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# ANNAMALAI UNIVERSITY

## DIRECTORATE OF DISTANCE EDUCATION

## Bachelor of Business Administration (B.B.A)

## THIRD YEAR

## PAPER – VIII

## MANAGEMENT ACCOUNTING

## LESSON : 1 – 20

LESSON – 1

# MANAGEMENT ACCOUNTING

**STRUCTURE**



## 1. INTRODUCTION

Management provides a reliable and regular source of information to manage better. It covers functions of Financial Accounting, Objectives of Management Accounting and Functions of Management Accounting.

Management means 'Getting things done by people in an organisation'. The art of management can be practiced effectively only if periodical, timely and reliable information is available to the managers. In a sole proprietary concern, the proprietor does not have elaborate organisation to collect information for making decisions. As organizations become complex, responsibilities and authorities get distributed over different managers. Things become more impersonal. Management turns to a reliable and regular source of information for gaining knowledge to manage better.

In recent years changes in technology have had a pronounced effect on all fields of knowledge. Developments in the field of science and mathematics have found applications practically in every field of life. The impact in the field of accounting have also been significant.

## 1.1 AREAS OF ACCOUNTING

Many accounts view different fields of accounting viz., financial as accounting, cost accounting, government accounting, co-operative accounting, management accounting etc., as different areas of accounting. But accounting is one comprehensive and cohesive system. In the context of modern business and industry, accounting has to be a versatile system serving a large number of varying goals simultaneously. The goal requirements of taxation, credit worthiness, earning power, resource control, managerial efficiency, shareholders' satisfaction,

government policy, industrial peace and public image are different and sometimes conflicting. Hence, a single system capable of handling voluminous and varied information, has to be created to achieve the objects.

### A. ACCOUNTING FUNCTIONS

Accounting is the process of identifying, measuring, recording and communicating economic information capable of being expressed in terms of money atleast partially to help the users of the information. If the transactions are mostly financial in nature, the accounting system will be termed as financial accounting. If they relate to costing information, the system will be known as cost accounting. The financial accounting is meant to serve all parties external to the firm such as creditors, investors, employees and public in general. On the other hand, accounting which is primarily concerned with providing information relating to the conduct of the various aspects of a business, like cost or profit associated with some portions of a business operation is called, "Management Accounting".

### B. CONCEPT OF FINANCIAL ACCOUNTING

Financial accounting is defined as the science and art of recording and classifying business transactions and making significant summaries for the determination of the profit or loss for the year and their effect on the owner's capital assets and liabilities. The American Institute of Certified Public Accountants had defined financial accounting as 'The art of recording, classifying and summarizing in a significant manner and in terms of money, transactions and events which are, in part at least, of a financial character and interpreting the results thereof'.

The Financial accounting is concerned with the compilation and communication of financial information. An analysis of the definitions brings out clearly the objectives and functions of financial accounting. The following may be listed out as the main objectives of Management Accounting:

(a) To ascertain the operating results of the enterprises,

(b) To reveal the financial position of the business, and

(c) To enable control over the operation as well as the resource of the business.

### 1.2 FUNCTIONS OF FINANCIAL ACCOUNTING

(a) *Recording*: It is considered as the primary function of accounting. It takes care to see that all transactions of a financial character are recorded in an orderly manner. The primary records used for the purpose are the journal and subsidiary books.

(b) *Classifying and Summarising*: Classification is concerned with the systematic analysis of recorded data by grouping them into items of a similar nature. The transactions are posted into a ledger under different ledger accounts. Then, they are summarized and presented in a significant manner. In this process, the following statements are prepared (1) Trial Balance (2) Profit and Loss Account,

and (3) Balance Sheet. These statements will reveal only information which are financial in nature.

(c) *Interpreting*: This is the most important function of financial accounting. It helps to know the financial position and profitability of operations. Accounting interpretation takes the form of the selection of data to be recorded and analytical reports prepared. The data so collected and compilled, is used for future planning and policy formulations.

(d) *Communicating*: Accounting is the language for communicating the financial facts about an enterprise to those who have an interest in using and interpreting them. The recorded data loses much of its utility if the facts are not available to those who require them.

**ACCOUNTING CONCEPTS**

The accounting concepts are the basic conditions upon which the accounting system is based. Some of the important accounting concepts are:

(i.) Business Entity Concept
(ii.) Going Concern Concept
(iii.) Money Measurement Concept
(iv.) Cost Concept
(v.) Dual-Aspect Concept
(vi.) Ralisation Concept
(vii.) Accrual Concept

**(i) Business Entity Concept**

Accountants treat a business as distinct from the proprietor. Without such a distinction the activities of the firm will all be mixed up with the private affairs of the proprietor and the true picture of the business will not be available.

**(ii) Going concern concept**

It is assumed that a business unit has a perpetual succession or continued existence and transactions are recorded from this point of view. It is only on this assumption that a distinction is made between capital expenditure and revenue expenditure.

**(iii) Money Measurement concept**

Under the money measurement concept, only these transactions which are expressed in monetary terms are recorded in the accounting books. Hence, non-monetary transactions are either omitted or recorded separately.

**(iv) Cost concent**

When transactions are recorded in the books only against the amounts actually involved, it is called cost concept. This concept prevents arbitrary values being used for recording purposes, mainly those resulting in the purchase of assets.

**(v) Dual Aspect concept**

The Dual Aspect Concept refers to the recording of the debit and credit aspect of a transaction. The assumption is that always the total claims of outsiders and proprietors will be equal to the total assets of the firm. That is, External Liabilities + Capital = Total Assets; Total Assets = Total Liabilities. This s called Accounting equation.

**(vii) REALISATION CONCEPT**

Accounting is a historical record of transactions. It does not attempt to mend the adverse effects of events that have already been recorded. This is important to prevent business concerns from inflating their profit. For instance, profit on sales will be taken into account only when money is realized.

**(vii) ACCRUAL CONCEPT**

Normally, all transaction are settled in cash but even if cash settlement has not yet taken place, it is proper to bring the transactions into the books of accounts. Expenditure incurred during the year but not paid and income earned but not received are called accrued items. According to this concept these items will be taken into consideration while arriving at profit or loss.

**LIMITATIONS OF FINANCIAL ACCOUNTING**

Financial accounting was able to cope up with the needs of business in the initial stages when business was not so complex. But the growth and complexities of modern business have made financial accounting highly inadequate. The inadequacies of financial accounting are as follows:

(a) *Change in Nature of Business*: Business activities have undergone a radical change and have become more complex. It fails to provide the required information. Some of the business expenditure incurred today may bring benefits to the business only in future and may to get any immediate return. Hence, the management needs a lot of varied information to decide whether it will be justifiable to incur a particular expenditure or not. Financial accounting fails to provide such information.

(b) *Post-mortem Record*: Business decisions are made today, to influence the future. The problem is how to use the records of the past as a guide to the future so that it may meet the needs of management. From this point of view, financial accounting furnished only a post-mortem record of business transactions as completed events alone are the subject of accounting process. Hence, financial accounting speaks only about the past and nothing about the future. In the modern business world under competitive conditions, Managements are in need of accounting information not about the past but the present and future. Management Accounting is related to an accounting which generates information that facilitates the management functions of planning, control and decision making.

(c) *Effect of Government Interference*: The demand for an integrated national economy has led to increased governmental interference in the economic life of the

people. Management has to take account of government decisions which are not capable of being quantitively expressed. Financial accounting, being concerned with objectively quantifiable information, is unable to take them into account.

**(d) Needs different level of management**

Financial accountings fails to meet the information need of different levels of management. The information needs of the different levels of management vary widely with regard to subject matter and amount of details. Top management, as the policy maker, is interested in information such as soundness of plans, proper structure of organisation, delegation of authority etc. The middle level management would like to know about the occurrence of a business event. The lower level management, as operating supervisor would like to know about the effectiveness of its operations. Financial accounting has no built-in-system to provide such information.

(c) *Elementary Information*: It provides only elementary information in consolidated form. The rapid changes in technology and fast growth of business units have made the task of modern management highly complicated, particularly in areas relating to planning and control of operations. For the purpose of planning and control, a very detailed break-up of all types of information connected with all aspects of the business is necessary. But the financial accounting provides only elementary information and that too in consolidated form.

Management accounting is free from the above limitations of the financial accounting. But management accounting makes use of information that is drawn from financial accounting for making inferences and estimating for the future.

## 1.3 MANAGEMENT ACCOUNTING

The term 'Management Accounting' is composed of two words:

1. Management and
2. Accounting.

Hence, a clear understanding of these two words will help us in understanding what is 'Management Accounting'.

'Management' is principally a task of planning, co-ordinating, motivating and controlling the errors towards a specific objective. The principal aim of all management is to achieve greatest efficiency in the utilization of available materials, man-power, machines and skill. There may be different levels of management such as top management, middle and lower level management. Top management is primarily concerned with formulating policies, setting targets, exercising controls and arranging for proper co-ordination of the various activities of a business with a view to securing economic and efficient performance. The other levels of management are generally concerned with the day-to-day operations within the framework of the plans, policies and objectives set by the top management. A business, big or small, can never afford to proceed on 'guess work' or adopt 'hit or miss' methods of working. The large scale units of to-day have found it necessary

to adopt scientific methods of production and financing. Scientific Management is the substitute for guess-work. Its main objectives are to study the operating problems on the basis of facts and to work out the best use and application of human and material resources. Therefore, Management Accounting is a science which aims at achieving these objectives.

The other word is 'Accounting'. It is an art of analyzing and interpreting the transactions in terms, of time quantity and money. Accounting may be broadly divided into (i) Financial Accounting (ii) Cost Accounting and (iii) Management Accounting. (i) Financial Accounting pertains to the periodical representation of the financial statements. It helps to protect the interest of those who have primarily a financial stake in the organisation's affairs, shareholders, creditors, investors, employees, regulatory bodies and public in general. (ii) Cost Accounting helps to find out the exact cost of manufacture and to eliminate or minimize waste and inefficiency with a view to maximise the output at the minimum cost. (iii) Management Accounting is primarily concerned with providing information relating to the conduct of various aspects of a business like cost or profit associated with some portions associated with some portion of business operations.

The term 'Management Accounting' is of recent origin. It was first coined by the British Team of Accountants who visited U.S.A. under the sponsorship of Anglo-American Productivity Council in 1950 with a view to highlighting utility of Accounting as an 'effective management tool'. It is used to describe the modern concept of accounts as a tool of management in contrast to the conventional periodical accounts prepared mainly for information of proprietors. The object is to expand the financial and statistical information so as to throw light on all phases of the activities of the organisation.

**MISCONCEPTIONS ABOUT MANAGEMENT ACCOUNTING**

There are certain misconceptions about Management Accounting. According to some persons, Management Accounting, is nothing but Financial Accounting is in a new name an old wine in new bottle'. Is it the same old wine served in a new bottle? The answer is a definite 'No'. Financial Accounting merely deals with the presentation of the financial data after a particular period, usually at the end of the year, and no managerial control is possible thereafter. But under Management Accounting the various data relating to finance, sales, purchasing, personnel etc., are periodically presented before the management and proper controls can be exercised by it in case of divergence from the set standards.

On the other hand, others believe that Management Accounting is allied to Cost Accounting. This notion also is incorrect. Although Cost Accounting is an essential phase of Management Accounting, the emphasis has been shifted from knowing cost to controlling costs and herein lies the distinction between Cost Accounting and Management Accounting.

As Littleton has pointed out that many important data for managerial use are beyond the purview of traditional accounting to supply, for example, market

demand, personnel information, legal limitations etc. We are well aware that management has to take day-to-day, hour to hour and even minute to minute decisions thanks to changing conditions of business environment. Thus, Management Accounting has been originated to fulfil managerial needs by providing the above mentioned data which traditional accounting failed to supply.

**DEFINITION OF MANAGEMENT ACCOUNTING**

Before attempting to define Management Accounting, it may be noted that there is no unanimity among management accountants as to its precise definition.

Management Accounting may be defined as "the presentation of accounting information in such a way as to assist the management in the creation of the policy and day-to day operation of an undertaking'.

This definition is given by the Management Accounting of the Anglo-American Council on Productivity. Perhaps, this is the most authoritative of Management Accounting.

Let us examine a few more definitions. The Institute of Chartered Accountants of England has defined it as:

"Any form of accounting which enables a business to be conducted more efficiently can be regarded as Management Accounting". This definition is of a general nature and hence it is not of much use.

Robert N.Anthony has defined Management Accounting as follows:

"Management accounting is concerned with accounting information that is useful to management". Antony's sweet and simple definition does not shed much light on all phases of the Management Accounting.

**ACCORDING TO AMERICAN ACCOUNTING ASSOCIATION**

"Management Accounting includes the methods and concepts necessary for effective planning for, choosing among alternative business actions and for control through the evaluation and interpretation of performance". This definition is fairly illustrative.

**SHILLING LAW**

He describes nearly the essential differences between financial and managerial accounting which "stem from the fact that, financial accounting is concerned almost exclusively with history whereas managerial accounting is concerned with what will or may happen in the future".

Keller emphasizes the ue of management accounting for profit control. According to him "Management Accounting for profit control includes Income Accounting, Cost Accounting and Budgetary Planning and Control".

Some authors prefer the phrase "Management Accountancy" which is described by James Batty as "blending together into a coherent whole, financial accounting, cost accounting and all aspects of financial management". He has used this term to include "the accounting methods, systems and techniques which,

coupled with special knowledge and ability, assist management in its task of maximizing profits or minimizing losses".

Now, we feel that we have various definitions of Management Accounting given by different scholars and experts in the subject as well as different professional bodies of the world. All these definitions bring out the mechanistic concept of Management Accounting. They do not touch the spirit of the system. As a matter of compromise, we can say that all accounting operations which are oriented towards resources of the enterprise constitute Management Accounting. Thus, all accounting which directly or indirectly provide effective tools to managers in enterprises and government organizations lead to increase in productivity is 'Management Accounting'.

In the absence of an internationally accepted concept and definition, authors have used the following terms to express the same concept:

1. Managerial Accounting
2. Control Accounting
3. Responsibility Accounting
4. Decision Accounting
5. Forward Accounting
6. Management Accounting
7. Management Accountancy

## 1.4 OBJECTIVES OF MANAGEMENT ACCOUNTING

The basic objective of management accounting is to assist the management in carrying out its duties efficiently, and

1. The compilation of plans and budgets covering all aspects of the business e.g. production, selling, distribution, research and finance.
2. The systematic allocation of responsibilities for implementation of plans and budgets.
3. The organisation for providing opportunities and facilities for performing responsibilities.
4. The analysis of all transactions, financial and physical, to enable effective comparisons to be made between the forecasts made and actual performance.
5. The statistical interpretation of such statements in a manner which will be of utmost assistance to management in planning future policy and operation.
6. The presentation to management, at frequent intervals up-to-date information in the form of operating statements.

## 1.5 SCOPE OF MANAGEMENT ACCOUNTING

The scope of Management Accounting is wide and broad based. It encompasses within its fold a searching analysis and branches of business operations. However, the following facts of Management Accounting indicate the scope of the subject:

1. Financial Accounting
2. Cost Accounting
3. Budgeting & Forecasting
4. Cost Control Procedure
5. Statistical Methods
6. Legal Provisions
7. Organisation & Method

**1. FINANCIAL ACCOUNTING**

This includes recording of external transactions covering receipts and payments of cash, recording of inventory and sales and recognition of liabilities and setting up of receivables. It also covers preparation of regular financial statements. Without a properly designed accounting system, management cannot obtain full control and co-ordination.

**2. COST ACCOUNTING**

It acts as a supplement to financial accounting. It is concerned with the application of cost to job, product process and process and operation. It plays an important role in assisting the management in the creation of policy and the operation of undertaking.

**3. BUDGETING & FORECASTING**

These are concerned with the preparation of fixed and flexible budgets, cash forecasts, profit and loss forecasts etc., in cooperation with operating and other departments. Management is helped by them.

**4. COST CONTROL PROCEDURE**

It is concerned with the establishment and operation of internal control and the preparation of internal report in order to convert the budget into operating service. Management is helped by them by measuring actual results against budgetary standards of performance.

**5. STATISTICAL METHODS**

These are concerned with generating statistical and analytical information in the form of graphs, charts etc., to all departments of the organisation. Management need not waste time in understanding the facts and more time and energy can be utilized in drawing sound plans an conclusions.

**6. LEGAL PROVISIONS**

Many management decisions depend upon the provision of various laws and statutory requirements. For example, the decision to make a fresh issue of shares

depends upon the permission of controller of Capital issues. Similarly, the form of published accounts, the external audit, the authority of float loans, the computation and verification of income, filing tax returns, making tax payments for excise, sales, payroll income etc., all depend on various rules and regulations passed from time to time.

**7. ORGANISATION & METHOD**

They deal with organisation, reducing the cost and improving the efficiency of accounting and also of office operations, including the preparation and issuance of accounting and other manuals where these will prove useful.

### 1.6 FUNCTIONS OF MANAGEMENT ACCOUNTANT

In U.S.A. the management accountant is called controller or comptroller. He is considered to be part of the management team. He has the responsibility for collecting vital information, both from within and outside the company. He has to design a framework for the management accounting system. Hence, he safeguards the accuracy of information and develops devices required for their organisation and interpretation. The functions of the controller have been laid down by the controller's Institute of America. The following are the typical of the functions of any management accountatnt:

1. To establish, co-ordinate and administer an adequate plan for the control of operations. Such a plan would provide for capital investments and for financing sales forecasts.

2. To compare performance with operating pland and standards and to report and interpret the results of operation to all levels of management and to the owners of the business. This function includes the formulation and administration of accounting policy and the compilation of statistical records and special reports, if any, required.

3. To consult with all sections of management responsible for policy or action concerning any stage of the operation of business as it relates to the achievement of objectives.

4. To administer tax policies and procedures.

5. To supervise and co-ordinate preparation of reports to government agencies.

6. To assure fiscal protection for the assets of the business through adequate internal control and proper insurance coverage.

7. To continuously appraise economic and social forces and government influences and interpret their effect upon business.

The above seven functions of a controller are broad enough to include all phases of policy and organisation within the controller's jurisdiction. This has elevated the position of a controller to the top management cadre to the level of vice president or Director for Finance.

## 1.7 FUNCTION OF MANAGEMENT ACCOUNTING

A considerable amount of work has to be done to make the basic information fit for utilization in decision making areas. It is also necessary to correlate this information with other relevant information, which does not come out from the books of account. The collection and utilization of accounting information correlated with relevant financial and economic information as well as other environmental factors such as political and social, can be called the theme of management accounting. Among other things, management has the functions of planning, control and decision making. The specific function of accounting in the service of management are:

1. To act as the storehouse of accounting and other economic information.
2. To make available the relevant data after suitably pruning them to adopt the same to the purpose and to analyse them meaningfully for effective planning and decision making.
3. To communicate the plans to all levels of management.
4. To act as the score board of actual events and to communicate the actual facts both within and outside the organisation periodically. This leads to better control, and
5. Expert analysis of working results to highlight prominent facts.

### (A) CONTROL FUNCTIONS

Control is the process through which the accountant helps to translate the given objectives and strategy into specific goals for attainment by a specified time and secure effective accomplishment of these goals in an efficient manner. The typical services performed by accounting to assist control are:

1. Communication of the goals as approved by the management to individuals made responsible for achievement in the proper perspective, so that they understand the responsibility as the management means it to be understood.

2. Make all the managers and various other persons, leading their units, aware of their responsibility and assist them in achieving their goals as efficiently as possible.

3. Look after the co-ordination of various activities of all the organizational units so as to optimize results.

4. Evaluate the performance and the degree of achievement of various responsibility centres as compared to the goals set for them and assess their efficiency.

5. Identify areas of unsatisfactory performance for the benefit of the performing people as well as the top management and assist in the formulation of corrective measures at both ends, or change in the goals set in order to make them more realistic.

Control action is left to the managers. Accounting only assists managers to control. Exercise of proper control is possible only through the formulation of an integrated system wherein there are no clashes among various organizational units and minimum of information is transmitted from and to various points to yield the maximum benefit. In fact, control is a systematic feasible structure wherein all components are cohesively related to each other. It has to be understood well and fully by all the participants in the orgnaisation leading to a common understanding of responsibilities and actions which would result in disciplined efficiency.

**(B) PLANNING FUNCTION**

Accounting department assists managers in planning which is the most difficult area in accounting. The accountant has to rely on a large volume of information gathered outside the accounting records as well as the information system maintained within the firm. The process of planning includes long-term decisions, as well as short-term actions. The business environment outside as well as conditions within the firm keep on changing and taking decisions under such fast-changing circumstances is difficult. The accounting department assists the managers with the requisite information to plan and take decisions.

**(C) FINANCE FUNCTION**

Finance is the lifeblood of a business. Procuring and judicious use of finance are the two important activities under financial management. Just as production and sale are major functions in an enterprise, Finance, is also an independent specialized function. Thus, Financial management is a separate management area.

The prime need of a business is to obtain and disburse funds. Each firm treats this as a special problem. Each firm has its own goals aiming at a certain extent of profit generation. It is not necessary for a firm to have the goal of profit maximization as the only objective in the short run or even in the long run. The management might have its own limitations of efficiency and capability levels of satisfaction and appraisal of future. Moreover, social responsibilities and to the alter-action of goals in various directions. The typical problems that are faced by an accountant dealing with financial functions are as follows:

1. Type of expenditure to which a firm should get itself involved in a commitment to spend.
2. The volume of funds that should be committed by a firm on various types of expenditure.
3. The financing pattern that is considered desirable.
4. The way and means by which the existing funds committed as well as non-committed could be utilized for getting the maximum benefit for the firm.
5. The course of action to be taken whenever the expectations do not materialize and a failure is to be averted.

6. Methods of meeting the promise of repaying, reimbursing the funds that have been borrowed or raised from outside or meeting the expectations of the suppliers of funds in order to keep the channels of inflow of funds clear.

The decisions in all these areas are conditioned by the objectives and goals a firm desires to seek and are influenced by the environment prevailing outside the firm. Irrespective of the objectives, goals and strategies, the relationship between costs of funds, sources and earnings from funds form an integral part of the finance function.

## 1.8 FINANCIAL ACCOUNTING Vs MANAGEMENT ACCOUNTING

The following are the major differences between Financial Accounting and Management Accounting.

**1. OBJECTIVES**

Financial Accounting is designed to supply information in the form of profit and loss account and balance sheet to the external parties like shareholders, creditors, Banks, Investors and Government. Information is supplied periodically and is usually of such type in which management is not much interested, while the management accounting is designed principally for providing accounting information for internal use by the management.

**2. ANALYSING PERFORMANCE**

Financial Accounting portrays the position of business as a whole. The statements like Income Statement and Balance Sheet Report an overall performance of the business. Whereas the management accounting directs its attention to the various divisions, departments of the business and reports about the profitability, performance etc., of each of them.

Financial Accounting deals with the aggregate and, therefore, cannot reveal what part of the management action is going wrong. But management accounting provides detailed analytical data for these purposes.

**3. DATA USED**

Financial Accounting is concerned with the monetary record of past events. It is a post-mortem analysis of past activity and, therefore, out of date for management action. On the other hand, the management accounting is accounting for future and, therefore, it supplies data both for present and future duly analysed and in detail in the management language so that it becomes a base for management action.

**4. MONETARY MANAGEMENT**

In Financial Accounting only economic events find place which can be described in terms of money. However, the management is equally interested in non-monetary economic events such as technical innovations and changes in the

value of money. These events affect managements decision and therefore, Management Accounting cannot afford to ignore them.

**5. PERIODICITY OF REPORTING**

The period of reporting is much longer in financial accounting while the management accounting takes a shorter period for reporting. The Income Statement and Balance Sheet are usually prepared yearly or in some cases half-yearly. Management requires information at frequent intervals and, therefore, financial accounting fail to cater to the needs of the management. In management accounting there is more emphasis on furnishing information quickly and at comparatively short intervals as per the requirements of the management.

**6. PRECISION**

There is less emphasis on precision in case of management accounting as the information is meant for internal consumption. Whereas in the case of financial accounting more precision is required as the data will be used by many outsiders.

**7. NATURE**

Financial Accounting is "more objective" while Management accounting is "more subjective". This is because Management accounting is fundamentally based on judgement rather than on measurement.

**8. LEGAL COMPULSION**

Financial Accounting is more or less has become compulsory for every business an accountant of the legal provisions of one or the other Act. However, a business is free to install or not to install, a system of management accounting.

## 1.9 QUALITIES OF MANAGEMENT ACCOUNTANT

A successful accountant has thus to create in himself abilities to perform a variety of functions. He is therefore, expected to have the following qualities:

1. A very good grasp of the economic environment in which the firm is placed.
2. An understanding of the methods to forecast economic activities sunder expected varying conditions. He will find that appreciation of mathematical and statistical tools will be of great assistance to him in his work.
3. Knowledge of the means of recording the company's history and describing its current conditions for the purpose of management review and control and to provide information to interested parties.
4. An understanding of the elements that determine the values offered by alternative uses of resources and the means of comparing promised alternative values of one to the other.
5. A knowledge of the ways to forecast the funds movement associated with alternative activities under consideration.
6. An understanding of the ways in which various means of raising funds can be combined to produce greater values for the enterprise.

7. An appreciation of the stock of funds already at the company's disposal, and of the ways to use this stock more efficiently.
8. An analytical mind can see through implication of alternate courses.
9. The ability to get along with people at all levels.

With the above abilities, an accountant can render adequate services expected of him. However, these new dimensions of accounting and a growing number of useful analytical techniques are not expected to supplant the activity of keeping accounts. But the keeping of accounts becomes a relatively minor task in the challenging job of a management accountant by whatever name called.

## 1.10 UTILITY OF MANAGEMENT ACCOUNTING

Management Accounting provides invaluable services to management in all of its functions. The basic functions of management are: (i) Planning, (ii) Controlling, (iii) Coordinating, (iv) Organising, (v) Motivating, and (vi) Communicating.

Management accounting helps in performance of each of these functions efficiently as explained below:

(i) *Planning:* It involves formulation of policies, setting up of goals and initiating necessary programmes for achievement of the goals. Management Accounting makes an important contribution in performance of this function. It makes available the relevant data after pruning and analyzing them suitability for effective planning and decision-making.

(ii) *Controlling*: It involves evaluation of performance keeping in view that the actual performance coincides with the planned one, and remedial measures are taken in the event of variation between the two. The techniques of budgetary control, standard costing and departmental operating statements greatly help in performing this function. As a matter of fact the entire system of control is designed and operated by the management accountant designated as controller.

(iii) *Coordinating*: It involves interelinking of different divisions of the business enterprise in a way so as to achieve the objectives of the organisation as a whole. Thus, perfect coordination is required among, production, purchase, finance, personnel, sales, etc., departments. Effective coordination is achieved through department budgets and reports. Which form the nucleus of management accounting.

(iv) *Organising*: It involves grouping of operative action in a way to identity the authority and responsibility within the organisation. Management accounting here also plays a prominent role. The whole organisation is divided into suitable profit or cost centres. A sound system of internal control and internal audit for each of the cost or profit centres helps in organizing and establishing a sound business structure.

(v) *Motivating*: It involves maintenance of a high degree of morale in the organisation. Conditions should be such that each person gives his best to realize the goals of the enterprise. The superiors should be in a position to find out whome

to demote or promote or to reward or penalize. Periodical departmental profit and loss accounts, budgets and reports go a long way in achieving this objective.

(vi) *Communication*: It involves transmission of data, results, etc., both to the insiders as well as outsiders. The orders of the superiors should be communicated to the subordinates while the results achieved by the subordinates should be reported to the superiors. Moreover, the management owes a duty to the creditors, prospective investors, shareholders, etc., to communicate to them about the progress, financial position etc., of the enterprise. Management accounting helps the management in performance of this function by developing a suitable system of reporting which emphasizes and highlight the relevant facts.

Management account is thus helpful to the management in every field of activity. This is the reason why management accountant is considered not only a service arm to management but also a part of management.

## 1.11 SUMMARY

Management Accounting acts as the store house of accounting and communicates the plans to all levels of management. Financial accounting supplies information in the form of profit and loss.

## REVIEW QUESTIONS

1. What are accounting concepts and conventions? Explain them clearly.
2. Explain how management accounting helps to eliminate the limitation of financial accounting.
3. What are the qualities of management accountant?
4. How does management accounting help planning and control functions in an organisation?
5. Explain the scope of management accounting in providing information to the management for the evaluation and control of business operations.

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LESSON – 2

# CAPITAL BUDGETING

**STRUCTURE**



## 2.1 INTRODUCTION

"Capital budgeting" refers to long-term planning and proposed capital outlays and their financing. It deals with the types and importance of capital budgeting.

A Business concern has to face quite often the problem of capital investment decisions. Capital investment refers to the investment in projects whose results would be available only after a period of time. Hence, planning for capital expenditure has become an integral part of policy making and budgetary control. Capital expenditure is one which is intended to benefit future periods and normally includes investment in fixed assets and other development products. It is essentially a long-term function, and such for a decision to buy land, buildings or standard machinery period of time. Therefore, it is essential to keep a close watch on capital expenditure.

## 2.2 CONCEPT OF CAPITAL BUDGETING

The term 'capital budgeting' refers to long-term planning for proposed capital outlays and their financing. It includes both raising of long-term funds as well as their utilization. It may thus be defined as the firms' formal process for the acquisition and investment of capital. It is the decision-making process by which firms evaluate the acquisition of major assets. It involves firm's decision to invest its current funds for addition, disposition, modification and replacement of long-term or fixed assets.

Capital budgeting is a many-sided activity. It includes searching for new and more profitable investment proposals, investigating engineering and marketing considerations to predict the consequences of accepting the investment and making economic analysis to determine the profit potential of each investment proposal.

**OPERATING BUDGET AND CAPITAL BUDGET**

Many large firms prepare two different budgets every year: (1) operating Budget, and (2) Capital Budget or Capital Expenditure Budget. Operating Budget

shows planned operations for the forth coming period and includes sales, production, production cost and selling and distribution overhead budgets. Capital Budget deals exclusively with major investment proposals. It assesses the economics of capital expenditure and investment.

Capital expenditure budget is a type of functional budget. It is the firms formal plan for the expenditure of money for purchase of fixed assets. It provides a guidance as to the amount of capital that may be required for procurement of capital assets during the budget period. The budget is prepared after taking into account the available production capacities, probable reallocation of existing resources and possible improvements in production techniques.

## 2.3 IMPORTANCE OF CAPITAL BUDGETING

Capital Budgeting decisions are among the most crucial and critical business decisions. Special care should be taken in making these decisions on account of the following importance.

**1. *Investment of Heavy Funds***

The capital investment involved is usually very large. It will have several far reaching implications on the activities of business and may even seriously affects the very financial stability or flexibility of the business. It is implications which make capital budgeting so important.

**2. *Long-term Implications***

The effect of capital budgeting decision will felt by the firm over a long period and therefore, they have a decisive influence on the rate and direction of growth of the firm.

**3. *A wrong decision can prove disastrous***

It shows the possibility of expanding the production facilities to cover additional sales shown in the sales forecast. In fact the economic life of the asset acquired represents an indirect sales forecast for the duration of its economic life. Any error in this regard may result in over or under investment in fixed assets, that is, excess production capacity or inadequate capacity. Just as an unwanted expansion results in assets would make it difficult for the firm to run the business in the long term. Thus, a wrong decision can prove disastrous for the long-term survival of the firm.

**4. *Irreversible decisions***

In most cases, capital budgeting decisions are irreversible. This is because it is very difficult to find a market for the capital assets. The only alternative will be to scrap the capital assets so purchased or sell them at a substantial loss in the event of the decision being proved wrong.

**5. *Most difficult to make***

The capital budgeting decisions require an assessment of future events which are uncertain. It is really a difficult task to estimate the probable future events, the

probable benefits and costs accurately in quantitative terms because of economic, political, social and technological factors.

**6. *Ensures selection of right source***

Capital expenditure decisions involve substantial funds which may not be immediately and automatically available. A well established capital budget would enable the management to decide in advance the sources of finance and ensure their availability at the right time.

**OBJECTIVES OF CAPITAL BUDGETING**

**1. *Selection of the right mix of profitable projects:***

The overall objections of capital budgeting is to allocate the available investible funds among the competing capital projects in order to maximise the total profitability. This is made possible by employing the various evaluation techniques for the selection of investment projects which contribute the maximum towards the overall investment objective. In case of public enterprises, capital budgeting may also assure fulfillment of other objective such as promotion of employment, development of backward regions etc.

**2. *Control of capital expenditure***

Control of capital expenditure is the next important in objective of capital budgeting. This is achieved by forecasting the long-term financial requirements and thereby enabling the management to plan in advance to raise funds at the right time. The objective of preparing capital budget is to plan and then compare the actual capital expenditures with the budgeted figure for controlling costs.

3. Determining the required quantum and the right source of funds for investment.

4. The next important objective of capital budgeting is to determined the funds required for long-term projects and to see that such estimates fall in line with the company's financial policies. It also aims to compromise between the available of funds and needs of the capital projects.

**2.4 TYPES OF CAPITAL INVESTMENT PROJECTS**

Investment projects may be classified in a number of ways. The following kinds of investment projects are commonly used by both private and public sector business units in their capital expenditure forecasts:

a) Expansion of existing product lines

b) Expansion into new product lines

c) Replacement and modernization schemes

d) Projects for the utilization of scraps and also of surplus installed capacity

e) Cost reduction projects

The above listed projects are generally profit oriented and therefore they may be evaluated on the basis of their costs and benefits. But there are certain projects

undertaken by all business and on which it would be difficult to measure returns. For instance:

**1. *Safety Precautions***

Provision of safety devices and equipment and may be demanded by various legal requirements.

**2. *Welfare Projects***

Provision of sports facilities for employees may boost morale. This cannot be evaluated financially.

**3. *Service Projects***

Provision of buildings and equipment for non-manufacturing departments may be essential, but the return from investment on them cannot be evaluated.

**4. *Research and Development***

This may be initiated to improve the company method or products. It would be very difficult to measure the return and R and D for a considerable period of time.

**5. *Educational Projects***

Provision of company training course may be instruments in improving the efficiency of employees but the returns from investment on such programmes may be difficult to evaluate.

**RELEVANT COST FOR CAPITAL EXPENDITURE**

Different types of investment decisions call for different kinds of costs. Not all costs which are used in conventional accounting decision making. A few items of relevant costs are:

1. *Future Costs*: Future costs are the projected or estimated costs. They are relevant for all types of investment decisions. Past cost are useful to the extent that they furnish a starting point for future cost projections. While calculating these costs, factors such as market conditions, political situations, general trend in the price levels, probabilities relating to future production and slaes, economic life of the project etc.

