages paid to workers directly engaged in the manufacturing process of a product, a job or an operation can be stated as direct labour.

- iii) **Direct Expenses:** All expenses other than direct material and direct labour that are specifically incurred for a particular job, product or process are called direct expenses or chargeable expenses. Cost of special tools, patterns etc., made for a particular job, product or process, hire charges of special equipment, excise duty, royalties, freight and insurance on special materials etc. are other examples.
- b) **Indirect Costs:** Indirect costs are those which cannot be assigned to any particular cost unit, i.e., job, product or process, but can be apportioned on a reasonable basis. These costs are of general character and are incurred for the business as a whole or for several cost centres at a time. Such costs are apportioned to those cost centres on the basis of benefits received by each. Indirect costs include:
 - i) **Indirect Material** such as fuel, lubricating oil, small tools, material consumed for repairs and maintenance, miscellaneous stores used in the factory, etc.
 - ii) **Indirect Labour** which includes wages of general supervisors, inspectors, workshop cleaners, store-keepers, time-keepers, etc.
 - iii) **Indirect Expenses** such as rent, lighting, insurance, canteen, hospital, welfare expenses, etc.

Indirect costs are also called "Overheads" which can be further classified into:

- a) **Factory Overheads** which include all indirect costs related with the manufacture of a product such as lubricants, oil, consumable stores, works manager's salary, time keeper's salary, factory rent, factory insurance, etc.
- b) **Office and Administration Overheads** which include all indirect expenses relating to administration and management of an office such as office rent, office lighting, insurance, salaries of clerical and executive staff, etc.
- c) **Selling and Distribution Overheads** which include all indirect costs connected with marketing and sales such as advertising expenses, salaries of salesmen, indirect packing materials, etc.

2. Functional Classification

On the basis of functions cost can be classified as follows:

- a) **Prime Cost:** It consists of cost of direct materials, direct labour and direct expenses. It is also known as direct cost or first cost.
- b) **Factory Cost:** It is prime cost plus factory overhead or works overhead. Also known as works cost, production cost or manufacturing cost.
- c) **Cost of Production:** It is factory cost plus office and administration overheads. Also known as office cost, administration cost or gross cost of production.
- d) **Total Cost or Cost of Sales:** It comprises of cost of production plus selling and distribution overheads.

Functional classification of cost can be summarized as below:

- 1. Prime Cost = Direct Material + Direct Labour + Direct Expenses
- 2. Factory Cost or Works Cost = Prime Cost + Works Expenses.
- 3. Office Cost or Cost of Production = Factory Cost + Office & Administrative Overheads.
- 4. Total Cost or Cost of Sales = Cost of Production + Selling & Distribution Overheads.

3. Classification on the basis of Behavior

On the basis of behavior or variability, costs may be classified as:

- a) **Variable Cost:** Costs that vary in direct proportion to the volume of production are called variable costs. For eg. Direct material, direct labor and direct expenses. Variable costs vary in total in relation to the units produced, but remain constant per unit at all levels, unless otherwise stated. Variable cost is also known as product cost.
- b) **Fixed Cost:** Costs which do not vary with the volume of production are called fixed costs. They remain fixed in total irrespective of the level of production, but vary per unit for different levels of activity. Fixed cost per unit decreases with increase in output and increases with decrease in output. Fixed costs are normally based on time and hence also known as period cost. Eg. Rent of building, office salary, insurance premium, etc.
- c) **Semi-variable costs:** These costs are partly fixed and partly variable. These costs may vary with the level of production but not in direct proportion to the output. Eg. Telephone charges, repairs and maintenance, depreciation of machinery, etc.

4. Classification for Managerial Decisions and Control

- a) **Controllable and uncontrollable costs:** Controllable costs are those costs which can be controlled or influenced by a specified person or a level of management of an undertaking. Costs which cannot be so controlled are known as uncontrollable costs.
- b) **Normal and abnormal cost:** Costs which are normally incurred at a given level of output are known as normal costs and it is charged to the cost of production. The costs which are not normally incurred at a given level of output in the normal conditions are abnormal costs, ie., any cost which is in excess of normal cost is treated as abnormal cost and is charged to costing profit and loss account.
- c) **Avoidable and unavoidable costs:** Avoidable costs are those costs which can be escaped if some activity of the business is discontinued. Unavoidable costs are those which cannot be escaped or eliminated.
- d) **Shut down and sunk costs:** Those fixed costs which have to be incurred even if production of an undertaking is discontinued temporarily due to some reasons such as strike, shortage of raw material, etc., are called shut down costs. Costs which have been incurred and are irrelevant in a particular situation are called sunk costs.
- e) **Out of pocket costs:** It is a cost which involves actual cash payment to outsiders, like rent, salary, interest, etc. Expenses like depreciation, goodwill written off, loss on sale of assets, etc. do not involve cash payment and hence are not out of pocket costs.
- f) **Opportunity costs:** It refers to the benefit forgone or sacrifice made in favor of an alternative course of action. When one alternative is rejected in favor of another, the loss of benefit from the rejected alternative is the opportunity cost. For e.g., if an owned building is used for business, the rent that would have been received by letting it out is an opportunity cost.
- g) **Conversion costs:** It is the cost of converting or transforming raw materials into finished products. It includes direct wages, direct expenses and factory overheads.
- h) **Replacement cost:** Replacement cost is the cost of replacing an asset by purchasing it from the market.

- i) **Imputed cost or Notional cost:** Imputed cost is a hypothetical cost which does not involve actual cash expenditure. For e.g., rent of owned building, interest on owned capital, etc.
- j) **Differential cost, incremental cost and decremental cost:** The difference in cost due to change in the level of activity or method of production is known as differential cost. If the change results in increase in total cost, it is called incremental cost. If the change results in decrease in total cost, it is called decremental cost.
- k) **Marginal cost:** Marginal cost is the cost of producing one additional unit. Marginal cost concept is based on the distinction between fixed cost and variable cost. Marginal cost includes variable costs only.
- l) **Budgeted costs and standard costs:** Budgeted costs are estimated costs prior to a defined period of time. Standard cost is a predetermined cost based on technical estimate for materials, labour and overheads for a selected period of time and for a prescribed set of working conditions.
- m) **Relevant cost:** It is a cost which has a direct influence on managerial decision-making.
- n) **Postponable cost:** Postponable cost is a cost which can be postponed to a future period without any adverse effect on the efficiency of the present operations.

These are the important classifications of cost.

Now let us move on to the next module on Variable costing and Absorption costing.

VARIABLE AND ABSORPTION COSTING

VARIABLE COSTING

An analytical study of the behavior of overheads in relation to changes in volume of output reveals that there are some items of cost which vary directly with volume of output whereas, there are some other costs which remain unaffected by variations in the volume of output. Fixed and variable costs behave differently with changes in the volume of output; variable costs tend to vary in total with increase or decrease in the level of activity, but fixed costs tend to remain constant in total irrespective of the level of activity.

The volume of production fluctuates from one period to another due to seasonal and other factors. But fixed costs being same during each period, fluctuations occur in unit cost of production during different periods. The total cost per unit may vary as a result of variation in the volume of output, because of the incidence of fixed cost in it. To prevent this uneven incidence of fixed cost on units produced, fixed costs are treated as period costs and excluded from product costs. The necessity for separating fixed cost from product cost in order to eliminate the fluctuations in cost has given rise to the concept of marginal costing. The essence of marginal costing lies in considering fixed costs as distinct from variable cost and as such excluded from the product cost. Only variable cost is considered as relevant to product cost and matched with revenues under different conditions of production and sales, and hence marginal costing is also called as variable costing.

Definition: Marginal cost is the additional cost of producing an additional unit of a product. ICMA, London defines Marginal cost as "the amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit." In practice, this happens to be the total variable cost attributable to one unit.

Marginal cost may also be defined as the 'aggregate of variable costs' or "prime cost plus variable overheads".

For e.g.: Variable cost per unit Rs.6, fixed cost for the period Rs. 5,000, units produced during the period: 500

Cost of production = $500 \times 6 = 3000 + 5000 = \text{Rs. } 8,000$

If in another period, 501 units are produced, then cost of production will be:

Cost of production = $501 \times 6 = 3006 + 5000 = \text{Rs. } 8,006$

Therefore, the change in aggregate cost per unit, i.e., the marginal cost is Rs. 6, (8006-8000) which is the same as the variable cost per unit.

A detailed discussion on marginal costing is done later in this text.

ABSORPTION COSTING AND MARGINAL COSTING

Let us compare and study the differences between these two concepts of costing:

1. Absorption costing, also known as total costing, conventional costing, traditional costing, full costing etc., is the practice of charging all costs, both variable and fixed, to operations, processes, or products. All costs whether variable or fixed, are treated as product costs under absorption costing. It is a total cost technique.

In marginal costing only variable costs are treated as product cost and fixed costs are treated as period cost and charged to profit and loss account for that period.

2. There are differences in the valuation of closing inventory. Under absorption costing, the stock of finished goods and work-in-progress is valued at total cost, which includes both fixed and variable cost. Under marginal costing, stocks are valued at marginal cost, i.e., variable cost only. Hence, it results in higher valuation of inventories in absorption costing as compared to marginal costing.
3. Under absorption costing, there is apportionment of fixed cost over the products, which may result in under or over absorption of such costs. While marginal costing excludes fixed costs, the question of under or over absorption of fixed costs does not arise.
4. In absorption costing, managerial decision making is based upon 'profit', which is the excess of sales value over total cost. While in marginal costing, the managerial decisions are guided by 'contribution' which is the excess of sales value over variable cost.
5. Absorption costing is more suitable for long-term decision making where as marginal costing is more suitable for short-term managerial decision making.

UNIT- THREE

EMERGING COSTING APPROACHES

Some of the emerging costing approaches are discussed below:

Life Cycle Costing: The process of identifying and documenting all costs involved over the life of an asset is known as life cycle costing. Consideration of costs over the life of an asset provides a sound basis for decision making. It is possible to –

- Assess future resource requirements- cost wise projection of different items.
- Assess comparative costs of potential acquisitions- investment appraisal.
- Decide sources of supply- financing.
- Account for resources used now or in the past- reporting and auditing.
- Improve system design- manpower and utilities over the life cycle.
- Optimize operational and maintenance support.
- Assess when assets reach the end of their economic life and whether renewal is required.

Life cycle costing is an important economic analysis used in the selection of alternatives that impact both pending and future costs. It compares initial investment options and identifies the least cost alternatives to purchase, own, operate, maintain and finally dispose off. Life cycle costing takes into account all user costs, agency costs related to future activities including future periodic maintenance and rehabilitation. (e.g., Highway construction). All these costs are discounted to see the Net Present Value of the project. In short, Life cycle costing is an analysis of cost of a system over its entire life span which involves acquisition costs, operating costs, maintenance costs and disposal costs.

QUALITY COSTING

There is a new awareness about quality in industry. The opening of Indian markets to multinationals since 1990 has forced a sense of competition in Indian producers. The consumer started preferring goods from foreign producers for the reason of lower price and better quality. It is at this stage that Indian producers started thinking of product or service quality. The organizations that will maintain productivity and quality on a continuous basis will be able to stay in the market for long. There is a new competition in India for implementing total quality management and getting ISO 9000 certification.

The modern view of quality is that product should satisfy customers' needs and expectations on a continuous basis. This concept of quality calls for well designed products with functional perfection, prompt satisfaction of customers' expectations, excellence in service and absolute empathy with customer.

Quality is the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs. Customer satisfaction will come when the product satisfies his needs and aspirations from it. Total quality is the mobilization of the whole organization to achieve quality continuously, economically and in entirety. Quality improvement is possible through an improvement in purchasing, marketing, after sales service and many other factors.

CLASSIFICATION OF QUALITY COSTS

Quality costs can be classified under three heads:

- a) Cost of conformance b) Cost of non-conformance c) Cost of lost opportunities.

- a) **Cost of conformance** can be further grouped under the following two sub-heads:

- 1) **Cost of Prevention-** It refers to the cost of those activities which prevent failure from occurring, such as cost of training employees, cost of quality awareness and quality maintenance programmes, cost of providing quality reports, quality circles, etc.
- 2) **Cost of Appraisal-** It is the cost incurred to determine conformance with quality standards such as cost of inspection, testing, quality audit, etc.
- b) **Cost of Non-conformance:** It includes:
 - Cost of internal failure,** such as the cost incurred on correcting defects of products or services which do not meet quality standards. Such defects are discovered prior to delivery of products to the customers. Eg. Costs of scrap, spoilage, re-worked costs, etc.
 - Cost of External failure,** such as the cost incurred on correcting products or services after delivery to the customers. Eg. Warranty costs, installation costs, cost of replacement of defectives, after sales service, etc.
- c) **Cost of Lost Opportunities:** If the products or services are not delivered according to required quality standards, it will result into loss of existing as well as potential customers. This loss of revenue resulting from loss of customers is called cost of lost opportunities.
- d) The quality costs constitute a significant percentage of total sales in the present days. Thus, it is very important to reduce quality cost so as to increase the profitability of a concern.

KAIZEN COSTING

Kaizen means improvement, continuous improvement, involving everyone in the organization, from top management to managers, supervisors, workers, etc. According to Imai "our way of life - be it our working life, social life, or home life- deserves to be constantly improved." Kaizen is a Japanese philosophy for process improvement. 'kai' and 'zen' means 'to break apart and investigate' and to 'improve up on the existing situation'. The essence of kaizen is that the team effort encourages innovation and change and by involving all layers of employees, the imaginary organizational walls disappear to make room for productive improvements. Everyone in the organization is a contributor. Kaizen could be an attitude for continuous improvement for every individual.

According to James Womack "the machine that changed the world(1991), with kaizen, the job of improvement is never finished and the status quo is always challenged. Toyota used Kaizen to rise to world automotive leadership. Kaizen generates process oriented thinking, is people oriented and is directed at people's efforts.

Major differences between a conventional and kaizen approach:

Conventional Approach	Process Oriented Approach (Kaizen)
Employees are the problem	Process is the problem
Doing my job	Helping to get things done
Understanding my job	Knowing how my job fits in the process
Measuring individuals	Measuring performance
Change the person	Change the process
Correct errors	Reduce variation
Who made the error?	What allowed the error to occur?

Improvements through Kaizen: a process focus

The kaizen philosophy is: 'not one single day should go in the firm without some type of improvement being made in some process in the company'. Kaizen is everyone's job; requires sophisticated problem-solving expertise as well as professional and engineering knowledge and involves people from different departments working together in teams to solve problems.

Steps in Kaizen

- Establish a plan to change whatever needs to be improved
- Carry out changes on a small scale
- Observe the results
- Evaluate the results and the process and determine what has been learned.

The three pillars of Kaizen, according to Imai are: 1) Housekeeping (managing the work place) 2) Waste elimination 3) Standardization.

THROUGHPUT COSTING

Throughput costing or super variable costing is a method of costing a product, where only the unit level direct costs are assigned to the product. It considers only direct materials as true variable cost and other costs as period costs. Only direct material costs are charged to product. It is relevant only for internal use of the management.

There is slight difference in the valuation of inventories under absorption costing, variable costing and throughput costing. Consider the following example:

Production: 10,000 units; Sales: 9,000 units @ Rs 350 per unit. Variable manufacturing cost Rs 150 per unit; consisting of materials Rs 90, direct labour Rs 40 and variable manufacturing overhead Rs 20. Fixed overheads are: manufacturing: Rs 8,00,000 and administration: Rs 4,00,000. The cost of inventory under each method of costing would be:

Cost statement for a production of 10,000 units

Cost elements	Total Cost	Cost Per unit
Direct Materials	9,00,000	90
Direct Labour	4,00,000	40
Variable manufacturing Overhead	2,00,000	20
Total variable cost or marginal cost	15,00,000	150
Fixed Overheads: Manufacturing cost	8,00,000	80
Administration overheads	4,00,000	40
Cost of Production	27,00,000	270

Under Absorption costing: 1000 units @ Rs 270 per unit = 2,70,000

Variable costing: 1000 units @ Rs 150 per unit = 1,50,000

Throughput costing: 1000 units @ Rs 90 per unit = 90,000

It can be observed that the closing inventory is valued differently under these three methods.

It is valued at cost of production under absorption costing, at marginal cost under variable costing and at direct material cost under throughput costing.

BACKFLUSH COSTING

Backflush costing is a product costing approach used in JIT (Just In Time) environment, in which costing is delayed until goods are finished. Standard costs are then flushed backwards through the system to assign costs to products. The detailed tracking of cost is thus eliminated. Backflush costing transaction has two steps:

1. Product part which serves to increase the quantity on hand of the produced part, and
2. Which relieves the inventory of all component parts.

This represents huge savings over traditional method of

- a) Issuing component parts, one at a time
- b) Receiving the finished parts in to inventory, and
- c) Returning any unused components, one at a time, back to inventory.

Backflush costing simplifies costing since it ignores both labour variances and work-in- progress. This method is employed where the overall business cycle time is relatively short and inventory levels are low.

ACTIVITY BASED COSTING

Since liberalization policy in early nineties, Indian industry is facing intense competition from multinationals of developed countries. These companies are offering products at low prices when compared to Indian companies. In this context, every firm is trying to stay in the market by offering goods and services at competitive prices. Since prices are dictated by competitors, a firm can use price control measures for surviving in the market. Activity Based Costing (ABC) is a method used to control costs.

Meaning: ABC is a new term used for finding out cost. It uses activities as the basis for calculating the costs of goods and services. ABC attempts to absorb overheads into product cost on a more realistic basis. In traditional costing direct costs are allocated to various products on the basis of use and indirect costs are allocated through cost centres. The direct costs will be in proportion to the volume of production and indirect costs (like production, administration, selling and distribution overheads etc.) are apportioned on some suitable basis, say, based on machine hours, labour hours, direct costs, input, output, etc. ABC is emphasizing more on indirect costs in the manufacturing operations as these costs far outweigh the direct processing costs in many a situations, where advanced manufacturing technology is used. The idea behind ABC is that costs are grouped according to what drives them to be incurred. The cost drivers are then used as an absorption base.

Kaplan and Cooper of Harvard Business school, have developed this new approach. The ABC approach relates overhead costs to the forces behind them, known as cost drivers. A cost driver can be defined as an activity which generates cost.

Steps in implementing ABC

Following steps are involved in implementing ABC:

1. Identifying of functional areas such as manufacturing, assembling etc., as well as support activities like purchasing, packing and dispatching.
2. Identify the relative activities involved in each area.
3. Collect accurate data on labour, materials and overhead costs.

4. Allocate the common expenditure to various activities in functional and support areas.
5. Identify the most suitable cost driver in each activity.
6. Absorb overhead expenses on the basis of rate/ cost driver.

ABC AND CORPORATE STRATEGY

In the present competitive environment, no organization can stay in the market without using ABC. The accurate cost information is essential for taking important decisions. The main benefits of ABC arise from quality managerial decisions based on accurate cost information provided by ABC. This is the most promising aspect of ABC which is now being called Activity Based Management (ABM). ABM views the activities in a dynamic sense rather than just a step for cost allocation to the end products.

BENEFITS OF ABC

1. Determination of cost: ABC system allows allocation of expenses on the basis of activity and cost drivers which facilitates accurate pricing of products. ABC also considers the increasing non-manufacturing costs like marketing and servicing costs.
2. Helps improving performance: A better reporting of costs of activities and their performance measures help in taking appropriate decisions and improving efficiency.
3. Helpful in strategic decision: ABC approach is helpful in taking important strategic decisions, like cost cutting, downsizing, lay off, close downs etc. As ABC is focusing on the activities, it is easy to spot out the non-value adding activity and discard it.
4. Make or buy decisions: Cost is a major factor in taking make or buy decisions. The analyses of both direct and indirect costs are undertaken in ABC to arrive at such a decision.
5. Rationalizing product mix: ABC helps to take decision on discontinuing a product and promoting another, looking in to its profitability.
6. Formulating budgets: ABC helps in establishing a relationship between activities and indirect costs to facilitate formulation of proper budgets.
7. Helpful in target costing: Target costing is a tool used by Japanese manufacturers of automobiles and electronic goods. It is believed that a product has a specific price based on its usage and expectations of customers. The price of the product is fixed, sometimes, even before it is designed. In that case, its cost is determined by deducting profit from its predetermined price. This cost, known as target cost, is to be achieved through engineering, design, cutting out of non-value adding activities and increasing efficiency. ABC helps in identifying and eliminating the non-value adding activities.

UNIT - FOUR

CAPITAL INVESTMENT PROCESS

INTRODUCTION:

This unit gives a brief account of the important capital budgeting techniques or investment appraisal methods. Capital budgeting is the process of making investment decisions in capital expenditures. A capital expenditure may be defined as expenditure, the benefits of which are expected to be received over a long period of time in future. Some of the examples of capital expenditure are:

- 1) Cost of acquisition of permanent assets such as land and building, plant and machinery, furniture and fixtures, goodwill, etc.
- 2) Cost of addition, expansion, improvement or alteration in the fixed assets.
- 3) Cost of replacement of permanent assets.
- 4) Research and development project cost, etc.

Capital expenditure decisions are also called as long-term investment decisions. It involves planning and control of capital expenditure. It is the process of deciding whether or not to commit resources to a particular long term project whose benefits are to be realized over a period of time, longer than one year.

Definitions of Capital Budgeting

Charels T Horngreen: "Capital budgeting is long term planning for making and financing proposed capital outlays."