2. *Opportunity Costs:* Opportunity cost referes to the benefits of the best alternative foregone. As the investment in a project involves commitment of the firms investable funds. It becomes relevant to consider the opportunity of getting some benefits by employing the resources on some other alternative. Imputed cost is a kind of opportunity cost. It is the cost which is not actually incurred, but would be incurred in the absence, of self-owned factors. For instance cost of retained earnings, rent cost of retained earnings, rent a company owned facilities etc.

3. *Incremental Cost of Differential Cost*: It is an additional cost due to a change in the volume of business or nature of business activity. Hence, it is useful for

decisions such as adding new machinery, new product, changing distribution channel etc. As it refers to the cost of an added unit of the cost of an output, it is different from marginal cost.

4. *Interest Cost*: Accounting reports normally ignore the imputed interest on capital which is relevant for decision-making purpose interest cost constitutes the minimum acceptance criterion for capital investment projects undertaken for profit. A firm must atleast recover its money cost before it can realize a profit on its own investment.

5. *Depreciation and Income-tax*: Depreciation is normally excluded while calculating cash flows for investment, appraisal and evaluation. But it is included for calculating the accounting rate of the project payment of taxes results in cash flows and, therefore, is an important element in capital investment decisions.

6. *Secondary Costs and Benefits*: These costs and benefits are particularly relevant for the capital expenditure decisions in public enterprises. They are external to the project implementing body and therefore are called external cost and benefits. There are two types of externalities pollution and noise are examples of technological externalities. Pecuniary externalities are such as increasing rates of hire for factors of production, reduction in prices of substitute products. Secondary benefits are the increase in profits that can be attributed to the increased activity of processors, merchants and others who handle the project's output or input. The major problems associated with these costs and benefits are their identification and measurement. However, for easy identification they should be related to the socio-economic objectives assigned to the project. To measure these costs and benefits, shadow prices or imputed prices should be used.

## 2.5 CAPITAL EXPENDITURE CONTROL

The control over capital expenditure is growing in importance as mechanization and automation are introduced and extended. However, formal capital budgeting is still undeveloped as it is of comparatively recent origin. Any system of capital expenditure control should have the following feature:

A. Planned development

B. Control of progress

C. Post-completion audit

D. Forms and procedures

### (A) PLANNED DEVELOPMENT

Capital expenditure should be carefully planned to include developments in each side or department to ensure that each unit in the group or company is developing in step with the overall plan. Preparation of capital budget will be essential, even when companies d not operate a complete system of budgetary control. Capital appropriation and payments must be planned well in advance.

**(B) CONTROL OF PROGRESS**

A progress record is necessary to show the progress of each capital project. The budget and actual expenditure will be compared for analysis and control. These reports are also useful to ensure that the overall programme remains within the limits set by the policy of the company.

**(C) POST-COMPLETION AUDIT**

This is an important step of capital expenditure control. Post-completion audits of projects determine whether their actual value is in accordance with the one determined at the time of authorization. This review can be very important because it may reveal inefficiencies in the system, and it would provide experience which would help in avoiding repetition of mistakes.

**(D) FORMS AND PROCEDURES**

There should be a routine for controlling capital expenditure. A procedure should be adopted for the various stages, requesting for capital expenditures, authorization, reporting the progress of such projects and audit. A well designed form should be used for these purposes for better control.

## 2.6 CLASSIFICATION OF CAPITAL EXPENDITURE BUDGET

The following are the different types of capital expenditure budget:

**1. *Initial Capital Expenditure Budget***

It is prepared for new project on the basis of estimates for civil works, electrical works, cost of plants, machinery, equipments and tools, preliminary expenses, pre-operative expenses and margin money.

**2. *Capital Budget for Replacement and Expansion***

Expenditure necessary to replace worn out of damaged equipment are included in this group. Replacement may be undertaken for either maintenance of business or cost reduction or both. Expansion may be on existing product markets or into new product markets. Expenditures to increase of existing products, or to expand outlets or distribution facilities in markets now being served are included under expansion of existing products or markets Expansion into new products, markets, include those expenditures necessary to produce a new product or to expand into geographical area not currently being served.

**3. *Annual Capital Budget***

Usually, every year there is some amount of capital expenditure for purchase of office equipments, vehicles, extension of building, furniture, machine accessories and the like.

Capital Expenditure projects may also be classified into

**(a) *Profit Earning Projects***

These projects are taken up with a view to increasing or maintaining profits such as an investment in a plant which is expected to (i) improve the quality of

products, or (ii) improve facilities to increase productivity or (iii) expand the productive capacity, or (iv) reduce the cost. Profit earning project may be either a new equipment or a new project or replacement project or expansion project. It may even relate to a project involving utilization of surplus capacity.

**(b) *Non-Profit Projects***

Capital investment are sometimes undertaken for meeting some contractual obligations such as labour agreements or statutory requirements or the orders of government or local authorities. These may be in the form of safety measures for employees, pollution control, provision of welfare and amenity measures, research and development projects, educational and training projects, service departmet projects etc. Prestige-value projects are also undertaken in order to create a favourable image in the minds of the public. For instance, investments on guest houses, community hall, traffic umbrella parking lots etc.

## 2.7 PROJECT REPORT

The first stage in the development of a project is the preparation of a Project Report. The main influence affecting the capital investment decisions to be incorporated in the project report are as follows:

1. The amount of the investible funds available during the project period.
2. The project cost and the production life of the investment.
3. The phasing of the expenditure (the time of the investment) under the project.
4. The amount of earnings i.e. the rate of return expected from the investment project.
5. The future net increase in income or future net savings in costs.
6. Opportunity or alternative cost.
7. Interest cost of the capital to be invested.
8. Tax implications and depreciation eg. investment allowance, tax benefits in backward areas, tax holiday benefits etc.
9. The effect of the project upon the profitability of the remaining sectors of the business.
10. Additional working capital requirements.
11. The scrap value of the end of the effective life of the asset.

Capital expenditure proposals are considered first at the department level before they are initiated for acceptance by higher level management. At this stage, the department may have to consider the available alternatives before a decision is made on capital expenditure such as repairing or remodeling the present equipment, leasing another one instead of buying a new machine, buying a second hand equipment etc. At the top management level the selection process consists of

selection from among conflicting proposals on the basis of some criteria of evaluation then only limited funds are available.

**(A) CAPITAL PRIORITIES**

When the capital available is limited, it is essential to establish a system of priorities so that best use is made of it. The management accountant has to record priorities, thus

a) Projects already in hand ie. projects that are incomplete but need additional expenditure for completion.

b) Projects necessitated by law.

c) Projects to maintain productive capacity of the business.

d) Projects to increase earnings by cost reduction or boosting; and

e) Projects to develop new products needed to improve the profitability of business.

In order to be able to evaluate accurately by a capital investment proposal, it is necessary that all reasonable alternatives be stated in precise terms, otherwise it will be very difficult, it not impossible, to evaluate cash flows. It is always desirable to avoid averaging two or more investment alternatives into a single decision.

## 2.8 FINANCE SOURCE MIX

A major consideration in project evaluation is the examine the various methods of financing the project and their effects on profitability on the project. Whether capital expenditure takes the form of additional equipment or equipment replacement, it requires liquid cash to execute the project and when production increases in turn, this requires additional working capital also. This additional finance must be obtained either from outside sources or from sources inside the business.

The resources having been finalized, the next step is to phase the expenditure, especially where the capital expenditure is being financed by internal sources. This is taken care off by the preparation of a detailed cash budget by periods. The approved capital expenditure proposals are included in the cash budgets for the period where the expenditure is planned to be incurred.

**FEASIBILITY STUDIES**

There are five major areas with reference to which the feasibility of a capital project must be evaluated: (a) Technical (b) Commercial (c) Financial (d) Managerial and (e) Economic feasibility. Since the primary purpose of this lesson is to explain the financial feasibility of a project through profitability statements. Hence, it is assumed here that in dividing whether or not to invest in fixed assets, the sole criterion is the profit expected from the investment. It is the responsibility of the management accountant to see that the management is presented with the most useful information about each project. Thus decisions are based not on a guess work but on reasoned calculations.

## 2.8 SUMMARY

Capital budgeting helps to understand selection of the right mix of profitable projects and control of capital expenditure.

## REVIEW QUESTIONS

1. Explain the concept of capital budgeting.
2. How will you classify the budget.
3. State the important of capital budget.

❐

LESSON – 3

# CAPITAL BUDGETING – METHODS OF RANKING INVESTMENT

**STRUCTURE**



## 3.1 INTRODUCTION

In this Chapter, methods of Capital Budgeting are discussed in detail with illustrations.

## 3.2 PROPOSALS

The final step in the capital budgeting system involves evaluating the profitability of the alternative project and selecting the best one. A firm may face a situation where more investment proposals may be available than investible funds. Some proposals may be good, some moderate and many poor. Hence, a ranking procedure has to be evolved so that the available funds can be allocated among different proposals in a profitable manner. Essentially, the ranking procedure envisages relating of a stream of future benefits to the cost of investments.

There are various techniques ad criteria which can be used for evaluating the profitability of a capital project. Among the various methods, the following are commonly used by many business concerns:

## 3.3 METHODS OF CAPITAL BUDGETING

1. *Traditional or non-time value technique*
   a) Payback period
   b) Average rate of return
2. *Modern or time value technique*
   Discounted cash flow methods
      i) Net present value
      ii) Internal rate of return
      iii) Benefit/cost ratio



### a (i) TIME UNADJUSTED RETURN ON INVESTMENT

The time unadjusted return on investment measures the percentage return on investment, which is obtainable from proposed investments. This is an indicator of the profitability of investment proposals. If there are several projects then they would be ranked according to the respective returns. Proposals which show a return on investment higher than the cost of capital are proposals worth undertaking. However, if funds are limited then projects will be ranked according

to the profitability and the most profitable proposals would be accepted. Some projects may earn a return on investment higher than the cost of capital but have to be rejected due to the non-availability of funds.

**a (ii) TIME ADJUSTED RETURN ON INVESTMENT**

In the previous method it is obvious that when we are computing the rate of return, we are considering two unlike things. One is investment which is invariably instantaneous and second the savings which are spread over the economic life of the investment proposal. The validity of composing investment today with savings receivable at a future date is to be examined. This is because a rupee of savings receivable at a future date is not worth the same as a rupee today.

However, a good yardstick for measuring the profitability or otherwise of investment should possess the following characteristics.

a) It should summarise the merit of an investment proposal i.e., it should be capable of determining the profitability of the investment proposal in object terms.

b) It should provide basis for comparisons between different proposals.

c) It should be expressed in terms compatible with company's long rang objective.

d) Lastly, it should be simple to understand and operate.

**a (iii) PAYBACK PERIOD METHOD**

One of the most commonly used techniques for evaluating capital investment proposals is the cash payback or otherwise simply called as payback. It attempts to calculate the period known as payback period, require to recover the initital investment out of inflow of net cash flows savings or profit by the investment. Payable period is defined as the number of years required for the savings in costs or net cash inflow to recoup the original cost of the project. Next cash inflow is calculated after tax but before depreciation. The payback method is based on the principle that every capital expenditure pays itself back over a number of years. It is called by different names such as pay off period of recoupment period.

**CALCULATION OF PAYBACK PERIOD**

First of all, in case of even cash inflow, net cash flow is determined. Then divide the initial cost by annual cash inflows and the resulting quotient is the payback period.

$$\text{Payback period} = \frac{\text{Original cost of investment}}{\text{Annual net cash inflows or savings}}$$

$$P = \frac{I}{S} \text{ or } \frac{I}{C} \text{ or } \frac{I}{E}$$

P = Payable Period

I = Initial investment

S = Savings per year

C = Annual Cash inflow

E = Earnings per year

If the annual cash inflows are uneven, then the calculation of payback period takes a cumulative form. The annual cash inflows are accumulated till they equal the original cost of investment and as soon as this amount is recovered, it is the expected number of payback years. Compare the payback period with some predetermined standard period in which the investment should pay for itself or with the payback period of the alternative project and if the project pays for itself in less time than the predetermined standard period of the period of the alternative project, the project is considered profitable and hence is accepted, otherwise it is rejected as unprofitable. As a rule shorter the period, the better is the investment made.

**ILLUSTRATION 1:**

| | **Option I Rs.** | **Option II Rs.** |
|---|---|---|
| Required Investment | 8000 | 7000 |
| Cash inflow | | |
| Year 1 | 4000 | 2500 |
| Year 2 | 3000 | 2500 |
| Year 3 | 2000 | 2500 |
| Year 4 | 1000 | 2500 |

**SOLUTION**

Payback period Option I = 2.5 years

Option II = 2.8 years

Option I would thus be preferred because of the shorter payback period.

Payback period method is easy and useful so long as projects of similar life duration are considered. The defect with the payback period method is its linked up historical coverage. It is useful provided the life of the different projects is identical. If one project has a longer duration than the other. This method is not effective.

Secondly, the outflows of different years are added together to determine the number of years in which the investment is recovered. But, strictly speaking, the flow of each year is interrupted by a time gap of a year.

Effect should be given to this time gap while aggregating together the inflow of various years. This is taken care of in the discounted cash flow method.

**a (iv) RETURN ON INVESTMENT METHOD**

The Return on Investment (ROI) method takes into consideration the rate of return likely to be obtained from the project. This may be defined as the ratio of

profit (net of depreciation and takes) to initial capital outlay. Acceptable projects are ranked according to the respective rates of returns and the one which yields a highest rate of return is selected. This method is often referred to as 'Accounting Method', 'Interest Rate of Return Method', 'Unadjusted Rate of Return Method', 'Average Rate of Returns Method', 'Financial Statement Method', etc.

In calculating the rate of return, different practices are adopted. For instance, the term 'investment' is interpreted present investment and residual value. Similarly, the term 'return' or 'earning' may be. (a) total earning, (b) average annual earning (c) average annual net earning or (d) average additional earnings per annum. The return on investment should be calculated on the basis of data available and whenever possible both total and average investment methods should be applied.

**a (v) TOTAL INCOME METHOD**

Under this method, total earnings are ascertained (after depreciation and taxes) and then it is divided by the total investment. This gives the average rate of return per rupee invested in the project. The higher the earning per rupee or the higher the percentage, better the project and deserves to be selected.

$$\text{Earning per unit of investment} = \frac{\text{Total earnings}}{\text{Project outlay}}$$

This can also be expressed as the total expected income from a project as a percentage of its capital cost.

**(B) AVERAGE RATE OF RETURN ON INVESTMENT**

In this case, all the earnings after taxes and depreciation are added and then, it is divided by the project's effective economic life. This gives the figure of average earnings over the period which is again divided by original investment. The project which gives the highest rate of return is normally selected.

$$\text{Formula} = \frac{\text{Net profit (After depreciation and tax)}}{\text{Life of Asset x Capital outlay}} \text{ x } 100$$

Average Rate of Return on average investment may also be calculated by dividing average rate of return by average investment. Average investment in a project is calculated at half of depreciable cost and residual or scrap value. The concept of taking only half of capital outlay is based on the view that the amount periodically recovered in the form of depreciation is ploughed back in the business.

$$\text{Average Investment} = \frac{\text{Initial investment} + \text{Scrap value}}{2}$$

$$\text{Average Rate of Return} = \frac{\text{Annual net income}}{\text{Average investment}} \text{ x } 100$$

**ILLUSTRATION 2:**

The Directors of Madras Rubber Factory Limited consider a proposal to invest a sum of Rs.1,00,000 on a plant that has an expected life of 5 years at the end of which has no residual value.

The expected annual incomes during the life of the plant are:

| | | | | |
|---|---|---|---|---|
| At the end of | I | Year | Rs. | 30,000 |
| | II | Year | Rs. | 40,000 |
| | III | Year | Rs. | 40,000 |
| | IV | Year | Rs. | 20,000 |
| | | Total | Rs. | 1,60,000 |

Money is available at an interest rate of 10% per annum. Calculate rate of return and advise the directors of the company.

**SOLUTION**

Calculation of Rate of Returns:

| | |
|---|---|
| Total earnings (in five years) | 1,60,000 |
| **LESS** Cost of the asset | 1,00,000 |
| Net yield in five years | 60,000 |

(a) Average Return = $\frac{60,000}{5}$ = Rs.12,000

(b) Average Return on Original Investment = $\frac{12,000}{1,00,000} \times 100 = 12\%$

(c) Average Return on Average Investment = $\frac{12,000}{1,00,000/2}$

$= \frac{12,000 \times 2 \times 100}{1,00,000} = 24\%$

Since the rate of return from the proposed investment is more than the market rate of interest (10%) the directors of this company can proceed to invest in this plant.

**ILLUSTRATION 3**

Chidambaram Textiles Limited has a machine which has been in operation for six years. The management is considering a proposal to purchase an improved model of a similar machine which gives an increased output. Give your opinion as a management accountant in regard to the proposal from the following data:

| | | Old Machine Rs. | New Machine Rs. |
|---|---|---|---|
| 1. | Purchase price of machine | 60,000.00 | 1,20,000.00 |
| 2. | Expenditure p.a. on account of | | |
| | (i) Power consumption | 7,000.00 | 8,000.00 |
| | (ii) Consumable Stores | 4,000.00 | 5,000.00 |
| | (iii) Repairs and maintenance | 5,000.00 | 4,000.00 |
| 3. | Labour cost per running hour | 2.00 | 2.25 |
| 4. | Units of output per hour | 40.00 | 60.00 |
| 5. | Machine running hours per annum | 2,000.00 | 2,000.00 |
| 6. | Material cost per unit | 0.40 | 0.40 |
| 7. | Selling price of output per unit | 1.00 | 1.00 |
| 8. | Estimated life | 10 Years | 10 Years |

**SOLUTION**

**Statement of Profitability**

| | | | Old Machine | New Machine |
|---|---|---|---|---|
| Purchase price | | | 60,000 | 1,20,000 |
| Estimated life (years) | | | 10 | 10 |
| Unit per annum | | | 80,000 | 1,20,000 |
| | | | Rs. | Rs |
| 1. Sales | | | 80,000 | 1,20,000 |
| 2. Cost of Production | | | | |
| Material | | | 32,000 | 48,000 |
| Wages | | | 4,000 | 4,500 |
| | | | 36,000 | 52,500 |
| Variable Overheads: | | | | |
| Power | 7,000 | 8,000 | | |
| Consumable Stores | 4,000 | 5,000 | | |
| Repairs | 5,000 | 4,000 | 16,000 | 17,000 |
| Marginal cost | | | 52,000 | 69,500 |
| ADD Depreciation | | | 6,000 | 12,000 |
| | | | 58,000 | 81,500 |
| 3. Profit before tax | | | 22,000 | 38,500 |
| LESS Tax @ 50% | | | 11,000 | 19,250 |
| Profit after tax | | | 11,000 | 19,250 |

4. Average additional Profit per annum
   Before Tax (38,500 – 22,000) = 16,500

After Tax (19250 – 11,000) = 8250

$$\text{Profitability} = \frac{\text{Average additional profit}}{\text{Average Investment}} \times 100$$

$$\text{Before Tax} = \frac{16,500}{60,000} \times 100 = 27.5\%$$

$$\text{After Tax} = = \frac{8,250}{60,000} \times 100 = 13.75\%$$

The proposed project will yield an additional return on capital invested of 27.5% before tax or 13.75% after tax which is considered to be satisfactory. therefore, the new project may be undertaken.

**2. DISCOUNTED CASH FLOW TECHNIQUES (DCT)**

Since money has a time-value, time factor in investment is fundamental rather than incidental for the purpose of evaluating investments. Cash flows received in different years should not be treated to have uniform value. The nominal value of rupee received today is more valuable than a rupee to be received a year later. The Discounted Cash Flow method takes the time factor of income into consideration and the other methods life Payback and Return on Investment do not take time factor into consideration.

Discounting involves reducing the value of the future returns to make it directly comparable to the values at present. Suppose we could invest any money today in the capital market for a return of 10 percent. Conversely we can say that Rs.110 in a year's time is worth Re.1 now, at a rate of interest of 10 percent. Therefore, 1 in a year's time worth 91 paise (1/11) now, since 91 paise now could be invested at 10% interest rate to get Re 1 in a year's time and Rs.1.21 in two years time. The rate at which the future cash flows are reduced to their present value is termed as discount rate. Realistic capital investment appraisal depends on two factors, viz. discounting period and a suitable discount rate. Normally, the economic life of a project is used as the discounting period.

**(i) NET PRESENT VALUE TECHNIQUE**

NPV may be defined as the excess of present value of project cash inflows over that of outflows. The rate of discount employed for obtaining the present value of cash flows. Under this method the discount rate is assumed. Usually this assumed discount rate should be equal to the cost of capital. Unless a capital project is expected to yield atleast as much as the cost of capital, the project should not be accepted.

**ILLUSTRATION 4:**

The Alpha Company Limited is considering the purchase of a new machine. Two alternative machines (A and B) have been suggested, each costing Rs.4,00,000. Earnings after taxation are expected to be as follows:

| Year | Cash Flow | |
|---|---|---|
| | Machine A Rs. | Machine B Rs. |
| 1 | 40,000 | 1,20,000 |
| 2 | 1,20,000 | 1,60,000 |
| 3 | 1,60,000 | 2,00,000 |
| 4 | 2,40,000 | 1,20,000 |
| 5 | 1,60,000 | 80,000 |

The company has a target rate of return on capital at 10 percent and on this basis you are required to compare the profitability of the machines and state which alternative you consider financially preferable. The present value of Re.1 at 10% are as follows:

| | | |
|---|---|---|
| I | Year | 0.91 |
| II | Year | 0.83 |
| III | Year | 0.75 |
| IV | Year | 0.68 |
| V | Year | 0.62 |

**SOLUTION**

**Statement of Net Present Value**

| Year | Cash inflow Machine A | Cash inflow Machine B | PVF 10% | Present Value A | Present Value B |
|---|---|---|---|---|---|
| 1 | 40,000 | 1,20,000 | 0.91 | 36,400 | 1,09,200 |
| 2 | 1,20,000 | 1,60,000 | 0.83 | 99,600 | 1,32,800 |
| 3 | 1,60,000 | 2,00,000 | 0.75 | 1,20,000 | 1,50,000 |
| 4 | 2,40,000 | 1,20,000 | 0.68 | 1,63,200 | 81,600 |
| 5 | 1,60,000 | 80,000 | 0.62 | 99,200 | 49,600 |
| | 7,20,000 | 6,80,000 | | 5,18,400 | 5,23,200 |

NPV (A) = 518400 – 4,00,000 = Rs.1,18,400

NPV (B) = 523200 – 4,00,000 = Rs.1,23,200

**RECOMMENDATIONS**

Machine 'B' is financially preferable. Though the total cash inflow is greater for machine A than for machine 'B', the most present value of machine 'B' is greater than machine A (rs.1,23,200 as against Rs.1,18,400). This is so because the cash inflows in the earlier years are greater for machine 'B' than for machine 'A'.

## OTHER METHODS

The other methods (or Criteria) used, not very often, for evaluating the capital expenditure proposals are:

**1. *Degree of Urgency Method***

It is a qualitative and subjective methods of ranking projects. Some projects are needed at once to the survival of the firm while some others may be postponed to future. Those projects that cannot be postponed and are needed at once are undertaken first eg. break down in production process.

**2. *First Year's Performance Method***

Under this method, the investment projects are evaluated on the basis of their impact or revenue from sales of the savings in expenses resulting from the improved technique or equipment. If the sales revenue exceeds all the added expenses including interest and depreciation, the investment is accepted, otherwise it is rejected.

**3. *Comparative Cost Method***

In this method, comparison, is made between the original costs of alternative investment proposals and the investment that shows the minimum cost is preferred, provided that other things remaining constant.

**4. *Annual Cost Method***

Under this method, the capital as well as the operating costs of alternative investment schemes are converted into equivalent annual costs at an assumed rate of interest and one which has the lowest annual cost is preferred.

**5. *Net Terminal Surplus Method***

The annual cash inflows are compounded for the respective number of years from the first year of their generation upto the end of the life of the project. If the aggregate compounded value of the annual cash inflows exceed the aggregate compounded value of the investment, the project provides a net terminal surplus. The project that provides the greatest net terminal surplus will be the one to be selected on this basis.

## 3.4 SUMMARY

The methods of capital budgeting are useful for evaluation of the project and future benefits to the cost of investment.

## REVIEW QUESTIONS

1. What do you understand by capital budgeting?
2. Describe some circumstance where the payback method of analysis would be useful?
3. What considerations other than profitability are made in managerial decisions about investment proposals?
4. What are the various methods of financing capital projects?

5. Differentiate between
   (a) IRR method and NPV method
   (b) Payback reciprocal and rate of return on investment
   (c) Investment decisions and operating decision.
6. A project costs Rs.20,00,000 and yield annually a profit of Rs.3,00,000 after depreciation @ 12 ½ % but before tax at 50%. Calculate the Pay-back period.

(Ans.: 5 years)

7. ABC Limited is considering two projects. Each requires an investment of Rs.10,000. The firm's cost of capital is 10%. The net cash inflows from investment in the two projects X and Y are as follows:

| Year | X Rs. | Y Rs. |
|---|---|---|
| 1 | 5,000 | 1,000 |
| 2 | 4,000 | 2,000 |
| 3 | 3,000 | 3,000 |
| 4 | 1,000 | 4,000 |
| 5 | – | 5,000 |
| 6 | – | 6,000 |

The company has fixed three years pay-back period as the cut-off point. State which project should be accepted.

(Ans.: Project X should be accepted)

8. Each of the following project requires a cash outlay of Rs.10,000. You are required to suggest which project should be accepted if the standard pay-back period is 5 years:

| Year | Cash Inflows | | |
|---|---|---|---|
| | Project X Rs. | Project Y Rs. | Project Z Rs. |
| 1 | 2,500 | 4,000 | 1,000 |
| 2 | 2,500 | 3,000 | 2,000 |
| 3 | 2,500 | 2,000 | 3,000 |
| 4 | 2,500 | 1,000 | 4,000 |
| 5 | 2,500 | – | – |

(Ans.: Pay-back period in each case in 4 years. However, Project Y is the best out of all since in its case inflows are higher in initial Years).

9. A company has choose one of the following two mutually exclusive projects. Both the projects have to be depreciated on straight line basis. The tax rate is 50%.

| Year | Cash Inflows | |
|---|---|---|
| | **Project A** Rs. | **Project B** Rs. |
| 0 | 15,000 | 15,000 |
| 1 | 4,200 | 4,200 |
| 2 | 4,800 | 4,500 |
| 3 | 7,000 | 4,000 |
| 4 | 8,000 | 5,000 |
| 5 | 2,000 | 10,000 |

You have to use Pay-back period as the criterion.

(Ans.: Project A should be preferred).

10. X Limited, is considering the purchase of a new machine which will carry out operations performed by labour. A and B are alternative models. From the following information, you are required to prepare a profitability statement and work out the pay-back period in respect of each machine:

| | **Machine 'A'** | **Machine 'B'** |
|---|---|---|
| Estimated life of machine (years) | 5 | 6 |
| Cost of machine | 1,50,000 | 2,50,000 |
| Cost of indirect materials | 6,000 | 8,000 |
| Estimated savings in scrap | 10,000 | 15,000 |
| Additional cost of maintenance | 19,000 | 15,000 |
| Estimated savings in direct wages: | | |
| Employees not required | 150 | 200 |
| Wages per employee | 600 | 600 |

Taxation is to be regarded as 50% of profit (ignore depreciation for calculation of tax). Which model would you recommended? State your reasons.

(Ans: Pay-back period in case of Machine A is 4 years and in case of Machine B, it is 3 years. Hence, Machine A is preferable).

11. Project X initially costs Rs.25,000. In generates the following cash flows:

| Year | Cash Inflows Rs. | Present Value of Re.1 at 10% |
|---|---|---|
| 1 | 9,000 | 0.909 |
| 2 | 8,000 | 0.826 |
| 3 | 7,000 | 0.751 |
| 4 | 6,000 | 0.685 |
| 5 | 5,000 | 0.620 |

Taking the cut-off rate as 10% suggest whether the project should be accepted or not.

(Ans.: NPV Rs.2,244, the project should be accepted).

12. Using the information given below, compute the pay-back period under (a) Traditional Pay-back method and (b) Discounted Pay-back method and comment on the results:

| | | |
|---|---|---|
| Initial outlay | | 80,000 |
| Estimated life | | 5 Years |
| Profit after tax: | | |
| End of year | 1 | 6,000 |
| | 2 | 14,000 |
| | 3 | 24,000 |
| | 4 | 16,000 |
| | 5 | NIL |

Depreciation has been calculated under straight line method. The cost of capital may be taken at 20% p.a. and the P.V. of Re.1 at 20% p.a. is given below:

| Year | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| P.V. Factor | 0.83 | 0.69 | 0.58 | 0.48 | 0.40 |

(M.Com. Calcutta, 1975)

(Ans.: (a) 2.7 years (b) 4.39 years)

(Hint. (i) Add depreciation of Rs.16,000 to net profit each year for determining cash flows, (ii) Discount the cash for determining the present values for calculating pay-back period according to method (b)).

13. There are two projects X and Y. X requires an investment of Rs.26,000 while Y requires and investment of Rs.38,000. The cost of capital value of Re.1 at 12% you are required to state which project should be accepted:

| Year | Cash Inflows | | Present Value of Re.1 at 12% |
|---|---|---|---|
| | Project X Rs. | Project Y Rs. | |
| 1 | 9,000 | 8,000 | 0.893 |
| 2 | 7,000 | 10,000 | 0.797 |
| 3 | 6,000 | 12,000 | 0.712 |
| 4 | 5,000 | 14,000 | 0.636 |
| 5 | 4,000 | 8,000 | 0.567 |
| 6 | 4,000 | 2,000 | 0.507 |
| 7 | 3,000 | 16,000 | 0.452 |
| 8 | 3,000 | – | 0.404 |
| 9 | 3,000 | – | 0.361 |
| 10 | 3,000 | – | 0.322 |

(Ans: NPV Project X Rs.3,981; NPV Project Y Rs.7,344; Project Y to be preferred).

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LESSON – 4

# RISK ANALYSIS IN CAPITAL BUDGETING

**STRUCTURE OF THE LESSON**



## 4.1 INTRODUCTION

Risk is related to business decisions. It explains incorporation of Risk factor and its techniques.

Risk is linked with business decisions. It varies from one investment proposal to another. Some proposals may not involve any risk. For instance, investment in government securities which assure a return at a fixed rate. Some may be less risky like expansion of the existing business while others may be more risky such as taking up a new venture. A change in the business risk complexion of the firm also changes the perception of the investors and creditors about the firm. Such a change in their outlook will adversely affect the total valuation of the firm. It is, therefore, necessary that while evaluating capital investment proposals, a firm should take into account the effect that their acceptance will have on the firm's business risk as envisioned by its investors and creditors. Other things remaining the same, a firm should prefer a less risky investment proposals as compared to a more risky investment proposal.

## 4.2 WHAT IS RISK?

Riskness of an investment proposal can be judged from the variability of its possible returns. For example, if a person invests Rs.10,000 in Government securities carrying 10% interest, he can accurately estimate the return that he will get on his investment year after year. His investment is, therefore, risk free. On the other hand if he invests that amount in shares of companies, he will not be in a position to correctly estimate his return year after year on account of possible variations in dividend rates. His investments in shares is therefore, relatively risky as compared to his investment in Government securities. Thus, the term risk with reference to capital budgeting decisions may be defined as the variability that is likely to occur in future between the estimated and the actual returns. The greater is the variability between the two, the more risky is the project and vice-versa.

The decision situation as to risk may be classified into three types:

1. Certainty (or no risk)
2. Uncertainty, and
3. Risk

A risk situation is one in which the probabilities of a particular occurring are known while an uncertain situation is one where these probabilities are not known.

In other words, in case of risk chance of future loss can be foreseen-because of past experience. For example estimating loss in demand for tractors on account of poor harvest. In such a case the danger has been identified, that is, poor harvest and one can assign probabilities to this risk say 40% fall in demand due to this factor. On the other hand in case of uncertainty, the future loss cannot be foreseen, hence the management cannot deal with in planning process. For instance a firm investing in a foreign country may not foresee a revolution and takeover by an unfriendly group. This happened in Cuba in the late 1950's.

The basic difference between risk and uncertainty is that variability is less in risk as compare to uncertainty.

## 4.3 INCORPORATION OF RISK FACTOR

Incorporation of risk factor in capital budgeting decisions is a difficult task. Some of the popular techniques used for this purpose are as follows:

(i) *General Techniques*

(a) Risk adjusted discount rate

(b) Certainty equivalent

(ii) Quantitative Techniques

(a) Sensitivity analysis

(b) Probability Assignment

(c) Standard Deviation

(d) Co-efficient of variation

(e) Decision tree

### (i) (a) RISK ADJUSTED DISCOUNT RATE

The risk adjusted discount rate is based on the presumption that investors expect a higher rate of return on risky projects as compared to less risky projects. The rate requires determination on (i) risk-free rate and (ii) risk premium rate. Risk free rate is the rate at which the future cash inflow should be discounted had there been no risk. Risk premium rate is the extra return expected by the investor over the normal rate on account of the project being risky. Thus risk adjusted discount rate is a composite discount rate that takes into account both the time and risk factors. A higher discount rate will be used for more risky projects and a lower rate for less risky projects.

### ILLUSTRATION – 1

| Cash Flows: | A | B |
|---|---|---|
| Year 0 | -10,000 | -10,000 |
| Year 1 | 4,000 | 5,000 |
| Year 2 | 4,000 | 6,000 |
| Year 3 | 2,000 | 3,000 |

Risk-less discount rate is 5% Project A is less risky as compared to project B. The management consider risk premium rates at 5% and 10% respectively appropriate for discounting the cash inflows.

**SOLUTION**

Risk adjusted discount rate project

A: 5% + 5% = 10%

B: 5% + 10% = 15%

| Year | Discounted Cash Flows | |
|---|---|---|
| | **Project A @10%** | **Project B @15%** |
| 0 | -10,000 | -10,000 |
| 1 | 3,636 | 4,350 |
| 2 | 3,304 | 4,536 |
| 3 | 1,502 | 1,974 |
| | 8,442 | 10,850 |
| | -1,558 | 860 |

Project 'B' is superior to Project 'A'. Since NPV is positive it may be accepted.

**ADVANTAGES**

(a) It is simple to calculate and easy to understand.

(b) It incorporate the risk-averse attitude of investors.

**DISADVANTAGES**

(a) The determination of appropriate discount rates keeping in view differing degrees of risk is arbitrary. It may not, therefore, give objective results.

(b) Conceptually this method is incorrect since it adjusts the wrong element. As a matter of fact it is the future cash flow which is subject to risk. Hence it is to be adjusted and not the required rate of returns.

(c) The method presumes that the investors are averse to risk. Of course, this is true in most of the cases. However, there are investors who are risk-seekers and are prepared to pay premium for taking risk. In their case the discount rate should be reduced rather than increased with increase in degree of risk.

Inspite of the disadvantages the method is most widely used or account of its simplicity.

**(i) (b) CERTAIN EQUIVALENT CO-EFFICIENT**

According to this method the estimated cash flows are reduced to a conservative level by applying a correction factor termed as certainty equivalent co-efficient. The correction factor is the ratio of riskless (or certain) cash flow to risky cash flows.

$$\text{Certainty equation co-efficient} = \frac{\text{Riskless cash flow}}{\text{Risky cash flow}}$$

Riskless cash flow means the cash flow which the management is prepared to accept in case there is no risk involved. Naturally this will be lower than the cash flow which will be there in case the project is risky. For example, a project is expected to generate a cash flow of Rs.20,000. The project is risky but management feels that it will get at least a cash flow of Rs.12,000. It means that certainty equivalent co-efficient is 6 (i.e. 12,000/20,000).

Certainty equivalent co-efficient can be calculated for estimated cash flows of each year. They are then multiplied with the cash flow to ascertain cash flows which may be used for the purpose of determining IRR or NPV for capital budgeting decisions.

**ILLUSTRATION 2:**

Using the information given in Illustration – 2 state which project is better if certainty equivalent co-efficient are:

| | **Project A** | **Project B** |
|---|---|---|
| Ist Year | 0.90 | 0.80 |
| 2nd Year | 0.80 | 0.70 |
| 3rd Year | 0.60 | 0.50 |

**SOLUTION**

**Discounted Cash Flows at 5%**

| **Year** | **Project A** | | | **Project B** | | |
|---|---|---|---|---|---|---|
| | **Certain cash flows** | | **NPV** | **Certain cash flows** | | **NPV** |
| 0 | | -10,000 | -10,000 | | -10,000 | -10,000 |
| 1 | 4,000 x 0.90 | 3,600 | 3,427 | 5,000 x 0.80 | 4,000 | 3,808 |
| 2 | 4,000 x 0.80 | 3,200 | 2,902 | 6,000 x 0.70 | 4,200 | 3,809 |
| 3 | 2,000 x 0.60 | 1,200 | 1,037 | 3,000 x 0.50 | 1,500 | 1,296 |
| | NPV | | -2,634 | | | -1,087 |

Project B is better than project A. However, in both cases the NPV in negative and, therefore, none of them can be accepted.

**(ii) QUANTITATIVE TECHNIQUES**

**(a) Sensitive Analysis**

In the methods explained so far we have considered only one figure of cash flows for each year. However, there are chances of making some estimation errors. The sensitivity analysis approach takes care of this aspect by providing more than one estimate of the future return of a project. It is thus superior to one figure forecast since it gives a more precise idea about the variability of the returns.

Usually sensitivity analysis provides information about cash flows under three assumptions: (i) Pessimistic (ii) Most likely and (iii) Optimistic outcomes associated with the project. It explains how sensitive the cash flows are under these three different situations. The larger is the difference between the pessimistic and optimistic cash flow, the more risky is the project and vice versa.

**ILLUSTRATION 3:**

ABC Company Limited is attempting to evaluate two mutually exclusive project 'A' and 'B'. Each project requires a net investment of Rs.10,000 and the annual cash flows from each of the projects is estimated at Rs.2,000 per annum in the next 15 years. The Company's cost of capital may be taken at 10%. The management has made the following optimistic, most likely and pessimistic estimates of the annual cash inflows associated with each of these projects.

| | **Project A Rs.** | **Project B Rs.** |
|---|---|---|
| Initial Investment | 10,000 | 10,000 |
| Estimated cash flows (per annum) | | |
| Pessimistic | 1,500 | – |
| Most likely | 2,000 | 2,000 |
| Optimistic | 2,500 | 4,000 |

You are required to give your considered opinion for helping the management in arriving at a decision.

In order to arrive at decision about the selections of a project, the following figures have been ascertained regarding the net present value of cash inflows of each of the projects. Project A (Initial investment Rs.10,000).

| | **Cash inflows for each of the 15 years Rs.** | **Discount factor at 10 X** | **Present Value** | **Net Present Value** |
|---|---|---|---|---|
| Pessimistic | 1,500 | 7.606 | 11,409 | 1,409 |
| Most likely | 2,000 | 7.606 | 15,212 | 5,212 |
| Optimistic | 2,500 | 7.606 | 19,015 | 9,051 |
| Project B (Initial investment Rs.10,000) | | | | |
| Pessimistic | – | 7.606 | – | -10,000 |
| Most Likely | 2,000 | 7.606 | 15,212 | 5,212 |
| Optimistic | 4,000 | 7,606 | 30,424 | 20,424 |

The above data indicates that Project B is more risky than Project A. It will depend upon the management whether they would like to take Project A or B depending upon the risk they want to undertake. Project B has a higher risk together with a higher profitability. In case, the management is venturesome, it can go for Project B, and in case, it is orthodox, it may go for Project A.

Sensitivity analysis approach, as explained above, suffers from a limitation. No doubt it provides different cash flow estimates under three assumptions, it however does not provide chances of occurrence of each of these estimates. For example, in the illustration given above three possible cash inflows have been given, Rs.1,500, Rs.2,000 and Rs.2,500 in respect of Project A. The question is – are these equally likely? A better decision can be made if one can assign appropriate probabilities to each of these estimates. Suppose the probabilities assigned are 0.20, 0.60 and 0.20 respectively, the cash flows as adjusted by probabilities will be as follows:

| | **Cash Inflows** | **Probabilities** | **Expected Monetary Values** |
|---|---|---|---|
| Pessimistic | 1,500 | 0.20 | 300 |
| Most likely | 2,000 | 0.60 | 1,200 |
| Optimistic | 2,500 | 0.20 | 500 |

The above monetary values give a more precise estimate about the likely cash flows as compared to those estimated without assigning probabilities.

**(ii) (b) Probability Assignment**

Probability means the likelihood of happening an event. When it is said that an event has 1 probability, it means it is bound to happen. In case it has probability it means it is not going to happen. In the above example the chances of having cash flow as Rs.2000 has a probability of 0.6 or 60%. In other words, chances of not having cash flow of Rs.2,000 are, 4 or 40%.

Probability may be objective or subjective. An objective probability is based on a large number of observations under independent and identical conditions repeated over a period of time. A subjective probability is based on personal judgement since there are no large number of independent and identical observations. In capital budgeting decisions, the probability are of a subjective type since they are based on a single event.

The mechanism of assigning probabilities to cash flows for capital budgeting decisions will be clear with the following illustration.

**ILLUSTRATION 4:**

The Hypothetical Company Limited has given the following possible cash inflows for two or their project 'X' and 'Y' out of which one they wish to undertake together with their associated probabilities. Both the projects will require an equal investment of Rs.5,000.

You are requested to give your considered opinion regarding the selection of the project.

| Possible events | Project 'X' | | Project 'Y' | |
|---|---|---|---|---|
| | Cash inflows Rs. | Probability | Cash inflows Rs. | Probability |
| A | 4,000 | 0.10 | 12,000 | 0.10 |
| B | 5,000 | 0.20 | 10,000 | 0.15 |
| C | 6,000 | 0.40 | 8,000 | 0.50 |
| D | 7,000 | 0.20 | 6,000 | 0.15 |
| E | 8,000 | 0.10 | 4,000 | 0.10 |

**SOLUTION**

**Computation of Expected Monetary Values for Project 'X' and Project 'Y'**

| | Project 'X' | | | Project 'Y' | | |
|---|---|---|---|---|---|---|
| | Cash inflows Rs. | Probability | Expected value Rs. | Cash inflows Rs. | Probability | Expected value Rs. |
| A | 4,000 | 0.10 | 400 | 12,000 | 0.10 | 1,200 |
| B | 5,000 | 0.20 | 1,000 | 10,000 | 0.15 | 1,500 |
| C | 6,000 | 0.40 | 2,400 | 8,000 | 0.50 | 4,000 |
| D | 7,000 | 0.20 | 1,400 | 6,000 | 0.15 | 900 |
| E | 8,000 | 0.10 | 800 | 4,000 | 0.10 | 400 |
| | | Total | 6,000 | | Total | 8,000 |

The workings given above show that Project 'Y' has higher expected monetary value as compared to project 'X'. The monetary value in case of project 'Y' is Rs.8,000 while the expected monetary value in case of project 'X' is Rs.6,000. Thus, Project 'Y' is preferable to Project 'X'. Moreover, if monetary values in each of the two cases are discounted at 10% the net present value for Project 'X' will be only Rs.454 (i.e. Rs.6,000 x 0.909 - 5,000) while in case of Project 'Y', the net present value will be Rs.2,272 (i.e. Rs.8000 x 0.909 - 5,000).

**(iii) Standard Deviation**

The probability assignment approach for risk analysis in capital budgeting does not provide the decision maker with a precise value indicating about the variability of cash flows and therefore the risk. This limitation is overcome by adoption of standard deviation approach. Standard deviations is a measure of dispersion. It may be defined as the square root of squared deviations calculated from the mean. In case of capital budgeting this measure is used to compare the variability of possible cash flows of different projects from their respective mean of expected values. A project having a larger standard deviation will be more risky as compared to a project having smaller standard deviation.

The following steps are taken for calculating the standard deviation of the possible cash flows associated with a project:

(i) Mean value of possible cash flows is computed.

(ii) Deviations between the mean value and the possible cash flows are foundout.

(iii) Deviations are squared.

(iv) Squared deviations are multiplied by the probabilities which give weighted squared deviations.

(v) The weighted squared deviations are totaled and their square root is foundout. The resultant figure is the standard deviation.

**(iv) *Coefficient of Variation***

Standard deviation is an absolute measure. It is unfit for comparison particularly where projects involve different cash outlays or different expected (or mean) values. In such case relative measure of dispersion should be calculated. Coefficient of variation is one of such measures. It is calculated as follows:

$$\text{Co-efficient Variaiton} = \frac{\text{Standard deviation}}{\text{Expected (or Mean) Cash flow}} = \text{Ecf}$$

The coefficient of variation in case of Project X and Project Y will be calculated as follows:

$$\text{Project X} = \frac{1,095}{6,000} = 0.1825 \text{ or } 18.25\%$$

$$\text{Project Y} = \frac{2,098}{8,000} = 0.2623 \text{ or } 26.23\%$$

The coefficient of variation of Project Y is more as compared to Project X. Hence, Project Y is more risky. The choice would depend upon the capacity of the investor to bear the risk. Project Y has a higher expected monetary value as compared to Project X. Thus, with higher risk the profitability is also higher. In case the investor is not averse to risk, he may accept project Y. However, if he is averse to risk, he will accept Project X.

**(v) *Decision tree Analysis***

Decision tree analysis is another technique which is helpful in tackling risky capital investment proposals. Decision tree is a graphic display of relationship between a present decision and possible future events, future decisions and their consequences. The sequence of events is mapped out over time in a format resembling branches of a tree. In other words it is a pictoral representation in tree which indicates the magnitude, probability and interrelationship of all possible outcomes.

An outstanding feature of decision tree analysis technique is that it links events chronologically with forecasted probabilities and thus gives a systematic appearance of decisions and their forecasted results.

## 4.4 CONSTRUCTING A DECISION TREE

The following steps are taken for constructing a decision tree:

(i) *Definition of the Proposal*: The proposal is defined ie., what is exactly required under the proposal, e.g., enter a new market, introducing a new product line etc.

(ii) *Identification Alternatives*: Every proposal will have atleast two alternatives – accept or reject. However, there may be more than two alternatives also. For example, a firm may be considering the purchase of new plant for manufacturing a new product. It may have four alternatives (i) not to purchase the plant, (ii) purchase a large plant, (iii) purchase a small plant, or (iv) purchase a medium size plant.

(iii) *Graphing the decision tree*: The decision tree is then laid down showing decision point (i.e., the cash outlay), decision branches (i.e., alternatives available) and other data.

(iv) *Forecasting cash flows:* The forecasted cash flows regarding each decision branch are also shown along with the branch. Probabilities are also assigned to each cash flow. Expected values of future returns are calculated and the total expected value for the decision is determined.

(v) *Evaluating Results*: Having determined the expected value for each decision, the results are analysed. Some alternatives may look to be acceptable while others may be weak or unacceptable. The firm may proceed with the profitable alternatives or alternatives or may decide to reconsider them because of incomplete or other reasons.

## 4.5 SUMMARY

Risk analysis is used to decide definition of the proposal and identification alternatives and evaluating results of the proposal.

## REVIEW QUESTIONS

1. What is the purpose of a capital expenditure budget? How control over expenditure can be effected through this budget?
2. Discuss the methods used for evaluating and ranking investment proposals. Make a comparative study of the 'internal rate of return approach' with the 'present value' approach' in choosing a capital expenditure project.
3. Several methods are employed by management accountant for ascertaining the profitability of capital expenditure projects. Discuss any one method and explain the salient features thereof.

4. State how you consider the Pay-Back Method useful for assessing the economic worth of a project.
5. (a) Explain 'Discounted Cash Flow method' in ranking investment proposals.

   (b) Indicate the main factors to be considered in 'Investment Decisions'.
6. Explain the Internal Rate of Return method of project evaluation. In the absence of mutually exclusive investment, Projects explain whether or not both the IRR and IPV will lead to the same acceptance or rejection decision.
7. "Investments alternative yielding the highest discount rate of return is the most acceptable". Will this always be true? Explain.
8. "It is the capital expenditure decision that spells the difference between the business success and business failure". Do you agree with the above statement? Substantiate your views with reasons. Also explain the various methods used for evaluation of capital expenditure proposals bringing out their relative merits and demerits.
9. What are the basic components of capital budgeting analysis? Explain the difference between IRR and NPV methods.
10. Explain the salient features of the 'Present Value Method' of project evaluation and examine its rationality.

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LESSON – 5

# MARGINAL COSTING AND BREAK-EVEN ANALYSIS

**STRUCTURE**



## 5.1 INTRODUCTION

Marginal costing is a new area in the field of Accounting. It refers to the production of additional increments of output. It also discusses its relationship with Break-even analysis.

Marginal Costing, also known as Direct Costing or Variable Costing or by such other names, is a comparatively new area in the field of accounting and is one that is gradually gaining more and more acceptance. Described by different names on the two sides of the Atlantic. The term 'Marginal Costing' is common in U.K. and other countries of the Continent while the expression 'Direct Costing' or 'Variable Costing' is preferred in United States the technique signified by the use of the medle of these words has been able to generate strong views both for an against itself with the result that it has become a subject of lively raging controversy during recent times.

## 5.2 CONCEPT OF MARGINAL COST

'Marginal Cost' derived from the word 'Margin' is well-known concept of economic theory. Thus, quite in tune with the economic connotation of te term, it is described in simple words as the cost which arises from the production of additional increments of output and it does not arise in case the additional increments are not produced.

It has been derived by the Institute of Cost and Works Accountants, London, in its publication 'A Report of Marginal Costing' 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".

From this point of view, marginal costs will be synonymous with variable costs, i.e., prime costs and variable overheads, in the short run but, in a way, also include fixed costs in planning production activities over a long period of time

involving an increase in the productive capacity of the business. Thus, marginal costs are related to change in output under particular circumstances of a case.

However, where an increase in fixed costs is envisaged in the walk of an accretion to the production capacity and consequently to the level of activity, fixed costs are dealt with as a part of what are called 'Different Costs' so that the usage of the term 'Marginal Cost' is restricted in actual practice only to cases involving a more effective illustration of the existing installed capacity intended for a better recovery of fixed costs per unit of output.

According to the Institute of Cost and Works Accountants, London, "Marginal Costing is the ascertainment, by differentiating between fixed costs and variable costs, of marginal costs and of the effect on profit or changes in the volume and type of output.

In this context, marginal costing is not a system of costing in the sense in which other systems of costing, like process or job costing, has been designed simply as an approach to the presentation of accounting information meaningful to management from the viewpoint of adjusting the profitability to management from the viewpoint of adjusting the profitability of an enterprise by carefully studying the impact of the entire range of costs according to their respective nature.

The concept of marginal costing is a formal recognition of ideas underlying flexible budgets, break-even analysis and cost-volume profit relationship. It is application of these relationships which involves a change in the conventional treatment of fixed overheads in relation to income determination.

**(A) BASIC CHARACTERISTIC OF MARGINAL COSTING**

The concept of marginal costing is based on the important manufacturing between product costs and period costs, the former being related to the volume of output and the latter to the period of time rather than the volume of production.

Marginal costing regards as product costs only these manufacturing cost which have a tendency to vary directly with the volume of output. This is in complete contrast to the conventional system of costing under which all manufacturing costs-fixed as well as variable are treated as product costs. Variability with volume is the criterion for the classification of costs into product and period categories.

Thus, marginal costing necessities analysis of costs into fixed and variable. Even the semi-variable costs have to be closely and critically, analysed in order to resolve themselves into their fixed and variable components depending upon whether they tend to remain fixed or vary. In this way, marginal costing highlights the effect of costs on the level of output planned.

**(B) WORKING OF MARGINAL COSTING-INCOME DETERMINATION UNDER ABSORPTION AND MARGINAL COSTING**

According to traditional costing system, fixed costs of production are assigned to products to be subsequently released by way of expenses as part of cost of goods

sold or are carried forward as part of the cost of inventory depending upon whether a period's production was sole or not during the same period. Such an approach to the treatment of fixed costs has brought into vogue various methods of allocation of overheads to different departments on an equitable basis and their proper apportionments to units produced. However, the various methods devised fail to give precise results and sometimes even leads to absure situations. Marginal results costing removes all the difficult involved in the allocation apportionment and recovery of fixed costs. It is able to accomplish this by excluding fixed costs from product costs and by writing them of entirely against operations of the period.

Consequently, when the volume of output differs from the volume of sales the net income reported under marginal costing will differ from that reported under absorption costing.

**(C) ROLE OF CONTRIBUTION**

Contribution is of vital important for the system of marginal costing. The rationale of contribution lies in the fact that, where a business manufactures more than one product, the profit realized on individuals products cannot possibly be calculated due to the problem of apportionment of fixed costs to different products which is done away with under marginal costing. Therefore, some method is required for the treatment of fixed costs and marginal costing answer to the challenge is 'Contribution'.

Contribution is the difference between sales and the variable cost of sales and is therefore, sometimes referred to as "gross margin". It is visualized as some sort of 'fund' or 'pool' out of which all fixed costs, irrespective of their nature, are to be met and to which each product has to contribute either profit or loss as the case may be.

The concept of contribution is useful in the fixation of selling prices, determination of break-even-point, selection of product mix for profit maximization and ascertainment of the profitability of produces, departments, etc.

## 5.3 BREAK-UP OF SEMI-VARIABLE EXPENSES

In view of the fact that marginal costing classifies all costs broadly into fixed and variable only, it becomes necessary to insolate the two components of semi-variable costs. In fact, the exercise of segregating the fixed and variable costs. In fact, the semi-variable expenses constitutes by the most challenging problem of marginal costing.

**(a) *High and Low Points Method***

The method is based on the analysis of historical data relating to periods of high and low business activity which represent condition at two different levels of business operations. In selection these periods and in dealing with costs incurred during such periods, care should be taken to see that figures are not distorted and by any abnormal factors.

**(b) *Statistical Scattergraph Method***

This is widely used diagrammatic or graphic technique for insolating the fixed and variable portions of semi-variable costs.

According to this methods, costs and relevant figures relating to the level of activity are plotted on along the vertical or Yaxis and horizontal or X axis respectively thereby resulting in a scattergraph with each dot on the graph representing the expense for a particular period at a certain level of activity. A line is then drawn by visual inspection in such a manner that there are ideally as many dots above the line as there are below it in order to make it typical of the majority of dots on the graph. From the point of contact of this line with the vertical axis, another line across the face of the graph is drawn parallel to the base so that it represents the fixed component of a particular item of semi-variable expense while the portion of the diagram lying between the two lines shows variability of an expense as volume of production increase.

In spite of the fact that dots in the diagram are never to be found in a perfect linear pattern, the line of total expenditure is drawn as a straight line and, in most cases, the straight line would for all intents and purpose be a fair representation of the single line would conform to all observations.

**(c) *Method of Least Squares***

A mathematical techniques of 'least squares' is also used for computing a more exact line, called 'regression line' representing total cost of an item of semi-variable expense than what is possible according to the scattergraph method.

The method of least squares is based on the basic regression equation $y = a + bx$ where 'a' is the fixed portion and 'b' is the degree of variability.

Steps involved in putting the method to use are as follows:

(i) The simple means of two concerned variables scales of operations and total expense are calculated.

(ii) The deviations of actual figures in the two variables from their respective average calculated under step (i) above are found out with proper algebraic signs.

(iii) The deviations relating to the variable to relating variables from their respective means are multiplied together and products obtained.

(iv) Deviations of the actual figures of the two variables from their respective means are multiplied together and products obtained.

(v) Products under point (iv) are added.

(vi) Squared deviations under point (iii) are totaled.

(vii) To total of point (v) is divided by the total of point (vi) to arrive at the variable rate of an expense.

(viii) The fixed portion of the total expense can be calculated by deducting the products of variable rate and the average cost of the item of expense.

## 5.4 PRACTICAL APPLICATION OF MARGINAL COSTING

### (A) *Level of Activity Planning*

One of the very common problems confronting a business is regarding the level of activity for which it should have plans in hands, such plans may envisage an expansion or contraction of productive activities depending upon the qualitative conditions in the market. The expansion or contraction has to be arranged before the events overtake the business. In this context, management like to have an idea of the contribution at different levels of activities and marginal costing proves very useful from this point of view.

### (B) *Maximisation of Sales*

Usually, business enterprises have a variety or product lines, each making its own contribution to fixed expenses. Changing in the operating profit can result from shifts in the mixture of products sold in spite of the fact that sales expressed in terms of money remains the same. Such a situation may also be brought about by changes in distribution channels, or sales to different classes of customers, if such an arrangement affects the quantum of contribution over variable costs. It is in this context that marginal costing is called upon to inform management regarding the most profitable mix of sales from the entire range of selected alternatives.

### (C) *Marginal Costing and Pricing*

The determination of prices of products manufactured or services rendered, by business is often considered to be a difficult problem generally faced by management of an expertise. However, the basic problem involved in pricing is the matching of demand and supply.

To illustrate, of a person travels from Delhi to London by a leading international airline, he ay be able to arrange to trip of a country of the Middle East, he may be able to arrange diametrically by paying only half of the normal face. These two diametrically opposite position can be reconciled by pointing out that while normal fares are so determined by leading airlines companies as to normal overall costs of operation including fixed costs which are bound to be considerable, smaller companies may fix fares at a level as to cover only marginal costs and yield some contribution towards profit owing to their inability or reluctance to do away with their business due to huge funds being sunk in capital investments.

By placing emphasis on contribution margin, the technique of marginal costing offers a simple as well as clear portrayal of the relationship between specific product costs and the different possible selling prices considered. This is due to the fact that contribution margin is unaffected by the allocation of indirect costs.

**(D) *Profit Planning***

Marginal costing, through the calculation of contribution ratio, enables the planning of future operations in such a way as to attain either maximum profit or to maintain a specified level of profit. Thus, it is helpful in profit planning.

## 5.5 ADVANTAGES OF MARGINAL COSTING

**(i) *Constant in Nature***

Marginal costs remain the same per unit of output irrespective of the volume of production.

**(ii) *Realistic Valuation***

Elimination of fixed overheads from the cost of production means that finished goods and work-in-progress are valued at their marginal cost and therefore, the valuation is more realistic and uniform as compared to the one when they are valued at their total cost.

**(iii) *Simplification of Overhead Treatment***

Marginal costing does away with the need for allocation, apportionment and absorption of fixed overheads thereby removing an important source of accounting complications by way of under absorbed over-absorbed overheads.

**(iv) *Facilitating Cost Control***

The clear-cut division of costs into their fixed and variable components paves the way for a better cost control through flexible budget which is based on this important distinction.

**(v) *Meaningful Managerial Reporting***

As reports to management are based on figures of sales rather than of production, marginal costing constitutes a better approach in as much a stocks do not affect the comparisons of efficiency which are made on the basis of sales.

**(vi) *Basis for Pricing and Tendering***

Marginal costing furnishes a better and more logical basis for the fixation of sales prices as well as in tendering for contracts when business is at a low ebb.

(vii) *Aid to Profit Planning*

The technique of marginal costing enables data to be presented to management in a manner as to show cost-volume-profit relationships. In this connection use is made of break-even charts.

## 5.6 LIMITATIONS OF MARGINAL COSTING

**(i) *Difficulty in analysis***

Considerable difficulty is always experienced in analysis overheads into their fixed and variable components.

**(ii) *Lop-sided Emphasis***

Marginal costing has a tendency to attach more importance to the selling function which has the effect of relegating production function to a comparatively

unimportant position. However, the efficiency of a business is to be judged by taking together its selling as well as production functions into account.

**(iii) *Difficulty in Application***

The technique of marginal costing cannot be adequately applied in the case of industries in which, according to the nature of business, large stocks have to be carried by way of work-in-progress.

**(iv) *Limited Scope***

'As marginal costing distinguishes between the treatment of fixed and variable components as parts of fixed costs, it is difficult to adopt the technique in capital-intensive industries where fixed costs are very large.

**(v) *Inappropriate Basis for Pricing***

Selling price cannot reasonably be fixed on the basis of contribution alone because then there is the danger of too many sales being affected at marginal cost resulting either in loss to the business of inadequate profits.

In the light of these advantages and disadvantages, marginal costing may be considered to be a very useful technique from the point of view of management, but it must be applied with a full awareness of its limitations as well as of the circumstances in which it can be fruitfully used.

## 5.7 COST-VOLUME-PROFIT RELATIONSHIP – BREAK-EVEN-ANALYSIS

These days, in management accounting a great deal if importance is being attached to cost-volume-profit relationship which, as its name implies, is an analysis of three different factor-costs, volume and profit. In this case, an analysis is made to find out.

What would be the cost of production under different circumstances?

What has to be the volume of production?

What profit can be earned?

What is the difference between the selling price and cost of production?

The answers to these queries underline the important fact that the three factors of cost, volume and profit are interconnected and dependent on one another.

## 5.8 MARGINAL COSTS ARE USED PRIMARILY IN GUIDING DECISIONS

The most useful contribution of marginal costing is the assistance if renders to the management in vital decision-making. The presentation of information under marginal costing is of use in making policy decisions in cases where the information obtained from total cost method would be incomplete. Sometimes the information revealed by total cost method may be even misleading.

The following are a few of the managerial problems which are simplified by the use of marginal costing techniques:

(1) Pricing of products, (2) Make or buy decisions, (3) Selection of a suitable product mix, (4) Alternative methods of production and (5) Closing down of business.

**(a) *Pricing of Products***

Although prices are regulated more by market conditions and other economic factors than by decision by management, the management while fixing prices has to keep in view the level of profits expected. In normal times the price fixed must cover full costs as otherwise profits cannot be earned. But under certain circumstances, products may have to be priced at a level below total cost, if sucha course is necessary to meet the situation arising due to trade depression. This is so because fixed costs will have to be incurred irrespective of whether production continues or not. Any contribution towards the recovery to fixed costs will reduce the losses which will be incurred if production is stopped. As a word of caution fixation of prices below total cost should be made only on a short-term basis. Marginal costing presents information regarding the rate of contribution at various levels of prices and capacity, so as to enable the management to know the price limits within which it can operate.

**(b) *Make or But Decisions***

Decision to make of buy has to be taken when the product begin manufactured has a component part that can either be made within the factory or purchased from an outside firm. This decision can be arrived at only by comparing the supplier's price with the marginal cost. For example, the total cost of making a component part comes to Rs.11, consisting of Rs.8 as variable cost and Rs.3 as fixed cost. Suppose an outside firm is willing to supply the same component part at Rs.10. The prima facie conclusion is that it is cheaper to buy the component. But a study of cost analysis above shows that each unit of component contributes Rs.3 towards the recovery of fixed cost. This fixed cost has to be incurred whether to make or buy. The real cost in making one unit of component is only Rs.8, which is its variable cost. The offer should, therefore, be rejected because the acceptance will mean that the total cost of the purchased part will come to Rs.13 i.e. Rs.10 (Purchase Price) plus Rs.3 (Fixed cost, which cannot be saved if production is suspended).

However, in arriving at a final decision, other factors may have to be considered. Thus, the production facilities related by stoppage of production may be put to some alternative use in which the above argument may not hold good. It, however, remains true that cost analysis on the marginal cost technique illuminates an important aspect of decision-making.

**(c) SELECTION OF A SUITABLE PRODUCT MIX**

When a concern manufactures more that one product, a problem often arises as to which product mix will yield the highest profits. The cost-profit relation to different products would vary depending upon the structure and composition of cost elements and sales price. The products which give the maximum profits are to

be retained and their production pushed up. The production of comparatively disadvantageous products should be reduced or closed down altogether. Marginal costing helps management tin taking a decision to continue, increase, reduce or suspend production of a product or to change the product mix. The best product mix is one which yields the maximum contribution margin.

**(d) ALTERNATIVE METHODS OF PRODUCTION**

If the management has to choose from among alternative methods of manufacturing a product, the changes in the marginal contribution under each of the proposed methods has to be worked out. Thus for example, a new product may have been development and the management is faced with the problem of employing a machine or to manufacture entirely by manual labour. The method of manufacture which yields the greatest contribution is to be selected keeping of course, the various key factors in view.

**(e) CLOSING DOWN OF BUSINESS**

If a sufficient volume of business cannot be secured, the management may be faced with the problem of deciding whether production should be stopped or not. This business may take the shape of either temporary suspension of production or permanent closing down of business.

If the production is temporarily suspended, the object is to close down operations until trade recession has passed. If the products are making a contribution towards fixed costs, then generally speaking, production should not be stopped. This is so because if prices exceed marginal costs, losses will tend to be minimized by continuing the operations.

Permanent closing down of business is a very drastic decision and will be carried out only in extreme cases. In the long run selling price must exceed the total cost so as to give a net margin, otherwise it will not b economical to continue the production. If the business is not earning sufficient return for the risk involved, then the production may be closed down permanently.

## 5.9 SUMMARY

Marginal costs are useful for pricing of products, make or buy decision and selection of a suitable product mix. Besides the marginal costing help the organisation in simplication of overhead treatment on the other hand the limitations of marginal costing is difficulty to analysis the overhead in short for marginal cost some experiences is need.

## REVIEW QUESTIONS

1. Define the term 'Marginal Costing'?
2. Distinguish between absorption costing and marginal costing?
3. How can the cost be classified on the basis of variability?
4. Explain the advantages of classifying the cost into fixed and variable elements?

5. What do you mean by Semi-Variable expenses?
6. Explain the various methods of separating semi-variable expenses into fixed and variable components?
7. Explain the following terms: Contribution, P/V Ratio, BEP, Margin of safety.
8. Explain the advantages and disadvantages of marginal costing.
9. Discuss the applications of the marginal costing technique?
10. What are the limitations of marginal costing?

❐

LESSON – 6

# COST-VOLUME-PROFIT RELATIONSHIP

**STRUCTURE**



## 6.1 INTRODUCTION

BEP involves the study of profit planning cost control, and decision-making.

Based on the principles of classifying the operating costs of a business into fixed and variable, it defines the manufacturing cost and profit characteristic of a business and shows the total cost at all levels of activity. Fixed costs are those which remain the same in total regardless of changes in volume. Variable costs are those which vary in total amount as the volume of production increases or decreases. In fact, such costs remain the same, in amount per unit of production irrespective of increases or decreases in volume. As it highlights the relationship between cost, volume and profit, it transmits to management information for planning and evaluating business operations concept of planning.

"Planning" the activities consistent with the overall "objectives" of enterprise and carefully monitoring the course of events as per plan is a continuous managerial function universally accepted. 'Profit Planning' involves deciding upon the quantum of profits to be earned and striving to achieve the target. It requires scientific forecasting of revenue and cost. 'Revenue' depends upon the sales and costs depend upon the elements which constitute it. In analyzing the costs, classification on the lines of variability of such costs enables better profit planning. Hence, "direct costing" is an important tool in profit planning. Profit planning is based on predictions regarding level of activity. Though a target of specific level of activity can be fixed, it is ideal to have revenue and cost figures projected for varying levels of activity. Projections for varying levels of activity have been studied under "Flexible Budgeting". Flexible budgeting also requires the compartmentalization of cost into "variable" and "Fixed" to analyse the costs for various levels. The focus now is on that level of activity at which there is no "Profit or loss" or below which there are losses and above which there are profits i.e. break-even point. This information would be of great help to managements for taking their decisions.

## PROFIT PLANNING

The basic objective of running any business organisation is to earn profits. Profits determine the financial position. Liquidity and solvency of the company, profits serve as yardstick for judging the competence and efficiency of the management. Profit Planning is therefore a fundamental part of the overall management function and is a vital part of the total budgeting process. The management determination of goals and prepares budgets that will lead them to the realization of these goals. Profit planning can be done only when the management has the information about the cost of the product, both fixed and variable, and the selling price at which it will be in a position to sell the products of the company.

The profit is affected by several factors. Some of the important factors are:

i) Selling price of the products

ii) Volume of Sales

iii) Variable of Sales

iv) Total Fixed costs

v) Sales mix of different product

## 6.2 COST-VOLUME PROFIT LINKAGE

To understand break-even analysis, it is necessary to understand the relationship between sales, variable costs and profit. The division of costs into "Variable" and "Fixed" entails the establishment of a constant linkage between selling price and variable costs. This leaves behind a surplusous of the sales revenue. The surplus is called contribution which bears a constant relationship with sales.

The linkage between revenue and cost data are presented as follows:

| | Rs. |
|---|---|
| Sales | -------- |
| LESS Variable cost | -------- |
| Contribution | -------- |
| LESS Fixed Cost | -------- |
| Net Profit | -------- |

The relation of the contribution to sales is known as P/V ratio (Profit-Volume ratio). This ratio is the vital instrument in the hands of the management accountant while shifting operational data. The P/V ratio has the following special feature:

1. It is the result of linking contribution to the relevant sales which provides the contribution.
2. It remains constant so long as the selling price and variable costs per unit remain constant or fluctuate proportionately.