G.C. Philippatos: "Capital budgeting is concerned with the allocation of the firm's scarce financial resources among the available market opportunities".

Richard and Greenlaw: "Capital budgeting is acquiring inputs with long-run return".

Lynch: "Capital budgeting consists in planning and development of available capital for the purpose of maximizing the long-term profitability of the concern."

CAPITAL INVESTMENT PROCESS

The following procedure may be adopted in the capital investment process:

- 1) Identification of Investment Proposals: The capital investment process begins with the identification of investment proposals. The idea or the proposal may originate from the top management or middle level or bottom level management or even from floor level workers. The proposal is to be submitted to the Capital Expenditure Planning Committee for approval.
- 2) Screening the Proposals: The Expenditure Planning Committee screens the proposals from different angles to ensure that these are in accordance with the corporate strategies.

- 3) **Evaluation of the Proposals:** The next step in the capital investment process is to evaluate the profitability of various proposals by using traditional as well as modern techniques. (These techniques have been discussed later in this chapter).
- 4) **Fixing Priorities:** After evaluating various proposals, the profitable ones may be selected and others rejected. It is essential to rank such proposals in order to accommodate with the available resources, considering the risk and return of each.
- 5) **Final Approval and Preparation of Capital Expenditure Budget:** The capital expenditure budget lays down the amount of estimated expenditure to be incurred on fixed assets during the budget period.
- 6) **Implementing the Proposal:** The project has to be implemented in a time bound manner, avoiding unnecessary delays and cost over runs.
- 7) **Performance Review:** Evaluation of performance is made through post completion audit by comparing the actual expenditure on the project with the budgeted one. The actual revenue from the project is also compared with the anticipated income from it. Unfavourable variances, if any, should be looked into and the causes of the same be identified and corrective measures to be taken.

INVESTMENT APPRAISAL METHODS

There are several methods for evaluating and ranking the capital investment proposals. There may be a number of profitable projects available, but due to financial and other constraints, it may not be possible to invest in all of them. The primary concern should be to allocate the available resources to various proposals, considering the risk and return of each. The basic approach is to compare the investment in the project with the benefits derived there from.

Some of the important methods of evaluating capital investment proposals are given below:

A) **Traditional methods:** These comprise of:

- 1) Pay-back Period Method or Pay out or Pay off Method.
- 2) Improvement of Pay-back Period Method.
- 3) Accounting Rate of Return or Average Rate of Return Method

B) **Time Adjusted Method or Discounted Cash Flow Methods:** These comprise of:

- 1) Net Present Value Method
- 2) Internal Rate of Return Method
- 3) Profitability Index Method
- 4) Net Terminal Value Method

A. TRADITIONAL METHODS

- 1) **PAY-BACK PERIOD METHOD:** Pay-back period is the period in which the total investment in the project is recouped. It measures the period required to recover the original investment in a

project through the earnings from it. Under this method, various investments are ranked on the basis of their pay-back period and the project with the least pay-back period is selected.

The pay-back period can be calculated as follows:

- a) Calculate annual net earnings(profit) before depreciation and after taxes; it is known as annual cash inflows.
- b) Divide the cost of the project by the annual cash inflow, where the project generates constant annual cash inflow.

Thus, Pay- back period = Original cost of the project / Annual cash inflows

- c) Where the annual cash inflows are unequal, the pay-back period can be ascertained by adding up the cash inflows until the total is equal to the original cost of the project.

Eg. 1) A project costs Rs. 5,00,000 and yields an annual cash inflow of Rs.1,00,000 for 7 years. Calculate its pay-back period.

Soln.: Pay-back period = Initial outlay of the project / Annual cash inflow

$$= 5,00,000 / 1,00,000 = 5 \text{ years.}$$

Eg. 2) Initial investment Rs. 2,00,000 ; cash inflows over five years: 40,000, 80,000,60,000, and 40,000 in the first, second, third, and fourth year respectively. Calculate pay-back period.

Soln.:

Year	Annual cash inflow	Cumulative cash inflows
1	40,000	40,000
2	80,000	1,20,000
3	60,000	1,80,000
4	40,000	2,20,000

The above table shows that in three years Rs 1,80,000 has been recovered and Rs 20,000 is yet to be recovered towards the cost of the project. In the fourth year, the cash inflow is Rs. 40,000, which means that the pay-back period is between third and fourth year. Assuming that the cash inflows occur evenly throughout the year, the time required to recover Rs.20,000 will be:

$$= (20,000/40,000) 12 = 6 \text{ months.}$$

Hence pay-back period = 3years and 6 months.

Eg. 3) A project costs Rs.5,00,000 and yields annually a profit of Rs.80,000 after depreciation@ 12%p.a. but before tax of 50%. Calculate pay-back period of the project.

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Soln. Annual cash inflow is calculated as follows:

Particulars	Amount (Rs)
Profit before tax	80,000
Less tax @ 50%	40,000
Profit after tax	40,000
Add back depreciation@12% on 5,00,000	60,000
Profit before depreciation but after tax	1,00,000
Or Annual Cash inflow	

Pay-back period = Initial outlay of the project / Annual cash inflow

$$= 5,00,000 / 1,00,000 = 5 \text{ years.}$$

Try yourself:

1. A project costs Rs.6,00,000 and yields annually a profit of Rs.90,000 after depreciation at 12.5% p.a. but before tax at 50%. Calculate pay-back period.

(Ans. 5yrs)

2. Calculate the pay-back periods of the following projects, each with a cash outlay of Rs.1,00,000. Suggest which projects are acceptable if the standard pay-back period is 5 years

	Cash inflows		
Years	Project A	Project B	Project C
1	30,000	30,000	10,000
2	30,000	40,000	20,000
3	30,000	20,000	30,000
4	30,000	10,000	40,000
5	30,000	5,000	-----

(Ans. Project A = 3.33yrs ; B = 4yrs ; C = 4yrs. All are acceptable as the pay-back periods are below the standard fixed, ie. 5yrs)

Problem: X Ltd. is producing articles mostly by manual labour and is considering replacing it by a machine. There are two alternative models available: M and N. Prepare a statement of profitability showing the pay-back period of each machine from the following information:

Particulars	Machine M	Machine N
Estimated life	4 yrs	5 yrs
Cost (Rs)	90,000	1,80,000
Estimated savings in scrap	5,000	8,000
Estimated savings in direct wages	60,000	80,000
Additional cost of maintenance	8,000	10,000
Additional cost of supervision	12,000	18,000

Soln.

Profitability Statement

Particulars	Machine M	Machine N
Estimated savings per annum:		
Scrap	5,000	8,000
Direct wages	60,000	80,000
Total savings (a)	65,000	88,000
Additional cost per annum:		
Maintenance	8,000	10,000
Supervision	12,000	18,000
Total additional cost (b)	20,000	28,000
Net savings or annual cash inflows (a—b)	45,000	60,000
Pay-back period=	90,000/45,000	1,80,000/60,000
Initial Outlay/Annual cash inflow	= 2 yrs	= 3 yrs

Machine M is recommended as its pay-back period is less than that of Machine N.

Advantages of Pay-back Period Method

1. It is simple to understand and easy to calculate.
2. It takes less time and labour and hence saves cost.
3. It reduces the loss through obsolescence as it suggests the project with least pay-back period.
4. It is particularly suited to firms whose liquidity position is not so good due to its short term approach.

Disadvantages of Pay-back Period Method

1. It does not take into account the cash inflows after the pay-back period, which is inappropriate particularly when such amount is considerably high.
2. It ignores the time value of money as the cash inflows of different years are treated equally. It is true that a rupee today is more valuable than a rupee received after a year.
3. It does not consider cost of capital which is an important factor in making sound investment decision.
4. It does not take into account the profitability of the project throughout its life.
5. It may be difficult to determine the minimum acceptable pay-back period, which is usually a subjective decision.

In spite of the above mentioned limitations, the pay-back period method can be used in evaluating the viability of short and medium term capital investment proposals.

IMPROVEMENTS IN PAY-BACK PERIOD METHOD

- a) **Post Pay-back Profitability Method:** A serious allegation against Pay-back period method was that it does not consider cash inflows earned after pay-back period. Hence an improvement over the traditional method can be made by taking into account the cash flows beyond the pay-back period or post pay-back period profitability.

Post pay-back period profitability Index = $(\text{Post pay-back profit} / \text{Investment}) \times 100$

Eg. For each of the following projects compute: a) Pay-back period c) Post Pay-back Profitability

- b) Post pay-back profitability Index

I) Initial outlay	Rs.50,000
Annual cash inflow(after tax but before depreciation)	Rs.10,000
Estimated life	8 years
II) Initial outlay	Rs.50,000
Annual cash inflow (after tax but before depreciation):	
First three years	Rs.15000
Next five years	Rs.5000
Estimated life	8 years
Salvage	Rs.8000

Soln.

- I i) Pay-back period = $\text{Investment} / \text{Annual cash inflow} = 50,000 / 10,000 = 5 \text{ years}$
- ii) Post Pay-back Profitability = $\text{Annual cash inflow (Estimated life-- Pay-back period)}$
 $= 10,000(8-5) = 30,000$
- iii) Post pay-back profitability Index = $(30,000 / 50,000) \times 100 = 60\%$

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a). **Average Rate of Return Method:** Under this method average profit after tax and depreciation is calculated and then it is divided by the total investment in the project.

$$\text{Average Rate of Return} = (\text{Average Annual Profit} / \text{Net Investment in the Project}) \times 100$$

Eg. A project requires an investment of Rs.5,00,000 and has a scrap value of Rs.20,000 after five years. It is expected to earn profits after depreciation and taxes during five years: Rs.40,000, 60,000, 70,000, 50,000 and 20,000. Calculate the average rate of return on investment.

$$\text{Soln. Total profit} = 40,000 + 60,000 + 70,000 + 50,000 + 20,000 = 2,40,000$$

$$\text{Average profit} = 2,40,000 / 5 = 48,000$$

$$\text{Net investment in the project} = 5,00,000 - 20,000 = 4,80,000$$

$$\text{Average Rate Return} = (\text{Average annual profit} / \text{Net investment}) \times 100$$

$$= (48,000 / 4,80,000) \times 100 = 10\%$$

b) Average Return on Average Investment Method;

Under this method, average profit is divided by average investment to ascertain ARR.

$$\text{ARR} = (\text{Average Annual Profit after depreciation and taxes} / \text{Average Investment}) \times 100$$

$$\text{Average annual profit} = \text{Total profit over the life of the project} / \text{Life of the project in years.}$$

$$\text{Average Investment} = \text{Net Investment} / 2$$

Eg. Calculate average rate of return for projects A and B from the following:

Particulars	Project A	Project B
Investment (Rs.)	2,00,000	3,00,000
Expected life (no salvage value)	4 years	5 years
Projected Net income: (after interest, depreciation and taxes)		
Year 1	20,000	30,000
2	15,000	30,000
3	15,000	20,000
4	10,000	10,000
5	-----	10,000

If the required rate of return is 12% which project should be accepted?

Soln.

Particulars	Project A (Rs.)	Project B (Rs.)
Total Profit	60,000	1,00,000
Average Profit = Total profit/Life of the project	15,000	20,000
Net Investment in the Project		
Average Rate of Return on Net investment:	2,00,000	3,00,000
= (Average profit/Net investment) x 100	(15,000/2,00,000)	(20,000/3,00,000)

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If ARR is calculated on Average Investment:	0.075 or 7.5%	0.0666 or 6.67%
= (Average profit/Average investment) x 100	(15,000/1,00,000)	(20,000/1,50,000)
Average Investment= Net Investment/2	0.15 or 15%	0.1333 or 13.33%

Both projects have ARR higher than the required rate of return, 12%. Project A is recommended as its ARR is higher than that of Project B.

Problem: XLtd is considering the purchase of a machine. Two machines are available- E and F. The cost of each machine is Rs 60,000 with an expected life of 5 years. Net profits before tax and after depreciation during the expected life of the machines are given below:

Year	Machine E	Machine F
1	15,000	5,000
2	20,000	15,000
3	25,000	20,000
4	15,000	30,000
5	<u>10,000</u>	<u>20,000</u>
Total	85,000	90,000

Following the method of ARR on Average investment ascertain which of the alternatives will be more profitable, assuming tax rate as 50%.

(Hint: Compute profit after tax @ 50%, then average profit p.a. divided by average investment, will be the ARR.

Machine E = 28.33% and **Machine F** = 30%, hence, Machine F is more profitable)

Advantages of ARR method:

- 1) It is simple to understand and easy to operate.
- 2) It gives a better view of profitability as it uses the entire earnings of a project throughout its life.
- 3) It is based on accounting concept of profits and can be readily calculated from financial data.

Disadvantages of Average Rate of Return Method:

- 1) This method also ignores time value of money.
- 2) It does not deal with 'cash flows' which are more important than the accounting profits.
- 3) This method cannot be applied where investment is made in parts.

B. DISCOUNTED CASH FLOW METHODS OR TIME ADJUSTED TECHNIQUES

Discounted cash flow (DCF) methods are an improvement over the traditional techniques- pay-back period and ARR methods. The time adjusted or discounted cash flow techniques take into account the profitability throughout the life of the asset and also the time value of money. The expected future cash inflows are discounted to the present to compare with the

current cash outflow and check the financial viability of the project. These methods are also called modern methods of capital budgeting.

1) NET PRESENT VALUE METHOD

Under this method the present values of cash inflows and outflows are calculated at the cut off rate or cost of capital. Profit after tax but before depreciation represents cash inflows. Cash outflows represent the investment and commitments of cash in the project at various points of time. The Net Present Value (NPV) is the difference between the total present value of future cash inflows and the total present value of cash outflows. The proposal will be accepted if the NPV is positive, i.e., the present value of total cash inflows are higher than the present value of total cash outflows. It means that its yield is higher than the cost of capital. The projects having negative NPV will be rejected as their yield will be less than the cost of capital. When there are alternative projects, that with the highest positive NPV is to be selected.

The mathematical formula for calculating present value factor is: $PV = 1/(1+r)^n$

Where, PV = present value; r = rate of interest or discount rate; n = number of years.

The PV of cash flows for a number of years can be found as follows:

$$PV = A_1/(1+r)^1 + A_2/(1+r)^2 + A_3/(1+r)^3 + \dots + A_n/(1+r)^n$$

Where, $A_1, A_2, A_3, \dots, A_n$ = Future net cash flows; r = rate of interest or discount rate

1, 2, 3, \dots, n = number of years.

Alternatively, the present value of Re.1 at varying discount rates, due in any number of years can be found with the help of ready-made present value tables.

Now, let us work out a problem to familiarize the computation of NPV.

Eg. 1. Calculate the NPV of the two projects and suggest which of the two projects should be accepted assuming a discount rate of 10%.

Particulars	Project X (Rs)	Project Y (Rs)
Initial Investment	2,00,000	3,00,000
Estimated life	5 years	5 years
Scrap value (Rs)	10,000	20,000
The cash inflows (profit before depreciation & taxes) are:		
Year 1	50,000	2,00,000
2	1,00,000	1,00,000
3	1,00,000	50,000
4	30,000	30,000
5	20,000	20,000

Soln.1

The Net Present Value (NPV) of each project is calculated below by multiplying each cash flow by the appropriate discount factor, assuming that the cost of capital is 10%.

Calculation of Net Present Value of Project X and Project Y

Project X Year	Cash flows	PV Factor @10% (Using PV tables)	Present Value of cash flows (PVCF)	Project Y Cash flows	Present value of cash flows (PVCF)
1	50,000	0.909	45,450	2,00,000	1,81,800
2	1,00,000	0.826	82,600	1,00,000	82,600
3	1,00,000	0.751	75,100	50,000	37,550
4	30,000	0.683	20,490	30,000	20,490
5	20,000	0.621	12,420	20,000	12,420
5 (scrap)	10,000	0.621	6,210	20,000	12,420
Total PVCF			2,42,270		3,47,280
Less Investment			<u>2,00,000</u>		<u>3,00,000</u>
NPV			<u>42,270</u>		<u>47,280</u>

It is clear from the results that the net present value of Project Y is higher than the NPV of Project X and hence, Project Y is recommended for acceptance.

Fig. 2. No project is acceptable unless the yield is 10%. Cash inflows of a certain project along with cash outflows are as below:

Years	cash outflows	Cash inflows
0	1,50,000	-----
1	30,000	20,000
2		30,000
3		60,000
4		80,000
5		30,000

The salvage value at the end of the fifth year is Rs.40,000. Calculate NPV. PV factor at 10% are 0.909, 0.826, 0.751, 0.683, 0.621 respectively for one to five years.

Soln. 2:

In this problem, there are more than one cash outflow, unlike the conventional system of initial cash outflow and a series of future cash inflows. In such cases, all cash out flows are also to be discounted to the present to find the present value of total cash out flows. Then this will be deducted from the total cash inflows to ascertain the net present value of the project. Now, see the solution:

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Calculation of Present Value of Cash Outflows

Year	Outflow (Rs.)	PVFactor@10% discount factor	PresentValue (Rs.)
0	1,50,000	1.000	1,50,000
1	30,000	0.909	<u>27,270</u>
			<u>1,77,270</u>

Calculation of Present Value of Cash Inflows and NPV

Year	Inflows (Rs)	PVFactor @10% discount factor	Present Value (Rs)
1	20,000	0.909	18,180
2	30,000	0.826	24,780
3	60,000	0.751	45,060
4	80,000	0.683	54,640
5	30,000	0.621	18,630
5 Salvage	40,000	0.621	<u>24,840</u>
Total			1,86,130
Less PV of outflow			<u>1,77,270</u>
NPV			<u>8,860</u>

The project can be accepted as it has a positive NPV, which shows that its yield is more than 10%.

Problem.1

A project costing Rs. 10 lakhs has a life of 10 years at the end of which its scrap value is likely to be Rs. 1 lakh. The firm's cut off rate is 12%. The project is expected to yield an annual profit after tax of Rs.1 lakh, depreciation being charged on straight line basis. At 12% per annum, the present value of one rupee received annually for 10 years is Rs. 5.650 and the value of one rupee received at end of 10 years is 0.322.

Ascertain the net value of the project and state whether we should go for the project.

(Hint: Annual cash inflow = Profit after tax + Depreciation;

Depreciation= 10 lakh---scrap 1 lakh/life of the asset = 9,00,000/10 = 90,000

Annual cash flow = 1 lakh+ 90,000= 1,90,000; PV of annual inflow and salvage=

190000 x 5.65= 10,73,500+ 32,200= 11,05,700; NPV=11,05,700—10lakh = 1,05,700. We should go for the project.)

Problem 2.

A company is considering a proposal for investment of Rs.5 lakh on product development which is expected to generate net cash inflows for 6 years as under:

Years	1	2	3	4	5	6
Cash Inflows (Rs.'000)	Nil	100	160	240	300	600
PVFactor@15%	0.87	0.76	0.66	0.57	0.50	0.43

The company's cost of capital is 15%. Advise the company on the desirability or otherwise of accepting the proposal.

(Ans. NPV = Rs. 2,26,400; It is acceptable.)

Advantages of NPV method:

- a) It considers the time value of money and is suitable to be applied in a situation with uniform cash outflows and uneven cash inflows.
- b) It takes into account the earnings over the entire life of the project.
- c) It considers the objective of maximum profitability.

Disadvantages of NPV method:

- a) It is difficult to understand and operate, when compared to traditional methods.
- b) It may not give good results while comparing projects with unequal lives and unequal investments.
- c) It is no easy to determine an appropriate discount rate.

2 INTERNAL RATE OF RETURN OR TIME ADJUSTED RATE OF RETURN METHOD

Internal Rate of Return (IRR) is a modern technique of investment appraisal which considers both time value of money and total profitability throughout the life of the project. IRR is the rate at which the expected cash inflows are discounted to equate with the investment amount. At IRR, the total discounted present value of cash inflows will be exactly equal to the total discounted cash outflows, so that NPV at this rate will be zero.

The IRR may be found by 'trial and error' method. First, compute the present value of cash flows from an investment, using an arbitrary interest rate, say, the cost of capital. Then compare the present value so obtained with the amount of investment. If the present value is higher than the cost figure, try a higher interest rate and go through the procedure again. Continue the process until the present value of cash inflows from the project is approximately equal to its cost. The interest rate that brings about this equality is defined as the IRR.

Alternatively, IRR can be calculated with the help of the interpolation formula. Somewhere between a positive NPV and a negative NPV, there lies the IRR, which shows the NPV equals zero.

Computation of IRR

- a) When the annual net cash flows are equal or 'even' over the life of the asset: Find out the present value factor by dividing initial outlay (cost of the investment) by annual cash flow, ie,

$$PV \text{ Factor} = \text{Initial Outlay} / \text{Annual cash flow}$$

Eg. Initial outlay Rs. 80,000; annual cash inflow Rs.20,000; life of the asset 5 years.
Calculate IRR

Consulting PV Annuity tables for 5 years, at PV Factor of 4, IRR = 8% approx.

The IRR is calculated by trial and error method. (This has been already discussed in the beginning of this technique). Let us try a problem now:

Estimated net annual cash flows:

Calculate the Internal Rate of Return.