3. It is unaffected by an change in the level of activity. Hence the ratio would be constant whether studied on 10,000 units basis, 1000 units basis or a single unit basis.
4. The ratio is unaffected by any fluctuation in the fixed cost, because the latter does not enter into the computation of contribution at all.

A substitute for P/V ratio is "Contribution per unit". This is also an equally effective instrument of the management accountant in analyzing data. The utility of P/V ratio or contribution per unit is varied. The following illustration will show how the instrument is used.

**ILLUSTRATION 1**

A factory produces 300 units of a product per month. The selling price is Rs.120 and variable cost Rs.80 per unit. The fixed expenses of the factory amount to Rs.8,000 per month. Calculate:

(i) The estimated profit in a month wherein 240 units are produced.

(ii) The sales to be made to earn a profit of Rs.7,0000 per month.

**SOLUTION**

| | Rs. |
|---|---|
| Selling Price per unit | 120 |
| LESS Variable cost per unit | 80 |
| Contribution per unit | 40 |

$$\therefore \text{P/V ratio} = \frac{\text{Contribution}}{\text{Selling Price}} \times 100$$

$$= \frac{40}{120} \times 100 = 33\ 1/3\ \%$$

(i) *Profit on Sale of 240 Units*

| | | |
|---|---|---|
| Sales of 240 units at Rs.240 each | = | Rs. 28,800 |
| Contribution from the above at 33 1/3% | = | Rs. 9,600 |
| LESS: Fixed cost of the month | = | Rs. 8,000 |
| ∴ Profit | | Rs. 1,600 |

The result can also arrive at as follows:

| | | | |
|---|---|---|---|
| Number of units to be sold | = | 240 | |
| Contribution per unit | = | Rs.40 | |
| Contribution from 240 units | = | 240 x 40 | = Rs.9,600 |
| LESS: Fixed Cost | | | = Rs.8,000 |
| Profit | | | = Rs.1,600 |

(ii) Sales required to earn a profit of Rs.7,000/-

Profit required to earn a profit of Rs.7,000/-

| | | |
|---|---|---|
| Profit required to be earned | = | Rs. 7,000 |
| ADD: Fixed Cost | = | Rs. 8,000 |
| Total Contribution to be earned | = | Rs.15,000 |

Since P/V ratio = 33 1/3%

Sales required to earn Rs.15,000

$$\frac{15,000}{33\ 1/3} \times 100 = \text{Rs.}45,000$$

This result can also be arrived as follows:

Contribution per unit Rs.40

Number of units to be sold to earn Rs.15,000

$$= \frac{15,000}{40} = 375 \text{ Units}$$

Selling Price per unit = Rs.120

∴ Total Sales = 375 x 120 = Rs.45,000

### 6.3 DETERMINATION OF BREAK-EVEN POINT (BEP)

A break-even point is that level of activity where cost equals total revenue so that the firm neither earns profit nor suffers any loss. At this stage the firm is said to break even. This is the point at which the total contribution is just equal to the fixed costs, hence, no profit or loss is earned. No first would be content to reach only this point. But this represents a point which one must reach before one goes further to earn a profit. If one does not reach this point, one has suffered a loss. By determining this point, the firm can very well assess for itself how far away it actually is from that point. If the firm is actually at a level higher than the BEP, it means that it is very profitable. If difficulties develop, it has a cushion or margin of safety on which to fall back upon.

Out of the contribution after meeting fixed expenses, the net profit is to be ascertained. But at the BEP there is no profit or loss, hence at the BEP, contribution equals total fixed expenses. This idea can be stated as follows:

Sale(S) – Variable cost (V) = Fixed Cost (F) + Profit (P)

$S - V = F + P$

$\therefore \quad S = V + F + P$

$P = S - V + F$

Therefore, the number of units at the break even point can be worked out as:

$$\frac{\text{Fixed Expenses}}{\text{Contribution per unit}} = \frac{F}{C}$$

If the sales have crossed the BEP, it means that the contribution obtained by the extra sales over the BEP is completely profit because all fixed expenses have already been met at the BEP stage itself.

**ILLUSTRATION 2**

| | |
|---|---|
| The sales of company are at (Rs.200 per unit) | Rs. 20,00,000 |
| Variable cost | Rs. 12,00,000 |
| Fixed cost | Rs. 6,00,000 |
| The capacity of the factory | 15,000 units |

Determine the BEP. How much profit is the company making?

**SOLUTION**

| | Rs. |
|---|---|
| Selling Price per unit | 200 |
| Variable cost per unit | 120 |
| Contribution per unit | 80 |

Fixed expenses . . . . . Rs.6,00,000

$$\text{Break-even point} = \frac{6,00,000}{80} = 7,500 \text{ units}$$

*Profit Being Earned*

| | |
|---|---|
| Annual Sales (Units) | 10,000 |
| BEP (Units) | 7,5000 |
| Sales above BEP (Margin of Safety) | 2,500 |

∴ Contribution at Rs.80 per unit

80 x 2500 = 2,00,000

**PROOF**

S = V + F + P

= 12,00,000 + 6,00,000 + 2,00,000

Sales = 20,00,000

At break even point the contribution is just equal to fixed costs. Any sale above the BEP also provides the contribution. But as fixed costs are all met already such contributions become completely profit. The Sales above BEP are known as margin of safety. The contribution from margin of safety sales is profit as P/V ratio $\frac{\text{Contribution}}{\text{Sales}}$ x 100 and as profit is the contribution from these sales above BEP (ie. margin of safety), the following formula is also true.

$$\frac{\text{Profit}}{\text{Marginof Safety}} \times 100 = \text{P/V ratio}$$

## 6.4 PRESENTATION OF COST VOLUME-PROFIT RELATIONSHIP

In order to enable the management to understand and appreciate the Cost Volume Profit relationship, it is depicted in the form of a profit graph and presented to the management. A profit graph shows the fixed cost, variable cost, sales and profit or loss of a business at different volumes of output of sales. There are different types of profit graphs and all of them present a simplified picture of cost-volume-profit relationship at different levels of activity.

Broadly speaking, the cost-volume profit analysis assists profit planning, cost control and decision-making. When costs are regregated into fixed and variable costs, we know that any variation in the volume will cause a change in the variable costs, and in turn on the contribution and profit. With a view to maximizing its profits, a concern has to expand its output, when the output is expanded with the installed capacity, the variable costs rise with their impact on contribution and profit. The management has therefore, to know the effect of such an increase in output on its profits. The profit structure of a concern will thus comprise the relationship is of immense interest to the management in planning the profits of their business.

The cost-volume-profit analysis is of considerable utility in budgeting and budgeting control. Budgeted revenues and costs depend upon the budgeted volume, and must he based on an analysis of the cost volume-profit relationships. Flexible budgets can be set up and these indicate costs at various levels of activity. Since costs and profit depend upon volume, the effects of changes in volume should be considered while reviewing costs and profits achieved.

## 6.5 ASSUMPTIONS OF BREAK-EVEN ANALYSIS

Cost-volume-profit data are based upon certain assumed conditions which are to be rarely found in practice. Some of these basic assumptions are as follows:

1. The principle of cost variability is valid
2. Costs can be resolved into their fixed and variable components
3. Fixed costs remain constant
4. Variable costs vary proportionally with volume
5. Selling price does not change as volume changes
6. There is only one product or in the case of multiple products, sale mix remains constant
7. There will be change in general price level
8. Productivity per worker remains mostly unchanged.
9. There is synchronization between production and sales

10. Revenue and costs are being compared with a common activity base, eg. sale volume of production or units produced.
11. The efficiency of plant can be predicted.

A change in any one of the above factors will affect the break-even point so that profits are affected by factors other than volume. Thus, break-even chart must be interpreted in the light of the limitations of underlying assumptions, essentially with respect to price and sale mix factors.

## 6.6 MECHANICS OF BREAK-EVEN ANALYSIS

The most important point about break-even analysis is that cost must be capable of being resolved into their fixed and variable components so much so that its accuracy depends upon the precision with which cost variability is determined. Hence, a careful study of each cost, or group of costs is require.

### (a) FIXED OVERHEADS

Preliminary analysis of cost will readily indicate certain costs to be fixed for all practical purposes. Therefore, theoretically, costs may be shown by means of a straight line extended fully across the graph, though, from the practical point of view, they will be represented by a straight line within certain limits only. Beyond these limits, increased expenditure on fixed charges will be incurred to cater for additional plant or building. Changes in fixed costs will normally take the graphical form of definite steps rather than a general curve.

### (b) VARIABLE OVERHEADS

There are certain other elements of costs which are more or less variable in nature. This means that they vary directly with the volume of business. For plotting each point on the break-even chart, the variable overheads will be aggregated with the fixed and semi-variable overheads.

### (c) SEMI-VARIABLE OVERHEAD

There is a large group of costs possessing the characteristic of both fixed and variable costs, that is, semi-variable costs. These are the costs that require special analysis. The objective being to separate the fixed and variable components. Generally, the most logical basis on which to attempt such separation is an analysis of historical data. These overheads must be computed for several volumes of business as under flexible to plot each point on the chart. Thus, in effect, semi variable charges are plotted using the 'fixed charges' line as the horizontal axis.

### ILLUSTRATION 1

From the following particulars, Calculate a break-even point for (a) unit, and (b) sales value.

| | |
|---|---|
| Total variable costs | Rs. 10,000 |
| Total fixed costs | Rs. 20,000 |
| Total sales | Rs. 50,000 |

| | | |
|---|---|---|
| Selling price per unit | Rs. | 5 |
| Output | | 10,000 units |
| Variable cost per unit | Rs. | 1.00 |

**SOLUTION**

Brea-Even point for unit

$$= \frac{\text{Fixed Cost}}{\text{Unit Selling Price} - \text{Unit Variable Cost}}$$

$$= \frac{\text{Rs.}20,000}{\text{Rs.}5 - 1} = \frac{20,000}{4} = 5,000$$

$$= \frac{\text{Fixed Cost}}{\text{Fixed Cost} - \text{Net Profit}} \times 100$$

$$= \frac{\text{Rs.}20,000}{\text{Rs.}20,000 + \text{Rs.}20,000} \times 50,000$$

= Rs.25,000

**ILLUSTRATION 2**

From the following particulars calculate the break-eve point. Find out the net profit if sales are 10% and 15% above the break even volume.

| | Rs. |
|---|---|
| Selling price per unit | 10 |
| Trade Discount | 5% |
| Direct material cost per unit | 3 |
| Direct labour cost per unit | 2 |
| Fixed overheads | 10,000 |

Variable overheads 100% on Direct labour cost.

**SOLUTION**

Variable cost per unit (Rs.3 + Rs.2 + Rs.2) = Rs.7

| | | |
|---|---|---|
| Selling price | Rs. | 10.00 |
| LESS: 5% Discount | Rs. | 0.50 |
| | | 9.50 |

Contribution per unit Rs.9.50 – Rs.7.00 = Rs.2.50

$$\text{B.E.P.} = \frac{F}{\text{Contribution}} = \text{Rs.}\ \frac{10,000}{2.50} = 4,000 \text{ units}$$

| | |
|---|---|
| B.E.P. Units | 4,000 |
| ADD: 10% | 400 |

| | | |
|---|---|---|
| | 4,400 | @ Rs.2.50 = 11,000 – 10,000 |
| | | Profit = Rs.1,000 |
| B.E.P. Units | 4,000 | |
| ADD: 15% | 600 | |
| | 4,600 | @ Rs.2.50 = 11,500 – 10,000 |
| | | Profit = Rs.1,500 |

**PROFIT PLANNING-DESIRED PROFIT**

All business want to do something better than the just break-even. Cost-Volume-Profit analysis is incorporated into break-even analysis by applying the following formula for x

$$X_n = \frac{F + \pi}{P - V}$$

Sales necessary to reach desired profit:

$$= \frac{\text{Fixed cost} + \text{Desired profit}}{1 - \frac{\text{Variable costs}}{\text{Sales}}}$$

Desired Profit unit sales volume:

$$\frac{\text{Fixed cost} + \text{Desired profit}}{\text{Unit Contribution Margin}}$$

If the selling prices increase, the formula would be,

$$\text{B.E.P.} = \frac{\text{Fixed cost}}{1 - \frac{\text{Variable costs}}{\text{New Selling Price}}}$$

If the change in the variable cost takes place, the B.E.P would be

$$\text{B.E.P.} = \frac{\text{Fixed cost}}{1 - \frac{\text{New Variable Cost}}{\text{Sales}}}$$

**ILLUSTRATION 3**

Given the following information:

| | |
|---|---|
| Units of output | 5,00,000 |
| Fixed costs | Rs.7,50,000 |

Variable cost per unit Rs.2

Selling price per unit Rs.5

You are required to determine:

i) the break-even point

ii) the sales needed for a profit of Rs.6,00,000 and

iii) the profit if 4,00,000 units are sold at Rs.6 per unit

**SOLUTION**

(i) Break-even point = $\frac{\text{Fixed cost}}{1 - \frac{\text{Variable cost per unit}}{\text{Sales per unit}}}$

$= \frac{\text{Rs.}7,50,000}{1 - \frac{2}{5}} = c$

$= 7,50,000 \times \frac{5}{3} = \text{Rs.}12,50,000$

ii) Sales needed for profit of Rs.6,00,000

$= \frac{\text{Rs.}7,50,000 + \text{Rs.}6,00,000}{1 - \frac{2}{5}} = \frac{\text{Rs.}13,50,000}{\frac{3}{5}}$

$= \text{Rs.}13,50,000 \times \frac{5}{3} = \text{Rs.}22,50,000$

$= \frac{\text{Rs.}22,50,000}{\text{Sale per unit}} = \frac{22,50,000}{5} = 4,50,000 \text{ Units}$

**O**

$= \frac{F + \pi}{P + V} = \frac{\text{Rs.}7,50,000 + \text{Rs.}6,00,000}{3} = 5,40,000 \text{ Units}$

iii) Profit on sale of 4,00,000 units at Rs.6 per unit

Sales = 4,00,000 units x Rs.6 = Rs.24,00,000

$\frac{24,00,000}{1} = \frac{\text{Fixed cost} + \text{Desired Profit}}{1 - \frac{\text{Variable cost}}{\text{Sales per unit}}}$

$\frac{24,00,000}{1} = \frac{\text{Rs.}7,50,000 + \text{Profit}}{1 - \frac{2}{6}}$

$\frac{24,00,000}{1} \times \frac{2}{3} = 7,50,000 + \text{Profit}$

Profit = 16,00,000 – 7,50,000 = 8,50,000

Profit = 8,50,000

**ILLUSTRATION 4**

You are given the income statement of A company Limtied

| | Rs. | Rs. |
|---|---|---|
| Net Sales | | 5,00,000 |
| LESS: Expenses: | | |
| Variable | 3,50,000 | |
| Fixed | 2,50,000 | 6,00,000 |
| | | 1,00,000 |

Assuming that variable expenses will always remain the same percentage of sales.

*Compute*

(a) What amount of sales will cause the firm to break-even, if fixed expenses are increased by Rs.1,00,000?

(b) What amount of sales will yield a net profit of Rs.50,000 with the proposed increase in fixed expenses?

**SOLUTION**

(a) Break-Even Point $= \dfrac{\text{Fixed Expenses} + \text{Desired Profit}}{1 - \dfrac{\text{Variable Expenses}}{\text{Sales}}}$

OR

$$= \frac{\text{Fixed Expenses} + \text{Desired Profit}}{\text{Contribution Margin Ratio}}$$

$$= \frac{\text{Rs.}2,50,000 + \text{Rs.}1,00,000}{1 - \dfrac{\text{Rs.}3,50,000}{\text{Rs.}5,00,000}}$$

or $= \dfrac{\text{Rs.}3,50,000}{0.30}$ B.E.P. = Rs.11,66,667

(b) Required Sales (R.S.) $= \dfrac{\text{Fixed Expenses} + \text{Desired Profit}}{\text{Contribution Margin Ratio}}$

$$= \frac{\text{Rs.}4,00,000}{0.30} = \text{Rs.}13,33,333$$

**MARGIN OF SAFETY**

Margin of safety is an important concept in the context o, marginal costing and cost-volume-profit analysis. The margin of safety refers to the amount by which sales revenue can fall before a loss is incurred. In other words, it is the difference between the actual sales and sales at the break-even point or spread between

anticipated sales and break-even sales. Margin of safety can be expressed in absolute sales amount or in percentage. For example, if a company can break-even at 50 percent of expected sales, then it has margin of safety of 50 percent. If the present sales level is Rs.1,000 or 1,000 units the break-even volume may be sales Rs.500 or 500 units, so the margin of safety is Rs.500 or 500 units. The margin of safety is given by the formula:

$$\text{Margin of Safety} = \frac{\text{Actual Sales} - \text{Break Even Sales}}{\text{Actual Sales}}$$

$$= \frac{\text{Rs.1,000} - \text{Rs.500}}{\text{Rs.1,500}} \times 100 = 50 \text{ percent}$$

or Rs.1,000 – 500 = Rs.500

$$\text{Margin of safety} = \frac{\text{Sales above Break-Even Point}}{\text{Budget Sales}}$$

**OR**

$$\text{Margin of Safety (M/S)} = \frac{\text{Profit}}{\text{P/V Ratio}} \times 100$$

Actual Sales – Sales at BEP

Margin of safety is an important indicator of the strength or weakness of an enterprise. The large margin of safety indicates the soundness of a business because even with substantial fall in sale or fall in production, some profit shall be made. Small margin of safety on the other hand is an indicator of the weak position of the business and even a small reduction in sale of production will adversely affect the profit position of the business. In the labour intensive industry, the B.E. point occurs at a lower level of activity and, hence, the margin of safety is higher. Conversely in a capital intensive industry like motor car, B.E. point is reached at a higher level of activity and, hence, margin of safety is lower.

The margin of safety can be increased by the following steps:

1. By reducing fixed or variable costs.
2. By increasing production.
3. By increasing selling price.
4. By substituting unprofitable production with profitable one.
5. By dropping unprofitable production.

**ILLUSTRATION 5**

From the following calculate the break-even point and the turnover required to earn a profit of Rs.36,000.

| | | |
|---|---|---|
| Fixed Overheads | Rs. | 1,80,000 |
| Variable cost per unit | Rs. | 2 |
| Selling Price | Rs. | 20 |

If the company is earning a profit of Rs.36,000, express the 'margin of safety' available of it.

**SOLUTION**

Break-Even Point (in units)

$$= \frac{\text{Fixed Expenses}}{\text{Selling Price per unit} - \text{Marginal cost per unit}}$$

$$= \frac{1,80,000}{20-2} = 10,000 \text{ units}$$

Break-even point (in amount) = 10,000 units @ Rs.20 per unit

= Rs.2,00,000

Turnover required to earn a profit of Rs.36,000:

$$\text{Turnover units} = \frac{\text{Fixed Expenses} + \text{Profit}}{\text{Selling Price per unit} - \text{Marginal cost per unit}}$$

$$= \frac{\text{Rs.}1,80,000 - \text{Rs.}36,000}{\text{Rs.}20 - \text{Rs.}2} = 12,000 \text{ units}$$

Turnover is Rs.12,000 units @ Rs.20 per unit

= Rs.2,40,000

**MARGIN OF SAFETY**

| | **Units** | **Amount Rs.** |
|---|---|---|
| Sales to earn a profit of Rs.36,000 | 12,000 | 2,40,000 |
| LESS: Sales at Break-Even Point | 10,000 | 2,00,000 |
| Margin of safety | 2,000 | 40,000 |

Margin of safety can also be calculated by the other formula

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V Ratio}} = \frac{\text{Rs.}36,000}{\frac{18}{20}}$$

$$= \text{Rs.}36,000 \times \frac{20}{18} = \text{Rs.}40,000$$

$$\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} = \frac{\text{Sales} - \text{Marginal Cost}}{\text{Sales}}$$

$$\frac{\text{Rs.}20 - \text{Rs.}2}{\text{Rs.}20} = \frac{18}{20} \times 100 = 90\%$$

## KEY FACTOR OR LIMITING FACTOR

Key factor or limiting factor plays a very important part in decision-making. One of the objectives of a business enterprise is to maximise the profit. This could be done if an enterprise employ all its resources to manufacture and sell the maximum quantities of products that yield the highest individual marginal contribution. The profitability of the enterprise therefore has to be measured with reference to the key factor, it any, key factor is "the factor in the activities of an undertaking which at a particular point of time or over a period will limit the volume of output". Thus the key factor or scare factor puts a limit on production and profitability of an enterprise.

In practice, for various reasons there may be limitations to manufacture of the most remunerative product. For example, an enterprise may have orders on hand, ample labour and production capacity, but may be unable to get all the quantities of material it needs over a period for the production of maximum quantities which could be sold.

The following illustrations would clearly show how the key factor affects the relative profitability and influences the decision. It is therefore necessary that in deciding which product, combination of products or other course of action will yield the highest total contribution, each item must be examined to determine its potential contribution per unit of key factor.

For example, if the choice is between accepting an order A which yields 10 units of contribution, and an order B yields 12 units of contribution. Without a limiting factor order B would be accepted. However, if order A takes 2 units of material and order B takes 3 units, the respective contribution per unit of the limiting factor of material would be:

Order A $10 \div 2 = 5$

Order B $12 \div 3 = 4$

Thus, order A gives the greater contribution in terms of key factor and hence more profitable.

Examples of key factors or limiting factors are

Materials

Labour (either quantity of particular skills)

Manufacturing Capacity

Financial Resources

Thus, the profitability can be measured by : $\frac{\text{Contribution}}{\text{Key Factor}}$

**ILLUSTRATION 6**

Comment of the relative profitability of the following two products

| | **Production cost per unit** | |
|---|---|---|
| | **Product A Rs.** | **Product B Rs.** |
| Materials | 200 | 150 |
| Wages | 100 | 200 |
| Fixed overhead | 350 | 100 |
| Variable overhead | 150 | 200 |
| Profit | 200 | 350 |
| | 1000 | 1000 |
| Output per week | 200 units | 100 units |

(I.C.W.A. Final)

| | **Product A Rs.** | **Product B Rs.** |
|---|---|---|
| Sales price per unit | 1,000 | 1,000 |
| LESS: Variable cost per unit | 450 | 550 |
| Contribution per unit | 550 | 450 |
| LESS: Fixed cost per unit | 350 | 100 |
| Cost per unit | 200 | 350 |
| Total profit | 40,000 | 35,000 |
| P/V Ratio | 55% | 45% |

Contribution per unit and total profit is higher in case of Product A, though profit per unit for product B is higher. If output is the key or limiting factor then Product A is better. On the other hand if there is no limit to output then Product B would be more advantageous.

## 6.6 SUMMARY

BEP is useful in budgeting and budgeting control. It increases production with the help of BEP any organisation can study thus profit planning, cost control and decision making.

## REVIEW QUESTIONS

1) Explain BEP with examples.
2) Explain the assumption of BEP?
3) What do you mean P/V ratio?
4) Explain margin of safety?

❐

LESSON – 7

# THE GRAPHIC METHOD

**STRUCTURE**



## 7.1 INTRODUCTION

Break-Even chart is a graphical representation of Marginal Costing which is a form of profit graphs.

Unit now, the algebraic method of calculating the break-even point and the profit-volume ratio have been dealt with. Since members of the management are non technical they should be provided with the necessary information capable of catching their eyes. Such visual aids are charts and diagrams. The break-even chart, which is, infact, a graphical representation of marginal costing, is a form of profit graph. Portraying the cost-volume-profit relationship. The break-even-chart, thus, depicts fixed costs, variable costs, total costs, the value, the break-even point, the profit or loss, the margin of safety and the angle of incidence.

(i) Draw coordinates on a graph sheet. The X-axis or the abscissa represents the sales volume in money value or output is units. The Y-axis or the ordinate represents costs and revenue.

(ii) Select suitable scales for both.

(iii) Plot the sales volume or units. When plotted, the sales revenue or the output will be a straight line from origin to the right. If the scales on both the axes are the same, the sales lines will be at the 45 angle to the base.

(iv) Draw the fixed cost line parallel to the X-axis to indicate that it is infinitely elastic within the installed capacity.

(v) Plot the total cost line for a given sales volume or units.

(vi) The point at which the total cost line intersects the sales line is the break-even point. A line drawn perpendicular to the x-axis from the break-even point indicates on the x-axis the break-even sales volume.

(vii) The area between the total cost and the sales line below the break-even sales volume.

(viii) The angle formed at the point of intersection of the total cost and the sales line is called the angle of incidence.

**FORMS OF BREAK-EVEN CHART**

The following are the different forms of Break-even chart.

(a) Simple, orthodox or the Traditional Break-even chart.
(b) Contribution Break-even chart.
(c) Profit appropriation chart.
(d) Analysis Break-even chart.
(e) Cash Break-even chart.
(f) Control Break-even chart.
(g) The profit-volume chart.
(h) Profit path chart.

A chart prepared in accordance with the procedure outline above, represents a simple break-even chart.

## 7.2 BREAK-EVEN CHARTS/PROFIT GRAPHS

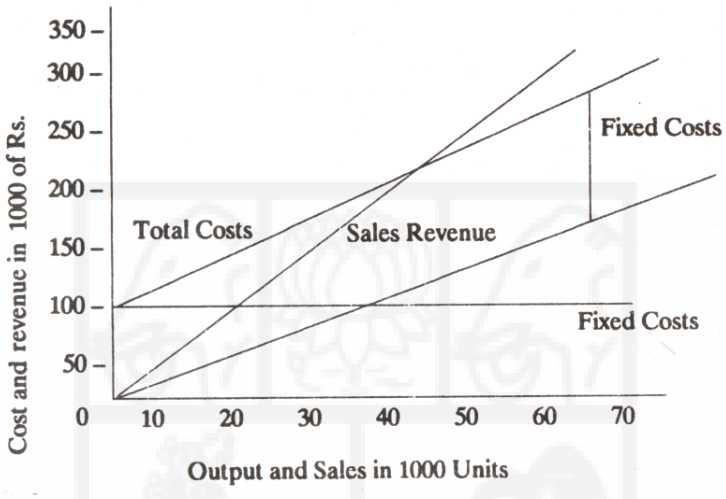
When the relevant data for the break-even points are plotted on a graph, it becomes a break-even chart, and as such can be defined as the graphical representation of the cost structure of a business. While the underlying principle is the same, the details of construction may vary. The horizontal (x) axis represents activity measured in terms of physical units, the rupee volume of production, percent of capacity, or any other index of output that is believed to control change in costs realistically. The vertical (y) ordinarily denotes monetary units and is applicable to both revenue and costs. The total variable costs are marked off at the top of the total fixed costs so that the upper line shows the total costs, which are to be incurred of the chart showing the fixed costs. It may be recalled that these include the expenses which could be separately classed as fixed, as also the fixed cost elements of the semi-fixed costs. The line rising from zero, the junction of the axes, is the sales line showing the revenue from selling various units of output, and if the horizontal and vertical scales are the same it forms an angle of 45 degrees. The point where the total revenue and total cost line intersect is the required break-even point on the basis of data given below. It may be stated, however, that the break-even point is really an oval area and not a point. This flattened outline of the area is due to the non-normal distribution of the deviation and the so-called break-even point will be found encompassed x in the oval.

**ILLUSTRATION 1**

Plot the following data on a graph and determine the break-even point.

| Volume (units) | Variable Costs Rs. | Sales/Revenue Rs. | Total Costs Rs. |
|---|---|---|---|
| 10,000 | 30,000 | 50,000 | 1,30,000 |
| 20,000 | 60,000 | 1,00,000 | 1,60,000 |
| 30,000 | 90,000 | 1,50,000 | 1,90,000 |
| 40,000 | 1,20,000 | 2,00,000 | 2,20,000 |

| | | | |
|---|---|---|---|
| 50,000 | 1,50,000 | 2,50,000 | 2,50,000 |
| 60,000 | 1,80,000 | 3,00,000 | 2,80,000 |
| 70,000 | 2,10,000 | 3,50,000 | 3,10,000 |




**ALGEBRAIC CALCULATION**

(a) Break-even for sales

$$\frac{\text{Fixed Cost x Sales}}{\text{Fixed Cost + Profit}} - \frac{\text{Rs.1,00,000 x Rs.3,50,000}}{\text{Rs.1,00,000 + Rs.40,000}} = \text{Rs.2,50,000}$$

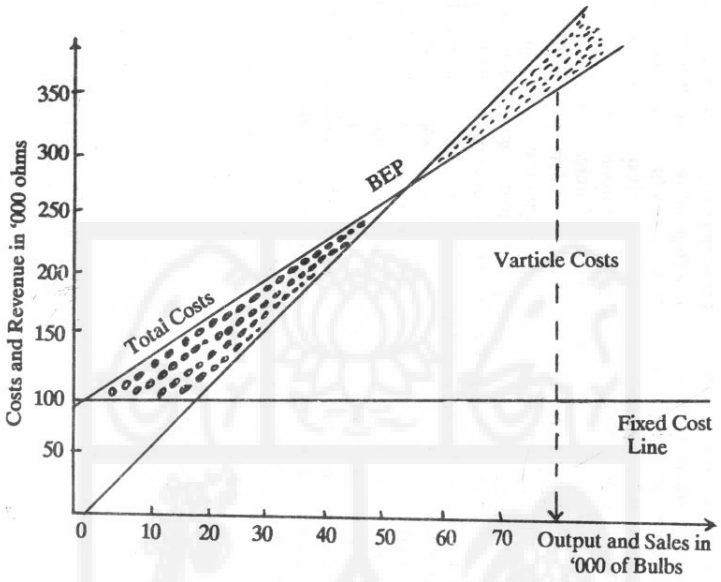
(b) BEP in units

$$= \frac{\text{Fixed Cost}}{\text{Sales price per unit - Variable cost per unit}}$$

$$= \frac{1,00,000}{\text{Rs.5 - Rs.3}} = \frac{1,00,000}{2} = 50,000 \text{ Units.}$$

Over this point an angle is formed, called the angle of incidence. The management's aim will be to have as large an angle as possible, because this indicates a high rate of profit. Once the fixed costs are absorbed, profit accrues at a relatively low rate of return, indicating that variable costs form a large part of the cost of sales. In any particular case, the amount of profit or loss can be measured by the vertical distance between the total cost line and the sales line. It is after BEP has been reached that the difference between it and the present level of activity will indicate what is known as "margin of safety" – how much the activity could shrink before losses reapper. This shows that if the break-even point appears well over to the right of the chart, the margin of safety will be low, either because fixed overhead is excessive for the existing volume of sales, or, variable costs themselves are high, keeping the contribution low. However, if the BEP is well over to the left of the chart and is accompanied by a large angle of incidence, room is open for an expansion of output, provided it can be sold with or without slashing down the selling price. By way of refinement, if variable costs line is plotted at the bottom

and the fixed costs line in super-imposed above it-the sales line drawn as usual, an additional information is obtained.




## 7.3 PROFIT GRAPHS

The difference between the bands of sales and total variable costs the total contribution or marginal income which goes on increasing till it coincides with the total costs at the breake-even level of activity. The advantage of this graph is that it distinctly depicts the role of contribution margin and, hence, is preferable to the traditional B E chart discussed earlier. Yet another innovation, rather simplification is made in the profit graph wherein separate fixed and variable cost lines are dispensed with, and only the profit difference and sales, lines are plotted. While the sales line is measured along the horizontal axis, profit (or loss) is shown on the vertical scale. Naturally, the losses appear below the X-axis and profits above it. The point at which the profit line crosses the base line is the required break-even point. The graph here comes to be known as "profit-volume chart" or "profit graph".

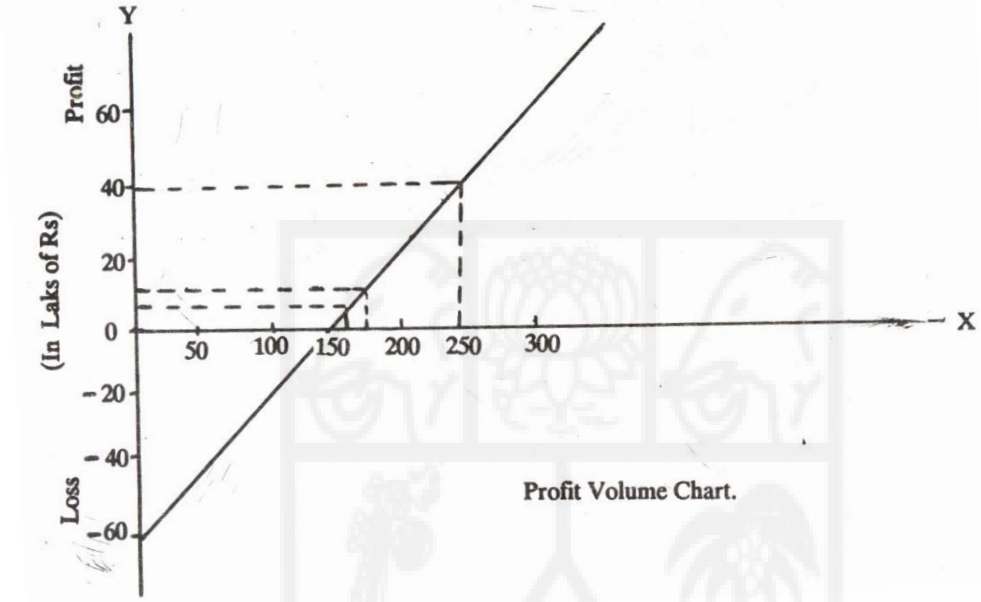
### ILLUSTRATION 2

Draw a break-even chart from the following figures:

| | **Sales** | **Profit** |
|---|---|---|
| | (Rs. in lakhs) | |
| Year – 1 | 160 | 4 |
| Year – 2 | 175 | 10 |

From the above chart predict the variable cost, contribution, fixed cost and profit associated with a sales volume of Rs.250 lakhs, and set you prediction in the form of a profit statement. State also the main assumption underlying the prediction.

**SOLUTION**




Statement showing costs and profits at Rs.250 lakhs of sales:

| | Rs. | Rs. |
|---|---|---|
| Sales | | 250 Lakh |
| LESS: Variable Costs | 150 lakh | |
| Fixed Cost (loss at nil sale) | 60 lakh | 210 lakh |
| Profit | | 40 lakh |

(Indicated also by the perpendicular meeting the point of sale of Rs.250 lakh).

However, the assumptions here are:

1. There is no increase in fixed cost during the two years. Hence the increase in costs is only due to variable costs.
2. Fixed costs remain constant even at the sale of Rs.250 lakhs. This implies that the firm has substantial excess capacity.
3. The variable cost per unit and the sale price per unit do not change at any of the three given levels.

**ILLUSTRATION 3**

From the following profit and loss statement, prepare a break-even chart and determine:

(a) The break-even point

(b) The margin of safety

(c) The sales necessary to obtain a profit of Rs.10,000

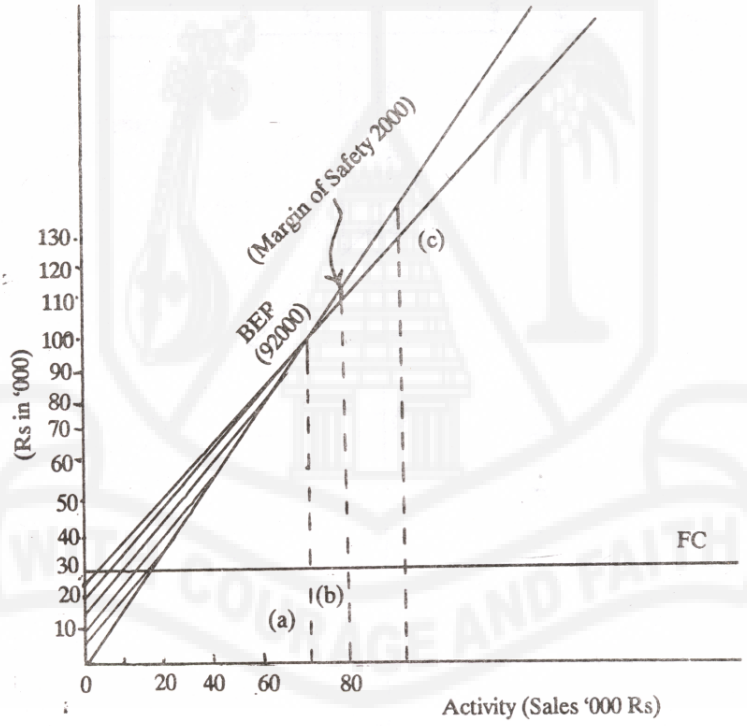
| | Rs. | Rs. |
|---|---|---|
| Sales | | 84,000 |
| Costs: Variable | 56,000 | |
| Fixed | 24,000 | 80,000 |
| Profit | | 4,000 |

**SOLUTION**

Break-even point by algebraic formula:

(a) Break-even point for sale = $\frac{\text{Fixed Cost x Sales}}{\text{Fixed Cost} + \text{Profit}}$

$= \frac{24,000 \times 84,000}{24,000 + 4,000}$ = Rs.72,000




(b) Margin of safety = Actual Sales – Break-even sales

= Rs.84,000 – Rs.72,000 = Rs.12,000

(c) Sales at desired profit = $\frac{\text{Fixed Cost} + \text{Desired Profit}}{1 - \frac{\text{Variable cost}}{\text{Sales}}}$

$= \frac{24,000 + 10,000}{1 - \frac{56,000}{84,000}}$

$$= \frac{34,000}{28,000} \text{ x } 84,000$$

$$= \text{Rs.}1,02,000$$

From the break-even chart shown above it will be seen that:

(a) The break-even point is at sales of Rs.72,000

(b) The margin of safety is Rs.84,000 – Rs.72,000 = Rs.12,000 = 14%

(c) The gap between the sales and total cost curves, (i.e., the profit) reaches Rs.10,000 when the sales are Rs.1,02,000

**ILLUSTRATION 4**

You are given the following data:

| | |
|---|---|
| Total Sales | Rs. 2,00,000 |
| Total fixed cost | Rs. 60,000 |
| Selling price per unit | Re. 1.00 |
| Variable cost per unit | Re. 0.40 |
| Units produced and sold | 2,00,000 |

Calculate (a) Break-even point for units and sales volume

(b) Also draw a graph and ascertain the break-even point for both units and sales.

**SOLUTION**

B.E.P. can be ascertained by three methods, i.e.,

(i) Algebraic method

(ii) Computation method

(iii) Graphic method

(i) The break-even point in units can be computed as:

Total revenue = Total costs

$P_x = F + V_x$

$P_x$ = Price x No. of units sold

F = Fixed Cost

$V_x$ = Variable cost per unit

Re.1 = Rs.60,000 + Re.0.40x

x = 1,00,000 units

$$\frac{\text{Total fixed cost}}{\text{Contribution per unit}} = \frac{\text{Rs.}60,000}{\text{Re.}1 - \text{Re.}0.40}$$

$$= \frac{60,000}{0.60} = 1,00,000 \text{ units}$$

Break-even in Rs.

$$\frac{\text{Fixed Cost}}{1 - \frac{\text{Variable cost}}{\text{Sales}}} = \frac{\text{Fixed cost}}{1 - \text{Variable cost per Re. of sale}}$$

$$= \frac{60,000}{1 - \frac{80,000}{2,00,000}} = \frac{60,000}{1 - 0.40} = \frac{60,000}{0.60} = \text{Rs.}1,00,000$$

$$= \frac{60,000}{\frac{1,20,000}{2,00,000}} \times \text{Rs.}1,00,000$$

Relationship among changes in output and total and unit costs

| Sales (Units) | Fixed Costs | | Variable Costs | | Total Costs | |
|---|---|---|---|---|---|---|
| | Total Rs. | Per Unit Rs. | Total Rs. | Per Unit Rs. | Total Rs. | Per Unit Rs. |
| 10,000 | 60,000 | 6.00 | 4,000 | 0.40 | 64,000 | 6.40 |
| 50,000 | 60,000 | 1.20 | 20,000 | 0.40 | 80,000 | 1.60 |
| 1,00,000 | 60,000 | 0.60 | 40,000 | 0.40 | 1,00,000 | 1.00* |
| 1,50,000 | 60,000 | 0.40 | 60,000 | 0.40 | 1,20,000 | 0.80 |
| 2,00,000 | 60,000 | 0.30 | 80,000 | 0.40 | 1,40,000 | 0.70 |

It would be observed from the above table that the total revenue equals total costs at sales/production of 1,00,000 units. This is the break-even point. It can be ascertained graphically also.

Note: * Indicates BEP.

(iii) Graphic presentation of BEP. BEP is ascertained by plotting the above data on a graph paper.

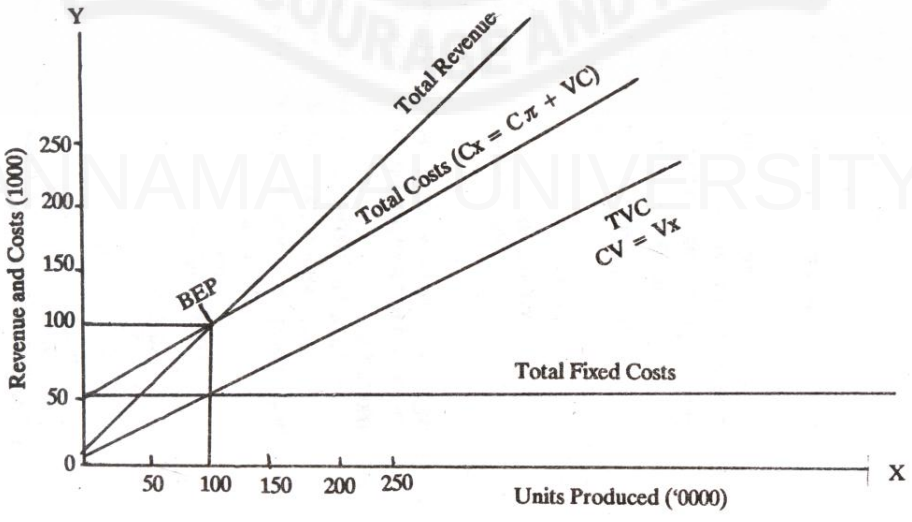


**ILLUSTRATION 5**

The following figures have been taken from a manufacturing company:

| | Rs. |
|---|---|
| Annual sales at 100% effective capacity | 12,00,000 |
| Fixed overhead | 4,000 |
| Total variable costs | 6,00,000 |

It is proposed to increase the capacity by the acquisition of 30% additional space and plant. One result will be to increase fixed overhead by Rs.1,00,000 per annum.

Plot the foregoing on a single break-even chart, and determine from the chart at what capacity-utilization the same profit as before will be produced after the extensions have been made.

(B.Com. (Hons.) Delhi)

**SOLUTION**

Verification:

$$= \frac{4,00,000}{\text{Break-even point} = \frac{\text{Fixed cost}}{\text{P/V ratio}}} \text{ or } 4,00,000 \times \frac{100}{50} = \text{Rs.}8,00,000$$

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

$$= \frac{6,00,000}{12,00,000} \times 100 = 50\%$$

Old break-even point

Profit at old capacity

= Sales – (Fixed cost + Variable cost)

= 12,00,000 – (4,00,000 + 6,00,000) = Rs.2,00,000

Sales required to Rs.2,00,000 profit at new plant capacity level

$$= \frac{\text{New fixed cost} - \text{Profit desired}}{\text{P/V ratio}}$$

$$= \frac{\text{Rs.}5,00,000 + \text{Rs.}5,00,000}{50\%} = \text{Rs.}14,00,000.$$

**ILLUSTRATION 6**

You are finished under noted data:

| | **Product A** | **Product B** |
|---|---|---|
| Sales | 10,000 units @ Re.1.00 | 7,500 units @ Re.1.33 |

| | | |
|---|---|---|
| Costs: | | |
| Fixed | Rs.2,000 | Rs.5,000 |
| Variable | @ Re.0.60 per unit | @ Re. 0.40 per unit |

Determine the effect on profits, if sales of A or B are increased in the mixture of total sales. Illustrate your argument by graphic representation (I.C.W.A. Final)

**SOLUTION**

Where a firm produced more than one product, considerable difficulty is experienced in the determination of optimum level of output. In such a situation, the main problem involves is the allocation of productive capacity available to different products. It is possible that the same productive capacity may be utilized for different products in different proportions. With different combination of output there may be more than one break-even points. Marginal cost curves may be drawn for each product of them by varying its output-sales proportions while taking output others as fixed. Then the marginal cost of each is compared with its incremental revenue for each level of output; contribution from other products being taken as fixed.

For purpose of B.E.P. the following total of the existing sales mix is prepared.

(a) Existing Sales Mix

| | Product A | | Project B | | Total |
|---|---|---|---|---|---|
| | Per unit | Total | Per unit | Total | |
| (i) Sales (unit) | | 10,000 | | 7,500 | |
| (ii) Sales (amount) | 1.00 | 10,000 | 1.33 | 10,000 | 20,000 |
| (iii) Variable cost | 0.60 | 6,000 | 0.40 | 3,000 | 9,000 |
| (iv) Contribution | 0.40 | 4,000 | 0.93 | 7,000 | 11,000 |
| (v) Fixed cost | 0.20 | 2,000 | 0.73 | 5,500 | 7,500 |
| (vi) Profit | 0.20 | 2,000 | 0.20 | 1,500 | 3,500 |
| (vii)Break-even point units | | 5,000 | | 5,914 | |

$$\frac{\text{Fixed cost}}{\text{Contribution}} = \frac{2000}{0.40} = 5{,}000, \quad \frac{5{,}500}{0.60} = 5{,}914$$

Contribution of Product B is more than Product A so increase in sales per unit of Product B is more profitable than Product A.

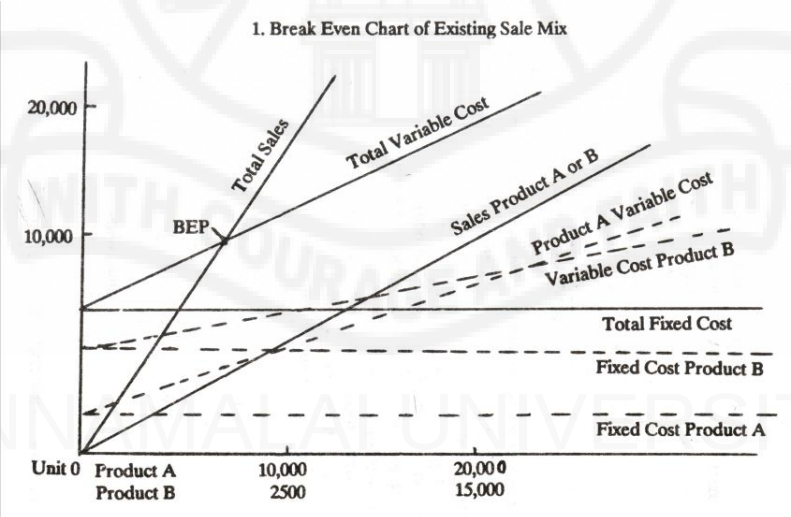
As the fixed cost of Product A being low, the break-even point is reached at the level of 5,000 units whereas B.E.P. of product B is 5,914 which is higher than Product A. The B.E.P. of the total output shall be Product A 4,700 and Product B 3,563 Units.

(b) If output of Product A in the total sales mix is increased than the Profit then profit position will appear to be as follows:

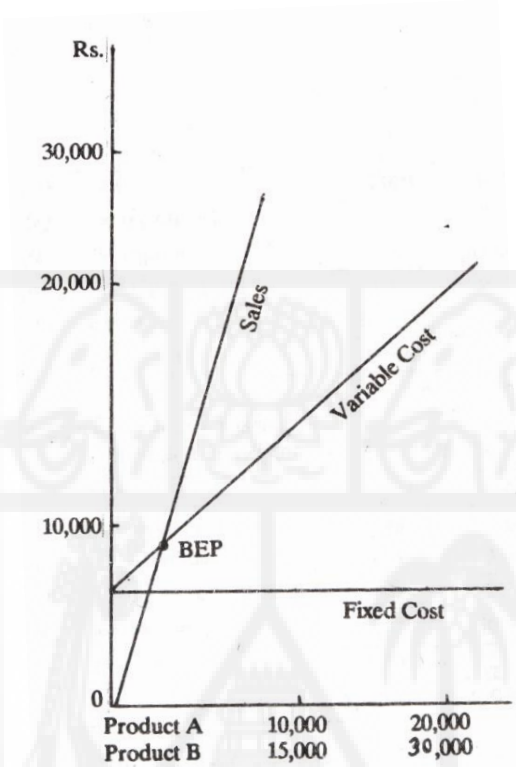
| | Product A | Product B | Total |
|---|---|---|---|
| (i) Sales (unit) | 15,000 | 7,500 | 25,000 |
| (ii) Sales (amount) | 15,000 | 10,000 | 12,000 |
| (iii) Variable cost | 9,000 | 3,000 | 12,000 |
| (iv) Contribution | 6,000 | 7,000 | 13,000 |
| (v) Fixed Cost (-) | 2,000 | 5,500 | 7,500 |
| (vi) Profit | 4,000 | 1,000 | 5,500 |

(c) If output of Product B in the total sales mix is increased then the profit position would be:

| | Product A | Product B | Total |
|---|---|---|---|
| (i) Sales (unit) | 10,000 | 15,000 | |
| (ii) Sales (value) | 10,000 | 20,000 | 30,000 |
| (iii) Variable cost | 6,000 | 6,000 | 12,000 |
| (iv) Contribution | 4,000 | 14,000 | 18,000 |
| (v) Fixed Cost (-) | 2,000 | 5,500 | 7,500 |
| (vi) Profit | 2,000 | 8,500 | 10,500 |



2. Break-Even Char product A increased in the Sales Mix




3. Break-Even Char product B increased in the Sales Mix

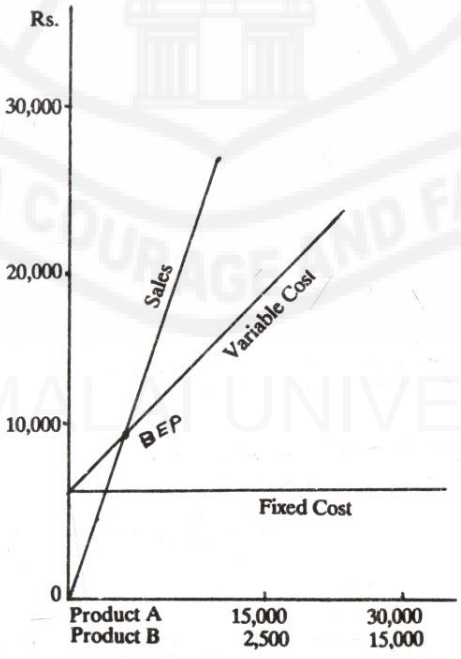


**ILLUSTRATION 7**

(a) Alcos Ltd., manufacture and sell four types of products under the brand names A, B, C and D. The sales mix in value comprises of 33 1/3 percent, 41 2/3 percent and 81/3 percent of products, A, B, C and D respectively. The total budgeted sales (100 percent) are Rs.60,000 per month operating costs are:

| | | |
|---|---|---|
| Product A | 60 | Per cent of selling price |
| Product B | 68 | Per cent of selling price |
| Product C | 80 | Per cent of selling price |
| Product D | 40 | Per cent of selling price |

Calculate the Break-even point for the products on an overall basis.

(b) it has been proposed to change the sales mix as follows, the total sales per month remaining Rs.60,000.

| | | |
|---|---|---|
| Product A | 25 | Per cent of selling price |
| Product B | 40 | Per cent of selling price |
| Product C | 30 | Per cent of selling price |
| Product D | 5 | Per cent of selling price |

(c) Illustrate the effect of the above change in product mix on a simple profit-volume chart.

**(a) Calculation of B.E.P**

| | **Product A** | **Product B** | **Product C** | **Product D** | **Total** |
|---|---|---|---|---|---|
| (i) Sales Mix | 33 1/3% | 41 2/3% | 16 2/3% | 8 1/3% | 100% |
| | Rs. | Rs. | Rs. | Rs. | Rs. |
| (ii) Sales value | 20,000 | 25,000 | 10,000 | 5,000 | 60,000 |
| (iii) Variable cost | 12,000 | 17,000 | 8,000 | 2,000 | 39,000 |
| (iv) Contribution (ii – iii) | 8,000 | 8,000 | 2,000 | 3,000 | 39,000 |
| (v) Fixed cost (-) | | | | | 14,700 |
| (vi) Profit | | | | | 6,300 |
| (vii) Percentage of contribution on sales | 40% | 32% | 20% | 60% | |

$$\text{Break –Even Point} = \frac{\text{Fixedcost}}{\text{Contribution}} \times 100 = \frac{14,700}{21,000} \times 100$$

= 70% of total capacity

= 70% of Rs.60,000 = Rs.42,000 (Sales)

**(b) Effect of change in the Sales Mix**

| | Product A | Product B | Product C | Product D | Total |
|---|---|---|---|---|---|
| (i) Sales Mix | 25% | 40% | 30% | 5% | 100% |
| | Rs. | Rs. | Rs. | Rs. | Rs. |
| (ii) Sales value | 15,000 | 24,000 | 18,000 | 3,000 | 60,000 |
| (iii) Variable cost | 9,000 | 16,320 | 14,400 | 1,200 | 40,920 |
| (iv) Contribution (ii – iii) | 6,000 | 7,630 | 3,600 | 1,800 | 19,080 |
| (v) Fixed cost (-) | | | | | 14,700 |
| (vi) Profit | | | | | 6,380 |

Break –Even Point = $\frac{14,700}{19,080}$ x 100

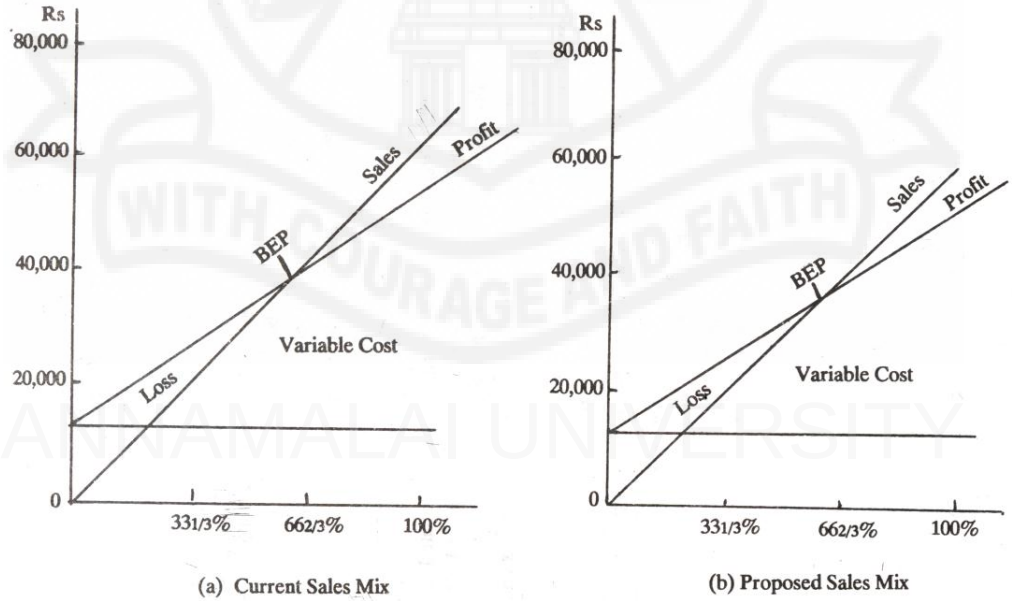
= 77% of total capacity

= 77% of Rs.60,000 = 46,200 (sales)

OR

Thus the B.E.P. has shifted adversely as the sales of production D and A which are contributing at the maximum rates have dropped and sales of product C which is contributing as the least rate has been almost doubled as a result total contribution has been down by about Rs.2000.

(c) Simple Profit/Volume graphs.




(a) Current Sales Mix (b) Proposed Sales Mix

## 7.4 MARGINAL COSTING-SPECIFIC DECISION MAKING AREAS

As discussed in the preceding and the present chapters, the techniques of marginal costing are of extremely useful in profit planning. The principles and

techniques of marginal/direct costing could profitably be used by management at all levels of decision making process.

Some specific areas where marginal costing techniques could be applied in the decision making process are listed below:

(i) Pricing decision

(ii) Make or buy decision

(iii) Selection of suitable product mix

(iv) Introduction of a new product

(v) Closing down on suspension of any product line activities

(vi) Maintaining a desired level of profits

(vii) Problem of limiting or key factors

(viii) Accepting tenders, exploring possibilities of foreign markets

(ix) Alternative course of action

### 7.5 PRICING DECISION

As stated earlier, the underlying theory of marginal costing is that any product which will produce revenue in excess of its variable cost is contributing towards recovering fixed costs and providing profits. Once the fixed costs are recovered at a particular level of production, the additional units of production would contribute larger amount towards profit. Thus, profit would be contribution of all such units minus all variable costs. On this 'fundamental principle' of marginal costing, the pricing decisions are made. The fixation of prices may be:

(i) Fixing selling price under normal conditions.

(ii) Fixing selling price for additional orders for utilizing idle capacity.

(iii) Pricing for exporting and exploring new markets.

(iv) Pricing during recession.

(v) Selling price at or below marginal cost.

Sometimes, price of a commodity is fixed at marginal cost i.e., realizing only variable cost and sacrificing fixed cost and profit. Under the compelling circumstances, prices are fixed even below the marginal cost i.e., recovering only a part of variable cost. The following are the circumstances where the price is fixed below marginal cost.

(i) To introduce a new product in the market, or to popularize a particular product.

(ii) To maintain production at the existing level so as to avoid the retrenchment of the workers.

(iii) Pricing for exporting and exploring new markets.

(iv) Pricing during recession.

(v) Selling price at or below marginal cost.

Sometimes, price of a commodity is fixed at marginal cost i.e., realizing only variable cost and sacrificing fixed cost and profit. Under the compelling circumstances, prices are fixed even below the marginal cost ie., recovering only a part of variable cost. The following are the circumstances where the price is fixed below the marginal cost.

(j) To introduce a new product in the market, or to popularize a particular product.

(ii) To maintain production at the existing level so as to avoid the retrenchment of the workers.

(iii) To explore foreign markets.

(iv) To prevent loss of existing customers and future orders.

(v) To keep the plant in the running condition.

(vi) To push the sale of a joint product.

(vii) To clear the stock of perishable goods or seasonal product.

(viii) To utilize the surplus resources which otherwise would go waste.

(ix) To eliminate the competition of competitors especially weaker rivals.

(x) To avoid a situation when closure of the factory will increase the total loss including fixed costs in the form of interest on capital and other fixed charges.

(xi) During a depression period where the prices have fallen in the market and it may be advisable to follow suit. However, such price cutting should be effected most cautiously.

**DISADVANTAGES AND DANGERS**

The cutting of prices below total cost, is however, not that easy and calls for managerial policy. Following are the principal dangers:

**(i) *Difficulty in Raising the Prices later*:**

Sometimes it may be difficult to reduce the price to particular customers while making normal figures for others. Again, once prices have been slashed to meet a temporary shortage of others, it may not be easy to increase them alter when business improves.

**(ii) *Possibility of an Overall Loss***

It too large a percentage of the sales is made at marginal prices, the total contribution will be insufficient to cover the fixed overheads and that an overall loss will result. It is only the marginal work which could be accepted at any price in excess of marginal cost. The bulk of the output should be priced sufficiently high to absorb the fixed costs of the machine and still provide a reasonable profit; it should be costed at a total cost basis. In the long run, economic selling prices

cannot be set without the allocation of fixed costs to the products. The difficulty in assigning fixed costs does not mean that they can be ignored in all circumstances.

**(iii) *Incorrect Price Fixing***

Since under marginal costing, period or time costs are ignored, this may lead to incorrect pricing decisions. Two jobs might have the same marginal costs, but one may take a longer time for completion than the other. Unless, therefore, fixed costs based on time factor are taken into account, their pricing will be wrong. It may lead to uneconomical action and unrealistic expectations.

**(iv) *Increasing Fixed Costs***

The industry is fast moving towards automation. If mechanization was the first stage of industrial revolution, automation could be said to be its second stage. Because of automation, the incidence of fixed costs is naturally increasing, which must be allowed for. Failure to do so might burden the enterprise with heavy losses and sometimes irrational decisions.

**(v) *Bifurcating Costs***

The problem that cannot be taken lightly is that of meaningfully separating the fixed and variable components of costs. In such separation, the bias has been towards fixed costs which has led to a gross understatement of variable unit costs and a gross over-statement of total fixed expenses. If an analysis of a cost does not indicate a clear-cut variability, the cost is likely to be classified as fixed.

## 7.6 SUMMARY

The graph method portrays the cost-volume profit relationship. It fixes price under normal conditions. Breakeven Chart is a graphical representation of marginal costing. Marginal costing are useful in profit planning.

## REVIEW QUESTIONS

1. Explain clearly what do you understand by “Contribution” in a cost accounting sense. How is it related to profit?
2. State the formula commonly used to determine the break-even point in rupees in units.
3. Of what benefit to management is a Break-Even Chart?
4. The break-even Chart and Unit Profit Graph intend to show the same information but seem to differ. How?
5. “The Break-Even Chart is an excellent planning device” Discuss.
6. Define Break-even Point. What would change the position of BE Point is a Break-Even Chart?
7. What are the various applications of Break-Even Chart? Enumerate the various criticisms usually put up against Break-Even Charts.
8. What is meant by “margin of safety” and How is such a figure determined.

9. Discuss the weakness inherent in the preparation and uses in break-even point analysis.
10. What is meant by the term cost-volume-profit relationship? Why is this relationship important in business management?
11. "A price reduction is always accompanied by a proportionate volume increase." Discuss.
12. Cost-volume-profit relationship provide management with a simplified framework for organizing, thinking on a number of problems. Elaborate.

❐

LESSON – 8

# DAY-TODAY DECISION-MAKING-I

**STRUCTURE**



## 8.1 INTRODUCTION

Day-today decision-making is concerned with marginal cost, relevant costs and differential costs.

Planning is a sequential process involving recognizing and defining the problem, search for alternative solutions, evaluating the alternatives, selecting out of the evaluated alternatives and reporting on actions taken and results achieved. Thus decision making is part of the planning process. Managerial decisions are basically in the nature of solutions of problems. The problems which crop up in the management of an undertaking may be varied and may have different consequences.

In the previous lesson we have discussed the technique of marginal costing. It is to be borne in mind that the major purpose of this technique is not to provide new concepts of income of inventory, but rather to clarify the relationship between costs, volume and profits, particularly in the areas of decision making. The present lesson deals with a group of specific operating decisions that require the decision maker to be selective in deciding which cost data he will use and how will he use them.

## (A) CONCEPT OF DECISION MAKING

Decision, making is the essence of management since it may make or mar the success as a whole. In general it means taking the final step in deliberations before acting. In management terms it has a specific meaning. It means the process of choosing among alternative courses of action, since if there is no choice, there is no decision to make. Moreover, since business takes place in a probabilistic world, every management decision deals with the future-whether it may be ten seconds ahead (the decision to adjust a dial) or eighty years ahead (the decision of where to locate the factory). A decision always involves a prediction. The function of decision-making is therefore to select course of action for the future. There is no opportunity to alter the past.

Future is risky. Of course, routine decisions do not involve much of risk. However, most of the top management decisions are not of a routine nature. They are generally of a crucial and critical nature on account of their requiring huge investments and involving much uncertainties. But they cannot be avoided. The

Executive has to take them. It has been correctly observed. "Uncertainty is his (execuive's) opponent, overcoming it is his mission. Whether the outcome is a consequence of luck or wisdom, the moment of decision is without doubt the most creative event in the life of executive".

## 8.2 CONCEPT OF RELEVANT COSTS

It has already been stated that for managerial decision making the decision, maker use of relevant costs. The term 'relevant' means 'pertinent to decision at hand' Costs are relevant if they guide the executive towards the decision that harmonise with top management's objectives. It will be ideal if the costs are not only relevant or pertinent but also accurate or precise.

It may be noted that 'relevance' and 'accuracy' are not identical concept. Costs may be accurate but irrelevant or inaccurate but relevant. For example, the sales manager's salary may be precisely Rs.60,500 per annum, however, this fact has no relevance in deciding whether to add or drop a production line.

The following are the two fundamental characteristics of relevant costs:

### (i) *They are Future Costs*

Of course all future costs are not relevant to alternative choice but all costs are not relevant unless they are future. This is because past costs are the result of past decisions and no current or future decision can change what has already happened. For example, a company has to decide whether or not to accept an order for a particular product. In calculating the cost of this product to see if the order would benefit the company financially, the company uses the expected cost at the time when it intends to produce the product. This could be quite different from the latest historical cost or standard cost. Thus, in forward decision-making, data regarding historical or standard cost is useful only as basis for estimating future costs.

### (ii) *They Differ Between Alternatives*

As stated above all future costs are not relevant for decision making. Only such future costs are relevant which may be expected to differ between alternatives. Those costs which will not change between different alternatives are to be ignored. For example a company is considering the substitution of an automatic process in place of a slow manual process. The material consumption per unit would be Rs.2 under both the processes but the conversion cost would be Rs.3 per unit under the new process in place of Rs.5 under the present process. In this case relevant cost for decision making is not the material cost which will not change but the conversion cost which will change. The cost of material should therefore be ignored. Conversion cost should only be considered. The proposal for automatic process should therefore be accepted since it will result in saving of Rs.2 per unit.

## 8.3 CONCEPT OF DIFFERENTIAL COSTS

The term differential cost means difference in cost between alternatives. It satisfied both the conditions necessary for relevant costs, i.e. it is a future cost as

well as it changes between alternatives. Mr.J.M.Clark has described the concept of differential costs as follows:

"When a decision has to be made involving an increase or decrease of n-units of output, the difference in costs between two policies may be considered to be the cost really incurred on account of these n-units of business, or of any similar units. This may be called the differential cost of a given amount of business. It represents the cost that must be incurred if that business is taken and which need not be incurred if that business is not taken".

Since the management's objective is to maximise the profit (or minimize the loss) of the firm, a comparison is made of differential costs with differential revenue under the available alternatives, to find out the most favourable alternative which will give the maximum possible return on the incremental capital employed in the business.

**STEPS IN DECISION MAKING**

Rational decision-making requires the taking of the following steps:

**1. *Defining the Problem***

The problem must be clearly and precisely defined so that quantitative amounts that are relevant to its solution can be determined.

**2. *Identifying Alternatives***

All possible alternative solutions to the problem should be identified. Sometimes consideration of more alternative solutions may make the matters more complex. In order to do away with this difficulty, after having identified all alternatives, the analysis should eliminate on a judgement basis those that are clearly unattractive. A details analysis of the remaining alternatives should then be done.

**3. *Evaluating Quantitative Factors***

Each alternative is usually associated with a number of advantages (relevant revenues) and disadvantages (relevant costs). The decision maker should evaluate each of the factors in quantitative terms to determine the largest net advantage.

**4. *Evaluating Qualitative Factors***

In most cases the advantages and disadvantages associated with each alternative are capable of being easily expressed in quantitative terms. However, in certain cases there may be qualitative factors associated with certain alternatives which may not be capable of being expressed easily and correctly in quantitative factors depends on the judgement of the decision-maker. Sometimes on account of a single qualitative factor, which though cannot be measured exactly and easily in monetary terms, the decision may just be reverse than what it was generally expected to be. For example, it is a known fact that many persons can meet their transportation needs less expensively by using public conveyances rather than by operating their own automobilies. In spite of this people own and use their own

automobiles for reasons for prestige, convenience, or other factors which cannot be measured in quantitative terms.

**5. *Obtaining Additional Information***

In case the decision maker feels necessary, he may ask for additional information. As a matter of fact many decisions could be improved by obtaining additional information and it is usually possible to obtain such information.

**6. *Selection of an Alternatives***

After having identifying, evaluating, weighing and obtaining additional information (if necessary), the decision-maker can select the alternative and act on it.

**7. *Appraisal of the Result*s**

Having implemented his decision, the decision maker should also from time to time carry out an appraisal of the results. This will help him in correcting his mistakes, revising his targets and making better predictions in the times to come.