Cash flow at various discount rates of 12%, 14% and 15%

As the cash inflows are uneven during the life of the asset, trial and error method is followed to find IRR. First an arbitrary rate of 12% is tried to calculate the present value of cash inflows. The total present value comes to be Rs. 6,33,500 at 12%. To equate the present value to the investment amount of Rs. 6,00,000, another higher rate is to be tried. Hence, 14% discount factor is tried which still shows a higher present value of Rs. 6,05,950. This attempt is to be continued till we get the present value more or less equal to the amount of investment. When the next higher rate is tried, ie. 15%, the present value came to Rs. 5,92,850, which is less than the capital outlay of Rs.6,00,000. It means that the IRR lies in between 14% and 15% discount rates. The exact IRR can be worked out by applying the formula for interpolation:

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$$\begin{aligned} \text{IRR} &= \text{Low rate} + [\text{NPV @ low rate} \div (\text{PVCF at low rate} - \text{PVCF at high rate})] \times \text{difference in rate} \\ &= 14\% + [5950 \div (6,05,950 - 5,92,850)] \times (15\% - 14\%) \\ &= 14\% + (595 \div 1310) \times 1\% = \underline{14.45\%} \end{aligned}$$

Eg. 2. A Ltd. is currently planning to invest in a project with the following returns over the life of the project:

Years	1	2	3	4	5
Gross yield (Rs.)	80,000	80,000	90,000	90,000	80,000
PV factor @10%	0.91	0.83	0.75	0.68	0.62
PV factor @14%	0.88	0.77	0.67	0.59	0.52

Cost of machinery to be installed is Rs.2,00,000, depreciation to be charged at 20% p.a. on straight line basis. Income tax rate is 50% and there is no salvage value. If the average cost of raising capital is 11%, would you recommend the project under IRR method?

Soln. 2. In this problem, the gross yield is given. It has to be converted into cash flow after tax as follows:

Year	Gross Yield (Rs.)	Depreciation (Rs.)	EBT (Rs.)	Tax@ 50% (Rs.)	EAT (Rs.)	CFAT (Rs.) (EAT+Depn.)
1	80,000	40,000	40,000	20,000	20,000	60,000
2	80,000	40,000	40,000	20,000	20,000	60,000
3	90,000	40,000	50,000	25,000	25,000	65,000
4	90,000	40,000	50,000	25,000	25,000	65,000
5	80,000	40,000	40,000	20,000	20,000	60,000

Note: EBT= Earnings before tax; EAT= Earnings after tax; CFAT= Cash flow after tax

Now the cash flow after tax is ascertained. Let us calculate the IRR next.

Calculation of Present Value of Cash Inflows at 10% and 14%

Year	Cash flows	PV Factor at 10%	PVCF	PV Factor at 14%	PVCF
1	60,000	0.91	54,600	0.88	52,800
2	60,000	0.83	49,800	0.77	46,200
3	65,000	0.75	48,750	0.67	43,550
4	65,000	0.68	44,200	0.59	38,350
5	60,000	0.62	37,200	0.52	31,200
			<u>2,34,550</u>		<u>2,12,100</u>

Note : PVCF = Present value of cash flows.

Both the present values of cash flows are higher than the amount of investment of Rs. 2 lakh. It means that IRR of the project is above 14%. The project can be accepted as its IRR is more than the cost of raising capital, 11%.

Advantages of IRR method:

- It takes into account the time value of money and profitability of the project throughout its economic life.
- It is suitable to situations of even as well as uneven cash flows in different periods of time.
- Determination of cost of capital is not necessary for the use of this method.
- It provides for uniform ranking of various proposals due to the percentage rate of return.
- It is considered to be a more reliable method of investment appraisal.

Disadvantages of IRR method:

- It is difficult to understand the evaluation of investment proposals.
- The assumption that the earnings are reinvested at IRR for the remaining life of the project, may not be a justified assumption always. NPV method seems to be better as it assumes that the earnings are reinvested at the rate of cost of capital of the firm.
- The results of NPV method and IRR method may differ when the projects differ in their size, life and timings of cash flows.

3. PROFITABILITY INDEX METHOD OR BENEFIT COST RATIO

Profitability Index (PI) method, like NPV and IRR methods, is also a time adjusted method of investment appraisal. It shows the relationship between present value of cash inflows and the present value of cash outflows.

$$\text{Profitability Index (PI)} = \text{Present Value of Cash Inflows} \div \text{Present Value of Cash Outflows}$$

The proposal will be accepted if the PI is more than one and will be rejected if the PI is less than one. When there are more projects, the one with the highest PI is to be selected.

Eg. The total present value of cash inflows from a project Rs. 2,34,550; Investment outlay Rs. 2 lakh. PI will be = PV of Cash Inflows \div PV of cash outflows

$$= 2,34,550 \div 2,00,000 = \underline{1.17275}$$

The project can be accepted as its PI is more than one.

Merits and Demerits of Profitability Index method

PI method is a slight modification of NPV method. NPV is the difference between present value of cash inflows and present value of cash outflows, whereas, PI is the relation between present value of cash inflows and present value of cash outflows. Under NPV method, it is not easy to rank projects whose costs differ significantly. PI method will be more suitable in such cases. The other merits and demerits of this method are the same as those of NPV method.

Problem. 1. Alpha company is considering the purchase of a new machine. Two alternatives, A and B, are available, costing Rs.4,00,000 each. Earnings after taxation are expected to be as follows:

Years	1	2	3	4	5
Cash inflows:					
Machine-A	40,000	1,20,000	1,60,000	2,40,000	1,60,000
Machine-B	1,20,000	1,60,000	2,00,000	1,20,000	80,000
PVF @ 10%	0.91	0.83	0.75	0.68	0.62

The company has a target of return on capital of 10%. Compare the profitability of the machines and state which alternative you consider financially preferable.

Soln.1. The profitability of machines can be compared on the basis of NPV and PI of the machines:

Year	PV Factor@10%	Machine A Cash Inflow	PVCF	Machine B Cash inflow	PVCF
1	0.91	40,000	36,400	1,20,000	1,09,200
2	0.83	1,20,000	99,600	1,60,000	1,32,000
3	0.75	1,60,000	1,20,000	2,00,000	1,50,000
4	0.68	2,40,000	1,63,200	1,20,000	81,600
5	0.62	1,60,000	<u>99,200</u>	80,000	<u>49,600</u>
Total			5,18,400		5,23,200
Less Cost			<u>4,00,000</u>		<u>4,00,000</u>
NPV			<u>1,18,400</u>		<u>1,23,200</u>
PI			<u>1.296</u>		<u>1.308</u>

Profitability Index = $PVCF \div \text{Investment}$

Machine – A = $5,18,400 \div 4,00,000 = 1.296$; B = $5,23,200 \div 4,00,000 = 1.308$

Machine B is recommended as its NPV and PI are higher than that of machine A.

You may calculate the PI of all the previous problems dealing with NPV and IRR, so as to make the concept clearer.

Problem without cash inflows, but only cash outflows: In such cases we have to compare the profitability of the projects by looking into the annual equivalent present value of cash outflows

Annual equivalent present value of cash outflows = $\text{Total PV of Cash Outflows} \div \text{Annuity factor}$

Eg. Company X is forced to choose between two machines A and B with identical capacity. Machine A costs Rs.3lakhs and will last for 3 years. It costs Rs.80,000 per year to run. Machine B is an economy model costing only Rs. 2,00,000 but will last only for two years, and costs Rs. 1,20,000 per year to run. The costs are forecasted in rupees of constant purchasing power. Ignore tax. Opportunity cost of capital is 10%. Which machine company X should buy?

The present value of annuity for 2 years and 3 years at 10% is 1.735 and 2.486 respectively.

Soln. Evaluation of Machines A and B

	Machine A (Rs.)	Machine B (Rs.)
Present Value of Cash Outflows:		
Cost of Machine	3,00,000	2,00,000
PV of running cost:		
A : for 3 years- 80,000 x 2.486	1,98,880	----
B : for 2 years- 1,20,000 x 1.735	-----	2,08,200
Total PV of cash outflows	4,98,880	4,08,200
Annual equivalent PV of cash outflow	$4,98,880 \div 2.486$	$4,08,200 \div 1.735$
	<u>2,00,676</u>	<u>2,35,274</u>

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The company should buy Machine A as its annual equivalent present value of cash outflow is lower than that of B. Hence Machine A is more profitable.

The inter relationship between Cost of Capital (COC), Net Present Value (NPV), Internal Rate of Return (IRR), and Profitability Index (PI) can be studied from the following table:

If, IRR is more than COC, NPV will be positive, and PI will be more than 1

If IRR is equal to COC, NPV will be zero, and PI will be equal to 1

If IRR is less than COC, NPV will be negative, and PI will be less than 1

4. TERMINAL VALUE METHOD

Terminal Value (TV) Method is an improvement over the NPV method of making capital investment decision. Under this method, it is assumed that each of the future cash flows is immediately reinvested in another project at a certain rate of return, until the termination of the project. The cash flows are compounded forward rather than discounting to the present, as in the case of NPV method. The proposal will be accepted if the present value of the total of the compounded reinvested cash inflows is more than the present value of the cash outlays. i.e., when there is positive Net Terminal Value (NTV). When there are more proposals to be selected from, the project with higher NTV will be selected.

The following example will make the concept clear.

Initial outlay Rs.2,00,000

Life of the project 4 years

Cash inflows @ Rs. 1,00,000 for 4 years; Cost of capital: 12%

Expected interest rates at which cash inflows will be reinvested:

End of the year	1	2	3	4
Interest rates (%)	7	7	9	9

Analyze the feasibility of the project using NTV method.

Soln. **Calculation of Compounded Value of Cash inflows**

Year	Cash inflows (Rs.)	Rate of Interest (%)	Years for Investment	Compounding factor *	Compounded value (Rs.)
1	1,00,000	7	3	1.225	1,22,500
2	1,00,000	7	2	1.145	1,14,500
3	1,00,000	9	1	1.090	1,09,000
4	1,00,000	9	0	1.000	1,00,000
			Total		4,46,000

*Compounding factors are available in the Compound Factor Table given at the end.

Note: Rs. one lakh inflow at the end of first year can be reinvested for 3 years at 7% interest. Similarly the second year inflow can be reinvested @ 7% for 2 years; and so on.

Now, to find NTV, the total of compounded reinvested cash inflows is to be discounted at the cost of capital, 12%, to ascertain its present value.

The PV Factor at 12% for 4 years is 0.636 (from present value table)

Hence, present value of compounded reinvested cash inflows = $4,46,000 \times 0.636 = 2,83,656$.

As the present value of the compounded reinvested cash inflows Rs.2,83,656 is greater than the initial cash outlay of Rs.2,00,000, the NTV is positive, i.e., Rs. 83,656, the project can be accepted.

CAPITAL RATIONING

Capital rationing refers to a situation where a firm is not in a position to invest in all profitable projects due to the constraints on availability of funds. In other words, the funds available may not be sufficient to take up and implement all the acceptable projects at a given time. In such a situation, the emphasis should be to select a combination of investment proposals which provides the highest NPV. Following are essential to achieve the objective of maximization of NPV:

- a) All the projects must be 'ranked' according to their Profitability Index.
- b) Projects must be selected as per the ranking until the available funds are exhausted.

Eg. Let us assume that a firm has only Rs.10 lakh to invest and more funds cannot be made available. The various proposals along with their cost and profitability index (PI) are given below:

Proposal	Cost involved (Rs)	PI
1	3,00,000	1.46
2	1,00,000	0.098
3	5,00,000	2.31
4	2,00,000	1.32
5	1,50,000	1.25

It can be seen from the table that all proposals except No.2 give PI exceeding one and are profitable investments. The total capital required to be invested in all the profitable projects is Rs. 11,50,000, where as the total funds available is only Rs. 10 lakhs. Hence, the firm has to do capital rationing and select the most profitable combination of projects within a total outlay of Rs. 10 lakhs. Project numbers 1, 3, and 4 can be selected, which needs a total investment of Rs. 10 lakhs and project number 5 need not be considered as its PI is the lowest among the profitable ones.

Try yourself:

A firm whose cost of capital is 10%, is considering two mutually exclusive projects X and Y, the details of which are:

Year	Project X (Rs)	Project Y (Rs)
Investment	<u>70,000</u>	<u>70,000</u>
Cash flow year 1	10,000	50,000
2	20,000	40,000
3	30,000	20,000
4	45,000	10,000
5	<u>60,000</u>	<u>10,000</u>
	<u>1,65,000</u>	<u>1,30,000</u>

Compute NPV, PI and IRR for the two projects.

(Ans. For Project X: NPV = 46,135 ; PI = 1.659 ; IRR = 27.326%

For Project Y: NPV = 36,550 ; PI = 1.522 ; IRR = 37.56%)

UNIT – FIVE

RISK ANALYSIS IN CAPITAL BUDGETING

In the preceding pages we have examined the various techniques for evaluating capital investment proposals. All these techniques require estimation of future cash inflows and cash outflows. Decisions are taken on the basis of these forecasts which depend upon future events whose occurrence cannot be anticipated with absolute certainty. It may be because of economic, social, fiscal, political and other reasons. Thus, it is clear that risk is linked with business decisions. The term risk in relation to capital budgeting decisions may be defined as “the variability likely to occur in future between the estimated and the actual returns”. It seems to be a tough job to precisely measure the extent of risk involved in accepting an investment proposal. Still some allowances for the element of risk have to be provided in investment decisions.

The following methods are suggested for accounting for risk in capital budgeting:

1. Risk-Adjusted Discount Rate, Risk-Adjusted Cut-off Rate or Varying Discount Rate Method.
2. Certainty Equivalent Method.
3. Sensitivity Technique.
4. Probability Technique.
5. Standard Deviation Method.
6. Co-efficient of Variation Method.
7. Decision Tree Analysis.

1. Risk-Adjusted Discount Rate: This method is based on the assumption that investors expect a higher rate of return on risky projects as compared to less risky projects. The rate requires determination of risk-free rate and risk premium rate. Risk-free rate is the rate at which future cash inflows should be discounted if there is no risk. Risk premium rate is the extra return expected by the investor over the normal rate (ie., the risk-free rate) on account of the project being risky. For eg., if the risk-free rate of return is 9% and the risk premium rate is 3%, then the risk adjusted rate of return will be: $9\% + 3\% = 12\%$.

2. Certainty Equivalent Method: Under this method, the forecasted cash inflows are reduced to a more conservative level by applying a correction factor called ‘certainty equivalent coefficient’. The correction factor is the ratio of riskless cash flows to risky cash flows.

Certainty Equivalent Coefficient = Riskless (or certain) cash flow ÷ Risky cash flow

Both these methods are simple to operate, and hence are more popular. The first method discounts the cash flows at a higher rate, ie., risk adjusted rate and the second method brings down the cash flows by multiplying the risky cash flows with a correction factor.

Eg. There are two projects X and Y. Each involves an investment of Rs. 40,000. The expected cash inflows and the certainty equivalent coefficients (CEC) are as under:

Project X			Project Y	
Year	Cash Inflow	CEC	Cash Inflow	CEC
1	25,000	0.8	20,000	0.9
2	20,000	0.7	30,000	0.8
3	20,000	0.9	20,000	0.7

Risk-free cut off rate is 10%. Suggest which of the two should be preferred.

Soln. Calculation of cash flows with certainty:

Project X			Project Y			
Years	Cash inflow	CEC	Certain cash inflow	Cash inflow	CEC	Certain cash inflow
1	25,000	0.8	20,000	20,000	0.9	18,000
2	20,000	0.7	14,000	30,000	0.8	24,000
3	20,000	0.9	18,000	20,000	0.7	14,000

Present Value of cash flows

Year	Discount factor @ 10%	Project X Cash inflows	Present Value of cash flows	Project Y Cash inflows	Present Value of cash inflows
1	0.909	20,000	18,180	18,000	16,362
2	0.826	14,000	11,564	24,000	19,824
3	0.751	18,000	<u>13,518</u>	14,000	<u>10,514</u>
		Total	<u>43,262</u>		<u>46,700</u>

NPV : Project X = 43,262—40,000 = 3262 ; Project Y = 46,700—40,000= 6700

Project Y is preferred as its NPV is more than that of Project X

3. **Sensitivity Technique:** Generally, a single estimate of cash flow is made for future period which may prove to be wrong. In sensitivity analysis cash flows are assumed to be sensitive under different circumstances. So three kinds of cash flow forecasts are made for each year- optimistic, most likely, and pessimistic. It explains how sensitive the cash flows are under these three different situations. The larger is the difference between the pessimistic and optimistic cash flows, the more risky is the project and *vice versa*.

Eg. Mr. Risky is considering two mutually exclusive projects A and B. Advise him about the acceptability of the projects from the following information:

Particulars	Project A	Project B
Investment outlay	50,000	50,000
Forecasted cash flows per annum for 5 years:		
Optimistic	30,000	40,000
Most Likely	20,000	20,000
Pessimistic	15,000	5,000
Cost of capital to be assumed as 15%		

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Soln. Calculation of NPV at a discount rate of 15% (Annuity of Re.1 for 5 years)

	Proj. A Cash inflow	PVF @ 15%	PVCF	NPV	Proj. B Cash inflow	PVF @ 15%	PVCF	NPV
Optimistic	30,000	3.3522	1,00,566	50,566	40,000	3.3522	1,34,088	84,088
Most Likely	20,000	3.3522	67,014	17,044	20,000	3.3522	67,044	17,044
Pessimistic	15,000	3.3522	50,283	283	5,000	3.3522	16,761	(33,239)

The NPVs calculated above under the three situations differ widely in the case of Project B, which indicates that it is more risky than Project A. The acceptability of the project will depend upon Mr. Risky's attitude towards risk.

4. **Probability Technique:** Probability is the relative frequency with which an event may occur in future. It means the likelihood of happening of an event. '0' probability means an event is not at all likely to happen and '1' probability shows that the event is certain to take place. Between 0 and 1 different probability values can be assigned to events. The predicted cash flows are multiplied by respective probability factors assigned. Then the usual method of ascertaining present values can be followed. The project that gives higher NPV may be accepted.
5. **Standard Deviation Method:** If two projects have the same cost and their NPVs are also the same, standard deviations of the expected cash inflows of the two projects may be calculated to judge the comparative risk of the projects. The project having higher standard deviation is said to be more risky compared to the other. Standard deviation can be defined as "the square root of squared deviations calculated from the mean". It is a measure of dispersion.

Eg. From the following information, ascertain which project is more risky on the basis of standard deviation:

Project A

Cash inflow	Probability	Cash inflow	Probability
2,000	0.2	2,000	0.1
4,000	0.3	4,000	0.4
6,000	0.3	6,000	0.4
8,000	0.2	8,000	0.1

Project B

Soln.

Calculation of standard Deviation

Project- A

Cash inflows	Deviation from mean (d)	Square of deviation (d ²)	Probability	Weighted sq. deviations
2,000	--3,000	90,00,000	0.2	18,00,000
4,000	-- 1,000	10,00,000	0.3	3,00,000
6,000	1,000	10,00,000	0.3	3,00,000
8,000	3,000	90,00,000	0.2	18,00,000
Mean = 20,000	÷ 4 = 5,000		n=1	Σ(fd ²) = 42,00,000

Standard Deviation = square root of $\frac{\Sigma fd^2}{n} = 2,050$

Project- B

Cash inflows	Deviation from mean (d)	Square of deviation (d ²)	Probability	Weighted sq. deviations
2,000	--3,000	90,00,000	0.1	9,00,000
4,000	-- 1,000	10,00,000	0.4	4,00,000
6,000	1,000	10,00,000	0.4	4,00,000
8,000	3,000	90,00,000	0.1	9,00,000
Mean 20,000	÷ 4 = 5,000		n=1	∑(fd ²) = 26,00,000

Standard Deviation = square root of $\frac{\sum fd^2}{n} = 1,612$

Project A is more risky as its standard deviation is more than that of Project B.

6. Coefficient of Variation Method: Coefficient of Variation is a relative measure of dispersion. If the projects have the same cost but different NPVs, coefficient of variation should be computed to judge the relative position of risk involved.

Coefficient of Variation = Standard Deviation ÷ Mean

Eg. Compute Coefficient of Variation using the same figures of the above problem.

Coefficient of Variation (CV) = Standard Deviation ÷ Mean

Project A, CV = $2050 \div 5000 = 0.41$

Project B, CV = $1612 \div 5000 = 0.32$

As the coefficient of variation of A is more than that of B, Project A is more risky.

7. Decision Tree Analysis: When a series of decisions are involved chronologically, decision tree analysis is the appropriate technique. A decision tree is a graphic representation of the relationship between a present decision and future events, future decisions and their consequences. The sequence of events is mapped out over time in a format resembling branches of a tree and hence the analysis is known as decision tree analysis.

Conclusion: Risk and uncertainty are inherent part of capital expenditure decision. However, analyzing the causes of risk, the extent of risk and possible course of action to deal with uncertainty are all necessary to minimize their impact on the investment decision. Specific technique to be used for investment appraisal depends on the circumstances and the experience of the analyst.

Try yourself:

1. Explain the risk incorporated techniques of capital budgeting.
2. Write short notes on the following:
 - a) Certainty Equivalent Coefficient
 - b) Sensitivity Analysis
 - c) Decision Tree Analysis
 - d) Probability Assignments
 - e) Capital Rationing

UNIT - SIX

CVP ANALYSIS AND DECISION MAKING

PART A: MARGINAL COSTING:

Marginal costing is a technique of costing which shows the effect on profit, of changes in the volume of output. There are some costs which vary in direct proportion to the volume of production. Whereas there are some other costs which do not vary in relation to the output. The first type of costs is known as variable costs and the second type is known as fixed costs. It is essential to classify the costs in to fixed and variable in marginal costing.

Definition:-

Marginal cost is the cost of producing one additional unit. It is the increase or decrease in total cost when there is an increase or decrease of one unit in production. The ICMA (Institute of cost and Management Accountants), England, defines marginal cost as "the amount at any given volume of output by which the aggregate costs are changed if the volume of output is increased or decreased by one unit. "The increase in cost due to an increase in output by one unit will be the result of its variable cost. Hence marginal cost is also known as variable cost.

Marginal Cost:- ICMA defines it as "the ascertainment of marginal costs and of the effect on profit of changes in volume of output by differentiating between fixed costs and variable costs".

Features of Marginal Costing

1. All costs can be classified into fixed and variable. Fixed cost remains fixed irrespective of the volume of production. Eg. Salary, rent, depreciation etc. variable cost varies in relation to the output eg. Direct material, direct labour, direct expenses etc.
2. Variable cost per unit remains fixed; total varies.
3. Fixed cost in total remains fixed; per unit varies.
4. Selling price per unit remains unchanged at all levels of activity.
5. The stock of work-in-progress and finished goods are valued at marginal cost.

Contribution:- Contribution is the difference between sales and marginal cost or variable cost. Contribution includes fixed cost and profit. Contribution is also known as marginal income, marginal revenue or contribution margin.

Marginal cost equation:

$$\text{Sales} - \text{variable cost} = \text{Contribution}$$

$$\text{Sales} - \text{Variable cost} = \text{Fixed cost} + \text{profit (or less loss)}$$

$$\text{I.e. } S - V = F + P \text{ (or } F - \text{loss)}$$

When contribution is equal to fixed cost, neither profit is enjoyed, nor loss is incurred. That is at this point of sales there will not be any profit or loss. Sales will exactly equal to total cost. Such a point is known as Break even Point (BEP). In other words BEP is the point of sales at which the firm enjoys neither profit nor loss.

At BEP, Sales = Total cost. i.e. Sales = Variable cost + Fixed cost

The following simple problems will make the concept more clear.

Prob:1

Calculate contribution and profit:

Sales Rs. 8,00,000, Variable cost Rs. 4,00,000; Fixed cost Rs. 2,00,000.

Sol-

$$\begin{aligned}\text{Contribution} &= \text{Sales} - \text{Variable Cost} \\ &= 800000 - 400000 = 400000 \\ \text{Profit} &= \text{Contribution} - \text{Fixed cost} \\ &= 4,00,000 - 2,00,000 = 2,00,000\end{aligned}$$

Prob:2

Calculate Fixed Cost:-

Sales: Rs. 20 lakhs, variable cost Rs. 9 lakhs, Profit Rs. 4 lakhs.

Sol-

$$\begin{aligned}\text{Fixed Cost} &= \text{Contribution} - \text{Profit} \\ \text{Contribution} &= S - V = 2000000 - 9,00,000 = 11,00,000 \\ \text{Fixed Cost} &= 11,00,000 - 4,00,000 = 7,00,000\end{aligned}$$

Prob:3

Calculate Variable cost:-

Sales = 12,00,000, Fixed cost 2,00,000, Profit 1,20,000

Sol-

$$\begin{aligned}\text{Variable cost} &= \text{sales} - \text{contribution} \\ &= \text{Sales} - (\text{Fixed cost} + \text{Profit}) = 12,00,000 - 3,20,000 \\ &= 8,80,000.\end{aligned}$$

Try yourself:-

1. Calculate contribution:
Sales Rs. 15,00,000 variable cost 60% of sales.
(Hint: Contribution 6,00,000)

Profit/Volume Ratio (P/V Ratio) or contribution Ratio or Marginal income Ratio:

P/V ratio is the ratio of contribution to sales i.e. $\text{P/V ratio} = \frac{\text{contribution}}{\text{sales}} \times 100$. A high P/V ratio indicates high profitability and vice versa. On the basis of this ratio, the following ratios can be formed:

- a) $\text{Sales} = \frac{\text{Contribution}}{\text{P / V Ratio}}$
- b) $\text{Contribution} = \text{Sales} \times \text{P/V Ratio}$

See the problem below:

1. Calculate P/V ratio:
Sales Rs.8,00,000, variable cost 4,80,000, fixed cost 1,50,000

Sol.

$$\begin{aligned}\text{P/V ratio} &= \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{8,00,000 - 4,80,000}{8,00,000} \times 100 \\ &= \frac{3,20,000}{8,00,000} \times 100 = 40\%\end{aligned}$$

(Fixed cost need not be considered as S-V is)

If contribution is 40% variable cost will be 60% i.e.,

i.e., variable cost = Sales (1 - P/V ratio)
 = 8,00,000 (1 - 0.40) = 4,80,000

2. Contribution of a firm Rs.5,00,000; P/V ratio 50%; calculate sales.

Sol.

$$\text{Sales} = \frac{\text{Contribution}}{\text{P/V ratio}} = \frac{5,00,000}{50} \times 100 = \text{Rs.} 10,00,000$$

Try yourself:-

1. Sales Rs. 6,00,000, P/V ratio 25%, Profit Rs. 50,000 calculate contribution and also fixed cost.

(Ans: C=1,50,000, FC = 1,00,000)

P/V ratio can be improved by:

- Increasing the selling price:
- Reducing variable cost or
- Concentrating on the most profitable product mix.

Prob: 3

Sales Rs. 2,00,000

Variable cost:-

Direct Material Rs. 60,000

Direct Labour Rs. 40,000

Variable overheads Rs. 20,000

Fixed cost Rs. 40,000

- Calculate: P/V ratio
- Sales to earn a profit of Rs. 80,000 and
- Profit at a sale of Rs. 4,00,000

Sol-

Contribution = S-V

$$= 2,00,000 - 1,20,000 = 80,000$$

a) $\text{P/V ratio} = \frac{C}{S} \times 100 = \frac{80,000}{2,00,000} \times 100 = 40\%$

b) Sales to earn a profit of Rs. 80,000 = $\frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V ratio}}$
 $= \frac{40,000 + 80,000}{40} \times 100 = \text{Rs.} 3,00,000$

c) Profit at a sale of Rs. 4,00,000 =

$$\text{Contribution at this sale} = \text{Sales} \times \text{P/V ratio} = 4,00,000 \times \frac{40}{100} = 1,60,000$$

$$\text{Profit} = C - \text{Fixed cost} = 1,60,000 - 40,000 = 1,20,000$$

Prob:4

During a period 1000 units are produced and sold at Rs. 100. Variable cost per unit is Rs. 50 and fixed cost Rs. 20,000 for the period.

Calculate:

1. P/V ratio
2. Profit at a sale of 2,000 units.
3. Number of units to be sold to earn a profit of Rs. 1,60,000.
4. What will be new P/V ratio if selling price is reduced by Rs. 20.
5. Calculate the number of units to be sold to earn a profit of Rs. 60,000 at reduced selling price.

Sol-4

Contribution Statement

	Total	P.u
Sales: 1000x100	1,00,000	100
Less variable cost=1000x50	50,000	50
<hr/>		
Contribution	50,000	50
Less fixed cost	20,000	=====
<hr/>		
Profit	30,000	=====

1. P/V ratio $= \frac{C}{S} \times 100 = \frac{50,000}{1,00,000} \times 100 = 50\%$

2. Profit at a sale of 2,000 units:-
 Contribution for 2000 units = 2000 x 50 = 1,00,000
 Less fixed cost 20,000

 Profit = 80,000

3. Units to be sold to earn a profit of Rs. 1,60,000
 The formula for this is $= \frac{\text{Fixed cost} + \text{Desired profit}}{\text{Contribution per unit}} = \frac{20,000 + 1,60,000}{50}$
 $= 3,600 \text{ units}$

Or

Sales amount to earn profit of Rs. 1,60,000 $= \frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V ratio}}$
 $= \frac{20,000 + 1,60,000}{50} \times 100 = \text{Rs. } 3,60,000$

\therefore No. of units to earn that profit $= \frac{\text{Sales in Rupees}}{\text{Selling price p.u}} = \frac{3,60,000}{100}$

School Of Distance Education

4. New P/V ratio when the selling price is reduced by Rs. 20

$$\begin{aligned}\text{New SP} &= 100 - 20 = 80 \\ \text{Contribution} &= S - V = 80 - 50 = 30 \\ \therefore \text{P/V ratio} &= \frac{C}{S} \times 100 = \frac{30}{80} \times 100 = 37.50\%\end{aligned}$$

5. Number of units to be sold to earn a profit of Rs.60,000/- at reduced selling price:

$$\begin{aligned}&= \frac{\text{Fixed cost} + \text{Desired profit}}{\text{New Contribution p.u.}} = \frac{20,000 + 60,000}{80 - 50} \\ &= \frac{80,000}{30} = 2,667 \text{ units}\end{aligned}$$

How to calculate P/V ratio when data for two periods are given:-

$$\text{P/V ratio} = (\text{Change in Profit} \div \text{Change in sales}) \times 100$$

$$\text{Or } (\text{Change in Contribution} \div \text{Change in sales}) \times 100$$

Prob:-

The data for two successive periods are given:-

	2013	2014
Sales (Rs.)	40,00,000	5,00,000
Profit (Rs.)	50,000	1,00,000

Calculate:-

- P/V ratio
- Profit at a sale of Rs. 7,00,000
- Sales to earn a profit of Rs. 75,000

Sol-

$$\text{a) P/V ratio} = \frac{\text{Change in profit}}{\text{Change in sales}} \times 100 = \frac{50,000}{1,00,000} \times 100 = 50\%$$

- b) Profit at a sale of Rs. 7,00,000:

At any level of sales, contribution will be = Sales x P/V ratio. Contribution – Fixed cost will be profit at that level.

\therefore Fixed cost has to be computed i.e.

$$\text{Contribution for Rs. 4,00,000 sales} = 4,00,000 \times 50\% = 2,00,000$$

$$\text{i.e. Rs. 2,00,000} = \text{Fixed cost} + \text{profit}$$

$$2,00,000 = \text{Fixed cost} + 50,000$$

$$\therefore \text{Fixed cost} = 2,00,000 - 50,000 = 1,50,000$$

Fixed cost at all levels will be same. (If not stated other wise)

Hence profit at a sale of Rs. 7,00,000

$$\text{Contribution} = 7,00,000 \times \frac{50}{100} = 3,50,000$$

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$$\begin{aligned}\text{Profit} &= 3,50,000 - \text{fixed cost} \\ &= 3,50,000 - 1,50,000 = \text{Rs. } 2,00,000\end{aligned}$$

$$\begin{aligned}\text{c) Sales to earn a profit of Rs. } 75,000 &= \frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V ratio}} \\ &= 1,50,000 + 75,000 \div 50\% = 4,50,000\end{aligned}$$

Try yourself:

1. Data for the two years are given as:-

Year	Sales (Rs.)	Total Cost (Rs)	
2014	2,00,000	1,40,000	2015
	3,00,000	1,90,000	

Calculate:

- a) P/V ratio
- b) Fixed cost
- c) Profit at a sale of Rs. 4,00,000
- d) Sales to earn a profit of Rs. 1,20,000

(Ans) a) 50% b) Rs. 40,000 c) Rs. 1,60,000 d) Rs. 3,20,000

**PART B: COST VOLUME PROFIT ANALYSIS
(C.V. P ANALYSIS)**

C.V.P analysis refers to the study of the relationship between cost, volume of sales and profit. It is the analysis of relationship between variations in cost with variations in volume of production as these are inter-related. It helps the management in profit planning, cost control and decision making regarding:

1. Sales required to earn a desired amount of profit.
2. Sales to be made to break-even.
3. To make or buy a product or component.
4. Selection of most profitable product mix.
5. Exploration of foreign market at a lower rate etc.

Break-Even Analysis

You have already seen what a Break-Even-Point is. It is the volume of sale at which the total sales equals the total cost, there is neither profit nor loss at this level i.e. Sales-Variable cost = Fixed cost. Break-Even Analysis is a method of C.V.P Analysis. It is used in two senses:-

1. Narrow sense:- It refers to the no profit no loss point i.e. B.E.P.
2. Broad sense: It refers to the study of relationship of cost, volume and profit at different levels of activity.

The assumptions of marginal costing are applicable in B.E. Analysis too. Break even point can be expressed in units or sales value. It can be calculated by:

a) Algebraic method or b) Graphic method.

A) Algebraic method of computing BEP:-

$$\begin{aligned}
 1. \quad \text{BEP in (Rs.)} &= \frac{\text{Fixed cost}}{\text{P/V ratio}} \text{ or } \frac{\text{Fixed cost} \times \text{sales}}{\text{Sales} - \text{variable cost}} \\
 2. \quad \text{BEP in units} &= \frac{\text{Fixed cost}}{\text{Contribution per unit}} \text{ or } \\
 &= \frac{F}{S - V} \text{ where} \\
 F &= \text{Total fixed cost} \\
 S &= \text{Selling price p.u.} \\
 V &= \text{Variable cost p.u.}
 \end{aligned}$$

Prob:1

Selling price p.u. Rs. 25, variable cost p.u. Rs. 15 Fixed cost Rs. 50,000. Units produced and sold 10,000. Calculate BEP in units and value.

Sol-

$$\begin{aligned}
 \text{BEP (Units)} &= F \div C_{pu} = 50,000 \div 10 = 5000 \text{ units.} \\
 &\text{Contribution per unit} = S - V = 25 - 15 = 10 \\
 \text{BEP (Value)} &= \frac{F \times S}{S - V} = \frac{50,000 \times 25}{25 - 15} = \frac{50,000 \times 25}{10} = \text{Rs. } 1,25,000 \\
 \text{or BEP (value)} &= \text{BEP in units} \times \text{selling price per unit} = 5,000 \times 25 \\
 &= \text{Rs. } 1,25,000
 \end{aligned}$$

$$\text{or BEP (value)} = \frac{\text{Fixed cost}}{\text{P/V ratio}}, \text{ P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{25 - 15}{25} \times 100 = 40\%$$

$$= \frac{50,000}{40} \times 100 = \text{Rs. } 1,25,000$$

(Try to understand the different ways to arrive the BEP, from the above)

Prob: 2

Fixed cost Rs. 50,000, variable cost p.u. Rs. 5, selling price per unit Rs. 10

1. Determine BEP
2. What is the sale price if BEP is 8,000 units
3. What is the BEP if sale price is reduced by 10%
4. What is the BEP if variable cost is 60%.

Sol-2

$$1. \quad \text{BEP} = \frac{F}{C.p.u} = \frac{50,000}{10-5} = 10,000 \times 10 = 1,00,000 \text{ (Rs.)}$$

2. Sales price when BEP is 8000 units:

At BEP selling price = Variable cost + fixed cost

$$\text{Variable cost p.u} = 5$$

$$\text{Fixed cost p.u} = \frac{50,000}{8,000}$$

$$= 5 + \frac{50,000}{8,000} = 5 + 6.25 = 11.25$$

∴ If BEP is 8,000 units, the selling price p.u will be Rs. 11.25

3. BEP if sales price is reduced by 10%:-

$$\text{New selling price} = 10 - 10\% \text{ of } 10 = 10 - 1 = 9.00$$

$$\begin{aligned} \therefore \text{BEP} &= \frac{\text{Fixed cost}}{\text{Contribution p.u}} = \frac{50,000}{9-5} = \frac{50,000}{4} = 12,500 \text{ units} \quad \therefore \text{BEP in Rs.} \\ &= 12,500 \times \text{Rs. } 9 = \text{Rs. } 1,12,500 \end{aligned}$$

4. BEP if variable cost is 60%:-

In this case variable cost is, 60% of sales price.

$$\therefore \text{VC} = 60\% \text{ of } 10 = \text{Rs. } 6.00 \text{ p.u}$$

$$\text{BEP} = \frac{F}{C.p.u} = \frac{50,000}{10-6} = 12,500 \text{ units}$$

Prob:3

The fixed cost amounts to Rs. 50,000. Percentage of variable cost to sales = $66\frac{2}{3}\%$. If 100% capacity sales are Rs. 3,00,000, find out the BEP and the percentage sales at BEP. Determine also the profit at 80% capacity.

Sol-3

$$\text{BEP} = \frac{F}{P/V \text{ ratio}}$$

$$P/V \text{ ratio} = \frac{C}{S} \times 100;$$

$$C = S - V$$

Here variable cost is $66\frac{2}{3}\%$ of sales. Hence P/V ratio should be (i.e. $100 - 66\frac{2}{3}\%$.)

$$\therefore \text{BEP} = \frac{50,000}{33\frac{1}{3}} \times 100 = \text{Rs. } 1,50,000$$

Percentage of BE sales = $(1,50,000 \div 3,00,000) \times 100 = 50\%$

Profit at 80% capacity:-

Sales at 80% capacity = $3,00,000 \times \frac{80}{100} = 2,40,000$

$$\therefore \text{Contribution at 80\% capacity} = 240,000 \times \frac{33\frac{1}{3}}{100} = \text{Rs. } 80,000$$

$$\therefore \text{Profit at 80\% capacity} = C - F = 80,000 - 50,000 = 30,000$$

Margin of safety

Margin of safety is the excess of sales over break even sales. It indicates the strength of a business. A large margin of safety shows higher profitability of a concern. It is calculated as:

Margin of safety (M/S) = Sales - Break Even Sales.

or

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

Prob: 4

Sales 10,000 units at Rs. 50 pu. Variable cost Rs. 25pu. Fixed cost Rs. 1,00,000.

- A. Calculate 1) P/V ratio. 2) BEP. 3) Margin of safety & M/S ratio.
- B. Calculate 1) New P/V ratio 2) New BEP 3) Margin of safety and M/S ratio
- 4) Sales to earn the same profit as before after reducing the selling price by 10%
- 5) Number of units to be sold to get a profit of Rs. 60,000 at the reduced price.

Sol-4

Contribution Statement

Sales: $10,000 \times 50 = 5,00,000$

Less Variable cost $10,000 \times 25 = \underline{2,50,000}$

Contribution = $2,50,000$

Less fixed cost = $\underline{1,00,000}$

Profit = $\underline{1,50,000}$

A) 1. P/V ratio = $\frac{C}{S} \times 100 = \frac{2,50,000}{5,00,000} \times 100 = 50\%$

2. BEP = $\frac{F}{P/V \text{ ratio}} = \frac{1,00,000}{50} \times 100 = 2,00,000$

3. Margin of safety = Sales - BEP = $5,00,000 - 2,00,000 = 3,00,000$

Margin of safety ratio = $\frac{M/S \text{ Sales}}{\text{Sales}} \times 100 = \frac{3,00,000}{5,00,000} \times 100 = 60\%$

B) 1. New P/V ratio = (New Contribution pu ÷ New Selling Price pu) x 100

$$\text{New selling price} = 50 - 5 = 45$$

$$\text{New Contribution pu} = 45 - 25 = 20; \text{ New P/V ratio} = 20 \div 45 = 0.44 \text{ or } 44.44\%$$

$$2. \text{ New BEP} = \frac{F}{\text{P/V ratio}} = \frac{1,00,000}{44.44} \times 100 = 2,25,023.00$$

$$3. \text{ Margin of safety} = S - \text{BES} = 10,000 \times 45 - 2,25,023$$

$$= 4,50,000 - 2,25,023 = 2,24,977$$

$$\text{M/S} = \frac{2,24,977}{4,50,000} \times 100 = 49.99\%$$

4. Sales to earn a profit of Rs. 1,50,000 as before after reducing SP by 10%.

$$= \frac{\text{Fixed cost} + \text{Desired profit}}{\text{New P/V ratio}}$$

$$= \frac{1,00,000 + 1,50,000}{44.44} \times 100 = \text{Rs. } 5.62.556$$

5. Number of units to be sold to earn a profit of Rs. 60,000 at the reduced price:

$$\frac{\text{Fixed cost} + \text{Desired profit}}{\text{New contribution per unit}} = \frac{1,00,000 + 60,000}{45 - 25} = \frac{1,60,000}{20} = 8,000 \text{ units}$$

Try yourself:

I. A. fixed cost Rs. 40,000: variable cost 60% on sales: Determine BEP

B. Find out new BEP if-

1. Fixed costs increases by Rs. 10,000.
2. Variable cost increase by 15% on sales.
3. Sales price increased by 20%.
4. Variable cost reduces by 10%.

(Ans: Assume sales price Rs. 100: A. BEP = 1,00,000 B. 1) 1,25,000 2) 1,60,000 3) 80,000
4) 80,000

II. Sales (5,000 units @ Rs. 20 each) = Rs. 1,00,000, variable cost Rs. 60,000 fixed expenses Rs. 20,000.

Calculate a) P/V ratio. b) BEP c) Margin of safety d) If the selling price is reduced by 20% what extra units should be sold to maintain the same profit as before?

$$(\text{Ans: a) } 40\% \text{ b) Rs. } 50,000 \text{ c) Rs. } 50,000 \text{ d) } \frac{F + P}{\text{New C.p.u}} = \frac{20,000 + 20,000}{16 - 12} \text{ (Extra 5,000 units)}$$

should be sold to maintain the profit = 10,000 units - present 5,000 units)

III. The ratio of variable cost is 60%. BEP occurs at 50% capacity sales. Find the capacity sales (Total sales) when fixed costs are Rs. 2,00,000. Determine profit at 80%, and 100% sales.