## 8.4 MARGINAL COSTING-SPECIFIC DECISION MAKING AREAS

Some specific areas where marginal costing techniques could be applied in the decision making process are listed below:

1. Pricing decisions
2. Make or buy decisions
3. Selection of suitable product Mix
4. Introduction of a new product
5. Discontinuation of a product line
6. Maintaining a desired level of profit
7. Problem of limiting or key factors
8. Accepting, tenders, exploring possibilities of foreign markets
9. Alternative course of action
10. Determination of sales Mix
11. Equipment replacement decision
12. Investment on asset
13. Change verses status guo
14. Expand of contract

### PRICING DECISIONS

As stated earlier, the underlying theory of marginal costing is that nay product which will produce revenue in excess of its variable cost is contributing towards recovering fixed costs and providing profits. Once the fixed costs are recovered at a particular level of production, the additional units of production would contribute larger amount towards profit. Thus, profit would be contribution of all such units

minus all variable costs. On this fundamental principle of marginal costing, the pricing decisions are made. The fixation of prices may be:

(i) Fixing selling price under normal conditions.

(ii) Fixing selling price for additional orders for utilizing idle capacity.

(iii) Pricing for exporting and exploring new markets.

(iv) Pricing during recession.

(v) Selling price at or below marginal cost.

Sometimes, price of a commodity is fixed at marginal cost i.e., realizing only variable cost and sacrificing fixed cost and profit. Under the compelling circumstances, prices are fixed even below the marginal cost ie. recovering only a part of a variable cost. The following are the circumstances where the price is fixed below marginal cost.

(i) To introduce a new product in the market, or to popularize a particular product.

(ii) To maintain production at the existing level so as to avoid the retrenchment of the workers.

(iii) To explore foreign markets.

(iv) To prevent loss or existing customers and future orders.

(v) To keep the plant in the running condition.

(vi) To push the sale of a joint product.

(vii) To clear the stock of perishable goods or seasonal product.

(viii) To utilize the surplus resources which otherwise would go waste.

(ix) To eliminate the competition of competitors especially weaker rivals.

(x) To avoid a situation when closure of the factory will increase the total loss including fixed costs in the form of interest on capital and other fixed charges.

(xi) During a depression period where the prices have fallen in the market and it may be advisable to follow suit.

However, such price cutting should be effected most cautiously.

**DISADVANTAGES AND DANGERS**

The cutting of prices below total cost, is however, not that easy and cells for managerial policy. Following are the principal dangers:

**(i) *Difficulty in Raising the Prices Later***

Sometimes it may be difficult to reduce the price to particular customers while making normal figures for others. Again, once price have been slashed to meet a temporary shortage of others, it may not be easy to increase them later when business improves.

**(ii) *Possibility of an Overall Loss***

It too large a percentage of the sales is made at marginal prices, the total contribution will be insufficient to cover the fixed overheads and that an overall loss will result. It is only the marginal work which could be accepted at any price in excess of marginal cost. The bulk of the output should be priced sufficiently high to absorb the fixed costs of the machine and still provide a reasonable profit; it should be costed at a total cost basis. In the long run, economic selling prices cannot be set without the allocation of fixed cots to the products. The difficulty in assigning fixed costs does not mean that they can be ignored in all circumstances.

**(iii) *Incorrect Price Fixing***

Since under marginal costing, period or time costs are ignored this may lead to incorrect pricing decisions. Two jobs might have the same marginal costs, but one may take a longer time for completion than the other. Unless, therefore, fixed costs based on time factor are taken into account, their pricing will be wrong. It may lead to uneconomical action and unrealistic expectations.

**(iv) *Increasing Fixed Costs***

The industry is fast moving towards automation. If mechanization was the first stage of industrial revolution, automation could be said to be its second stage Because of automation, the incidence of fixed costs is naturally increasing, which must be allowed for. Failure to do so might burden the enterprise with heavy losses and sometimes irrational decisions.

**(v) *Bifurcating Costs***

The problem that cannot be taken lightly is that of meaningfully separating the fixed and variable components of costs. In such separation, the bias has been towards fixed costs which had led to a gross understatement of variable unit costs and a gross over-statement of variable unit costs and a gross over-statement of total fixed expenses. If an analysis does not indicate a clear-cut variability, the cost is likely to be classified as fixed.

**MAKE OR BUY - DECISIONS**

In a make of buy decision, the B.E.P. is achieved when the additional cost making the parts is equal to the cost of buying the parts. Here, B.E.P. = Additional cost to make the parts = Cost to buy the parts. Hence the decision would depend:

(i) Make the parts – If additional cost to make the part < cost to buy parts.

(ii) Buy the parts-If additional cost to make the part > cost to buy the parts. When buying the parts, both variable and fixed costs are to be considered.

**ILLUSTRATION 1**

A radio manufacturing company finds that while it costs Rs.6.25 each to make component x 273 Q, the same is available in the market at Rs.5.75 each, with an assurance of continued supply.

| | | |
|---|---|---|
| Materials | Rs.2.75 | each |
| Labour | Rs.1.75 | ” |
| Other variables | Rs.0.50 | ” |
| Depreciation and other fixed cost | Rs.1.25 | ” |
| | Rs.6.25 | |

(i) Should you make or buy?

(ii) What would be your decision if the supplier offered the component at Rs.4.85?

**SOLUTION**

(i) The variable cost of producing the component is Rs.5 made up as follows:

| | Rs. |
|---|---|
| Materials | 2.75 |
| Labour | 1.75 |
| Other variables | 0.50 |
| Variable | 5.00 |

Since the depreciation and other fixed costs are sunk costs, the cost that can be saved if it is decided to buy the component instead of making it Rs.5 per unit which is the variable cost. Hence, there will be no saving. Secondly, the cost of buying will be more Rs.5.75 unless the capacity released, by the decision to buy, can be utilized in making some other profitable product. So the decision to make or buy will be influenced by the fact whether the capacity to be released by the stoppage of production of the component can be utilized profitably or not. If yes, then buying is preferable, if not, making is preferable.

(ii) If the price offered by the supplier is reduced to Rs.4.85 each then there will be a saving of 15 paise per unit even if the capacity released cannot be profitably employed. In such a case it would be advantageous to buy the component and efforts may be made to utilize the spare capacity in producing other profitable products.

**Foreign Market**

**ILLUSTRATION 2**

A manufacturer of a certain product has been selling exclusively in the Indian Market up to now. He has just received his first export enquiry and wants to quote as competitively as the circumstances will allow. This latest Indian Cost Sheet is:

| | Rs. | |
|---|---|---|
| Raw materials | 34 | per unit |
| Direct labour | 13 | |
| Services | 6 | |

| | |
|---|---|
| Works overhead | 7 |
| Office overhead | 2 |
| Profit earned in India | 62 |
| Indian Selling Price | 6 |
| | 68 |

Management is thinking of quoting a selling price somewhere between Rs.62 and Rs.68 per unit for this export order. One of the Directors suggests quoting an even lower price based on the principles of marginal costing. As the firm's Accountant you are requested to compute the lowest the management could quote on these principles. State clearly any assumptions that you may make on the above facts and also on any other costs or facts.

Statement showing the lowest price for the Export Enquiry:

| | Rs. | |
|---|---|---|
| Raw materials | 34 | per unit |
| Direct labour | 13 | |
| Services | 4 | |
| Marginal Cost | 51 | per unit |

The cost sheet depend on the assumption made. The above is one illustrative cost sheet based on the principles of marginal costing using the figures given in the latest "total" cost sheet. The assumptions are given below:

1. It is assumed that sufficient manufacturing capacity exists not to disrupt the supplies now being made to the Indian mark while fulfilling this export order. If any such disruption takes place the negative costs of this disruption will be another direct or opportunity cost of fulfilling this export order.

2. It is assumed in the above calculation that service costs to the extent of Rs.4 per unit are directly variable with the production put through the shops, and that the balance of Rs.2 is a fixed expense.

3. Similarly, it is assumed that works overhead is entirely fixed and should, therefore, be excluded in marginal costing. It is possible that on occasion a part of the works overhead may actually be variable. Similarly, it is assumed that office overhead is totally fixed.

4. Certain direct costs of this export order like insurance, special packing, import duties in the foreign country, special commissions, etc., would have to be separately calculated and added on to the above marginal cost of Rs.51 before the selling price is finally fixed. We would have to carefully determine whether the quoted price should be on FOB or CIF basis. In the same way, the benefit available from exports, such as cash subsidy that may be available, should be added to the available price.

On the above basis, any price above Rs.51 (plus the items mentioned in Notes 1 and 4 above) will be the lowest possible price which can be quoted by the company.

**ILLUSTRATION 3**

Sunita Manufacturing Company produces Chairs. An analysis of their accounting reveals:

| | |
|---|---|
| Fixed Cost | Rs.50,000 for the year |
| Variable cost | Rs.20 per chair |
| Capacity | 2,000 chairs per year |
| Selling price | Rs. 70 per chair |

(i) Find the break-even point.

(ii) Find the number of chairs to be sold to get a profit of Rs.30,000

(iii) What will be the answer for (i) and (ii) if selling price changes to Rs.60 per chair?

(iv) If the company can manufacture 600 chairs more per year with an additional fixed cost of Rs.2,000, what should be the selling price to maintain the profit per chair as it (ii) above?

**SOLUTION**

**Statement of Present Profit**

| | Per unit Rs. | Total Rs. |
|---|---|---|
| Sales 2,000 Chairs | 70.00 | 1,40,000 |
| LESS: Variable Cost | 20.00 | 40,000 |
| Contribution | 50.00 | 1,00,000 |
| LESS: Fixed Cost | 25.00 | 50,000 |
| Total profit | 25.00 | 50,000 |

(i) B.E.P. (units)

$$= \frac{\text{Fixed cost}}{\text{Contribution Per Unit}}$$

$$= \frac{50,000}{50} = 1,000 \text{ Units}$$

(ii) Sales (units)

$$= \frac{F + P}{\text{Contribution Per Unit}}$$

$$= \frac{50,000 + 30,000}{50} + 1,600 \text{ Units}$$

are to be sold to earn profit Rs.30,000

Profit per Chair:

$$\frac{Rs.30,000}{1,600} = Rs.18.75.$$

(iii) Revised contribution per unit = Rs.60 – Rs.20 = Rs.40

(i) B.E.P. (Units)

$$= \frac{Rs.50,000}{40} = 1.250 \text{ Units}$$

(ii) Sales (Units)

$$= \frac{Rs.80,000}{40} = 2,000 \text{ Units}$$

(iv) S = V + F + P

= (2,600 x SP) = Rs.52,000 + Rs.52,000 + Rs.48,750

= Rs.1,52,750

Selling per unit, therefore $\frac{1,52,000}{2,600}$ = Rs.58.75

Per chair to maintain profit of Rs.58.75

Verification of (iv)

| | Per unit Rs. | Total Rs. |
|---|---|---|
| Sales 2,600 chairs | 58.75 | 1,52,750 |
| LESS: Variable Cost | 20.00 | 52,000 |
| Contribution | 38.75 | 1,00,750 |
| LESS: Fixed Cost | 20.00 | 52,000 |
| Profit | 18.75 | 48,750 |

**ILLUSTRATION 4**

A machine tool manufacturing company sells its lathes at Rs. 36,500 each made up as follows:

| | |
|---|---|
| Direct Materials | 16,000 |
| Direct Labour | 2,000 |
| Variable Overheads | 5,000 |
| Fixed Overheads | 3,000 |
| Depreciation | 2,000 |

| | | |
|---|---|---|
| Variable Selling Overheads | 500 | |
| Royalty | 1,000 | |
| Profit | 2,000 | 31,500 |
| Central Excise Duty | | 2,000 |
| Sales Tax | | 3,000 |
| | | 36,500 |

There is enough idle capacity.

(a) A firm in Arabia has offered to buy 10 Capstan lathes at Rs.28,500 each. Should the company be interested in the business?

(b) It has been decided to sell 5 such lathes to an engineering company under the same management at bare cost. What price should you charge?

**SOLUTION**

The variable or marginal cost of producing and selling one Capstan lathe be computed as follows:

| | |
|---|---|
| Direct materials | 16,000 |
| Direct labour | 2,000 |
| Variable overheads | 5,000 |
| Variable selling overhead | 500 |
| Royalty | 1,000 |
| Marginal cost | 24,500 |
| Price offered (export) | 28,500 |
| Gross Contribution Margin | 4,000 |

(a) If central excise duty is exempted then there will be a net contribution margin of about Rs.1,500 since sales tax payable (on the sale price) will be about Rs.2,500 or less. The company is having enough idle capacity so there is no possibility of increase in fixed cost, on the other hand the contribution available from sale of 10 lathes will partly reduce overhead burden. The profitability of the proposal is considerably influenced by the prospect of obtaining relief in central excise duty and also in the sales tax. The Central government usually allows such relief in order to encourage export and to earn foreign exchange.

(b) Bare cost of the lathe is the total cot less selling overhead and profit that is Rs.29,000 to which may be added. Central excise duty and sales tax (if payable on inter-company sale). So the price chargeable is Rs.29,000 pus duty and tax payable.

**PROFITABILITY**

**ILLUSTRATION 5**

Company A and Company B, both under the same management make and sell the same type of product. Their budgeted Profit and Loss Accounts for January – June 1982 are as under:

| | Company A | | Company B | |
|---|---|---|---|---|
| | Rs. | Rs. | Rs. | Rs. |
| Sales | | 3,00,000 | | 3,00,000 |
| LESS: Variable Costs | 40,000 | | 2,00,000 | |
| Fixed Costs | 30,000 | 2,70,000 | 70,000 | 2,70,000 |
| | | 30,000 | | 30,000 |

You are required to:

(i) Calculate the Break-even Point for each.

(ii) Calculate the sales volume at which each of the two companies will make a profit of Rs.10,000

(iii) Assess how their profitability will change with decrease or increase in volume.

**SOLUTION**

(i) $\text{B.E.P.} = \frac{\text{Fixedcost}}{\text{Contribution}} \times \text{Sales}$

Company A : Contribution = 3,00,000 – 2,40,000 = 60,000

$\text{B.E.P.} = \frac{30,000}{60,000} \times 3,00,000 = \text{Rs.}1,50,000$

Company B: Contribution = 3,00,000 – 2,00,000 = Rs.1,00,000

$\text{B.E.P.} = \frac{70,000}{1,00,000} \times 3,00,000 = \text{Rs.}2,10,000$

(ii) Desired Contribution = F.C. + Profit desired.

Desired Constribution of Company A

= 30,000 + 10,000 = 40,000

$\text{Desired Sales} = 40,000 \times \frac{30,000}{60,000} = \text{Rs.}2,00,000$

Desired contribution of Company B

= 70,000 + 10,000 = 80,000

Desired Sales

$= 80,000 \times \frac{30,000}{1,00,000} = \text{Rs.}2,40,000$

(iii) $\text{Profit/Volume ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$

P/V ratio of Company A = $\frac{60,000}{3,00,000}$ x 100 = 20%

P/V ratio Company B = $\frac{1,00,000}{3,00,000}$ x 100 = 33 1/3%

**Comparative Statement of Profitability**

| Sales | Company A | | Company B | |
|---|---|---|---|---|
| | Contribution | Profit/Loss | Contribution | Profit/Loss |
| 1,00,000 | 20,000 | -10,000 | 33,333 | -36,667 |
| 1,50,000 | 30,000 | - | 50,000 | -20,000 |
| 2,00,000 | 40,000 | 10,000 | 66,667 | -3,333 |
| 2,50,000 | 50,000 | 20,000 | 83,333 | 13,333 |
| 3,00,000 | 60,000 | 30,000 | 1,00,000 | 30,000 |
| 3,50,000 | 70,000 | 40,000 | 1,16,667 | 46,667 |
| 4,00,000 | 80,000 | 50,000 | 1,33,333 | 63,333 |

**ILLUSTRATION 6**

From the following data you are required to calculate break-even point and net sales value at this point:

| | Rs. |
|---|---|
| Direct Material cost per unit | 8 |
| Direct Labour cost per unit | 5 |
| Fixed overhead | 24,000 |
| Variable overheads @ 60% on direct labour | |
| Selling unit | 25 |
| Trade Discount | 4% |

If sales are 15% and 20% above the break-even volumes determine the net profits.

**SOLUTION**

| (i) Contribution | Rs. | Rs. |
|---|---|---|
| Selling price per unit | | 25 |
| LESS: Trade discount 4% | | 1 |
| | | 24 |
| LESS: Variable cost per unit: | | |
| Direct material | 8 | |
| Direct labour | 5 | |
| Variable overheads @ 60% on direct labour | 3 | 16 |
| Contribution per unit | | 8 |

$$\text{B.E.P.} = \frac{\text{Fixed cost}}{\text{Contribution}} = \frac{24,000}{8} = 3,000 \text{ Units}$$

| | | |
|---|---|---|
| Sale value at B.E.P. 3,000 x 25 | = | 75,000 |
| LESS: Trade discount 4% | = | 3,000 |
| Net Sales value | Rs. | 72,000 |

(ii) Determination of net profit if sales are 15% above BEP volume:

| | | | |
|---|---|---|---|
| Sales at B.E.P. | 3,000 | Units | |
| ADD: 15% of BEP | 450 | | |
| | 3,450 | | |
| Contribution on 3,450 units x 8 | | | 27,600 |
| LESS: Fixed costs | | | 24,000 |
| Profit | | | 4,800 |

**CAPACITY UTILIZATION**

**ILLUSTRATION 7**

A factory engaged in manufacturing buckets is working at 40% capacity and produced 10,000 buckets per annum.

The present cost break-up for one bucket is as under:

| | Rs. | |
|---|---|---|
| Material | 10 | |
| Labour Cost | 3 | |
| Overheads | 5 | (60% fixed) |

The selling price Rs.20 per bucket.

It is decided to work at 50% capacity, the selling price falls by 3%. At 90% capacity, the selling price falls by 5% accompanied by a similar fall in the prices of material.

You are required to calculate the profit at 50% and 90% capacities and also calculate break-even point for the same capacity productions.

**SOLUTION**

**Statement showing profit at different capacity levels**

| **Capacity Levels** | **50%** | | **90%** | |
|---|---|---|---|---|
| **Production (in units)** | **12,500** | | **22,500** | |
| | Per Unit Rs. | Total Rs. | Per Unit Rs. | Total Rs. |
| (a) Sales | 19.40 | 2,42,400 | 19.00 | 4,27,500 |

| | | | | |
|---|---|---|---|---|
| Variable costs: | | | | |
| Materials | 10.00 | 1,25,000 | 9.50 | 2,13,750 |
| Wages | 3.00 | 37,500 | 3.00 | 67,500 |
| Variable overheads | 2.00 | 25,000 | 2.00 | 45,000 |
| (b) Total variable cost | 15.00 | 1,87,500 | 14.50 | 3,26,250 |
| Contribution (a-b) | 4.40 | 55,000 | 4.50 | 1,01,250 |
| LESS: Fixed costs | | 30,000 | | 30,000 |
| Profit | | 25,000 | | 71,250 |

Break-even point

(i) Units $\frac{\text{Rs.30,000}}{\text{Rs.4.40}}$ = 6,818 $\frac{\text{Rs.30,000}}{\text{Rs.4.50}}$ = Rs.6,667

6,818 x Rs.19.40 = Rs.1,32,270

6667 x Rs.19.00 = Rs.1,26,673

**ILLUSTRATION 8**

*Calculate*:

(i) The amount of fixed expenses;

(ii) The number of units to Break-even;

(iii) The number of units to earn a profit of Rs.40,000

The selling price per unit can be assumed of Rs.100

The company sold in two successive periods 7,000 and 9,000 units and has incurred a loss of Rs.10,000 and earned Rs.10,000 as profit respectively.

**SOLUTION**

| | Sales (Units) | Profit/Loss Rs. | |
|---|---|---|---|
| | 9,000 | 10,000 | Profit |
| | 7,000 | 10,000 | Loss |
| Subtracting | 2,000 | 20,000 | |

Contribution per unit = $\frac{20,000}{2,000}$ = Rs.10

| | |
|---|---|
| (i) Contribution on 7,000 units @ Rs.10 | 70,000 |
| (+) Loss incurred | 10,000 |
| Fixed cost | 80,000 |
| Contribution on 9,000 units @ Rs.10 | 90,000 |

| | |
|---|---|
| LESS: Profit earned | 10,000 |
| Fixed Costs | 80,000 |

(ii) BEP = Fixed cost – Contribution per unit

= 80,000 + 10 = 8,000 units

(iii) Fixed cost = Rs.80,000 + Profit desired Rs.40,000

= Contribution Rs.1,20,000

Number of units to be sold: = $\frac{1,20,000}{10}$ = 1,200 Units

**ILLUSTRATION 9**

The following figures have been extracted from the accounts of a manufacturing undertaking, which produces a single product, for the previous (base) year:

| | | |
|---|---|---|
| Units produced and sold | | 10,000 |
| Fixed Overhead | Rs. | 20,000 |
| Variable costs per unit: | | |
| Labour | Rs. | 4 |
| Materials | Rs. | 2 |
| Overheads | Rs. | 0.80 |
| Selling price per unit | Rs. | 10 |

In preparing the Budget for the current (budget) year the under noted changes have been envisaged:

| | |
|---|---|
| Units to be produced and sold | 15,000 |
| Fixed overheads increased by | 5,000 |
| Fall in labour efficiency | 20% |
| Special additional discount for bulk purchase of material | 2½% |
| Variable overheads per unit reduced by | 1¼% |
| Fall per unit in selling price | 10% |

*Calculate:*

(i) the number of units which must be sold to break-even in each of the two years,

(ii) the number of units which would have had to be sold to double the profit in the base year under base year conditions.

(iii) the number of units which will have to be sold in budget year to maintain the profit level of the preceding year.

**SOLUTION**

**Comparative Statement**

| | Base Year | Current Year |
|---|---|---|
| Selling price per unit | 10.00 | 9.00 |
| Material cost per unit | 2.00 | 1.95 |
| Labour cost per unit | 4.00 | 5.00 |
| Variable overhead per unit | 0.80 | 0.79 |
| Variable cost per unit | 6.80 | 7.74 |
| Contribution per unit | 3.20 | 1.26 |
| Units produced and sold | 10,000 | 15,000 |
| Total contribution | 32,000 | 18,900 |
| Fixed overheads | 20,000 | 25,000 |
| Profit/Loss (–) | 12,000 | -6,000 |
| (i) Break-even output (units) | 6,250 | 19,842 |

$$\text{B.E.P.} = \frac{\text{Fixed Overheads}}{\text{Contribution Per Unit}}$$

(ii) Double profit in the base year = 12,000 x 2 = 24,000

Fixed overheads in the base year = 20,000

= 44,000

Number of units to be sold = $\frac{44,000}{3.20}$ = 13,750

(iii) Profit in the base year = 12,000

Fixed overheads in the current year = 25,000

Contribution of units to be made = 37,000

Number of units to be sold = $\frac{37,000}{1.26}$ = 29,365

**NOTE**

Current year's budgeted figures have been derived as under selling price = 90% of Rs.10 = Rs.9

Material cost = 97 ½ % of Rs.2 = Rs.1.95

Labour cost = Rs.5 ÷ 80% = Rs.5

Variable overhead = 98 = 3/4% of 8.80 paise = 0.79 paise

## 8.5 SUMMARY

Decision-making is associated with the process of choosing among alternative courses of actions. Most of the top management are crucial and critical in nature

because of huge investments. It is also related to pricing for exporting and exploring new markets.

**REVIEW QUESTIONS**

1. Explain the specific decision-making areas where the principles of marginal costing could be applied.
2. A factory engaged in manufacturing plastic buckets is working at 40% capacity and produced 10,000 buckets per annum. The present cost break-up for one bucket is as follows:

   Material Rs.10

   Labour 3

   Overheads 5 (40% variable)

   The selling price is Rs.20 per bucket. If it is decided to work at 50 percent capacity, the selling price falls by 3%. At 90 percent capacity the selling price falls 5% accompanied by a similar fall in the price of materials.

   You are required to calculate profit at 50 per cent and 90 percent capacities.

   (Answer: Rs.25,000; Rs.72,250)
3. X Ltd. plans to earn Rs.49,500 after income taxes in 1986. The rate is to be 55% of net income before taxes. The fixed costs for the year are estimated at Rs.90,000. The contribution margin is estimated at Rs.90,000. The contribution margin is estimated at 25% of sales revenue.

   You are required to compute the sales revenue needed to earn a net income after tincome tax of Rs.49,500. If the contribution margin can be increased to 30 per cent, how much sales revenue will be required to earn a net income, after income tax, of Rs.49,500. (Answer Rs.8,00,000; Rs.6,66,667 app.)
4. A Ltd sold in two successive years 21,000 and 27,000 units, and incurred a loss of Rs.30,000 and earned a profit of Rs.30,000 respectively. The selling price per unit is Rs.100. *Calculate:* (i) The amount of fixed cost (ii) the number of units to break-even (iii) the number of units to earn a profit of Rs.1,20,000 (Answer: (i) 2,40,000 (ii) 24,000 (iii) 36,000)



❐

LESSON – 9

# DAY-TODAY DECISION-MAKING-II

**STRUCTURE**



## 9.1 INTRODUCTION

It is concerned with determination of sales mix on the basis of the contribution per unit of each product.

## 9.2 DETERMINATION OF SALES MIX

Presuming that fixed costs will remain unaffected decision regarding sales/production mix is taken on the basis of the contribution per unit of each product. The product which gives the highest contribution should be given the highest priority and the product whose contribution is the least, should be given the least priority. A product giving a negative contribution should discontinued or given up unless there are other reasons to continue its production.

**ILLUSTRATION 1**

Following information has been made available from the cost records of United Automobiles Ltd, manufacturing spare parts:

| Direct Materials | Per Unit |
|---|---|
| X | Rs.8 |
| Y | 6 |
| Direct Wages | |
| X | 24 hours @ 25 paise per hour |
| Y | 16 hours @ 25 paise per hour |
| Variable overhead | 150% of direct wages |
| Fixed Overheads (total) | Rs.750 |
| Selling Price | |
| X | Rs.25 |
| Y | Rs.20 |

The directors want to be acquainted with the desirability of adopting any one the following alternatives sales mixes in the budget for the next period.

(a) 250 units of X and 250 units of Y

(b) 400 units of Y only

(c) 400 units of X and 100 units of Y

(d) 150 units of X and 350 units of Y

**Marginal Cost Statement (Per Unit)**

| | Products | |
|---|---|---|
| | X | Y |
| Direct Materials | 8 | 6 |
| Direct Wages | 6 | 4 |
| Variable Overheads | 9 | 6 |
| Marginal Cost | 23 | 16 |
| Contribution | 2 | 4 |
| Selling Price | 25 | 20 |

Selection of Sales Mix

| | Rs. |
|---|---|
| (a) 250 units of X and 250 units of Y Contribution: | |
| Product X 250 units x 2 | 500 |
| Product Y 250 units x 4 | 1,000 |
| | 1,500 |
| LESS: Fixed overheads | 750 |
| Profit | 750 |
| (b) 400 units of product Y only | |
| Contribution 400 x 4 | 1,600 |
| LESS: Fixed overheads | 750 |
| Profit | 850 |
| (c) 400 units of X and 100 units of Y Contribution: | |
| Product X 400 x 2 | 800 |
| Product Y 100 x 4 | 400 |
| | 1,200 |
| LESS: Fixed overheads | 750 |
| Profit | 450 |
| (d) 150 units of X and 350 units of Y Contribution: | |
| Product X 150 x 2 | 300 |
| Product Y 350 x 4 | 1,400 |
| | 1,700 |
| LESS : Fixed overheads | 750 |
| Profit | 950 |

The alternative (d) is most profitable since it gives the maximum profit of Rs.950.

**ILLUSTRATION 2**

The budgeted results for A Company Ltd. included the following:

| | Rs. in lakhs | Variable cost as % of sales value |
|---|---|---|
| Sales: | | |
| Product A | 50.00 | 60% |
| Product B | 40.00 | 50% |
| Product C | 80.00 | 65% |
| Product D | 30.00 | 80% |
| Product E | 44.00 | 75% |
| | 244.00 | 65.77% |

Fixed overheads for the period is Rs.90 lakhs, You are asked to (a) Prepare a statement showing the amount of loss expected, (b) recommended a change in the sales volume of each profit which will eliminate the expected loss. Assume that the sale of only one product can be increased at a time.

Statement showing the Estimated Loss and the Increased Sales Required to Set off the Loss

Rs. in Lakhs

| **Particular** | **A** | **B** | **C** | **D** | **E** | **Total** |
|---|---|---|---|---|---|---|
| (i) Sales | 50.00 | 40.00 | 80.00 | 30.00 | 44.00 | 244.00 |
| (ii) Variable Cost | 30.00 | 20.00 | 52.00 | 24.00 | 33.00 | 159.00 |
| (iii) Contribution | 20.00 | 20.00 | 28.00 | 6.00 | 11.00 | 85.00 |
| Fixed overheads | | | | | | 90.00 |
| Loss | | | | | | 5.00 |
| P/V ratio $\frac{(iii)}{(i)}$ | 40% | 50% | 35% | 20% | 25% | |
| Increased sales required to set of the loss* | 12.5 | 10.00 | 14.29 | 25.00 | 20.00 | |

*Note:* As there is a budgeted loss of Rs.5.00 lakhs and the sales of only one product can be increased, this loss has to be set off by additional contribution. As the fixed overheads are constant, additional contribution has been calculated by dividing the budgeted loss of Rs.5 lakhs by the P/V ratio of respective products. The sales of any one of the products to the extent of the amount stated in the table would be sufficient to set off the loss.

## EXPLORING NEW MARKETS

Decision regarding selling goods in a new market (whether Indian or foreign) should be taken after considering the following factors:

(i) Whether the firm has surplus capacity to meet the new demand?

(ii) What price is being offered by the new market? In any case it should be higher than the variable cost of the product plus any additional expenditure to be incurred to meet the specific requirements of the new market.

(iii) Whether the sale of goods in the new market will affect the present market for the goods? It is particularly true in case of sale of goods in a foreign market at a price lower than the domestic market price. Before accepting such an order from a foreign buyer, it must be seen that the goods sold are not dumped in the domestic market itself.

## ILLUSTRATION 3

A company annually manufacturers 10,000 units of a product at a cost of Rs.4 per unit and there is home market for consuming the entire volume of production at the sale price of Rs.4.25 per unit. In the year 1977, there is a fall in the demand for home market. Which can consume 10,000 units only at a sale price of Rs.3.72 per unit. The analysis of the cost per 10,000 units is:

| | Rs. |
|---|---|
| Materials | 15,000 |
| Wages | 11,000 |
| Fixed overheads | 8,000 |
| Variable overheads | 6,000 |

The foreign market is explored and it is found that this market can consume 20,000 units of the product if offered at a sale price of Rs.3.55 per unit. It is also discovered that for additional 10,000 units of the product (over initial 10,000 units) the fixed overheads will increase by 10 per cent. Is it worth while to try to capture the foreign market?

## SOLUTION

**Statement Showing the Advisability of Selling Goods in Foreign Market**

| | Year 1976 | Year 1977 | | |
|---|---|---|---|---|
| | Home Market 10,000 Units | Home Market 10,000 Units | Foreign Market 20,000 Units | Total 30,000 Units |
| Materials | 15,000 | 15,000 | 30,000 | 45,000 |
| Wages | 11,000 | 11,000 | 22,000 | 33,000 |
| Overheads: | | | | |

| | | | | |
|---|---|---|---|---|
| Fixed | 8,000 | 8,000 | 1,600 | 9,600 |
| Variable | 6,000 | 6,000 | 12,000 | 18,000 |
| Total Cost | 40,000 | 40,000 | 65,600 | 1,05,600 |
| Profit | 2,500 (loss) | 2,800 | 5,400 | 2,600 |
| Sales | 42,500 | 37,200 | 71,000 | 1,08,200 |

From the above it is clear that it is advisable to sell goods in the foreign market. It will compensate not only for the loss on account of sale in domestic market but will also result in an overall profit of Rs.2,600.

**ILLUSTRATION 4**

A machine tool manufacturing company sells its lathes at Rs.36,500 each made up as follows:

| | Rs. | Rs. |
|---|---|---|
| Direct Materials | 16,000 | |
| Direct Labour | 2,000 | |
| Variable overheads | 5,000 | |
| Fixed overheads | 3,000 | |
| Variable Selling Overheads | 500 | |
| Royalty | 1,000 | |
| Profit | 5,000 | 32,500 |
| Central excise duty | | 1,000 |
| Sales Tax | | 3,000 |
| | | 36,500 |

There is enough idle capacity.

(a) A firm in Arabia has offered to buy 10 company's lathes at Rs.28,500 each. Should the company be interested in the business?

(b) It has been decided to sell 5 such lathes to an engineering company under the same management at bare cost. What price should you charge?

**SOLUTION**

Computation of the Marginal Cost and Contribution Per Lathe

| | Rs. |
|---|---|
| Direct Materials | 16,000 |
| Direct Labour | 2,000 |
| Variable overhead | 5,000 |
| Variable selling overhead | 500 |

| | |
|---|---|
| Royalty | 1,000 |
| Marginal Cost | 24,500 |
| Price Offered (export) | 28,500 |
| Gross Contribution as margin | 4,000 |

(a) The contribution per lathe is Rs.4,000, out of which about Rs.2,500 will go for sales tax. There will be saving of about Rs.1,500 per lathe in case the export order is executed. This is on the presumption that the Central Government may exempt the company and earn foreign exchange. There will be no increase in fixed costs since there is already surplus capacity. The company may, therefore, accept the export order.

(b) The company may charge a price of Rs.31,000 (i.e., Rs.36,500, Rs.5,500 (profit and selling overhead) as the bare cost, subject to any variation in the Sales Tax and Central Excise Duty payable by the company on such sales.

**DISCONTINUANCE OF A PRODUCT LINE**

The following factors should be considered before taking a decision about the discontinuance of a product line:

(i) The contribution given by the product. The contribution is different from profit. Profit, is arrived at after deducting fixed cost from contribution. Fixed costs are apportioned over different products on some reasonable basis which may not be very much correct. Hence contribution gives a better idea about the profitability of a product as compared to profit.

(ii) The capacity utilisation, i.e., whether the firm is working to full capacity or below normal capacity. In case a firm is having idle capacity, the production of any product which can contribute towards the recovery of fixed costs can be justified.

(iii) The availability of product to replace the product which the firm wants to discontinue and which is already accounting for a significant proportion of total capacity.

(iv) The long term prospects in the market for the product.

(v) The effect on sale of other products. In some cases the discontinuance of one produce the overall profitability of the firm.