[Ans: P/V ratio 40%. BEP = $F \div \text{P/V ratio} = 2,00,000 \div 40\% = 5,00,000$; Capacity sales = $5 \text{ lakhs} \div 50\% = \text{Rs. } 10 \text{ lakhs}$; profit at 80% capacity = 1,20,000, profit at 100% capacity Rs. 2,00,000]

B. Graphic method of Break Even Analysis or Break Even Chart: The BEP can be computed with the help of a graph. Break Even chart (BEC) is graphical representation of marginal costing. It shows the break-even point and the relationship between cost, volume and profit. The break-even point in the graph will be the point when the total cost line and sales line intersect. At this point the firm enjoys neither profit nor loss.

Construction of Break-Even Chart.

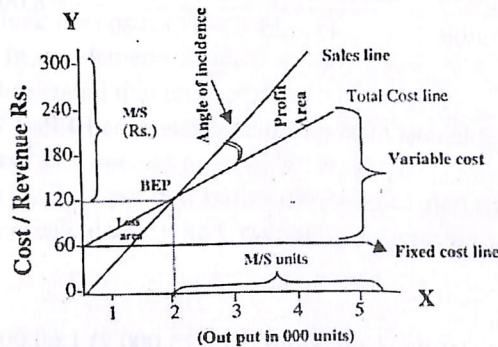
1. Draw 'X' axis to present sales in units or percentage capacity. Draw 'Y' axis to show costs and revenue in rupees.
2. Draw fixed cost line parallel to the 'X',-axis. Fixed cost remains fixed at all levels of output.
3. Variable cost line is to be plotted over the fixed cost line at different levels, it becomes the total cost line, when connected.
4. Sales to be plotted from zero level, splits the graph diagonally as the levels of activity improves. A line joining these plotted points indicates sales line.
5. The point where sales line cuts the total cost line is the BEP.
6. A perpendicular may be drawn from the BEP to the x-axis to find the break- even units. Similarly a perpendicular to the 'Y'-axis will show the break- even sales in rupees.
7. The area below the BEP is loss area and above it is profit area.

Prob: Draw a break-even chart.

Sales: 5000 units @ Rs. 60 p.u variable cost Rs. 30 p.u. fixed cost Rs. 60,000.

Sol-

Break Even Chart



Break-even chart shows the BEP at 2000 units on the 'X' axis and Rs. 1,20,000 on the 'Y' axis. Margin of safety in units 3,000, M/S in Rs. 1,80,000. Variable cost, sales revenue, fixed cost, and total cost at each level of activity are shown below:

Out put units	Variable cost per unit Rs.	Total Variable cost Rs.	Fixed cost Rs.	Total cost Rs.	Selling price unit Rs.	Total sales Rs.
0	-	-	60,000	60,000	-	-
1,000	30	30,000	60,000	90,000	60	60,000
2,000	30	60,000	60,000	1,20,000	60	1,20,000
3,000	30	90,000	60,000	1,50,000	60	1,80,000
4,000	30	1,20,000	60,000	1,80,000	60	2,40,000
5,000	30	1,50,000	60,000	2,10,000	60	3,00,000

Note: It is better to follow same scaling for X-axis and Y-axis. For eg: 'X' axis: 1cm=1,000 units; 'Y' axis: 1 cm = sales revenue of 1,000 units, i.e., Rs 60,000.

It can be seen from the table that at a production of 2000 units the total cost is Rs. 1,20,000. At this level, the sales revenue is also Rs. 1,20,000. i.e., Sales = Total Cost. This is the BEP.

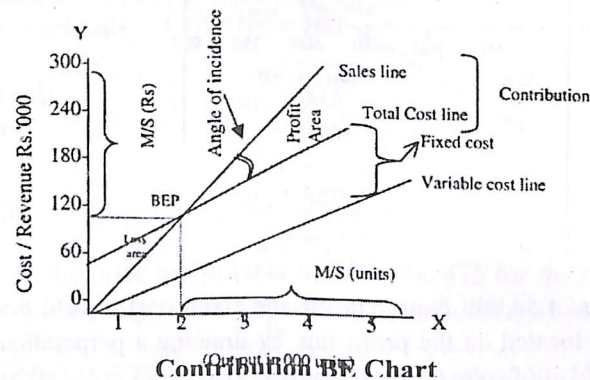
Angle of incidence: It is the angle between sales line and total cost line formed at the BEP. It indicates the profit earning capacity of a firm. A large angle of incidence reflects a high rate of profit and vice versa. A large angle with a high margin of safety shows the most favourable position.

Types of Break Even chart

Apart from the simple break even charts, there are other forms of BEC, such as contribution BEC, cash BEC, Control BEC, Analytical BEC etc.

Contribution BEC:- Under this method the variable cost line is drawn first. Fixed cost line is drawn over and parallel to the variable cost line, then becoming the total cost line. Sales line is drawn as usual and the difference between sales and variable cost line is seen together as contribution.

Eg: The above example can be used to draw a contribution BEC as follows



Cash break chart: This chart shows the point at which the cash inflows from sales will be equal to the costs requiring cash payments. It considers only the costs involving cash payments. Depreciation, written off items etc. will not be included in the fixed cost.

Control BEC: It shows the actual figures as well as budgeted figures. It helps to compare and study the deviations in cost, revenue etc. There will be two lines for each item in the graph for which the actual and budget differs.

Analytical BEC: This chart analyses the elements of variable costs such as direct material, direct labour, factory Overheads etc. Also shows the appropriation of profit.

Try yourself:

Draw a simple Break-even chart:

Plant capacity: 1,60,000 units, fixed cost Rs. 4,00,000 variable cost Rs. 5 per unit, selling prices Rs. 10 per unit.

PROFIT VOLUME GRAPH (P/V Graph)

It is a simplified form of break even chart which shows the relationship of profit to volume of sales. Profit or loss at different levels of sales can be seen directly from the profit graph (P/V graph)

Construction of a P/V Graph

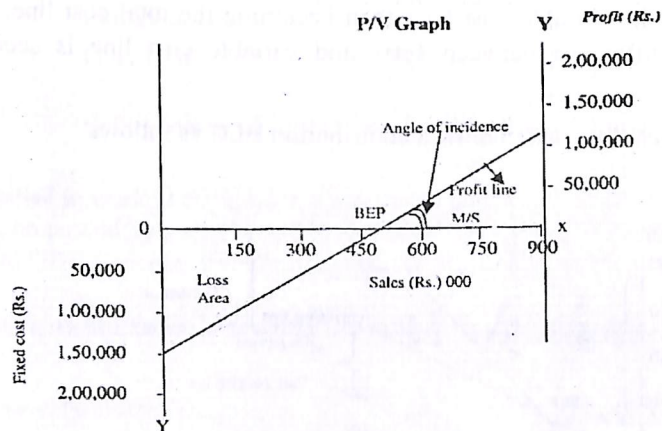
1. Sales in volume or value are presented on the X-axis.
2. Profit-above the X-axis and fixed cost below X-axis, on Y-axis.
3. Profits and losses at different levels are plotted and the points joined and where this line cuts the sales line is the BEP.

Eg:-

Draw a P/V graph from the following:

Units produced: 60,000 units, selling price p.u Rs. 15, variable cost pu Rs. 10; Fixed cost Rs. 1,50,000.

Sol-



BEP = 30,000 units or Rs. 4,50,000 Note: Profit and fixed cost should be on a similar scaling. Profit at any level can be located on the profit line by drawing a perpendicular from that level of sales to the profit line.

Try yourself:-

Budgeted output 8,000 units, fixed cost Rs. 4,00,000 selling price Rs. 200 pu. variable cost Rs. 100 pu.

Draw a P/V graph and mark the BEP.

Show also the new BEP, if the selling price pu. is reduced to Rs. 180 pu.

UNIT – EIGHT

MANAGERIAL APPLICATION OF CVP ANALYSIS

Marginal costing is an important tool for managerial decision-making. Some of the problems for managerial solutions are:

a) **Profit Planning:** Marginal costing helps to plan the future operations with the help of contribution, to maximize profit or maintain a desired level of profit. Change in sales price, variable cost and product mix affects the profitability of a firm.

Prob:

KAMCO Ltd. Manufactures and sells 10,000 machines at a price of Rs. 500 each

The cost structure of a machine is as follows:-

Materials	100
Labour	50
Variable overheads	25

Marginal cost	175
Fixed overheads	200

Total cost	375
Profit	125

Selling	500
	=====

Due to heavy competition, the price has to be reduced to Rs. 425 for the next year. Assuming no change in costs, state the number of machines to be sold to maintain the total profit enjoyed now.

Sol-

Present total profit = $10,000 \times 125 = 12,50,000$; Fixed Cost = $10,000 \times 200 = 20,00,000$

New contribution per unit = New selling price – Variable cost = $425 - 175 = 250$

∴ No. of units to be sold to

$$\begin{aligned} \text{Maintain the present profit} &= \frac{\text{Fixed cost} + \text{Desired profit}}{\text{Contribution Per unit}} \\ &= \frac{20,00,000 + 12,50,000}{250} = 13,000 \text{ units} \end{aligned}$$

It shows that, by selling 13,000 units @ Rs. 425 p.u. the company can earn the present profit of Rs. 12,50,000.

b) **Pricing Decisions:** Under normal circumstances, the prices should be fixed at total cost plus a desired margin of profit. Under special circumstances, products will have to be sold at a price below the total cost, or at marginal cost or even below the marginal cost. Marginal costing technique helps the management in fixing the selling price at different market situations.

Prob:

A toy manufacturer produces 30,000 toys at 60% of the installed capacity and sells it @ Rs.30/- per toy, earning a profit of Rs. 6 per unit.

His cost structure is:-

Direct Material	Rs. 8 per unit
Direct Labour	Rs. 2 pu.
Works overhead	Rs. 12 pu.(50% fixed)
Selling overhead	Rs. 2 pu.(25% varying)

During the current year he desires to produce the same number but expects that:

- His fixed charges will increase by 10%
- Direct labour rates will increase by 20%
- Rates of material will rise by 5%
- Selling price will remain the same.

Under these circumstances he obtains an order for further 20% of the capacity. What minimum price will you recommend for accepting the order to give the manufacturer an over all profit of Rs. 1,80,000

Soln.

Marginal cost statement for current year

	P.U. Rs.	Total Rs.
Sales (30,000 Units	30.00	9,00,000
Less Marginal cost:-		
Material: 8+5% increase	8.40	
Labour 2+20% increase	2.40	
Variable works: 50% of 12	6.00	
Variable selling: 25% of 2	0.50	
	<u>17.30</u>	5,19,000
Contribution = (S-V)	12.70	3,81,000
Less fixed works overhead:	<u>1,98,000.00</u>	
30,000x6=1,80,000+10% increase 18,000		
Fixed selling overhead:	49,500.00	
30,000x1.5= 45,000		2,47,500
+10% increase 4,500		
Profit		<u><u>1,33,500</u></u>

The current year profit will be Rs. 1,33,500. Over all profit planned: 1,80,000

∴ Minimum price for the special order of 20% capacity:-

$$\text{No. of units at 20\% capacity} = \frac{30,000}{60} \times 20 = 10,000 \text{ toys}$$

Additional profit to be earned out of 10,000 toys

$$= 1,80,000 - 1,33,500 = 46,500$$

Minimum price to be charged to earn this profit:-

Variable cost for 10,000 toys =	10,000x17.30 =	1,73,000
Profit to be earned	=	<u>46,500</u>
Sales values of 10,000 toys	=	2,19,500
∴ Minimum selling price per toy =	$\frac{2,19,500}{10,000}$	= Rs.21.95

No additional fixed cost will be incurred for the production of this special order as it is within the existing capacity of the plant. At present the plant is utilizing only 60% of its capacity.

Note:- A product may be sold at a price below the marginal cost in special cases such as:-

1. When a new product is launched in the market.
2. When new markets are explored in foreign countries.
3. To popularize a product.
4. To eliminate a weaker competitor from the market.
5. To dispose off perishable products and surplus stock.
6. To avoid retrenchment of labour and keep the plant in the running condition.
7. When the sale of one product will push up the sale of a joint product.

c) Make or buy decision: Marginal costing helps to determine whether a product or a component should be produced in the factory or bought from outside. While deciding to 'make or buy', the variable cost of manufacturing it should be compared with the price at which it is available outside. It is advisable to produce it if the marginal cost is less than its purchase price. Similarly it will be better to buy it if the purchase price is less than the variable cost of producing it.

Prob:

Ashok Ltd. finds that while the cost of making a component No. X5 in its own workshop is Rs. 8 each, the same is available in the market at Rs. 6.50. Give your suggestions whether to make or buy this component. Give also your views incase the supplier reduces the price from 6.50 to 5.50. The cost data are:

Materials	3.00
Direct Labour	2.00
Other variable exp.	1.00
Depreciation and other fixed exp.	2.00
	<u>8.00</u>

Sol-

To take a decision, the variable cost can be compared with the purchase price; (Fixed cost is not considered as it will be incurred in any case)

Materials	3.00
Direct Labour	2.00
Other variable exp.	1.00
	<u>6.00</u>

School Of Distance Education

Decision:-

1. The marginal cost per unit when produced in the factory: Rs. 6.00, purchase price from the market Rs. 6.50. As the marginal cost is less than the purchase price, it should be produced in the factory.

2. If the supplier reduces the price from 6.50 to Rs. 5.50: It is better to buy the component as there is a saving of 50 paise per unit.

d) **Selection of a suitable sales mix:** When a firm produces more than one product, the most profitable product mix has to be selected. Marginal costing technique helps to select the most profitable sales mix – i.e., the mix that gives maximum contribution.

Prob: The cost records of Alcos Ltd. Shows the following:

	Product X	Product Y
Direct Material	25.00	30.00
Direct Wages	15.00	15.00
Selling price	75.00	125.00

Variable overheads: 100% of direct wages, fixed overheads Rs. 10,000 per annum.

Prepare a contribution statement and recommend which of the following sales mix should be adopted.

- 450 units of X and 300 units of Y
- 900 units of X only
- 600 units of Y only
- 600 units of X and 200 units of Y

Soln.

Contribution Statement

	Product X	Product Y
Selling price (Rs.)	75.00	125.00
Less Marginal Cost:-		
Direct material	25.00	30.00
Direct wages	15.00	15.00
Variable O/H	15.00	15.00
Contribution per unit	20.00	65.00

- 450 units of X and 300 units of Y:

Contribution for 450 units of X	450x20	9,000.00
Contribution for 300 units of Y	300x65	19,500.00
		28,500.00
Less fixed Expenses		10,000.00
Profit		18,500.00

- 900 units of X only:-

Contribution for 900 units of X	900x20	18,000.00
Less fixed expenses		10,000.00
Profit		8,000.00

- 600 units of Y only:-

Contribution from 600 units of Y	600x65	39,000.00
Less fixed expenses		10,000.00
		29,000.00

4. 600 units of X and 200 units of Y:-

Contribution from 600 units of X	600x20	12,000.00
Contribution from 200 units of Y	200x65	13,000.00
Less fixed expenses		25,000.00
Profit		10,000.00
		15,000.00

The sales of 600 units of Y gives maximum profit and hence recommended.

e) **Key factor or limiting factor, principal budget factor, critical factor or governing factor:-**

A key factor is one that limits the volume of production and profitability of a concern for eg: shortage of material, labour, capital, plant capacity or market. Any one of these may act as limiting factor. When limiting factor is in operation, contribution per unit of limiting factor should be the criteria to assess the profitability of a product line.

$$\text{Profitability} = \frac{\text{Contribution p.u}}{\text{Limiting factor p.u}}$$

Prob:

Show which product is more profitable from the following data

	Product A Cost per unit	Product B Cost per unit
Materials	5.00	5.00
Labour A 6 hrs @ Rs.0.50	3.00	
B 3 hrs @ Rs.0.50		1.50
Overheads fixed-50% of labour	1.50	0.75
Variable O/H	1.50	1.50
Total cost	11.00	8.75
Selling price	14.00	11.00
Profit	3.00	2.25

Total production for the month A = 600 units B = 600 units. Maximum capacity per month is 4,800 hrs.

Sol-

Here the limiting factor is the labour hours. Hence contribution per labour hour is to be calculated.

Contribution Statement

	Product A per Unit (Rs.)	Product B Per unit (Rs)
Selling price (Rs.)	14.00	11.00
Less variable cost:-		
Materials	5.00	5.00
Labour	3.00	1.50
Variable O/H	1.50	1.50
Contribution per unit	4.50	3.00
Labour hours required p.u	6 hrs	3 hrs.
∴ Contribution per hour	$\frac{4.50}{6} = 0.75$	$\frac{3.00}{3} = 1.00$

∴ Product B is more profitable as it has more contribution per hour.

If the maximum capacity is used to produce A:-

Contribution: 4,800 hrs x 0.75 contribution per hour = Rs. 3,600

If used for producing B:-

Contribution = 4,800 hours x Re. 1 contribution per hours = Rs. 4,800

It shows that product B is more profitable.

f) Level of activity planning: Marginal costing technique helps the management to plan the optimum level of activity- the level of activity, which gives the highest contribution, will be the optimum level.

Prob:

Tip Top Ltd., manufacturing plastic buckets is working at 40% capacity and produces 10,000 buckets per annum

Cost break-up for one bucket

Materials	Rs.100
Labour cost	Rs. 30
Over heads	Rs.50 (60% fixed)

Selling price	Rs. 200
	=====

If it is decided to work at 50%, the selling price falls by 3%. At 90% capacity, the selling price falls by 5% accompanied by a similar fall in the price of material. You are required to calculate the profit at 50% and 90% capacities and also calculate break even points for the capacity productions.

Sol-

Present capacity utilization = 40% = 10,000 buckets

∴ 50% capacity production = $\frac{10,000}{40} \times 50 = \underline{12,500 \text{ buckets}}$

∴ 90% capacity production = $\frac{10,000}{40} \times 90 = \underline{22,500 \text{ buckets}}$

BEP = Fixed cost ÷ Contribution per unit; F = 10,000 x 30 = Rs. 3,00,000

Contribution per unit = 200 - 150 = 50

BEP = 3,00,000 ÷ 50 = 6000 units

BEP = at 50% capacity:

S P = 200 - 3% = 200 - 6 = 194; C = 194 - 150 = 44

BEP = 3,00,000 ÷ 44 = 6818 buckets.

BEP at 90% capacity:

SP = 200 - 5% = 200 - 10 = 190; C = 190 - 145 = 45

BEP = 3,00,000 ÷ 45 = 6667 buckets

Profitability Statement

	At 50% Capacity 12,500 units		At 90% capacity 22,500 units	
	Per unit	Total	Per Unit	Total
Sales Price Rs.	194.00	24,25,000	190.00	42,75,000
Less variable costs:				
Materials	100.00	12,50,000	95.00	21,37,500
Wages	30.00	3,75,000	30.00	6,75,000
Variable (40% of 50)	20.00	2,50,000	20.00	4,50,000
Total variable cost	150.00	18,75,000	145.00	32,62,500
Contribution	44.00	5,50,000	45.00	10,12,500
Fixed over heads (30x10000)		3,00,000		3,00,000
Profit		<u>2,50,000</u>		<u>7,12,500</u>

g) Shut down decision:- Sometimes the management may be forced to shutdown the unit because of low demand for the product. There are some fixed costs, which are unavoidable even if the business is closed down. Such costs are known as shutdown cost. If operating losses are higher than the shut down costs, the firm should not continue its operation. Where the operating losses are equal to shut down costs, the point is known as shut down point.

h) Alternative Methods of Production:- Sometimes the management has to choose from among alternative methods of production, eg., machine work or hand work, or machine A or B etc. In such circumstances, marginal costing technique can be applied and the method which gives the highest contribution can be adopted keeping in view the limiting factor.

Prob. Product 'A' can be manufactured either by Machine X or Machine Y. Machine X can produce 50 units of 'A' per hour and Machine Y, 100 units per hour. Total machine hours available are 2000 hours per annum. Taking into account following cost data, determine the profitable method of manufacture:

	Machine X (Rs) p.u.	Machine Y (Rs) p.u.
Direct material	8	10
Direct wages	12	12
Variable overheads	4	4
Fixed overheads	5	5
	29	31
Selling Price	30	30

Soln.

Profitability Statement

	Machine X (Rs) p.u.	Machine Y (Rs) p.u.
Selling Price	30	30
Less: Direct Material	8	10
Direct wages	12	12
Variable overhead	4	4
Contribution per unit	6	4

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Output per hour	50 units	100 units
Contribution per hour	Rs. 300	Rs. 400
Total Machine Hrs per annum	2000	2000
Total Contribution	Rs. 6,00,000	Rs. 8,00,000
Machine Y is more profitable		

i) Accepting Special orders, Bulk orders, Export orders and Exploring New Markets:- Bulk orders, additional orders, export orders from foreign or new markets, may be accepted at a price below the normal market price so as to utilize the idle capacity. Such orders are received usually asking for a price below the market price and hence a decision is to be taken to accept or reject the order. The order may be accepted at any price above the marginal cost because the fixed costs have to be incurred even otherwise. Any contribution resulting from the additional sales would mean an additional profit. But care must be taken to see that accepting an order below the market price does not affect the normal selling price adversely.

Prob. A manufacturing company's product cost Rs.17 per unit and sold at Rs.20 per unit. Its normal production capacity is 50,000 units per annum and the budgeted costs at this level are:

Direct materials	3,00,000
Direct labour	2,00,000
Expenses: Fixed	2,50,000
Variable	1,00,000

Calculate the break-even sales volume.

There is a fall in the demand in local market and orders are expected for 35,000 units only. The sales manager has stated that an export order for an additional 10,000 units could be negotiated at a special price of Rs.14 per unit. He has also established that a second order of 4,000 modified units could be obtained at a special price of Rs.13 per unit. The modifications would reduce the cost of direct materials by Re.1 per unit but would increase the direct labour and variable expense by 25%. Make necessary calculations and prepare a statement showing the effect of sales manager's proposals.

Soln.

Marginal cost and contribution statement for existing sale of 50,000 units

Particulars	Perunit (Rs)	Total (Rs)	Perunit (Rs)	Total (Rs)
Sales (50000X20)			20	<u>10,00,000</u>
Less Variable cost:				
Direct Materials	6.00	3,00,000		
Direct Labour	4.00	2,00,000		
Variable expenses	<u>2.00</u>	<u>1,00,000</u>	<u>12</u>	<u>6,00,000</u>
Contribution			8	4,00,000
Less Fixed cost				<u>2,50,000</u>
Profit				<u>1,50,000</u>

Calculation of Break-even Sales volume:

BEP (units) = Fixed cost ÷ contribution per unit = 2,50,000 ÷ 8 = 31,250 units

BEP (Rs) = 31,250 x 20 = Rs. 6,25,000

Statement showing marginal cost and contribution of alternative proposals

Particulars	Estimated sales in domestic market		
Sales	35,000 units @ 20 =		7,00,000
--variable cost;			
D.Materials	35000 x 6 = 2,10,000		
D.Labour.	35000 x 4 = 1,40,000		
V.Expenses	35000 x 2 = 70,000		4,20,000
Contribution			2,80,000
Contribution: Export order-1	Contribution: order-2	Export	Total: Domestic + Export 1 and 2
Sales: 10000 x 14 = 1,40,000	4000 x 13 =	52,000	8,92,000
Less:			
D.mat. 10000 x 6 = 60,000	4000 x 5 = 20,000		
D.lab. 10000 x 4 = 40,000	4000 x 5 = 20,000		
V.exp. 10000 x 2 = 20,000	4000 x 2.5 = 10,000	50,000	5,90,000
Contribution = 20,000		2,000	3,02,000
Less Fixed cost			2,50,000
Profit			52,000

Advantages of Marginal costing

1. Effective tool for cost control- by classifying the costs into fixed and variable.
2. It is simple to understand and easy to operate.
3. There is no chance of over absorption or under absorption of overheads.
4. Helpful to management to managerial decision-making.
5. It facilitates the study of cost-volume-profit relationship.
6. Relative profitability of various products can be studied.
7. It helps in fixing selling prices, level of activity planning, deciding on alternative investment proposals, sales mixes etc.
8. Better presentation of information through graphs, charts etc.

Disadvantages of marginal costing

1. Difficulty in segregation of total costs into fixed and variable.
2. Assumptions like variable cost per unit remains fixed at all levels, fixed cost in total remains fixed at all levels etc. are most of the time unrealistic.
3. Elimination of fixed cost from the valuation of stock and work-in progress is illogical.
4. Time factor is completely ignored.
5. It does not provide any standard for the evaluation of performance.

Try yourself:

1. X co. Ltd has a P/V ratio of 40%. The marginal cost of product A is Rs. 30/- per unit. Determine the selling price.

(Ans: Variable cost ratio = 1 - P/V ratio = 60%; $SP = \frac{30}{60} \times 100 = \text{Rs.} 50$)

2. Plant A produces a product which costs Rs. 3 p.u. when produced in quantities of 10,000 units and Rs. 2.50 p.u when produced in quantities of 20,000 units. Find out fixed cost.

(Ans:- VC. P.u = $\frac{\text{Difference in Total cost}}{\text{Difference in units}} = \text{Rs.} 2 \text{ FC : } 10,000$)

3. The P/V ratio of a company is 40% and its margin of safety is 50%. Work out the net profit and the BEP if sales volume is Rs. 8,00,000.

(Ans: M/S 4,00,000; BEP = 4,00,000; Profit 1,60,000)

4. Company A & B, under the same management make and sell the same type of product. Their budgeted P/L A/c for the year ending 2002 are:-

	Company A		Company B	
Sales (Rs.)		3,00,000		3,00,000
Less variable cost	2,40,000		2,00,000	
Fixed cost	30,000	2,70,000	70,000	2,70,000
Profit		30,000		30,000

- Calculate the BEP for each company
- Calculate the sales at which each will make a profit of Rs. 10,000.
- State which company is likely to earn greater profits in conditions of
 - Heavy demand for the products.
 - Low demand for the products.

(Ans: a) BEP of Co.A: 1,50,000; Co. B = 2,10,000

b) Co.A = Rs. 2,00,000; Co. B = 2,40,000

c) M/S = Co.A = Rs. 1,50,000; Co. B Rs. 90,000

- heavy demand = Co. B is better as its P/V ratio is high
- Low demand = Co.A is better BEP earlier, M/S more)

5. Mr. X has Rs. 2,00,000 investment in his business firm. He wants a 15% return on his money. His variable cost of operating is 60% of sales, fixed costs are Rs. 80,000 per year.

Answer the following questions:-

- What sales volume must be obtained to Break even?
- What sales volume will bring 15% return on investment?
- He expects that even if he closes the business, he would incur Rs. 25,000 as expenses per year. At what sales would he be better off by closing his business up?

(Ans: P/V ratio = 40%, return expected = Rs. 30,000)

a) BEP = Rs. 2,00,000; b) $\frac{F + P}{P/V \text{ ratio}} = \text{Rs.} 2,75,000$

c) Sales level at which it is better to lock up business, fixed cost when looked up 25,000.

Sales to recover such fixed cost $\frac{25,000}{40} \times 100 = 62,500$

If sales fall below Rs. 62,500, it is better to lock up).

(Try to solve some more problems from texts).

UNIT-NINE

COST OF CAPITAL

Introduction

The cost of funds used for financing a business can be termed as cost of capital. Cost of capital depends on the mode of financing used – it refers to the cost of equity if the business is financed solely through equity or to the cost of debt if it is financed solely through debt. Many companies use a combination of debt and equity to finance their businesses, and for such companies, their overall cost of capital is derived from a weighted average of all capital sources, widely known as the weighted average cost of capital (WACC). Since the cost of capital represents a hurdle rate that a company must overcome before it can generate value, it is extensively used in the capital budgeting process to determine whether the company should proceed with a project or not.

The cost of capital is very important in financial decision making. It is used as a measuring scale for an investment proposal and in various methods of capital budgeting. It is the important in formation of capital structure. It is used to evaluate the financial performance and the decision in capital budgeting and the other alternative source of financing.

Definition

“The cost of capital is the minimum required rate of return, the hurdle or target rate or cut off or the financial standard of performance of a project-“ G.C. Philippatos

“The cost of capital is the minimum required rate of earning or the cut off rate for capital expenditures”- Solomon Ezra

“It is a cut off rate for the allocation of capital to investments or projects. It is the rate of return on a project that will leave unchanged the market price of the stock”- James Van Horne

Concept of Cost of Capital

The cost of various capital sources varies from company to company, and depends on factors such as its operating history, profitability, credit worthiness, etc. In general, newer enterprises with limited operating histories will have higher costs of capital than established companies with a solid track record, since lenders and investors will demand a higher risk premium for the former.

Importance of the concept

1. Design the corporate financial structure.
2. Allocation of capital.
3. Helpful in evaluation of expansion project based on Net present value, benefits cost ratio and internal rate of return.

Every company has to chart out its game plan for financing the business at an early stage. The cost of capital thus becomes a critical factor in deciding which financing track to follow – debt, equity or a combination of the two. Early-stage companies seldom have sizable assets to pledge as collateral for debt financing, so equity financing becomes the default mode of funding for most of them.

Specific Cost and Weighted Average Cost of Capital

The capital structure of a company comprises of various sources of funds such as debt capital, preference share capital, equity share capital, retained earnings, etc. The cost of debt is merely the interest rate paid by the company on such debt. Since interest expense is tax-deductible, the after-tax cost of debt is calculated as: Interest offered on debt capital $\times (1 - T)$ where T is the company's marginal tax rate.

The cost of preference share capital is the rate of dividend offered on such shares. Like interest on debt funds, there is no tax implication for dividend payment. The cost of equity is more

complicated, since the rate of return demanded by equity investors is not as clearly defined as it is by lenders.

The firm's overall cost of capital is based on the weighted average of these costs. For example, consider an enterprise with a capital structure consisting of 70% equity and 30% debt; its cost of equity is 10% and after-tax cost of debt is 6%. Therefore, its WACC would be $(0.7 \times 10\%) + (0.3 \times 6\%) = 8.8\%$. This is the cost of capital that would be used to discount future cash flows from potential projects and other opportunities to estimate their Net Present Value (NPV) and ability to generate value.

Companies strive to attain the optimal financing mix, based on the cost of capital for various funding sources. Debt financing has the advantage of being more tax-efficient than equity financing, since interest expenses are tax-deductible. However, too much debt can result in dangerously high leverage, resulting in higher interest rates sought by lenders to offset the higher default risk.

COMPUTATION OF COST OF EACH SPECIFIC SOURCE OF CAPITAL:

To calculate the overall cost of capital, we have to compute the specific cost of various sources of finances employed by the company. Generally there may be four sources- debt funds, equity share capital, preference share capital and retained earnings. We shall look into the computation of cost of these individual sources of financing in the following pages.

a) Cost of debt

Debt funds include debentures, bonds, loans, borrowings and other creditorship securities. The debenture may be redeemable or irredeemable, issued at par, premium or discount. The cost of debenture is defined in terms of required rate of return that the debt financial investment must yield to prevent damages to the stockholders position. This is the contractual interest rate adjusted further for the tax liability of the firm. Normally the cost of debenture is denoted as K_d

Cost of debt issued at par

$$K_d = (1-T) R$$

Where, T = Tax rate

R = Contracted interest rate

Cost of debt issued at premium or discount

$$K_d = I/NP (1-T)$$

Where, I = Interest on debt, NP = Net proceeds, T = Company tax rate.

$$\text{Before tax } K_d = \frac{I + (P - NP)/n}{(P + NP)/2} \times 100$$

Where, I = Interest on debt, P = Par value of debentures, NP = Net proceeds of debentures, n = number of years to maturity

After tax K_d = before tax K_d (1-tax)

Eg. A firm issues debentures of Rs. 1,00,000 and realizes Rs. 98,000 after allowing 2% commission to brokers. The debentures carry an interest rate of 10% and due for maturity at the end of the 10th year. Calculate the effective cost of debt before tax and after tax, if the tax rate is 40%.

$$\begin{aligned} K_d (\text{before tax}) &= \frac{I + (P - NP)/n}{(P + NP)/2} \times 100 = \frac{10,000 + (1,00,000 - 98,000)/10}{(1,00,000 + 98,000)/2} \times 100 \\ &= \frac{10,000 + 200}{99,000} \times 100 = 10.30\% \end{aligned}$$

$$K_d (\text{after tax}) = K_d (\text{before tax}) \times (1-T) = 10.3(1-0.4) = 6.18\%$$

b) Cost of Preference Share capital:

The fixed percentage of dividend offered is assumed to be the cost of preference share capital.

$K_p = PD/NP$, where PD = Preference dividend, NP = Net proceeds of preference shares. The same formula can be applied to calculate cost of preference capital when issued at premium or at discount.

Eg. A company raises preference share capital of Rs. 1,00,000 by issue of 10% preference shares of Rs. 10 each. Calculate the cost of preference capital when they are issued at- a) 10% premium and b) 10% discount.

Sol. A) When preference shares are issued at 10% premium:

$$K_p = \frac{PD}{NP} \times 100 = \frac{10,000}{110,000} \times 100 = 9.09\%$$

B) When preference shares are issued at 10% discount:

$$K_p = \frac{PD}{NP} \times 100 = \frac{10,000}{90,000} \times 100 = 11.11\%$$

Cost of Redeemable Preference shares: In case of redeemable preference shares, the cost of capital is the discount rate that equals the net proceeds of sale of preference shares with the present value of future dividends and principal repayments. It is calculated almost like cost of redeemable debentures, except for the tax adjustments..

$$K_p = \frac{PD + (P - NP)/n}{(P + NP)/2} \times 100$$

Where,

PD = Preference dividend, P = Par value of preference shares, NP = Net proceeds,

n = term of the share.

Eg. A firm issues 10% redeemable preference shares of Rs. 1,00,000, redeemable at the end of the 10th year. The underwriting costs came to 2%. Calculate the effective cost of preference share capital.

$$\begin{aligned} K_p &= \frac{PD + (P - NP)/n}{(P + NP)/2} \times 100 = \frac{10,000 + (1,00,000 - 98,000)/10}{(1,00,000 + 98,000)/2} \times 100 \\ &= \frac{10,000 + 200}{99,000} \times 100 = 10.30\% \end{aligned}$$

Before tax and after tax cost of preference share will be same as preference dividend is not a tax deductible item like debenture interest.

c) Cost of Equity Share Capital :

It is the minimum rate of return a company should earn on its equity capital so as to keep the equity shareholders satisfied. Cost of equity share capital may be defined as the minimum rate of return that a firm must earn on the equity financed portion of an investment project in order to leave unchanged the market price of such shares. The four important approaches of calculating cost of equity are:

1. **Dividend/Price approach:** Under this approach, the investor arrives at the market price of an equity share by capitalizing the set of expected dividend payments. Cost of equity capital is "the discount rate that equates the present value of all expected future dividends per share with the net proceeds of the sale or current market price of a share." In other words, cost of equity will be that rate of expected dividends which will maintain the present market price of equity shares.

$K_e = D/MP$, where K_e = Cost of equity, D = Dividend per equity share,
 MP = Market Price per equity share. (for existing equity shares)

Or $K_e = D/NP$, NP = Net Proceeds per equity share (for fresh issue of equity shares)

Eg. A company offers for public subscription equity shares of Rs. 10 each at a premium of 10%. The company pays 5% of the issue price as underwriting commission. The rate of dividend expected by the equity shareholders is 20%. Calculate the cost of equity capital.

Will your cost of capital be different if it is to be calculated on the present market value of the equity shares, which is Rs. 15 per share?

Soln. Cost of new equity, $K_e = D/NP$

$D = 20\%$ of Rs. 10 = Rs. 2, $NP = 10 + 10\% - 5\% = 11 - 0.55 = 10.45$

$K_e = 2/10.45 = 0.19$ or 19%

Cost of existing equity = D/MP

$K_e = 2/15 = 0.133$ or 13.3%

2. Dividend price plus growth approach: ($\frac{\text{Dividend}}{\text{Price}} + \text{Growth approach}$)

In this case the cost of equity is determined on the basis of the expected dividend rate plus the rate of growth in dividend.

$K_e = (D/MP) + g$: for existing equity shares

Or $(D/NP) + g$: for fresh issue of equity shares.

Where, D = Dividend per share, MP = Market Price per share, NP = Net Proceeds per share,
 g = Growth rate in expected dividend.

Eg. The current market price of an equity share is Rs. 90. The current dividend per share is Rs. 4.50. In case the dividends are expected to grow at the rate of 7%, calculate the cost of equity capital.

Soln. $K_e = (D/MP) + g = 4.50/90 + 0.07 = 0.05 + 0.07 = 0.12$ or 12%

Prob. Calculate the cost of equity capital:-

Details of XLtd. : Each share is of Rs. 150, Underwriting cost per share Rs. 2, The company has a fixed dividend payout ratio. The expected dividend on the new shares amounts to Rs. 14.10 per share.

Following are the dividend paid by the company for the last five years:

Year	2011	2012	2013	2014	2015
DPS	10.50	11.00	12.50	12.75	13.40

DPS = Dividend Per Share.

Soln. Growth rate of dividend is to be calculated. During the last four years (and not five years, since dividends declared at the end of 2011 is compared with dividends at the end of 2015), the dividend declared by the company has increased from Rs. 10.5 to 13.4, giving a compound factor of 1.276 (ie., $13.4/10.5$). From compound value factor table it can be seen that Re. 1 would accumulate to 1.276 in 4 years at 6% interest. This means that growth rate of dividend is 6%. Thus, cost of equity will be calculated as:

$K_e = (D/NP) + g = (14.10/147) + 6\% = 9.6\% + 6\% = 15.6\%$

Net Proceeds = $150 - \text{underwriting cost per share @ } 2\% \text{ of } 150 = 150 - 3 = 147$

3. Earnings Price (E/P) Approach: Under this approach, it is the earnings per share (EPS) which determines the market price of the share. This is based on the assumption that the shareholders capitalize a stream of future earnings (as distinguished from dividends) in order to evaluate their shareholdings.

K_e = Earnings per share/Net Proceeds per share or EPS/NP

Eg. The capital employed by a company consists of 1,00,000 equity shares of Rs. 100 each. Its current earnings are Rs. 10 lakhs per annum. The company wants to raise additional funds of Rs. 25 lakhs by issuing new shares. Calculate the cost of equity capital.

Soln. $K_e = E/NP = 10/90 = 0.11$ or 11%

Where, E = EPS = Rs. 10,00,000/1,00,000 = Rs. 10

NP = Net Proceeds per share = Rs. 100—floatation cost @ 10% = 100 – 10 = Rs. 90

4. Realized Yield Approach: Under this method the cost of equity capital should be determined on the basis of return actually realized by the investors on their equity shares. The past records of dividend payment and actual capital appreciation in the value of the equity shares held by the shareholders are to be taken to compute the cost of equity capital. This method fairly good results in case of companies with stable dividends and growth records.

Eg. A purchased five shares in a company at a cost of Rs. 240 on January 1, 2011. He held them for 5 years and finally sold them in January, 2015 for Rs. 300. The amount of dividend received by him in each of these 5 years was as follows:

Years	2011	2012	2013	2014	2015
Dividend (Rs)	14.00	14.00	14.50	14.50	14.50

You are required to calculate the cost of equity capital.

Soln. In order to calculate cost of capital, it is necessary to calculate internal rate of return (IRR) through "trial and error" method. (This method has been explained in unit four on investment appraisal techniques). Let us see how it works:

Calculation of Present Value of Cash inflows in the form of Dividends and sale price

Year	Dividend (Rs)	Sale proceeds (Rs)	Discount Factor @ 10%	Present Value (Rs)
2011	14.00		0.909	12.70
2012	14.00		0.826	11.60
2013	14.50		0.751	10.90
2014	14.50		0.683	9.90
2015	14.50		0.621	9.00
2015		300	0.621	<u>186.30</u>
				240.40

The purchase price of the five shares on January 1, 2011 was Rs. 240. The present value of cash inflows as on January, 2011 amounts to Rs.240.40. Thus, at 10%, the present value of cash inflows over a period of 5 years is equal to the cash outflow in the year 2011. The cost of equity capital can, therefore, be taken as 10%.

d) Cost of Retained Earnings

The companies do not generally distribute the entire earnings by way of dividend among their shareholders. Some profits are retained by them for future expansion of the business. Many people feel that such retained earnings are absolutely cost free. This is not true because the amount retained by the company, if it had been distributed among the shareholders by way of dividend, would have given them some earning. The company has deprived the shareholders of this earning by retaining a

part of profit with it. Thus, the cost of retained earnings is the earning forgone by the shareholders. In other words, the opportunity cost of retained earnings may be taken as the cost of retained earnings.

The following adjustments are made for ascertaining the cost of retained earnings:

- 1) Income tax adjustment: The dividends receivable by the shareholders are subject to income tax. Hence, the dividends actually received by them are the amount of net dividend, i.e., gross dividend less income tax.
- 2) Brokerage cost adjustment: Usually the shareholders have to incur some brokerage cost for investing the dividends received

Thus, Cost of Retained Earnings (K_r) = $K_e (1-T) (1-B)$

Where, K_r = Cost of retained earnings K_e = Cost of equity share capital

B = Brokerage cost. T = Shareholders' marginal tax rate.

Eg. ABC Ltd. is earning a net profit of Rs. 50,000 per annum. The shareholders' required rate of return is 10%. It is expected that retained earnings, if distributed among the shareholders, can be invested by them in securities of similar type, carrying return of 10% per annum. It is further expected that the shareholders will have to incur 2% of the net dividends received by them as brokerage cost for making new investments. The shareholders of the company are in 30% tax bracket. Calculate the cost of retained earnings.

Soln. $(K_r) = K_e (1-T) (1-B)$ $= 10\% (1-0.30) (1-0.02)$
 $= 10\% \times 0.7 \times 0.98 = 6.86\%$

Thus, the cost of retained earnings is 6.86%, which is less than cost of equity, 10%. It is because of the personal tax and brokerage effect.

Weighted Average Cost of Capital (WACC)

After calculating the cost of each component of capital, the average cost of capital is generally calculated on the basis of weighted average method. This is also known as overall cost of capital.

The computation of the weighted average cost of capital (WACC) involves the following steps:

1. Calculation of the cost of each specific source of funds: It involves the determination of the cost of debt, equity capital, preference capital, retained earnings etc. as explained earlier.
2. Assigning weights to specific costs: This involves determination of the proportion of each source of funds in the total capital structure of the company.
3. Adding of the weighted cost of all sources of funds to get an overall weighted average cost of capital.

Eg. From the following capital structure of a company, calculate the overall cost of capital, using- a) book value weights and b) market value weights.