**ILLUSTRATION 5**

A manufacture is thinking whether he should drop one item from his product line and replace it with another. Below are given his present cost and output data:

| Product | Price | Variable Costs Per Unit | Percentage of Sales |
|---|---|---|---|
| Book shelfs | 60 | 40 | 30% |
| Tables | 100 | 60 | 20% |

| | | | |
|---|---|---|---|
| Beds | 200 | 120 | 50% |
| Total fixed costs per year | | Rs.7,50,000 | |
| Sales last year | | Rs.25,00,000 | |

The change under consideration consists in dropping the line of cabinets. If this dropping and change is made the manufacturer forecasts the following cost and output data:

| Product | Price | Variable Costs Per Unit | Percentage of Sales |
|---|---|---|---|
| Book shelfs | 60 | 40 | 50% |
| Tables | 160 | 60 | 10% |
| Beds | 200 | 120 | 40% |
| Total fixed costs per year | | Rs.7,50,000 | |
| Sales last year | | Rs.26,00,000 | |

*In this proposal to be accepted? Comment,*

**Comparative Profit Statement**

| | Existing Situation | | | | Proposed Situation | | | |
|---|---|---|---|---|---|---|---|---|
| | **Book Shelfs** | **Tables** | **Beds** | **Total** | **Book Shelfs** | **Tables** | **Beds** | **Total** |
| Sales | 7,50,000 | 5,00,000 | 12,50,000 | 25,00,000 | 13,00,000 | 2,60,000 | 10,40,000 | 26,00,000 |
| LESS: Variable Cost | 5,00,000 | 3,00,000 | 7,50,000 | 15,00,000 | 8,66,667 | 97,500 | 6,00,000 | 15,88,166 |
| | 2,50,000 | 2,00,000 | 5,50,000 | 9,50,000 | 4,33,333 | 1,62,500 | 4,16,000 | 10,11,833 |
| LESS: Fixed cost | | | | 7,50,000 | | | | 7,50,000 |
| | | | | 2,00,000 | | | | 2,61,833 |

The above analysis shows that the manufacturer will stand to gain in case he drops the production of tables in preference to cabinets. However, the demand for cabinets should be of a permanent nature.

*Working Notes*

*Existing Situation*

Computation of Sales and Variable Costs

| Sales | Variable Cost |
|---|---|
| Book Selfs 25,00,000 x $\frac{30}{100}$ = Rs.7,50,000 | 75,00,000 x $\frac{40}{100}$ = Rs.5,00,000 |
| Tables 25,00,000 x $\frac{20}{100}$ = Rs.5,00,000 | 5,00,000 x $\frac{60}{100}$ = Rs.30,00,000 |
| Beds 25,00,000 x $\frac{50}{100}$ = Rs.12,50,000 | 12,50,000 x $\frac{120}{100}$ = Rs.7,50,000 |

**Computation of Sales and Variable Costs**

Book Selfs 26,00,000 x $\frac{50}{100}$ = Rs.13,00,000 13,00,000 x $\frac{40}{100}$ = Rs.8,66,667

Tables 26,00,000 x $\frac{10}{100}$ = Rs.2,60,000 26,00,000 x $\frac{60}{100}$ = Rs.97,500

Beds 26,00,000 x $\frac{40}{100}$ = Rs.10,40,000 10,40,000 x $\frac{120}{100}$ = Rs.6,24,000

**ILLUSTRATION 6**

A company manufactures 3 product A, B and C. There are no common processes and the sale of one product does not affect prices or volume of sale of any other.

The company's budgeted profit/loss for 1978 has been abstracted thus:

| | Total Rs. | A Rs. | B Rs. | C Rs. |
|---|---|---|---|---|
| Sales | 3,00,000 | 45,000 | 2,25,000 | 30,000 |
| Product Cost: Variable | 1,80,000 | 24,000 | 1,44,000 | 12,000 |
| Production Cost: Fixed | 60,000 | 3,000 | 48,000 | 9,000 |
| Factory Cost | 2,40,000 | 27,000 | 1,92,000 | 21,000 |
| Selling & Administration Costs: | | | | |
| Variable | 24,000 | 8,100 | 8,100 | 7,800 |
| Fixed | 6,000 | 2,100 | 1,800 | 2,100 |
| Total Cost | 2,70,000 | 37,200 | 2,01,900 | 30,900 |
| Profit | 30,000 | 7,800 | 23,100 | -900 |

On the basis of above, the board had almost decided to eliminate product C, on which a loss was budgeted. Meanwhile, they have sought your opinion. As the Company's Cost Accountant what would you advise? Give reason for your answer.

**SOLUTION**

In order to comment upon the profitability of different products presentation of costs according to Marginal Costing system is essential. We have also to compute P/V Ratios.

| | Total Rs. | A Rs. | B Rs. | C Rs. |
|---|---|---|---|---|
| Sales | 45,000 | 2,25,000 | 30,000 | 3,00,000 |

| | | | | |
|---|---|---|---|---|
| Product Cost (Variable) | 24,000 | 1,44,000 | 12,000 | 1,80,000 |
| Selling & Adm. (Variable) | 8,100 | 8,100 | 7,800 | 24,000 |
| Total Variable Cost | 32,100 | 1,52,000 | 19,800 | 2,04,000 |
| Contribution | | | | |
| (Sales Variable Costs) | 12.900 | 72.900 | 10.200 | 96.000 |
| LESS: Total Fixed Cost | 5,100 | 49,800 | 11,100 | 66,000 |
| Profit | 7,800 | 23,100 | (-) 900 | 30,000 |
| P/V Ratio | 28.7% | 32.4% | 34.0% | |

It product C is discontinued, the fixed cost of Rs.10,200 being recovered but cannot be recovered since product C is making a contribution of Rs.10,200 towards fixed cost. Considering the P/V ratio, product C doesn't seem to be unprofitable, as it is 34% being maximum as compared to other two products. Therefore, if the heavy burden of fixed overheads which has been apportioned to product C, being 39% of the total such burden, is not taken into account, product C is most profitable. Its profit volume ratio is higher as compared to the other two products which leads us to conclude that total profit will increase if its output and sales can be increased.

**EQUIPMENT REPLACEMENT DECISION**

While deciding about replacement of a capital equipment, the firm should take into consideration the resultant savings in operating costs and the incremental investment in the new equipment. In case the savings is more than the cost of raising additional funds for the new 4 equipment, the proposal may be accepted. Besides this the firm must take into account the benefits the firm is likely to derive in the long run by replacing old equipment should be taken as irrelevant cost for this purpose. Many accountants disapprove replacement of an obsolete equipment by a new one by pointing out 'loss on disposal of old asset'. Such a tendency is unfortunate since the past costs are sunk costs and they should not be allowed to affect adversely the future decisions and firm's goal of maximizing long-term profits.

**ILLUSTRATION 6**

A company purchased a machine two years ago at a cost of Rs.60,000. The equipment has no salvage value at the end of its useful life and the company is charging depreciation according to straight line method. The company learns that a new equipment can be purchased at a cost of Rs.80,000 to do the same job and having an expected economic life of 4 years without any salvage value. The advantage of the new machine lies in its greater operating efficiency, which will reduce the variable operating expenses from the present level of Rs.1,65,000 to Rs.1,30,000 per annum. The sales volume is expected to continue at Rs.2 lakhs per annum for the next four years.

You are required to evaluate the usefulness of the proposal.

**SOLUTION**

A natural tendency on the part of most of the accountants and the managers is to reject the proposal on the ground that the present machine is functioning well and is expected to render useful service for another four years. Its scrapping at the present time would result in a loss of Rs.40,000—the undepreciated book value.

This is not really the correct approach. The book value of the old machine is irrelevant while taking the decision made two years ago. The depreciation expense merely reflects apportionment of that past cost over the fiscal perios, whole income benefits from the use of the asset. The book value of old asset should therefore, be eliminated as a factor while deciding whether to buy or not to buy the machine. Moreover, from the accounting point of view an immediate write-off of Rs.40,000 in no difference in Rs.10,000 per annum for four years, results in no difference in total cost and product's profits for the next 4 years when taken as a whole. The following table analysis the profitability or otherwise of the new machine.

Statement Showing the Profitability of the Present and the New Machine Over a Period of 4 Years

| | | **Present Machine** | **New Machine** | **Increase (Decrease) in costs** |
|---|---|---|---|---|
| | | **Rs.** | **Rs.** | **Rs.** |
| 1. | Sales | 8,00,000 | 8,00,000 | |
| 2. | Variable Costs | 6,60,000 | 5,20,000 | (1,40,000) |
| 3. | Loss on account of writing off of the old machine | 40,000 | 40,000 | |
| 4. | Depreciation of new machine | - | 80,000 | 80,000 |
| | Total Costs | 7,00,000 | 6,40,000 | (60,000) |
| | Net Profit | 1,00,000 | 1,60,000 | 60,000 |
| | Average annual incremental income | | | 15,000 |
| | Incremental investment | | | 80,000 |
| | Return on incremental investment | | | 18.75% |

The above data is an indicator of the fact that there will be 18.75% return on additional investment of Rs.80,000. The return seems to be quite reasonable and, therefore, it will be appropriate for the company to go in for the replacement of the present machinery by a new machine.

## CHANCE VERSUS STATUS QUO

A firm is frequently faced with problem of continuing with the existing policies or change to the new ones. Such change may relate to reduce or not to reduce the selling price, process or not to process a product further, etc. While taking a decision about such matters, as in case of any other matter, the management must keep in view the long-term interests of the firm. For example it may be disadvantageous to sell a product below its variable or marginal cost, but sometimes the management may have to resort to this practice for the very survival of the firm.

## ILLUSTRATION 7

The following details have been furnished to you regarding two proposals which are for consideration before a firm.

(a) Improvement in the quality of the product, which will result in an additional sale of 5,000 units at the existing price. However, this improvement in quality will result increase in the variable cost by 10 paise pr unit.

(b) Reduction in the selling price of the product by 12 paise per unit. This will push up sales by 5,000 units.

In both cases the fixed expenses will increase by Rs.1,000

The present sales of the firm are 10,000 units at the rate of Rs.2.10 per unit. The variable cost is Rs.1.60 per unit and the total fixed costs are Rs.3,000.

You are required to state whether it will be appropriate for the firm to select any of the new proposals or should it continue with the existing scheme.

## SOLUTION

| | Present Case | Proposed Case | |
|---|---|---|---|
| | | (a) | (b) |
| Expected sales (units P) | 10,000 | 15,000 | 15,000 |
| Selling price (Rs.) | 2.10 | 2.10 | 1.98 |
| Variable cost (Rs.) | 1.60 | 1.70 | 1.60 |
| Contribution (Rs.) | 0.50 | 0.40 | 0.38 |
| Total contribution (Rs.) | 5,000 | 6,000 | 5,700 |
| Fixed expenses (Rs.) | 3,000 | 4,000 | 4,000 |
| Profit (Rs.) | 2,000 | 2,000 | 1,700 |

## EXPAND OR CONTRACT

Expansion of business operations results in economics of scale, greater flexibility, lower fixed costs and greater capacity of the firm to meet the customers specifications. Expansion also brings with it many organisational and

communicational problems. Control and monitoring functions become more complex and delegation of authority and responsibility becomes more confused.

Since profit maximization is a firm's primary goal, the expansion of business operations should also be viewed from that angle. Expansion results in heavy fixed costs, it means sales volume will have to be increased for meeting such costs though there may be increase in per unit contribution on account of economies of the scale. The management must therefore make sure that market will absorb the additional volume of required sales.

**ILLUSTRATION 8**

A company is considering expansion. Fixed costs amount to Rs.4,20,000 and are expected to increase by Rs.1,25,000 when plant expansion is completed. The present plant capacity is 80,000 units a year. Capacity will increase by 50% with the expansion. Variable costs are currently Rs.6.80 per unit and are expected to go down by Rs.0.40 per unit with the expansion. The current selling price is Rs.16 per unit and is expected to remain same under both alternatives. What are the break-even points under both alternatives? Which alternative is better and why?

Computation of Break-Even Point under the Two Alternatives

| | **Present Position** | **After Expansion** |
|---|---|---|
| Fixed Costs | 4,20,000 | 5,45,000 |
| Capacity (Units) | 80,000 | 1,20,000 |
| Variable cost per unit | 6.80 | 6.40 |
| Contribution margin per unit | 9.20 | 9.60 |
| Selling price per unit | 16 | 16 |

Break-even point $\frac{4,20,000}{9.20}$ = 45,652 Units $\frac{5,45,000}{9.60}$ = 56,771 Units

Assuming that the whole production can be sold, the profit under the two alternative will be as under:

| | **Present Position** | **After Expansion** |
|---|---|---|
| | **Rs.** | **Rs.** |
| Sales | 12,80,000 | 19,20,000 |
| Variable cost | 5,44,000 | 7,68,000 |
| Contribution | 7,36,000 | 11,52,000 |
| Fixed Cost | 4,20,000 | 5,45,000 |
| Profit | 3,16,000 | 6,07,000 |

It is obvious from the above calculations that profits will be almost doubled after the expansion. Hence, the alternative of expansion is preferable.

## SUMMARY

The product with the highest contribution should be given highest priority. Equipment replacement in linked with the resultant savings in operations cost.

## REVIEW QUESTIONS

***Decision Regarding Sales Mix***

1. Present the following information to show to the management:

(a) the marginal product cost ad the contribution per unit:

(b) the total contribution and profits resulting from each of the following sales mixture:

| | Product | Per unit Rs. |
|---|---|---|
| Direct Materials | A | 10.00 |
| | B | 9.00 |
| Direct wages | A | 3.00 |
| | B | 2.00 |
| Fixed expenses; Rs.80 | | |
| (Variable expenses are allocated to products as 100% of direct wages) | | |
| Sales price | A | 20.00 |
| | B | 15.00 |

*Sales Mixtures*

(i) 1,000 units of product A and 2,000 units of B

(ii) 1,500 units of product A and 1,500 units of B

(iii) 2,000 units of product A and 1,000 units of B

Recommended which of the sales mixtures should be adopted.

(Ans: Profit (i) Rs.7,200 (ii) Rs.8,200 (iii) 9,200 Mixture (iv) is recommended).

2. From the following data you are required to present to the management

(i) The marginal cost of products X and Y and the contribution per unit

(ii) The total contribution and profit resulting from each of the suggested sales mixtures.

| Direct Materials | Rs. Per Unit | Direct Wages | Per Unit Rs. |
|---|---|---|---|
| Product X | 10.50 | Product X | 3.00 |
| Product Y | 8.50 | Product Y | 2.00 |
| Fixed expenses (Total) | 800 | Selling price: | |
| Variable expenses 100% | | Product X | 20.50 |
| of direct wages per product | | Product Y | 14.50 |

| Suggested sales mixtures | No. of Units Product X | Product Y |
|---|---|---|
| (a) | 100 | 200 |
| (b) | 150 | 150 |
| (c) | 200 | 100 |

(Answer: Profit: (a) Nil (b) Rs.100 (b) Rs.200 Mixture (c) is recommended)

**EXPLORING NEW MARKETS**

3. Due to industrial depression, a plant is running, at present, at 50% of its capacity. The following details are available

| | **Cost of Production per unit** |
|---|---|
| Direct Materials | Rs.2 |
| Direct Labour | Re.1 |
| Variable overhead | Rs.3 |
| Fixed overhead | Rs.2 |
| | Rs.8 |

| | Rs. |
|---|---|
| Production per month | 20,000 |
| Total cost of production | 1,60,000 |
| Total cost of production | 1,40,000 |
| Loss | 20,000 |

An exporter offers to buy 5,000 units per month at the rate of Rs.6.50 per unit and the company hesitates to accept the offer for fear of increasing its already large operating losses.

Advise whether the company should accept the offer (Answer: The company should accept the offer since the amount of loss will stand reduced from Rs.20,000 to Rs.17,500).

**DISCONTINUANCE OF A PRODUCT LINE**

4. A Company which sells four products, some of them unprofitable, proposes discounting the sale of one of them. The following information is available regarding income, costs and activity for the year ended 31st March, 1979.

| | Products | | | |
|---|---|---|---|---|
| | A | B | C | D |
| Sales | 30,00,000 | 5,00,000 | 2,50,000 | 4,50,000 |
| Cost of sales at purchase price | 2,00,000 | 4,50,000 | 2,10,000 | 2,25,000 |

| | | | | |
|---|---|---|---|---|
| Area of storage (sq.ft) | 50,000 | 40,000 | 80,000 | 30,000 |
| Number of parcels sent | 1,00,000 | 1,50,000 | 75,000 | 1,75,000 |
| Number of invoices sent | 80,000 | 1,40,000 | 60,000 | 1,20,000 |

Its overhead costs and bases of allocation are:

| Fixed Costs | | Basic of allocation to products |
|---|---|---|
| Rend and insurance | Rs.30,000 | sq. ft. occupied |
| Depreciation | Rs.10,000 | Parcels Sent |
| Salesman's Salaries and expenses | Rs.60,000 | Sales volume |
| Administration wages and salaries | Rs.50,000 | No. of invoices |
| Variable costs: | | |
| Packing wages and materials | | 20 paise per parcel |
| Commission | | 4% on sales |
| Stationary | | 10 paise per invoice |

*You are required to*

(a) Prepare profit and loss statement, showing the percentage of profit or loss to sales for each product.

(b) Compare the profit if the company discontinues sale of product 'B' with the profit if it discontinues product 'C'. Answer (a) A: Profit 9.5% B: Loss 12.1% C: Loss 8%; D: Profit 26.4% (b) Total profit if B is discontinued Rs.79,000, Total profit if C is discontinued Rs.56,000).

**MAKE OR BUY**

5. A radio manufacturing company finds that while it costs Rs.6.25 each to make component X 2730, the same is available in the market at Rs.5.75 each, with an assurance of continued supply. The breakdown of costs is:

| | |
|---|---|
| Materials | Rs.2.75 each |
| Labour | Rs.1.75 each |
| Other variables | Rs.0.50 each |
| Depreciation and other fixed cost | Rs.1.25 each |
| | Rs.6.25 each |

(a) Should you make or buy?

(b) What would be your decision if the supplier offered the component at Rs.4.85 each?

(Answer: (a) Variable cost Rs.5, hence not profitable to buy)

(c) There is a saving of 15 p. per component, the offer may be accepted

**CHANGE VERSUS STATUS QUO**

6. A company is producing two products 'X' and 'Y' from a joint manufacturing process. The joint costs are Rs.2,00,000 and it has given a production of 1 lakh kilogram of 'X' having a selling price of Re.1/- per kilogram and 2 lakh kilogram of 'Y' having a selling price or Rs.1.50 per kilogram.

The company is considering a proposal to process product 'X' into a new product 'Z' which sells at Rs.3 per kilogram. The processing cost would amount of Rs.1,75,000 for converting one lakh kilograms of product 'X' to product 'Z'.

You are required to advise the company about the acceptance or rejection of the above proposal.

Answer: Transformation will result in an additional profit of Rs.25,000. The proposal may therefore be accepted.

❐

LESSON – 10

# DIFFERENTIAL COSTING

**STRUCTURE**



## 10.1 INTRODUCTION

Differential cost is concerned with the preparation of adhoc information with cost and income differences.

## 10.2 DEFINITION

The I.C.M.A. Terminology defines differential costing as "A technique used in the preparation of ad hoc information in which only cost and income differences between alternative courses of action are taken into consideration."

According to this definition, differential costing, like marginal costing, is also a technique of providing information to management with regard to cost and income differences between alternative courses of action. Differential cost is also decision-making cost. It is the cost difference between two levels of activity.

According to Harper, "Differential costing is a decision-making technique in which only cost and income differences between alternatives are examined. When laid out correctly, these differences indicate the profitability differences between alternatives so that most profitable alternative can be identified".

## 10.3 FEATURES

Differential costing exhibits the following features:

(a) Differential costs do not find a place in the accounting records though they may be incorporated in budgets.

(b) The data made use for analysis of costs, revenue and the investment factors that will be affected by the decision towards which the analysis is directed.

(c) Differential costs are estimated by studying the total of the elements of differential cost rather than cost per unit.

(d) Items of cost which are identical for the alternatives are not taken into consideration, since only the differences in costs at two levels are relevant.

(e) The differentials are measured from a common base position such as the present level of output.

(f) The analysis is limited to real differences in cost and not merely apparent differences that result from methods of accounting for the costs incurred.

(g) Differential cost analysis emphasizes future costs. However, historical of standard costs, although irrelevant, may however, be used in the projection of future costs but only after the necessary adjustments to the requirements of future conditions.

### 10.4 MARGINAL Vs DIFFERENTIAL COSTING

Owing to the existence of different cost concepts, and the view of some authors that differential costing "is synonymous with direct, variable and marginal costing" there is bound to be confuction with regard to the two terms marginal costing and 'differential cost'. It is, therefore, necessary to know the point of similarity and of difference between the two.

(a) Both marginal costing and differential costing are the techniques of cost analysis and presentation of information to management.

(b) The information supplied by both the techniques is used by management for planning and decision-making.

(c) Both types of analysis are based upon the behaviours of cost under varying conditions.

(d) Differential cost analysis comes close to the economist's concept of marginal cost.

(e) Both the techniques will be the same if there is no change in fixed costs in an alternative course of action.

### DIFFERENCES

(i) The scope of differential costing is much wider than that of marginal costing.

(ii) Marginal costing is confined to short-run tactical decisions. Although differential costing is a technique of long-run decision-making, it becomes appropriate for both short-run and long-run decisions where fixed costs do alter.

(iii) Marginal cost can precisely be defined as 'prime cost plus variable overheads'. However, differential costs cannot be precisely defined except in terms of 'increase or decrease in total costs'.

(iv) Under the marginal costing technique cost information is presented to management by the contribution approach while differential costs are presented under both absorption and marginal costing techniques.

(v) While contribution and profit-volume ratio are the main criteria of performance evaluation and decision-making in marginal costing, a comparison of differential costs with incremental revenue is the basis of policy decisions under the differential cost analysis.

(vi) Differential costs do not find a place in the accounting records since they are anticipated costs and refer to future operations, although they may be incorporated in budgets. Marginal costs however, may be incorporated in the accounting system.

## 10.5 MANAGERIAL USES

Since differential costing examines cost differences between two levels of activity, it is suitable for situation where fixed costs alter and thus become appropriate for both short-run decisions. Such situations are:

(a) Introduction of a new product.

(b) Discontinuing a product, suspending or closing down a segment of the business.

(c) The profitability of a change in a product mix.

(d) Make or buy decisions.

(e) Lease or buy decisions.

(f) Change in the methods of production.

(g) Determination of the most profitable levels of production and price.

(h) Acceptance of an offer at a lower selling price.

(i) Submitting tenders.

(j) Opening of new sales area of territory.

(k) Equipment replacement decisions.

(l) Profitability or otherwise of further processing.

## PRACTICAL APPLICATION

Differential cost analysis is applicable to situations where fixed costs alter. As such, it is necessary to compare the differential costs with incremental revenue for making a decision, whether tactical or strategic. So long as the incremental revenue is greater than differential costs, the decision should be in favour of the proposal.

*(a) Acceptance of an Order at a Lower Selling Price*

### ILLUSTRATION 1

A company, currently operating at full capacity, manufactures and sells a product at Rs.6 each. Current production is 1,00,000 units per annum. The cost structure relevant to current production is:

| | | | |
|---|---|---|---|
| Materials | 1,00,000 | Fixed overheads | 80,000 |
| Labour | 1,50,000 | Sales | 6,00,000 |
| Variable overheads | 2,00,000 | | |

There is an offer from a local buyer for 20,000 units at Rs.5.50 per unit. Acceptance of this order would entail additional fixed cost of Rs.20,000 per annum

for the hire of special machinery and payment of overtime premium of 20% for the extra direct labour required.

Should the order the accepted? What are the other factors to be considered?

**SOLUTION**

**Differential Cost Statement**

| | **Present 1,00,000 Units** | | **Proposed 1,20,000 Units** | | **Difference 20,000 Units** | |
|---|---|---|---|---|---|---|
| Sales | | 6,00,000 | | 7,10,000 | | 1,10,000 |
| LESS: Marginal Cost | | | | | | |
| Material | 1,00,000 | | 1,20,000 | | 20,000 | |
| Labour | 1,50,000 | | 1,86,000 | | 36,000 | |
| Overheads | 2,00,000 | | 2,40,000 | | 40,000 | |
| | | 4,50,000 | | 5,46,000 | | 96,000 |
| Contribution | | 1,50,000 | | 1,64,000 | | 14,000 |
| LESS: Fixed Cost | | 80,000 | | 1,00,000 | | 20,000 |
| Net Profit | | 70,000 | | 64,000 | | (-)6,000 |

Although, on the basis of marginal costing technique, the acceptance of the order may appear worthwhile because of the increase in contribution by Rs.14,000 since increase in contribution is not sufficient to cover the increase in fixed cost, the order should not be accepted. If accepted, it will entail a loss of Rs.6,000. Here lies the fundamental difference between marginal costing and the technique of differential costing.

**ILLUSTRATION 2**

The overhead expenses of a factory, producing a single article at different operating levels, are as follows:

| Operating Level Capacity | Works Overhead Rs. |
|---|---|
| 80% | 36,000 |
| 100% | 40,000 |
| 120% | 50,000 |
| 60% | 33,000 |

The factory is currently working at 60% operating level and its annual sales amount is Rs.1,44,000.

Selling prices have been based on 100 per cent capacity and have the following relationship with costs at this level.

| | |
|---|---|
| Factory Cost | 66.67% of sales value |
| Prime Cost | 75.00% of factory cost |

Administration and Selling expenses (of which 75% is variable) 20.00% of sales value.

Which 75% is variable 20.00% of sales value for another company values at Rs.33,000 per annum which will take up 40% of capacity. The prime cost for the work is estimated at Rs.20,000. There will be an addition to administration expenses of Rs.1,500 per annum.

The Sales Manager estimates that the sales of the Company's own product will increase of capacity by the time new order materializes.

Calculate the profits on current production. Give your views, supported by figures, on the advisability of taking on the new work.

| | | | 100% | 60% |
|---|---|---|---|---|
| | | | Rs. | Rs. |
| Sales | | | 2,40,000 | 1,44,000 |
| LESS: Cost Sales | | | | |
| Prime Cost | 1,20,000 | 72,000 | | |
| Works overhead | 40,000 | 33,000 | | |
| Factory Cost | 1,60,000 | 1,05,000 | | |
| Adm. and Selling | 48,000 | 33,600 | | |
| | | | 2,08,000 | 1,38,600 |
| Profit | | | 32,000 | 5,400 |

Factory costs: 66.67% of sales, and sales at 100% Rs.2,40,000 66.67% is the same as 2/3

$$2,40,000 \times \frac{2}{3} = \text{Rs.}1,60,000$$

Prime cost: 75% of factory cost, i.e., 75% of Rs.1,60,000 = Rs.1,20,000 Factory overhead: Given in the problem of Rs.40,000 (100% capacity). Administration and selling expenses: 20% of sales.

= 20% of Rs.2,40,000 = Rs.48,000

Of this amount, 75% i.e., Rs.36,000 is variable and Rs.12,000 fixed at 60% capacity: 60% of Rs.1,20,000 = Rs.72,000 (prime cost)

Works overhead is Rs.33,000 given at 60% capacity,

Administration and selling: Variable 75% and Fixed

Rs.12,000 Variable 60% of Rs.36,000 = Rs.21,600

**Profitable Statement (New Work)**

| | Own | Additional | Total |
|---|---|---|---|
| Capacity: | 80% | 40% | 120% |
| Sales | 1,92,000 | 33,000 | 2,25,000 |

| | | | |
|---|---|---|---|
| LESS: Cost or Sales: | | | |
| Prime cost | 96,000 | 20,000 | 1,16,000 |
| Works overhead | 36,000 | 14,000 | 50,000 |
| Factory Cost | 1,32,000 | 34,000 | 1,66,000 |
| Administration and Selling | 40,800 | 6,450 | 47,250 |
| | 1,72,800 | 40,450 | 2,13,250 |
| Profit Sales-Cost of Sales | 19,200 | (-7,450) | 11,750 |

Additional order is not profitable since it reduces profit by Rs.7,450.

**ILLUSTRATION 3**

A factory annually manufacturers 10,000 units of a product at a cost of Rs.4 per unit there is a home market for consuming the entire volume of production at the sale price of Rs.4.25 per unit. In a certain year, there is a fall in the home market which can consume 10,000 units only at a sale price of Rs.3.72 per unit.

An analysis of cost of sale for the 10,000 units is:

| | Rs. |
|---|---|
| Materials | 15,000 |
| Wages | 11,000 |
| Fixed overheads | 8,000 |
| Variable Overheads | 6,000 |

The foreign market is explored and it is found that this market can consume 20,000 units of the product if offered at a sale price of Rs.3.55 per unit. It is also discovered that for additional 20,000 units of product (over the initital 10,000 units) the fixed overheads will increase by 80 per cent.

Is it worthwhile to capture the foreign market?

**SOLUTION**

**Profitability Statement**

| | 10,000 Units | 20,000 Units |
|---|---|---|
| Sales | 37,200 | 71,000 |
| LESS: Materials | 15,000 | 30,000 |
| Wages | 11,000 | 22,000 |
| Variable Overheads | 6,000 | 12,000 |
| | 32,000 | 64,000 |
| Contribution: Sales-Marginal Cost | 5,200 | 7,000 |
| Fixed overhead | 8,000 | 6,400 |
| Profit | (-)2,800 | 600 |

It is worthwhile to capture the foreign market since it yields a profit of Rs.600 in spite of the reduction in the selling price and increase in fixed cost by 80%.

**ILLUSTRATION 4**

The cost sheet of a product is given as follows:

| | Rs. |
|---|---|
| Direct Materials | 10.00 |
| Direct Wages | 5.00 |
| Factory overhead | |
| Fixed | 1.00 |
| Variable | 2.00 |
| Administration expenses | 1.50 |
| Selling and Distribution overheads: | |
| Fixed | 0.50 |
| Variable | 1.00 |
| | 21.00 |

The selling price per unit is Rs.25. The above figures are for an output of Rs.50,000 units whereas the capacity of the firm is 60,000 units. A foreign customer is desirous of buying 10,000 units at a price of Rs.19 per unit. The extra cost of exporting the product 50 paise per unit. Advise the manufacturer whether the order should be accepted.

**Differential Cost Analysis**

| | Local | Foreign | Differential |
|---|---|---|---|
| | 50,000 Units | 60,000 | 10,000 |
| Sales | 12,50,000 | 14,40,000 | 1,90,000 |
| LESS: Costs: | | | |
| Direct Materials | 5,00,000 | 6,00,000 | |
| Direct Wages | 2,50,000 | 3,00,000 | |
| Variable overheads | 1,50,000 | 1,80,000 | |
| Fixed overheads | 1,50,000 | 1,55,000 | |
| | 10,50,000 | 12,35,000 | 1,85,000 |
| Profit | 2,00,000 | 2,05,000 | 5,000 |

***(b) Fixation of Selling Price***

**ILLUSTRATION 5**

Sunita Manufacturing Company produces chairs. An analysis of their accounting reveals:

Fixed Cost Rs.50,000 for the year

Variable cost Rs.20 per chair

Selling price Rs.70 per chair

(i) Find the break-even point

(ii) Find the number of chairs to be sold to get a profit of Rs.30,000.

(iii) What will be the answer for (i) and (ii) if the selling price changes to Rs.60 per chair?

(iv) If the company can manufacture 600 chairs more per year with an additional fixed cost of Rs.2,000 what should be the selling price to maintain the profit per chair as at (ii) above?

**SOLUTION**

(i) BEP $= \frac{\text{Fixed Cost}}{\text{Unit Contribution}}$

$= \frac{50,000}{50} = 1,000$ chairs

(ii) No. of chairs to be sold to get a profit of Rs.30,000

$= \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{Unit Contribution}}$

$= \frac{50,000 + 30,000}{50}$

= 1,600 Chairs

(iii) If the selling price were Rs.60

BEP $= \frac{50,000}{40} = 1,250$ Chairs

No. be sold: $\frac{50,000 + 30,000}{40} = 2,000$ Chairs

**Differential Cost Analysis**

| | **2,000 Chairs** | **2,600 Chairs** | **600 Chairs** |
|---|---|---|---|
| Sales | 1,40,000 | 1,82,000 | 42,000 |
| LESS: Costs: | | | |
| Variable | 40,000 | 52,000 | 12,000 |

| | | | |
|---|---|---|---|
| Contribution | 1,00,000 | 1,30,000 | 30,000 |
| Fixed | 50,000 | 52,000 | 2,000 |
| Profit | 50,000 | 78,000 | 28,000 |

Incremental revenue is Rs.42,000 and differential cost Rs.14,000. Since 2,600 chairs cannot be sold at the original price of Rs.70, it is necessary to recude the price to realize the same profit of Rs.18.75 per chair. Hence, the selling price should be:

$S - V = F + P$

$S = 52,000 = 52 + (2,600 \times 18.75)$

$S = 52,000 + 52,000 + 48,750$

$S = Rs.1,52,750$

$$\text{Selling price per chair} = \frac{1,52,750}{2,600}$$

**ILLUSTRATION 6**

A company is at present working at 90% of its capacity and producing 13,500 units per annum. It operates a flexible budgetary control system. The following figures are obtained from its budget:

| | 90% Rs. | 100% Rs. |
|---|---|---|
| Sales | 15,00,000 | 16,00,000 |
| Fixed expenses | 3,00,000 | 3,00,000 |
| Semi-fixed expenses | 97,500 | 1,00,500 |
| Variable expenses | 1,45,000 | 1,49,000 |
| Units made | 13,500 | 15,000 |

Labour and material costs per unit are constant under present conditions. Profit margin is 10 per cent.

(a) You are required to determine the differential cost of production 1,500 units increasing capacity to 100 per cent.

(b) What would you recommend for export price for these 1,500 units taking into account that overseas prices are much lower than indigenous price?

**SOLUTION**

Material and labour costs not given in the problem have to be found out by working backward from sales.

| | |
|---|---|
| Sales at 90% Capacity | 15,00,000 |
| LESS: Profit 10% of sales | 1,50,000 |
| Cost of goods sold | 13,50,000 |

| | | |
|---|---|---|
| LESS: Other expenses: | 3,00,000 | |
| Fixed expenses | 97,500 | |
| Variable expenses | 1,45,000 | 5,43,000 |
| Labour and materials | | 8,07,000 |

**Differential Cost Analysis**

| | 90% 13,500 units Rs. | 100% 15,000 Rs. | Differential Cost Rs. |
|---|---|---|---|
| Materials and Labour | 8,07,000 | 8,96,667 | 89,667 |
| Variable expenses | 1,45,000 | 1,49,000 | 4,500 |
| Semi-fixed expenses | 97,500 | 1,00,500 | 3,000 |
| Fixed expenses | 3,00,500 | 3,00,500 | Nil |
| Total Cost | 13,50,000 | 14,47,167 | 97,167 |

Differential cost per unit = $\frac{97,167}{1500}$ = Rs.64.78

The export price should not be below the differential cost per unit. However, since this price does not include any profit it is only the minimum price below which the order should not be accepted. Any price above this limit is acceptable, depending upon what the foreign businessman is willing to pay.