Source	Book value (Rs)	Market value (Rs)
Equity share capital (Rs. 10 shares)	45,000	90,000
Retained earnings	15,000	
Preference share capital	10,000	10,000
Debentures	30,000	30,000

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The after tax cost of different sources of finance is as under:

Equity share capital: 14%; Retained earnings: 13%; Preference share capital: 10% and Debentures; 5%.

Soln. Let us compute the overall cost of capital (WACC), considering both book value and market value as weights.

a) Computation of weighted average cost of capital (Book value Weights)

Source	Amount (Rs)	Proportion	After tax cost (in %)	Weighted cost (in %)
Equity sh.capital	45,000	0.45	14	6.30
Retained Earnings	15,000	0.15	13	1.95
Pref.share capital	10,000	0.10	10	1.00
Debentures	30,000	0.30	5	1.50

b) Weighted Average cost of capital (Market value weights):

Sources	Amount	Proportion	After tax cost	Weighted cost (in %)
Equity capital	90,000	0.692	14%	9.688
Pref. share capital	10,000	0.077	10%	0.770
Debentures	30,000	0.231	5%	<u>1.155</u>
				11.613

Weighted Average Cost of Capital (K_o) = 11.613%

Problems:

1. XYZ Company has following capital structure on 31 December,

11% Debenture	Rs. 5,00,000
10% Preference share	Rs. 1,00,000
4000 Equity share of Rs 100 each	Rs. <u>4,00,000</u>
Total	10,00,000

Equity shares are quoted at Rs 102 and it is expected that the company will declare a dividend of Rs 10 per share at the end of current year. The dividend is expected to grow at 10% for the next 5 years. The company tax rate is 50 %.

- (a) Calculate from the foregoing data the cost of equity capital and weighted average cost of capital.
- (b) Assuming the company can raise additional debenture of Rs 3 lakhs at 12%. Calculate revised weighted cost of capital, if the resultant changes are
 1. Increase in dividend rate from 10 to 12%
 2. Reduction in growth rate from 10 to 8 %
 3. Fall in market price of share from Rs 102 to Rs. 92.

Solution

a) Cost of equity = $(D/MP) + g$

$$K_e = (10/102) + 10\%$$

$$.09 + .10 = .19 \quad 19\%$$

b) Revised $K_e = (12/92) + 8\%$

$.130 + .8 = .21 \quad 21\%$

c) Cost of Debt (K_d) = $11(1 - 0.5) = 5.5\%$

d) K_d of additional debt = $12(1 - 0.5) = 6\%$

a) Statement of Weighted Average Cost of Capital

Sources	Amount Rs	After Tax	Weight	Weighted Cost
Equity share	4,00,000	.19	.400	.76
Preference share	1,00,000	.10	.100	.010
Debenture	<u>5,00,000</u>	.055	.500	.0275
	10,00,000			<u>.1135</u>

Weighted Average cost of capital = 11.35%

b) Statement of Weighted Average Cost of Capital (Revised)

Sources	Amount Rs	After Tax	Weight	Weighted Cost
Equity share	5,00,000	.21	.357	.0749
Preference share	1,00,000	.10	.71	.0071
Debenture (1)	5,00,000	.055	.357	.0196
Debenture (2)	<u>3,00,000</u>	0.60	.215	.0129
	14,00,000			<u>.1145</u>

Weighted Average cost of capital = 11.45%

Try yourself:

1. Mendex Ltd. issued 10% irredeemable preference shares of Rs. 100 each. Calculate the cost of preference share capital in each of the following cases:

a) When issued at 5% discount, b) When issued at 5% premium

(Ans. a) 10.53% b) 9.10%)

2. The current MP of the shares of A Ltd. is Rs. 95. The floatation costs are Rs. 5 per share. Dividend per share amounts to Rs. 4.50 and is expected to grow at a rate of 7%. Calculate the cost of equity share capital.

(Ans.: 12%)

3. Explain the concept of cost of capital as a device for establishing a cut off point of capital investment proposals.

4. Focus Ltd. has the following capital structure:

Equity Share Capital (Expected dividend 12%): Rs. 10,00,000

10% Preference Share Capital : Rs. 5,00,000

8% Loan : Rs. 15,00,000

You are required to calculate the weighted average cost of capital, before and after tax, assuming 50% as the rate of income tax.

(Ans.: before tax 9.66%, after tax 7.67%)

5. Following are the details regarding the capital structure of Samurai Ltd.

Type of capital	Book value	Market value	Specific cost(%)
Debentures	40,000	38,000	5
Pref. capital	10,000	11,000	8
Equity capital	60,000	1,20,000	13
Retained earnings	<u>20,000</u>		9
	<u>1,30,000</u>	1,69,000	

Determine the WACC using – a) book value as weight, and b) market value as weights. Do you think, there can be a situation where WACC would be the same irrespective of the weights used ?

(Ans.: a) 9.54% b) 10.17%. WACC would be the same irrespective of the weights in case the book value and the market value of the securities are the same)

Hint. Market value of equity shares and retained earnings is Rs. 1,20,000 against their book value of Rs. 80,000. On this basis the market value of retained earnings is Rs. 30,000 (ie., $20,000 \times 120,000/80,000$) and market value of equity capital is Rs. 90,000 (ie., $60,000 \times 1,20,000/80,000$)

UNIT-TEN
COST CONTROL

Introduction

Control of cost has become a major task of the management in the present day of competitive environment. Entrepreneurs have to face stiff competition from within and outside the country. Quality goods and services at minimum cost should be provided to survive and compete in the market. This can be achieved by eliminating wastage and inefficiency in different areas of operation. This needs proper planning and control of cost.

Definition

The Institute of Cost and Management Accountants, London defines cost control as “the regulation by executive action of the cost of operating an undertaking particularly where such action is guided by cost accounting”. The term ‘regulation’ and ‘executive action’ indicate conscious attempt of regulating the cost on the basis of predetermined ideas about what cost should be. It is only when costs are predetermined i.e. a system of standard costing is in operation, that cost control measures can give their best. Thus, cost control aims at reducing inefficiencies and wastages and setting up predetermined costs and in achieving them.

Cost Control Techniques

Following are some of the techniques which have become popular for ensuring cost control:

- a. Material control
- b. Labour control
- c. Overhead control
- d. Budgetary control
- e. Standard costing
- f. Control of capital expenditure
- g. Productivity ratio

Essentials for success of cost control

The following steps should be taken in an effective system of cost control:

- (1) For an effective system of cost control, the firm should have a definite plan of organization. Authority and responsibility of each executive should be clearly defined. Targets for performance of work as well as the cost to be incurred for the purpose should be laid down for each area of responsibility so that responsibility may be fixed for the deviation of actual costs from the predetermined costs.
- (2) Costs should be collected by each area of responsibility and reporting of efficiency or inefficiency displayed by each section should be prompt. Information delayed is information denied. If a considerable time elapses between happening of events and reporting, opportunity for taking appropriate action may be lost or some wrong decisions may be taken by management in the absence of information.
- (3) The report draws management’s attention to exceptionally good or bad performance, so that management by exception may be carried out effectively. The aim should be to bring to light the factor leading to increase in cost rather than to punish people to take the remedial action to improve the performance in future.
- (4) Good performance should be handsomely rewarded, so that workers may be motivated towards better performance.

Cost Reduction

Definition

The Institute of Cost and Management Accountants, London defines cost reduction as follows:

“Cost reduction is to be understood as the achievement of real and permanent reduction in the unit costs of goods manufactured or services without impairing their suitability for the use intended”.

The definition given above brings to light the following characteristics of cost reduction:

- (1) The reduction must be a real one in the course of manufacture or service rendered. Real cost reduction comes through greater productivity.
- (2) The reduction must be permanent one. It is short lived if it comes through reduction in the price of inputs such as material, labour etc. The reduction should be through improvement in the method of production from research work.
- (3) The reduction must not be at the cost of essential characteristics such as quality of the products or service rendered.

Thus, cost reduction must be genuine one and should aim at the elimination of wasteful elements in the methods of doing things. It should not be at the cost of quality.

Cost Control and Cost Reduction

Cost control and cost reduction are two efficient tools of management but their concepts and procedures are widely different. The main points of difference between the two are the following

- (1) Cost control aims at achieving the predetermined costs, whereas cost reduction aims at reduction of costs.
- (2) The process of cost control is to lay down a target, ascertain actual performance from the target and take corrective action. On the other hand, cost reduction is not concerned with maintenance of performance according to the predetermined standards.
- (3) Cost control seeks adherence to standard, whereas cost reduction is a challenge to the standard themselves; cost reduction assumes that there are chances of improvement in predetermined standards.
- (4) The aim of cost control is to see that actual cost do not exceed the predetermined cost, so it is preventive function. On the other hand, cost reduction is a corrective function because it challenges the predetermined cost and seek to improve the performance by reducing cost or increasing production.

Areas of Cost Reduction

1. Product Design:

Cost reduction begins with the improvement in the design of the product. Product design is the first step in the manufacturing of the product and the impact of cost reduction effected at this stage is felt throughout the manufacturing life of the product. An investigation into the possibilities of cost reduction should be made both when introducing new design and when making improvement in the existing design.

2. Factory organization and production methods

All efforts should be constantly made to reduce the cost by the adoption of new methods of organization and new product methods.

3. Factory layout

A cost reduction program should make a study of the factory layout to determine whether there is any scope of cost reduction by elimination of wastage of time, unnecessary efforts and loss of money due to useless movement and travel of work-in-progress.

4. Administration

There is ample scope of cost reduction in this area because cost reduction is a top management problem. Office should be recognized if there is scope of improvement in the efficiency of persons engaged in the office. Use of unnecessary forms should be avoided to save the cost of stationary and labour cost involved for compiling them. Efforts should be made to reduce the expenses on telephone, lighting and travelling but not at the cost of efficiency.

5. Marketing

The various activities which can be brought under the cost reduction program include market research, advertisement, packing, warehouse, distribution, after sales service etc.

6. Finance

With the increasing difficulty in procuring finance, management should eliminate useless investment. To be able to do so, it must critically examine the amount of working capital and fixed capital needed and the financial conveniences of reducing them. Wasteful use of capital is as bad as inadequate capital. Over and under capitalization are both danger signals; what is needed is fair capitalization. Capital should be procured at economical cost and it should be economically used so as to give the maximum return. Fixed assets and inventories which cannot be economically used should be sold and the money realized from their sale should be reinvested in more profitable channels.

Tools and Techniques of Cost Reduction

The various tools and techniques used for achieving cost reduction are practically the same which have been suggested for cost control. Some of these are

1. Budgetary control
2. Standard costing
3. Material control
4. Standardization of products and tools and equipments
5. Simplification and variety reduction
6. Improvement in design
7. Labour control
8. Overhead control
9. Production plan and control
10. Automation
11. Operation research
12. Market research
13. Planning and control of finance
14. Value analysis

Advantages of cost reduction

1. Cost reduction increases profit. It provides basis for more dividend to the shareholders, more bonus to the staff and more retention of profit for expansion of the business
2. Cost reduction will provide more money for labour welfare schemes and thus improve men-management relationship.
3. Cost reduction will help in making goods available to the consumers at cheaper cost.
4. Higher profit will provide more revenue to the government by way of taxation.

Value Analysis or Value Engineering

It is one of the newer scientific aids to managerial decision making. It comprises a group of techniques aimed at the systematic identification of unnecessary cost in a product or service and efficiently eliminating them without impairing its quality and efficiency. It can also be defined as a systematic analysis and evaluation of technique and functions in the various areas of a concerned with a view to exploring channels of performance improvement so that value attached to the particular product or service may be improved. It endeavors to achieve the maximum possible value for a given cost by a continuous process of planned action and aims at cost of reduction from the point of view of value.

Value analysis involves a creative approach for finding out unnecessary cost. Such costs are those costs which though incurred in a product or service, are unnecessary and do not improve its quality or efficiency, give it a better appearance, prolong its life nor provide any additional satisfaction to the customer.

Value analysis is an effective tool for cost reduction. Cost reduction may be achieved by economizing expenditure and increasing productivity. Whereas value analysis probes into economic attributes of value. In value analysis, it is possible to improve performance, increase the value of a product and thus reduce the cost by a continuous process of planned action.

Procedures of value analysis

1. Identification and defining the problem:
Ascertaining whether the customer is being given the full use value and esteem value for the product he purchases and if not, what is required to be done.
2. The feasibility of alternatives and exploring the best method of performing the work at the minimum cost.
3. The investment, if any required for the alternative.
4. Costs resulting indirectly out of a decision to change to alternative like costs of items becoming obsolete, cost of training etc.
5. The benefits from alternatives like reduction in costs and increased revenue.
6. Percentage of return on new investment.
7. Recommendation of the final proposal for implementation.

Types of Industrial Product Value

1. Use value:

There are certain characteristics of a product which make it useful for certain purposes. For example a book is written for the use of some category of students and it gives its full value if it serves the purpose of that category of students. It measures the quality of performance of a product. Use value may be primary use value, secondary use value and auxiliary use value. Primary use value indicates the attributes of the products which are essential for its performance as engine, steering wheel and axle in a motor car without which car cannot run. Secondary use value refers to such devices as the bonnet or the mudguard or the windscreen without which motor car can be driven but these are necessary for the protection of engine and other parts. Auxiliary use value is essential for better control and operation as speedometer, electric horn etc. in motor car.

2. Esteem value:

Certain properties of a product do not increase its utility value but they make it esteemable which would induce customers to purchase the product. For example a watch with gold cover has an esteem value. A rich customer may prefer a watch with a gold cover although a watch with a steel cover may serve the same purpose of keeping time.

3. Cost value:

This value is measured in terms of cost involved. In the case of a manufacturing concern, it refers to the cost of production of the product produced and if some part of the product is purchased from outside, it means cost of purchase of that part.

4. Exchange value:

Certain characteristic of product facilitates its exchange for something else and which we get is the exchange value of that product.

Relationship between Value, function and cost

The relationship between Value, Function and Cost can be expressed as follows:

Value = Function/Cost

Higher the ratio, higher is the value and lower ratio, lower is the value. Value can be improved:

- (1) by improving functions, cost remaining constant, or
- (2) by improving cost, function remaining constant, or
- (3) by improving function and reduction cost.

Example 1: Cast iron components when purchased from a particular sole supplier and machined showed certain cracks during machine operation. The percentage of such rejection was 5% and considered normal but when alternative source of supply was tapped, at the same price, the rejections were reduced to 2%. Thus, it has improved the function without reducing the cost.

Example 2: In manufacturing a machine tool, two small parts were riveted together before assembly of a product, frequently broke off during operation. In order to improve the function, the two parts were redesigned and machined into one combined operation in order to eliminate the necessity of riveting. This has also lowered the cost of operation.

Example 3: A spare part made of cast iron was being used in a machine. Its cost of manufacturing increased. Experiments were carried out with plastic and rubber material to manufacture the spare part which served for the purpose equally well. Besides improving the function, it reduced the cost substantially.

Advantages of value analysis

- 1- It is a powerful tool for cost reduction because its basic objective is the identification of unnecessary costs in a product or service and efficiently eliminating them without inspiring its quality and efficiency.
- 2- It is the scientific tool for increasing productivity of a concern because it aims at exploring various alternatives for efficient use of all types of resources in employment and making available goods and services of the kind and quality most wanted by customer at lower cost. In this way, the manufacturer of most suitable production is facilitated because value analysis aims at giving highest use value and esteem value to customer.
- 3- It ensures the fullest possible use of resources because it aims at eliminating all unnecessary costs.
- 4- It induces the creative ability of the staff because it involves a creative approach for finding out unnecessary costs. Creativity develops new ideas which in turn make available the least expensive alternative to do the same function.
- 5- It creates the proper atmosphere for increased efficiency because it aims at a continuing search for improvement in efficiency.
- 6- It is helpful in any drive for import substitution because it explores new methods and techniques of manufacturing indigenous goods which may serve the same purpose which imported goods serve. Thus, it is helpful in saving precious foreign exchange.
- 7- It can be applied at all stages from the initial design stage of an item right up to the final stage of its packing and dispatch because it aims at identifying unnecessary costs at all level with a view to eliminating them systematically.

UNIT-11

PERFORMANCE MEASUREMENT

MEANING AND CONCEPT

Performance measurement is the process of evaluating the efficiency of a business. It is the basis of a management control system. Periodic comparisons of actual costs, revenues, profits and investments with the budgeted costs, revenues, profits and investments help management in taking decisions about future actions. The objective of performance measurement system should be to implement the firm's strategy. Performance measurement should be undertaken in respect of all the responsibility centers.

MEASURES OF PERFORMANCE OR TECHNIQUES OF PERFORMANCE MEASUREMENT

There are many techniques or measures which may be used to evaluate the performance of a business. These measures may be broadly classified into:

- (a) Financial performance measures
- (b) Non financial performance measures

(a) Financial performance measures

Financial performance measures include the following:

- i. Responsibility accounting
- ii. Budgetary control
- iii. Variance analysis
- iv. Contribution margin
- v. Ratio Analysis
- vi. Return on investment or return on capital employed(ROI)
- vii. Residual income(RI)
- viii. Economic Value Added(EVA)
- ix. Balanced Score Card(BSC)
- x. Transfer Pricing Policy

(b) Non financial performance measures

Financial measures of performance are important measures of evaluating the efficiency of a business. However, these measures are not fully adequate and in fact can be dysfunctional for several reasons. Financial performance measures generally lead to short term actions which may not necessarily be in the firm's long-term interests. The business/divisional managers may not undertake long-term actions which may be useful in the long run but are risky to obtain short term results which may not be beneficial to achieve the overall objectives of the firm in the long run. Hence it is essential to use non-financial measures also along with the financial measures for evaluating the performance of a business unit. The following are some non-financial measures that may be employed for measuring the performance of a firm:

- i. Market share for each product
- ii. Product quality
- iii. Productivity
- iv. After sale service
- v. Labor turnover
- vi. Customer satisfaction
- vii. Employee satisfaction
- viii. Corporate governance

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- ix. Social responsibilities
- x. Business ethics
- xi. Innovation and research

However, it may be emphasized that no single measure whether financial or non-financial is sufficient to evaluate the performance. It is desirable to use multiple measures, both financial as well as non-financial to measure the performance of a business unit.

RESPONSIBILITY ACCOUNTING

The system of costing like standard costing and budgetary control are useful to management for controlling the costs. In those systems the emphasis is on the devices of control and not on those who use such devices. Responsibility accounting is a system of control where responsibility is assigned for the control of costs. The persons are made responsible for the control of costs. Proper authority is given to the persons so that they are able to keep up their performance. In case the performance is not according to the predetermined standards then the persons who are assigned this duty will be personally responsible for it. In responsibility accounting the emphasis is on men rather than on systems. For example, if Mr. A, the manager of a department, prepares the cost budget of his department, then he will be made responsible for keeping the budgets under control. A will be supplied with full information of costs incurred by his department. In case the costs are more than the budgeted costs, then A will try to find out reasons and take necessary corrective measures. A will be personally responsible for the performance of his department.

“Responsibility accounting is a system of accounting that recognizes various responsibility centers throughout the organization and reflects the plans and actions of each of these centers by assigning particular revenues and costs to the one having the pertinent responsibility. It is also called profitability accounting and activity accounting”

According to this definition, the organization is divided into various responsibility centers and each centre is responsible for its costs. The performance of each responsibility centre is regularly measured.

Responsibility accounting focuses main attention on responsibility centers. The managers of different activity centers are responsible for controlling the costs of their centers. Information about costs incurred for different activities is supplied to the persons in charge of various centers. The performance is constantly compared to the standard set and this process is very useful in exercising cost controls. Responsibility accounting is different from cost accounting in the sense that the former lays emphasis on cost control where as the later lays emphasis on cost ascertainment.

Steps involved in responsibility accounting

Responsibility accounting is used as a control device. The aim of Responsibility accounting is to help management in achieving organizational goals. Steps are:

1. The organization is divided in to various responsibility centers. Each responsibility center is put under the charge of responsibility manager. The managers are responsible for the performance of their departments.
2. The targets of each responsibility centre are set in. The targets or goals are set in consultation with the manger of the responsibility centre so that he may be able to give full information about his department. The goals of the responsibility centers are properly communicated to them.

3. The actual performance of each responsibility centre is recorded and communicated to the executive concerned and the actual performance is compared with goal set and it helps in assessing the work of these centers
4. If the actual performance of a department is less than the standard set, then the variances are conveyed to the top management. The names of those persons who were responsible for that performance are also conveyed so that responsibility may be fixed.
5. Timely action is taken to take necessary corrective measures so that the work does not suffer in future. The directions of the top level management are communicated to the concerned responsibility centre so that corrective measures are initiated at the earliest.

The purpose of all these steps is to assign responsibility to different individuals so that the performance is improved. In case the performance is not up to their targets set, then responsibility may be fixed for it. Responsibility accounting will certainly act as control device and it will help in improving the overall performance of the business.

RESPONSIBILITY CENTERS

“A responsibility centre is like an engine in that it has inputs, which are physical quantities of material, hours of various types of labor, and a variety of services; it works with these resources usually; working capital and fixed assets are also required. As a result of this work, it produces output, which is classified either as goods, if they are tangible or as services, if they are intangible. These goods or services go either to other responsibility centers within the company or to customers in the outside world.

Responsibility accounting is used to measure both inputs and outputs. The inputs of materials in quantity and labor in hours are expressed in monetary terms. The total of various inputs is called ‘cost’. The output can be expressed either in goods produced or services rendered. If the output is meant for outsiders, then it is easy to measure the monetary value of the output, but if the output is used for other departments of the center, then it will have to be valued objectively. The total output is called ‘revenue’. So responsibility accounting is used in measuring costs and revenues.

The responsibility centers represent the sphere of authority or decision points in an organization. For effective control, a large firm is usually divided into meaningful segments, departments or divisions. These divisions of an organization unit are called responsibility centers. In the words of *Deakin and Maher*, “a responsibility centre is a specific unit of an organization assigned to a manager who is held responsible for its operations and resources.”

TYPES OF RESPONSIBILITY CENTERS

For the purpose of evaluating financial performance and control, the responsibility centers are generally classified into following categories:

1. Cost or expenses centre
2. Profit centre
3. Revenue centre
4. Investment centre

1. COST OR EXPENSES CENTRE

“Cost centers are segments in which managers are responsible for costs incurred but have no revenue responsibilities.” As observed earlier, responsibility accounting is used to measure both inputs and outputs. However, when we can measure only expenses or costs incurred and not the revenue earned from a responsibility centre, it is known as cost or expense centre.

The contribution of accounting department to the company cannot be measured in monetary terms; so will call it an expense centre. Generally, a company has production and service departments. The output of production departments can be measured whereas, service departments incur only expenses and their output is not measured. It may be either feasible or necessary to measure the output of some service departments. Such centers are there for called expense cost centers.

The performance of cost centre is measured in terms of quantity of inputs producing a given output. A comparison between actual input used and the pre determined budgeted inputs are made to determine the variances which represent the efficiency of the cost centre.

Types of cost/expense centers

There can be two general types of expense centers

- (a) Engineered expense centers
- (b) Discretionary expense centers

The above classification of expense centers is based upon the two types of cost. i.e., engineered and discretionary. Engineered costs are those costs which can be estimated with reasonable reliability, for example, factory costs for direct material, direct labor and direct overheads. An engineered cost has a definite physical relationship with output. Discretionary costs are those for which no such engineered estimate is feasible. In discretionary expense centers, the costs incurred depend upon the manager's decisions. Discretionary expense centers include administrative and support cost centers.

Cost centers can also be classified on functional basis as:

- i. Production cost centre
- ii. Service cost centre
- iii. Ancillary cost centre
- iv. Administrative and support centre
- v. Research and development centre
- vi. Marketing centre

2. PROFIT CENTRE

Responsibility centers may have both inputs and outputs. The inputs are taken as costs and outputs are revenues. The difference between the revenue earned and costs incurred will be profit. When a responsibility centre gets a profit from output, it will be called profit centre. The output of a centre may be undertaken either for outside customers or for other centers in the same organization. When the output is meant for outsiders, then the revenue will be measured from the price charged from customers. If the output is meant for other responsibility centre then management takes a decision whether to treat the centre as profit centre or not. For example, if a business has number of processes and output of one process is transferred to the next process. When the transfer from one process to another is only on cost, then these processes will not be profit centers. On the other hand, if management decides to transfer the output from one process to the other as internal transfers at profit, do not increase company's assets whereas sales to outsiders will increase assets of the company (in the shape of cash, debtors, bills receivables, etc.) The income statement of a profit centre is used as a control device. The profits of a responsibility centre will enable in evaluating the performance of the manager of that centre.

The performance of the manager of a profit centre may be evaluated by the following measures of profitability.

- i. Contribution margin
- ii. Direct profit
- iii. Controllable profit
- iv. Profit/income before tax
- v. Profit/income after tax/net income

Suitability of profit centers

Establishment of profit centers may be suitable if the following conditions are satisfied:

- (a) There exist a decentralized form of organization
- (b) The divisional manager has access to all relevant information needed for decision making
- (c) The divisional manager is sufficiently independent
- (d) Internal transfers of output from one division/centre to another division are not significant
- (e) A definite measure of performance is available

Advantages of profit centers

Establishing of profit centre offers the following advantages

- i. It encourages initiative as a manager of a profit centre is subject to a lesser degree of control of the top management
- ii. It may improve the quality of decisions as these are made by managers responsible for their execution.
- iii. It may quicken the decision making process as these need not be referred to top management
- iv. It saves time of top management by allowing them management by exception
- v. It enhances profit consciousness in the centre division/organization
- vi. It promotes competition amongst managers of various profit centers and improves their performance
- vii. It helps in training divisional managers for top management responsibilities

Disadvantages of profit centers

In spite of many advantages of establishing profit centers, there are many limitations or disadvantages;

- i. Loss of top management control over different divisions
- ii. Faulty decisions at divisional level which might have been avoided at top management level
- iii. Conflicts amongst individual interests of divisions and the organization as a whole.
- iv. Too much emphasis on short term profitability
- v. Increased cost due to multiple requirements of facilities and personnel at each profit centre
- vi. Transfer pricing problems amongst profit centers

3. REVENUE CENTRE

A revenue center is a segment of the segment of the organization which is primarily responsible for generating sales revenue. A revenue centre manager does not process control over cost, investment in assets, but usually has control over some of expenses of the marketing department. The performance of a revenue centre is evaluated by comparing the actual revenue with budgeted revenue. The marketing managers of a product line or an individual sales representative are example of revenue centers.

4. INVESTMENT CENTRE

“An investment centre is an entity segment in which a manager can control not only revenues and costs but also investment.”

The manager of a responsibility centre is made responsible for properly utilizing the assets used in his centre. He is expected to earn a fair return on the amount employed in assets in his centre. Measurement of assets employed poses many problems. It becomes difficult to determine the amount of assets employed in a particular responsibility centre. Some assets may be used in a responsibility centre but their actual possession may be with some other department. Some assets may be used by two or more responsibility centers and it becomes difficult to apportion the amount of those assets to various centers. Investment centers may be used for big responsibility centers where assets will be in exclusive possession of that centre.

The performance of an investment centre can be measured by relating profit to investment base. The two methods which are generally used to evaluate performance of an investment centre are:

- 1) Return on investment/capital employed(ROI)
- 2) Economic Value Added(EVA) or residual Income approach(RI)

RETURN ON INVESTMENT/CAPITAL EMPLOYED

Return on capital employed establishes the relationship between profits and the capital employed. The term 'capital employed' refers to the total investment made in the investment centre/business. However, net capital employed comprises the total assets used less its current liabilities. The profit for the purpose of calculating return on capital employed should be computed according to the concept of capital employed. i.e., gross capital employed or net capital employed. Further, net profits should be taken before tax because tax is paid after profits have been earned and has no relation to the earning capacity of a centre. Return on investment can be computed as follows:

$$\text{Return on investment/capital Employed} = \frac{\text{Net Profit}}{\text{Capital employed}} \times 100$$
$$\text{Or, ROI} = \frac{\text{Net profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Capital Employed}} \times 100$$
$$\text{Or, ROI} = \text{Net profit Ratio} \times \text{Capital Turnover Ratio}$$

Significance of Return on Capital Employed/ROI

The return on capital employed is the prime ratio which measures the efficiency of the business. The study of this ratio is significant due to following reasons.

1. It is a prime test of the efficiency of business. It measures not only the overall efficiency of business but also helps in evaluating the performance of various departments.
2. The owners are interested in knowing the probability of the business in relation to amounts invested in it. A higher percentage of return on capital employed will satisfy the owners that their money is profitably utilized.
3. The performance of the enterprise can be assessed in relation to other concerns by making inter-firm and intra-firm comparisons.
4. The borrowing policy of the enterprise may be properly formulated. The rate of interest on borrowings should always be less than the return on capital employed.
5. The outsiders like bankers, creditors, financial institutions will be able to find whether the concern is viable for giving credit or extending loans or not
6. Return on capital employed may help in devising future business policies for expansion or diversification, etc
7. It helps in providing fair remuneration to various factors of production. Management aims to make optimum use of various factors of production for increasing rate of return on investment. The higher return on investment will enable better payments to workers and other factors of production.

ECONOMIC VALUE ADDED/RESIDUAL INCOME APPROACH

Economic value added is a measure of performance evaluation that was originally employed by Stern Stewart and Co. It is also referred to as residual income(RI) approach of

performance evaluation. It is a very popular method used to measure the surplus value created by an investment or a portfolio of investments. **EVA has been considered as a better measure of divisional performance as compared to the return on assets ROA or ROI.** It is also being used to determine whether an investment positively contributes to the shareholders wealth. The economic value added of an investment is simply equal to the after tax operating profits generated by the investment minus the cost of fund used to finance the investment. EVA can be calculated as below:

$$\text{EVA} = (\text{Net operating profit after tax}) - (\text{cost of capital} \times \text{capital invested})$$

Or,
$$\text{EVA} = \text{Capital employed} (\text{Return on investment} - \text{cost of capital})$$

Or,
$$\text{EVA} = \text{Capital employed} (\text{ROI} - \text{Cost of Capital})$$

According to this approach, an investment can be accepted only if the surplus (EVA) is positive. It is the only positive EVA that adds value and enhances the wealth of stake holders. However, to calculate the economic value added, we need to estimate the net operating profit after tax and cost of funds invested. Suppose an investment generates net operating profit after tax of Rs. 20 lakhs and the cost of financing investment is Rs. 16 lakhs. The economic value added by the investment shall be Rs. 4 lakhs and it should be accepted.

BALANCED SCORE CARD (BSC)

The balanced score card is another technique of performance measurement. According to Robert S. Kaplan and David P. Norton, the business units should be assigned goals and then measured from the following four perspectives.

1. Financial, e.g., Profit margins, return on assets, cash flow
2. Customer, e.g., Market share, customer satisfaction
3. Internal business processes, e.g., capacity utilization, on time delivery, quality, employee retention.
4. Innovation, e.g., development of new products

The BSC aims at achieving a balance among various strategic measures so as to achieve integration of organizational and individual goals in the best interest of the organization.

The balanced score card is thus a tool that helps to achieve better communication and a focused approach to implement the firm's objectives and strategy. Balanced score card implies use of multiple measures, both financial and non-financial, for the evaluation of performance of a business unit. It also emphasizes the need to strike a balance between external measures such as customer satisfaction and internal measures such as productivity. The balanced score card further emphasizes the idea of cause and effect relationships among various performance measures. It is true to say that balanced score card is a tool to translate firm's strategy into action, although, some critics have said that it is an old wine in a new bottle.

UNIT-TWELVE
TRANSFER PRICING

Introduction

A transfer price is a price used to measure the price of goods or services furnished by a profit centre to other responsibility centers within a company. As observed earlier, the evaluation of managerial performance within the company through profit centers is impossible without determining transfer prices in case various profit centers of the company exchange goods and services. In such situations, there is a need to determine the monetary values, called transfer price, at which the transfer should take place so that costs and revenues could be properly assigned. The implication of transfer price is that for the transferring division it will be a source of revenue, whereas for the division to which transfer is made it will be an element of cost. Thus, there is need to determine proper transfer price for the successful implementation of responsibility accounting.

Methods of Transfer Pricing

There are various transfer pricing methods in use based on either (a) cost, (b) market price. The following are the important types of intra-company transfer price.

1. Cost price
2. Cost plus a normal mark-up
3. Incremental cost
4. Shared profit relative to the cost
5. Market price
6. Standard price
7. Negotiated price
8. Dual or Two-way Price

1. Cost price: According to this method, goods and services are transferred from one segment of the company to another on the basis of unit cost of production of the transferring division. The cost could either be taken to be the actual cost of production or the standard cost of production. The advantage of these methods of transfer pricing is that it is very simple and convenient to operate. But, it distorts the profit of the various responsibility centers in the sense that the profit of the transferring centre shall be underestimated and that of the centre to which transfer is made would be over estimated. In fact, this method of transfer pricing is inappropriate for profit centre analysis.

2. Cost plus a normal mark-up: To overcome the short comings of the simple cost price method, many companies add to the cost a margin of profit, say 15% of the cost, to determine the transfer price. Thus, in this method, the buying division is charged the actual unit cost of production of the transferring department. What so ever it may be, plus a mark up for the profit. The merit of this method is again simplicity and convenience, but this methods is also not an appropriate method for profit centre analysis as the inefficiencies of one department along with their costs are transferred to another department.

3. Incremental cost: Another method of transfer pricing in use by certain companies is the incremental cost of the transferring division. Incremental cost can be computed in two ways depending upon the circumstances. In case entire production is transferred to another division within the same company, the increment cost will be the total of variable cost of transferring centre plus any fixed costs which are directly attributable to that centre/division. The incremental cost so calculated suffers from the same defects as that of cost price method. The second approach may be used when goods and services are sold to outside customers as well as transferred within the same company. In such a case, incremental cost may be taken as the opportunity cost in the form of loss

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of revenue which the transferring division would have charged from the outside customers. The second approach is similar to the market price basis and is more useful for profit-centre analysis.

4. Shared profit relative to the cost: According to this method no price is charged for the intra-company transfers. Rather out of the total sales revenue of the company the aggregate cost of various divisions is deducted to find out the profit for the company as a whole; and then the profit is shared by the various profit centers relative to the cost basis of each centre, as below

$$\text{Share of the profit of a particular profit centre} = \frac{\text{Profit of the company} \times \text{cost of particular profit centre}}{\text{Total cost}}$$

Thus, in this method profit is shared according to the cost of each division. The drawback of this method is that in efficiencies are not evaluated, and hence, it is not an appropriate method for profit centre analysis.

5. Market price: In this method, the prices charged for intra-company transfers are determined on the basis of market prices and not on the cost basis. There are three ways of computing the market price. Firstly, the prevailing market price, after making adjustment for discounts and other selling costs, may be taken as transfer price if there is a active market for goods and services transferred between divisions of the same company. The main advantage of this method is that it protects the profitability interest of both the divisions as the buying division is charged what it has to otherwise pay to the outsiders, and the transferring division gets the price which, in any case, it would have obtained from outsiders. Further, selling and distribution costs as well as costs of bad debts are reduced and the transferring department gets an assured market, whereas, the buying division is assured of regular and timely deliveries. Secondly where active market-does not exist or where market price is not available, cost plus a normal profit may be taken as a reasonable market price. But, then, inefficiencies of one division will be transferred to another division. Thirdly, the company could invite bids from the market so as to determine the market price. The lowest bid may be accepted as the market price for the transfer; however, the problem may arise because of false bidding or no bidding at all.

6. Standard price: Transfer prices can also be fixed on predetermined standard price basis. The standard price may be determined on the basis of cost production and the prevailing market conditions. Thus, division working at less than the desired efficiency will show lesser profits as compared to the efficient division. However, difficulties may arise in fixing the standard price agreeable to the different divisions.

7. Negotiated price: The intra-company transfer price can also be determined on the basis of negotiations between the buying and the transferring division. The price arrived at after negotiation will be the mutually agreed price. Such as pricing method will be advantages to both the divisions as well as the company as a whole. However, this method could be used only when both the buying as well as transferring divisions has alternative choice available with them.

8. Dual or Two-way Price: According to this method, the transferring division is allowed to give credit price, whereas, the buying division is charged at a different price. It enables better evaluation of profit centers and avoids conflicts among them on account of transfer prices. However, the total profits of the various segments would differ from the actual profit of the company as a whole. But, it poses no problems for the company as transfer prices are meant for internal purposes of performance evaluation only.

SELECTION OF TRANSFER PRICING METHOD

The study of the various transfer pricing methods reveals that there is no particular method which could be termed as the best method for all situations. The selection of a particular method will depend upon the particular circumstances which may differ from case to case. However, the following general criteria should be kept in mind while determining the transfer price.

- a) The transfer price should be objectively determinable
- b) The transfer price should be able to compensate the transferring division and charge the buying division, commensurate with the value of the goods/services exchanged.
- c) It should contribute to congruence between the goal of the divisions and the goal of the organization
- d) It should provide for profit centre evaluation
- e) It should maximize the efforts towards achievement of organizational goals

PERFORMANCE BUDGETING

Budgeting is the technique of expressing, largely in financial terms of management's plans for operating and financing the enterprise during specific periods of time. Performance budgets use statement of mission, goals and objectives to explain why money is being spent. It is a way to allocate resources to achieve specific objectives based on program goals and measured results. The entire planning and budgeting frame work is result oriented.

Elements of Performance Budgeting: It comprises of three elements:

- a) The result (final income or outcome)
- b) The strategy (different ways to achieve the final outcome)
- c) The activity/outputs (what is actually done to achieve the final outcome)

Performance budgeting involves evaluation of the performance of the organization in the context of both specific as well as overall objectives of the organization. It presupposes the crystal clarity of organizational objectives and provides a definite direction to each employee and also a control mechanism to higher management. Thus performance budgeting lays immediate stress on the achievement of specific goals over a period of time. In the long run it aims at continuous growth of the organization so that it continues to meet the dynamic needs of its growing clientele.

Performance budgeting requires preparation of periodic performance reports. Such reports compare budget and actual data and show any existing variances. The responsibility for preparing the performance budget of each department lies on the respective departmental head. Periodical reports from various section of a department will be received by the departmental head who will in summary form submit a report about his department to the budget committee. The report may be daily, weekly or monthly depending on the size of business and the budget period. It facilitates comparison between budgeted and actual figures and take corrective action, where ever necessary.

ZERO BASE BUDGETING

The purpose of management control is to ensure better performance and better utilization of scarce resources. Traditional budgeting fails to achieve this objective of management effectively. "Zero base budgeting" provides a solution towards this end.

Zero base budgeting is a comparatively new technique designed to revitalize budgeting. This technique was first used by the US Department of Agriculture as long back as in 1961. Peter A. Pyhrr designed its logical basic frame work in 1970 and successfully developed, implemented and popularized its wider use in the private sectors. He defines ZBB as an "operating, planning and budgeting process which requires each manager to justify his entire budget request in detail from scratch (hence zero base) and shifts the burden of proof to each manager to justify why we should spend any money at all". The ZBB reviews a programme or project from scratch or zero.

Process of ZBB

The following are the steps involved in ZBB:

- 1) Specification of decision units: The decision making centre may be a segment of an organization or a project for which separate budgets are to be prepared and decisions are made regarding the amount to be spent and quantum and quality of work to be done.
- 2) Development of decision packages: Formulation of decision packages is a set of documents which identify and describe activities of the unit. A separate and different decision package is required for each major activity to be started or continued.
- 3) Prioritization of activities: The next step in ZBB is the ranking of proposed alternatives included in decision packages for various decision units.
- 4) Allotment of funds: The resources of the organization are allocated to various decision units keeping in mind the alternatives selected and approved as a result by ranking process.

Advantages of ZBB

- 1) Optimum use of financial resources on the basis of priority of needs.
- 2) Weeding out of wastage: Inefficiency is being removed and wastage being reduced.
- 3) Participation by all concerned in decision making, management by objective is practiced.
- 4) Flexibility in Budget: The frequent review of performance results in adjustment of budgets for shortfall of income.
- 5) Realistic targets: The budgets are prepared as per importance and essentiality of activity and not on the basis of past occurrence. The budgets are prepared as per conditions prevailing during the current period without considering the past as basis.

Limitations of ZBB

- 1) Time consuming: ZBB requires more time than traditional budgeting as there is no basis on which estimates are to be made.
- 2) Lack of skilled Managerial Personnel.
- 3) Limited application: It cannot be directly applied to direct materials, direct wages and overheads associated with production function.

SOCIAL COST BENEFIT ANALYSIS

The concept of social cost benefits is now increasingly applied to both the public and private sector. Both these sectors use the resources of the society and, therefore, they have moral responsibility to undertake only such projects which are socially desirable. Besides commercial viability of the projects, the associated cost and benefits to the society should also be considered. The Planning Commission has decided that the feasibility studies for the public sector projects will include an analysis of the social rate of return. In the case of private sector also, a socially beneficial project may be more easily acceptable to the Government and hence the social cost benefit analysis will be relevant while granting licenses, approvals etc.

MEASUREMENT OF SOCIAL COST BENEFIT

The United Nations Industrial Development Organization (UNIDO) and the Centre for Organization of Economic Co-operation and Development (COECD) have come with useful publications dealing with the problem of measuring social costs and social benefits. The actual cost of or revenues from the goods or services to the organization may not reflect the monetary measurement of the cost or benefit to the society. Following are some of the indicators or criteria which can be used for measuring the social costs and benefits associated with the projects:

- 1) Employment potential: A project having higher employment potentiality has to be preferred over a project having a lower employment potential.
- 2) Capital output ratio: This ratio measures the expected output in relation to the capital employed in the project. A project giving a higher output per unit of capital employed is to be preferred over a project with a lower output.
- 3) Value added per unit of capital: This criterion is superior to the 'capital output ratio' since it considers the net contribution of the firm to the nation's economy. The term value added refers to the cost incurred by an organization in converting materials into finished products. Projects having high value added content are to be ranked high.
- 4) Savings in foreign exchange: The impact of the project on the foreign exchange reserves of the country is also a good social criterion for accepting or rejecting a project. Projects having greater potentiality in terms of foreign exchange benefits will have priority over other projects.
- 5) Cost benefit ratio: The projects are evaluated on the basis of total social benefits and cost associated with the projects. The projects are ranked according to their cost benefit ratio. A project having the most favourable cost benefit ratio is given the highest preference.

Try yourself:

1. Explain the concept of social cost benefit analysis.
2. Discuss the different methods for measurement of social cost and benefits.
3. Write a short note on social cost benefit analysis
4. What is performance budgeting? What are the elements involved in it?
5. Explain the meaning and essential feature of 'Responsibility accounting'
6. What is zero base budgeting? Explain the process of ZBB and its advantages.