***(c) Profitable Level of Production***

**ILLUSTRATION 7**

A company is considering expansion. Fixed costs amount to Rs.4,20,000 and are expected to increase by Rs.1,25,000 when plant expansion is completed. The present plant capacity is 80,000 units a year. Capacity will increased by 50 per cent with the expansion. Variable costs are currently Rs.6.80 per unit and are expected to go down by Rs.0.40 per unit with the expansion. The current selling price is Rs.16 per unit and is expected to remain the same under either alternatives.

What are the break-even points under either alternative? Which alternative is better and why?

| | **Present 80,000 units Rs.** | **Proposed 1,20,000 Rs.** | **Differential Rs.** |
|---|---|---|---|
| Sales | 12,80,000 | 19,20,000 | 6,40,000 |
| LESS: Variable costs | 5,44,000 | 7,68,000 | 2,24,000 |
| Contribution | 7,36,000 | 11,52,000 | 4,16,000 |
| LESS: Fixed Costs | 4,20,000 | 5,45,000 | 1,25,000 |
| Profit | 3,16,000 | 6,07,000 | 2,91,000 |

$$BEP = \frac{Fixed Cost}{Unit Contribution} = \frac{4,20,000}{9.20} = 45,652 \text{ units}$$

$$\frac{5,45,000}{9.60} = 56,771 \text{ units}$$

Since the incremental profit is more than the differential profit in spite of increased fixed cost, the proposed alternative by plant expansion is better.

**ILLUSTRATION 8**

Assuming that the rated capacity of the factory is 50,000 units, what should be the most profitable level of output?

| | **Output to 25,000 units Rs.** | **Output upto 40,000 units Rs.** | **Output up to 50,000 units Rs.** |
|---|---|---|---|
| Fixed Cost | 25,000 | 35,000 | 40,000 |
| Variable cost per unit | 2 | 2 | 1.90 |
| Sales revenue per unit | 4 | 3.50 | 3.20 |

**SOLUTION**

**Differential Cost Analysis**

| | 1 | 2 | 3 | Incremental revenue | Differential Cost |
|---|---|---|---|---|---|
| | 25,000 units | 40,000 units | 50,000 units | | |
| | Rs. | Rs. | Rs. | Rs. | Rs. |
| Sales | 1,00,000 | 1,40,000 | 1,60,000 | NIL | NIL |
| LESS: Costs | | | | 2,40,000 | 2,40,000 |
| Variable | 50,000 | 80,000 | 95,000 | 3,20,000 | 3,20,000 |
| | 50,000 | 60,000 | 65,000 | | |
| Fixed | 25,000 | 35,000 | 40,000 | | |
| Profit | 25,000 | 25,000 | 25,000 | | |

Incremental revenue is equal to differential cost at 40,000 and 50,000 units of output. Hence, it is not advisable to go beyond 25,000 units level of output.

***(d) Closing Down or Suspension***

**ILLUSTRATION 9**

A firm produces three products A, B and C. The following data are relevant to the products:

| | **A** | **B** | **C** |
|---|---|---|---|
| | **Rs.** | **Rs.** | **Rs.** |
| Sales | 10,00,000 | 8,00,000 | 2,00,000 |
| Contribution | 40% | 30% | 25% |
| Fixed cost | 3,40,000 | 1,80,000 | 90,000 |

Fixed cost attributable to product C is Rs.40,000. Product C incurs loss and hence the management wishes to consider two alternative, viz.,

(a) Discontinue product A

(b) Discontinue Product C an utilize the capacity to manufacture product D. In this case, the sales value of Product C will be Rs.2,00,000 and contribution 35%.

*Which of the alternative is desirable?*

| | A | B | C | D |
|---|---|---|---|---|
| | Rs. | Rs. | Rs. | Rs. |
| Sales | 10,00,000 | 8,00,000 | 2,00,000 | 20,00,000 |
| Contribution | 4,00,000 | 2,40,000 | 50,000 | 6,90,000 |
| Fixed Cost | 3,40,000 | 1,80,000 | 90,000 | 6,10,000 |
| Profit | 60,000 | 60,000 | (-40,000) | 80,000 |

(a) *If product C is discontinued:*

| | **A & B and C** | **A & B** | **Difference** |
|---|---|---|---|
| | **Rs.** | **Rs.** | **Rs.** |
| Sales | 20,00,000 | 18,00,000 | 2,00,000 |
| Contribution | 6,90,000 | 6,40,000 | 50,000 |
| Fixed Cost | 6,10,000 | 5,70,000 | 40,000 |
| Profit | 80,000 | 70,000 | 10,000 |

Discontinuance of product C results in reduced contribution by Rs.50,000 and profit by Rs.10,000. Reduction in profit is due to non-recovery of Rs.40,000 fixed cost attributable to product C (b) If product D is substituted for Product C:

(b) *If product D is substituted for product C:*

| | **Product C** | **Product D** | **Difference** |
|---|---|---|---|
| | **Rs.** | **Rs.** | **Rs.** |
| Sales | 2,00,000 | 2,00,000 | Nil |
| Contribution | 50,000 | 35% = 70,000 | 20,000 |

If product D is produced in the place of product C, contribution will be more by Rs.20,000. Thus, product D is more profitable than product C.

(c) *Overall profitability with product D*

| | A<br>Rs. | B<br>Rs. | D<br>Rs. | Total<br>Rs. |
|---|---|---|---|---|
| Sales | 10,00,000 | 8,00,000 | 2,00,000 | 20,00,000 |
| Contribution | 4,00,000 | 2,40,000 | 70,000 | 7,10,000 |
| Fixed Cost | 3,40,000 | 1,80,000 | 90,000 | 6,10,000 |
| Profit | 60,000 | 60,000 | (-20,000) | 1,00,000 |

Thus, if product C is discontinued in favour of product D, the loss being the unrecovered portion of fixed cost attributable to product C will be reduced by Rs.20,000 and contribution will be more by the same amount. The alternative to introduce product D in the place of product C is, therefore, desirable.

**ILLUSTRATION 10**

The management of X Ltd., which is now operating at 50% capacity, expects that the volume of sales will drop below the present level of 5,000 units per month. The operating statement prepared for monthly sales shows:

| | | |
|---|---|---|
| Sales (5,000 units at Rs.3 per unit) | | Rs.15,000 |
| LESS: Variable Cost at Rs.2 per unit | 10,000 | |
| Fixed overhead | 5,000 | 15,000 |
| Net Profit | | NIL |

It is proposed that the company should suspend production until market conditions improve. The General Manager estimated that a minimum of fixed costs (shut down costs) amounting to Rs.2,000 would be necessary in any event. Advise management at What level of sales it could think of suspending production. If the sales price decision is Rs.2.80 What should be the sales level for shutdown?

Profitability Statement
(Present Position)

| | Rs. |
|---|---|
| Sales | 15,000 |
| LESS: Variable costs | 10,000 |
| Contribution | 5,000 |
| Fixed Cost | 5,000 |
| Profit | NIL |

As could be seen from the profitability statement, the present level of sales is just sufficient to generate Rs.5,000 contribution to cover fixed costs. If production is suspended, the concern may avoid fixed cost but has to incur the shutdown cost amounting to Rs.2,000. It has, therefore, to produce as many units as are necessary to cover at least Rs.3,000 of fixed cost and meet only the shutdown cost.

In other words, contribution per unit being Re.1 it has to produce and sell 3,000 units at Rs.3 per unit to generate a contribution of Rs.3,000.

Profitability Statement

| | Rs. |
|---|---|
| Sales: 3,000 units @ Rs.3 each | 9,000 |
| LESS: Variable costs @ Rs.2 each | 6,000 |
| Contribution | 3,000 |
| LESS: Fixed overhead | 5,000 |
| Shutdown cost (loss) | 2,000 |

When the sale price is Rs.2.80 the shutdown level of production and sale would be:

| | | |
|---|---|---|
| Sale price per unit | Rs. | 2.80 |
| LESS: Variable cost | | 2.00 |
| Contribution | | 0.80 |

To generate a contribution of Re.0.80..... 1 units should be sold Rs.3,000 .....?

## 10.6 SUMMARY

It is useful for production X, make to buy decisions, submitting tenders, and opening of new sales area of territory.

## REVIEW QUESTIONS

1. What is differential costing? Distinguish differential costing from that of Marginal costing.
2. Explain the special features of differential costing?
3. A manufacturer produces a Product Act which the selling price is Rs.5 per unit. He manufactures another product B by combining A with other direct materials and employing further labour overhead for additional cost per unit required for converting A to B is: materials Rs.2, labour Rs.1.50 and increase in the manufacturing overhead cost is estimated from following flexible budget totals:

| | | | | | |
|---|---|---|---|---|---|
| Total labour hours | 6,000 | 6,500 | 7,000 | 7,500 | 8,000 |
| Total factory overhead | 6,000 | 7,000 | 8,500 | 10,500 | 12,000 |

The manufacturer estimates that he can sell 1,500 additional units of the product B with no increase in selling and administrative cost but at a reduction of 1,500 units in the sale of the product A. The factory is now operating at 6,500 labour hours, and if 1,500 additional units of B are produced, the labour hours required would be 7,000. Advise on the desirability or otherwise of producing 1,500 additional units of B.

4. A company produces product X, which is at present being sold at Rs.8 each. The monthly production of X is 30,000 units. The company can, as an alternative, produce another product Y, by using one unit X in each unit of Y as raw material. Product Y can be sold at Rs.12 each. The company pays

sales commission at 10% of sale value. It has the capacity to manufacture product Y to the extent of 13,000 untis per month without additional capital cost.

Taking the following information into consideration, advise management whether the manufacture of product Y is desirable:

| | X | Y |
|---|---|---|
| Raw materials cost | Rs.2 | Re.1 |
| Labour and overheads | 3 | 2 |

The figures given for product Y represent expenses incurred in addition those incurred for the manufacture of Product X. The supervision charges for manufacturing product Y will be Rs.5,000 extra per month.

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LESSON - 11

# BUDGETING AND BUDGETARY CONTROL

**STRUCTURE**



## 11.1 INTRODUCTION

Budgeting and Budgetary control explain plan, operations and decisions, financial terms, relating to future period, comprehensiveness and co-ordination.

The main function of cost accounting is "Cost Control". Budgets are an important tool of profit planning and cost controlling. The technique used by the management is to compare the actual with that of the budgeted figures. They form principal instruments for projecting the future costs and revenues. Budgets, undoubtedly, offer immense potentialities for monitoring costs both in physical and financial terms. Today's management is heavily relying on short-term and long-term budgets for evaluating the performance. Budgets are proved to be time tested tools for planning and control in any organisation.

### BUDGETS, BUDGETING AND BUDGETARY CONTROL

A budget is defined by J.M.Frengen as "a comprehensive and co-ordinated plan expressed in financial terms, for the operation and resources of an enterprise for some specified period in future. In simple, it is defined as "the quantitative and financial interpretation of the future plans of operation". It is nothing but the overall financial plan for future activities. Truly speaking, there are six essential elements in every budget which are briefly explained below:

### 1. PLAN

Budgeting involves planning. It includes two aspects that affect the day-to-day activities of an enterprise. The first set of factors are external factors on which the management has little control viz., Government Policy, Trade Cycle, Changes in the tastes and preferences. The second set of factors that effect the future activities of the firm are controllable by the management, viz. promoting wages, quality of supervision etc. Budgeting as a plan, covers both these aspects. In other words, is not only suggests what will happen but also help in making the things happen.

### 2. OPERATIONS AND RESOURCES

The operations of the firm are quantified in the form of revenues and expenses through a budget. Thus a budget is a mechanism to plan operations and resources.

**3. FINANCIAL TERMS**

The various activities and operations of a firm are expressed in different units of measurement. For example material is measured in tons and labour is expressed in man machine hours. These things are to be integrated and expressed in a common denominator. That is why budgets are prepared in financial terms.

**4. RELATING TO FUTURE PERIOD**

Budget is always related to a specific future period, usually a year. There is no meaning in budgeting past events.

**5. COMPREHENSIVENESS**

Usually, budgets are prepared covering the activities of the organisation as a whole. The term comprehensiveness here means that all activities and operations of each division are integrated for projecting the operations of the entire organisation.

**6. CO-ORDINATION**

Butgets are prepared for each division by activity so as to take care of the problems of each component/unit. These components are prepared is hormony with others. The success of a budget depends upon how nicely it co-ordinates the affairs of various sections units.

## 11.2 BUDGETING

It is a process of formulating short and long range plans for future activities. It is an attempt to frame the contemplated action in the form of budgets without leaving the things to chance. The terms 'budgets' and 'budgeting' are used as synonyms in common parallance. However, Rolland and Harr state that while budgets are individual objectives of a department, budgeting deals with the process of building budgets. Budgetary control embrasses all this and in addition to include the science of planning and control.

## 11.3 BUDGETARY CONTROL

ICWA, England, defines budgetary control as "the establishment of departmental budgets relating to the responsibilities of the executives to the requirements of a policy, and the continuous comparison of actuals with budgeted results either to secure by individual action the objectives of that policy or to provide a firm basis for its revision". Budgetary control involved use of budgets throughout the period to co-ordinate, evaluate and control day-to-day operations in accordance with the goals set. In involves constant check and evaluation of actual results against budgeted figures. It facilitates corrective action wherever necessary.

Budgetary control is designed to assist the management in the following areas:

a) Identification of responsibility.

b) Allocation of necessary authority.

c) Making estimates and plans for the future.

d) Assisting in the analysis of variations between budgeted and actual results.

e) Developing yardstick for measurement.

f) Evaluating operational efficiency, and

g) Initiating caused action to ensure that actual performance watches the budget;

**OBJECTIVES**

The main objectives of budgetary control are to:

1. Provide a detailed plan of action for a definite period of time;
2. Co-ordinate the various activities of a firm in such a way that maximum profit will be achieved for minimum investment.
3. Provide a means of supplying information on the basis of which control action may be taken.

**PROCESS OF SETTING BUDGETS**

The process of setting budgets is purely related to the broad system of planning and control in an organisation. It is a difficult exercise since it involves number of forecasts/projections. This process essentially involves 4 major steps.

1. The basis of the firms budget is sales budget. It is the focul point of the judging process. On the basis of past sales, present competitive conditions and future projections, sales budget has to be prepared.

2. The second step involves the preparation of various functional budgets. For each functional area, the work should be quantified first. Then costs and revenues involved should be quantified with future projections.

3. The next step is to estimate a advance the cost of goods sold via the budgeted cost of material, labour and overhead expenses. Attention should also be given in appointment of all direct and indirect expenses.

4. The last step is to synchoronise and co-ordinate the future transactions which are considered both probable and reasonably certain. It follows that preparing a budget amounts to construction of anticipatory statement supported by detailed future estimates.

## 11.4 ESSENTIALS OF A GOOD BUDGETARY CONTROL SYSTEM

i) *Flexible /Variable Budgeting*: The modern concept of the budgetary control is that such control shall be flexible and this is obtained by "the operation of variables". This is also termed as sliding scale budget. It takes both fixed and variable manufacturing costs into account. The analysis of costs under fixed and variable components is a vital aspect of budgeting.

Its preparation is more difficult as compared to the preparation of a fixed budget. But, from the point of view of management, it is more useful and purposeful.

ii) *Team Work*: The fundamental requirement of a system of budgetary control is the co-operation of all levels of members of the company. It is not possible to install a budget system without a review of the organisation in general coupled with the relationship of the department with another.

iii) *The Budget Period*: The length of budget period will depend on the type of business, the length of the manufacturing cycle from raw material to conditions. Usually, the budget period is the financial year.

Short-term budgets may be set to secure more accurate results. Long-term budgets are suitable more for the forecast of sales, capital expenditure, research and development activities etc.

iv) *Identical Classification – codes & Headings*: An identical scheme of classifying codes and headings/symbols avoid the use of long and cumbersome titles. There are four methods of numbering the accounts. (a) the decimal, (b) use of lettering, (c) the combination number and letter. (d) the four digit method.

The first three are similar in kind. The fourth system employs the principle of attracting a given meaning to each digit of the number, Ex.: 100 for assets, 2000 for liabilities and net worth, 3000 for sales & cost of sales, 4000 for direct labour and so on.

v) *Periodic Control Statements*: For implementing the system of budgetary control, it is necessary that control statements are submitted periodically. Reports will be rendered depending upon the necessity-daily, weekly and monthly. Acutal results need to be co-ordinated in a suitable accounting process. It enables comparison with budgeted amounts easy.

vi) *Interlocked Budgets*: The various budgets must be interlocked and integrated so that they reflect the operating plans for the specific future period.

vii) *Avoidance of Slack:* Slack can be defined as the difference between the minimum necessary costs and the actual costs incurred. One method of overcoming problems of slack is to offer cash rewards for permanent cost reduction schemes. Inspite of such efforts, however, slack remains a serious problems of budgeting in all types of organisation.

viii) *Delegation of Responsibility*: Cost centres should be clearly established along the line of hierarchy which is primarily responsible for decisions relating to such costs.



## 11.5 SUMMARY

Budgeting is a process of formulating short and long range plans for future activities. Budgetary control is the establishment of departmental budgets. Essentials of goods budgets are flexible, variable budgets, Team work, Budget period.

**REVIEW QUESTIONS**

(1) Explain Budget

(2) State the objectives of budgetary

(3) State the essentials of good budgetary control.

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LESSON - 12

# INSTRUMENTS FOR MAKING BUDGETS

**STRUCTURE**



## 12.1 BUDGET CENTRES

Budget centre is defined as a section or unit of the organisation for which a budget can be prepared. The nature and activities of each budget centre should be clearly defined and established. Ex: Labour budget, production budget, maintenance budget etc. It is desirable to identify each budget centre with a code when the organisation is too big.

### ORGANISATION CHART

A properly designed organisation chart shows the relationships and responsibilities of different executives. If facilitates free and un-interrupted flow of authority. The organisation chart should be so drafted so as to ensure full control over each budget centre.

### ACCOUNTING DATA

Good accounting system is the basis for the success of budgetary control technique. All accounting records should be coded so as to identify each transaction to its budget centre.

## 12.2 BUDGET MANUAL

It is a document providing rules and instructions for framing budgets. It sets out the forms and records required for control purposes and also identifies the persons for such control. Since all the executives are not likely to be familiar with the techniques of financial matters, the budget manual should guide the executives regarding what to do and what not to do.

Apart from this, a budget manual consists of the following particulars:

a) identification of central points at various levels;

b) clearly defined relationships among the various divisions of the operating systems.

c) clear cut identification of authorities and responsibilities of various executives

d) reports and statements to be prepared in support of the budget.

## 12.3 BUDGET COMMITTEE

Every company should set-up a budget committee with the representatives of various divisions which are responsible for total operations. It is not an executive

committee but an advisory committee. Weekly or monthly reports should be made available to the budget committee so that a check can be made to determine variance from planned performance. Usually, it consists of three persons. The functions include deciding policy relating to sales, expenditure, making budgets, review of estimates, analyse budget reports, receive suggestions and revise budgets, if necessary.

**BUDGET OFFICER**

A senior accounts officer is usually designated as the budget officer. He co-ordinates total budgeting activity. He is responsible for such functions as (a) Issuing instructions to various departments. (b) Providing historical data to them for forecasting purpose. (c) discussing difficulties with managers (d) preparing budget summaries (e) co-ordination all budget work so as to present the same in time.

## 12.4 KEY FACTOR

It is also termed as principal budget factor/limiting factor. Budgets can never be complete without paying adequate attention to the key factor. Ex. In the field of sales, customer demand is the key factor. Sales budget should be formulated only on the basis of this key factor. Sometimes, this key factor can be changed by management action, like vigorous advertising compaign.

In respect of most of the organizations, sales target becomes the key factory. Sometimes, other production, factors like availability of men, material, machines, money etc., may also become key factors. A typical list of key factors is presented below:

| | | |
|---|---|---|
| a) Management | : | 1. Shortage of skilled man power |
| | | 2. Failure to raise capital |
| | | 3. Poor research and development |
| b) Plant | : | 1. Size of plant's capacity |
| | | 2. Bottlenecks in production departments |
| c) Labour | : | 1. Shortage of skilled workers |
| | | 2. Existence of militant trade unions |
| d) Materials | : | 1. Restricted supply of materials |
| | | 2. Non-availability of quality of materials |
| | | 3. Restrictions imposed by licencies or quotas |
| e) Sales | : | 1. Inability to spend more on advertisement |
| | | 2. Shortage of dynamic salesmen |
| | | 3. Volatile market |

Identification of the key factor is the starting point of budget. Sometimes two or more limiting factors may exist simultaneously. It may be mentioned that the

key factor is not a permanent factor and in the long-term, management may overcome this limitation by developing suitable alternatives.

## 12.5 SUMMARY

Budget centre is the one of the fore most instrument for making body budget. It is nothing but the centre or unit of the organisation key factor is limiting factor became budgets can never be complete without paying adequate attention.

## REVIEW QUESTIONS

(1) Explain Budget Centre.

(2) What do you mean by key factor.

(3) State the objectives of budget committee

❐

LESSON - 13

# TYPES OF BUDGETS

**STRUCTURE**



## 13.1 INTRODUCTION

As stated earlier, identification of the key factor is the first step in preparing various budgets. Once this factor is defined, then the test of the budgets can be prepared. As a general rule, every budget should contain the title of activity, period to which relates, contents of budgets, by whom it is prepared, signature of person responsible for complying with the budget etc.

## 13.2 MASTER BUDGET

It provides the basic plan for operations during a stipulated period. That is why it is called as operating budget. It contains the targets to be attained during the budget period by each division or department of the organisation. It is a statement of company's operating policy for the budget period. It gives budgeted profit and loss account for the whole organisation for that period. A typical master budget consists of the essence of various inter-related small budgets like sales budget, production budget, manufacturing budget etc.

Such master budget must contain the budgeted profit and loss account for the current year as well as for the previous year showing clearly why there has been a change.

**MASTER BUDGET**

(a) Budgeted profit and loss account for the year ending 30.12.90

| Items | Budget Period | | Previous years | |
|---|---|---|---|---|
| | Amount | Per cent | Amount | Per cent |
| | Rs. | % | Rs. | % |
| Sales | | | | |

| | | | | |
|---|---|---|---|---|
| LESS: Cost of production | 1,00,000 | 100.0 | 80,000 | 100.00 |
| Gross profit (A) | 60,000 | 60.0 | 49,600 | 62.0 |
| | 40,000 | 40.0 | 30,400 | 38.0 |
| LESS: Operating expenses | | | | |
| Administration | 5,000 | 5.0 | 4,400 | 5.5 |
| Selling and distribution | 7,000 | 7.0 | 6,000 | 2.5 |
| Advertising | 2,000 | 2.0 | 2,000 | 2.5 |
| Total (B) | 14,000 | 14.0 | 12,400 | 15.5 |
| Operating profit (A – B) | 26,000 | 26.0 | 18,000 | 22.5 |
| ADD: Other income (investment) | 1,200 | 1.2 | 1,200 | 1.5 |
| Net profit before tax | 27,200 | 27.2 | 19,200 | 24.0 |

Appropriation are not shown in this account

Master budget – Profit and Loss Account

**(B) BUDGETED BALANCE SHEET AS AT 31st DECEMBER 1990**

| LIABILITIES | Budget year | Previous year | ASSETS | Budget year | Previous year |
|---|---|---|---|---|---|
| | Rs. | Rs. | | Rs. | Rs. |
| Share Capital | | | Fixed Assets | | |
| Ordinary Share | 2,50,000 | 2,50,000 | Buildings (net) | 1,80,000 | 2,00,000 |
| Reserves and Surplus | | | Plant & Machinery (net) | 90,000 | 1,00,000 |
| General Reserve | 50,000 | 50,000 | Current Assets: | | |
| Profit and Loss | 45,000 | 35,000 | Stocks | 38,000 | 40,000 |
| Current liabilities | | | Debtors | 20,000 | 25,000 |
| Creditors | 23,000 | 50,000 | Cash at bank | 40,000 | 20,000 |
| | 3,68,000 | 3,85,000 | | 3,68,000 | 3,85,000 |

Master budget – Balance Sheet

### 13.3 SALES BUDGET

The budgeting process starts with sales forecasting. This is prepared by the sales manager. It is mainly centering around the forecasting of sales, both in quantity and in value for the budget period. The preparation of such a forecast requires lot-of information. Number of units that can be sold for each product, the sales territories, prices, other factors like competition, quality, seasonal variations, past sales etc., should also be taken into-consideration.

### PROBLEM

An estimate shows that there is a market for 10,00,000 units of an electric bell. Two big companies, producing this electric bell will probably divide 80% of the market. Among other companies, producing the bell, Ranjini Limited should get 15% of the total market. 60% of Ranjini's sales will probably be evenly divided

between the first and the last calendar quarters of the year, with twice as many sales being made in the second quarter as in the third.

The bell sells for Rs.60 as unit, with manufacturing costs are follows: The cost is worked out with reference to normal working capacity for the production which is 1,50,000 bells a year.

Directi material cost – Rs.30; Direct labour cost Rs.15.

Variable overhead cost – Rs.5; Fixed overhead – Rs.2,00,000. Prepare a sales budget for the year showing cost of production, and gross profit by calendar quarters. Assume no change in the inventory levels during the year.

**SOLUTION**

Sales of Ranjini Limited should be 15% of 10,00,000 i.e., 1,50,000 bells. 60% of 1,50,000 i.e., 90,000 bells evenly divided between first and the last calendar quarter.

| | |
|---|---|
| First quarter | 45,000 |
| Last quarter | 45,000 |
| 2nd quarter: | |
| Balance 1,50,000 – 90,000 = 60,000 x $\frac{2}{3}$ = | 40,000 |
| 3rd quarter 60,000 x $\frac{1}{3}$ | 20,000 |
| Total Bells | 1,50,000 |

**Sales Budget**

(Rs.1 Lakhs)

| **Particulars** | **Quarter** | | | | |
|---|---|---|---|---|---|
| Production and Sales – Units | 1st 45,000 | 2nd 40,000 | 3rd 20,000 | 4th 45,000 | Total 1,50,000 |
| Direct Material | 13.50 | 12.00 | 6.00 | 13.50 | 45.00 |
| Direct labour | 6.75 | 6.00 | 3.00 | 6.75 | 22.50 |
| Variable overhead | 2.25 | 2.00 | 1.00 | 2.75 | 7.50 |
| Fixed overhead | 0.50 | 0.50 | 0.50 | 0.50 | 2.00 |
| Cost of Production | 23.00 | 20.50 | 10.50 | 23.00 | 77.00 |
| Sales | 27.00 | 24.00 | 12.00 | 27.00 | 90.00 |
| Gross Profit | 4.00 | 3.50 | 1.50 | 4.00 | 13.00 |

## 13.4 PRODUCTION BUDGET

It is based upon anticipated volume of sales and is prepared by the production manager. He will take into account the physical facilities like plant, power, material, labour etc., available for the budget period. It may be expressed in terms of the money value or quantity. It is also influenced by stock levels existing with the company. It consists of the sum total to purchase budget, labour budget and factory overhead budget.

**PROBLEM**

Prepare a Production Budget for each month and summarized Production Cost Budget for the 6-months period ending 31st December, 1980 from the following data relating to Product X:

i) The units to besold for different months are as under:

| | |
|---|---|
| July | 1,100 |
| August | 1,100 |
| September | 1,700 |
| October | 1,900 |
| November | 2,500 |
| December 1990 | 2,300 |
| January 1991 | 2,000 |

ii) There will be no work-in-process at the end of any month.

iii) Finished units equal to half the sales for the next month will be in stock at the end of each month (including June, 1990).

iv) Budgeted Production and production cost for the year 31-12-90 are as follows:

| | Rs. |
|---|---|
| Production (units) | 22,000 |
| Direct material per unit | 10.00 |
| Direct wages per unit | 4.00 |
| Total Factory overhead apportioned to product | 88,000 |

Ans: Production Budget for Each Month for 6 Month, Period Ending 31.12.90 (units)

| Production | July 90 | Aug. | Sept. | Oct. | Nov. | Dec. 90 |
|---|---|---|---|---|---|---|
| Sales | 1,100 | 1,100 | 1,700 | 1,900 | 2,500 | 2,300 |
| Add: Closing Stock 50% of Next month sales | 550 | 850 | 950 | 1,250 | 1,150 | 1,000 |
| Total requirements | 1,650 | 1,950 | 2,650 | 3,150 | 3,650 | 3,300 |
| Less: Opening Stock | 550 | 550 | 850 | 950 | 1,250 | 1,150 |
| Production Budget | 1,100 | 1,400 | 1,800 | 2,200 | 2,400 | 2,150 |
| Total | | | | 11,050 | Units | |

## 13.5 MATERIAL BUDGET

It indicates the quantity and value of different types of material to be purchased during the budget period. The following factors must be taken into account at the time of preparing the material budget.

a) Levels of production activity to be attained

b) Levels of existing inventory

c) Quantities of different material to be required

d) Delivery schedules by which material must be made available

e) Storage facilities available

f) Inventory carrying costs

g) Availability of finance credit to meet the cost of purchases; and

h) Price trends and quantity discounts

### ILLUSTRATION

Prepare a materials budget of A B Company Limited based on production budget. The production orders of the products show the following consumption:

Consumption for a batch of 1,000 units of

| Materials | Product A Kg. | Product B Kg. |
|---|---|---|
| 11 | 50 | 80 |
| 13 | 10 | 5 |
| 16 | - | 30 |
| 17 | 6 | 10 |
| 18 | 4 | 4 |
| Total | 70 kg. | 129 Kg |

(Solution in the next page)

## 13.6 LABOUR BUDGET

It is an important cost item of the total cost of operations of an enterprise. Therefore, the management should determine in advance labour budget. It consists of two elements; (a) Labour requirement budget and (b) Labour recruitment budget. The labour requirement for each job should be ascertained as to the nature of skill and number of man hours. The labour recruitment is based on the basis of job specification, the degree of skill and experience required and the rate of pay to retain talented people.

### SOLUTION

**MATERIAL BUDGET**

A B COMPANY LIMITED — For the year 1987

| Production | Quantity to be Produced | Mat. 11 | Mat. 13 | Mat. 16 | Mat. 17 | Mat. 18 |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Kg. | Kg. | Kg. | Kg. | Kg. |
| A | 12,000 | 600 | 120 | - | 72 | 48 |
| B | 11,000 | 880 | 55 | 330 | 110 | 44 |
| Total Quantity | | 1,480 | 175 | 330 | 182 | 92 |
| Rate per Kg. (from purchase budget) | Rs. 60 | Rs. 60 | Rs. 10 | Rs. 50 | Rs. 25 | |
| | Rs. | Rs. | Rs. | Rs. | Rs. | |
| Cost of material | 88,800 | 10,500 | 3,300 | 9,100 | 2,300 | |

**Material budget**

### 13.7 OVERHEAD BUDGET

This budget indicates details of all fixed, variable and semi-variable items of manufacturing overhead to be incurred during the budget period. Firstly, one budget for each division or cost centre may be drawn up for control purposes. Secondly, all overheads of service departments may be apportioned to production departments for their recovery.

### 13.8 CASH BUDGET

It is an estimate of probable receipts and payments for the budget period. It is essential to ensure that sufficient cash is available to carryout all operations smoothly and successfully. It should also indicate the working capital requirements, sources of getting funds on the time by which additional funds are required. In essence, it should project the cash-in-flows and out-flows for determining the results of operations.

### PROBLEM

A company making for stock in the first quarter of the year is assisted by its bankers with overdraft accommodation.

The following are the relevant budget figures:

| | Sales (Rs.) | Purchases (Rs.) | Wages (Rs.) |
|---|---|---|---|
| November | 60,000 | 41,500 | 4,900 |
| December | 64,000 | 48,000 | 5,000 |
| January | 36,000 | 81,000 | 4,000 |
| February | 58,000 | 82,000 | 3,800 |
| March | 42,000 | 89,500 | 5,200 |

Budgeted cash at the bank 1st January is Rs.8,600. Credit terms of sales are payment by the end of the month following the month of supply. On an average, one half of the sales are paid on the due date, while the other half are paid during the next month. Creditors are paid during the month following the month of supply.

You are required to prepare a Cash Budget for the quarter 1st January to 31st March, showing the budgeted amount of bank facilities required at each month end.

**SOLUTION**

Cash Budget 1st January – 31st March

| | January Rs. | February Rs. | March Rs. |
|---|---|---|---|
| Balance b/d | 8,600 | 18,600 | -16,200 |
| Receipts from debtors | 62,000 | 50,000 | 47,000 |
| | 70,600 | 68,000 | 30,800 |
| Payments to creditors | 48,000 | 81,000 | 82,000 |
| Payments to wages | 4,000 | 3,800 | 5,200 |
| | 52,000 | 84,800 | 87,200 |
| Balance c/f | 18,600 | -16,200 | -56,400 |

Bank facilities of, say, Rs.17,000 required in February and Rs.57,000 in March.

Depending upon the need of the hour, various types of other budgets may be prepared by the management from time to time. Some of the important other functional budgets are:

a) Plant Utilisation Budget
b) Capital Expenditure Budget
c) Administrative Cost Budget
d) Maintenance Budget
e) Advertising Budget
f) Research and Development Budget

With the help of all these budgets, a summary budget may thus be prepared, reviewed and readjusted in order to get the maximum benefits from budgetary control. Once, a summary budget is proposed and approved by the management, it ceases to be a mere estimate. It becomes the target to be achieved by executive directions during the budget period.

### 13.9 FLEXIBLE BUDGET

Unlike static budget, which shows the estimated costs at a single level of activity, a flexible budget depicts varying levels of cost in accordance with varying levels of activity. In other words, it is a precise statement of how costs are related to changes in the volume of activity. Therefore, it provides a dynamic basis for comparison of costs under various levels of activity.

A flexible estimates costs at several levels of activities in different assumed circumstances, since the business is operating under unpredictable environment. Preparation of a flexible budget is useful tool in the hands of management. The essence is that it presents estimated cost data at various levels of output. It means

that all costs must be identified together with their behaviour to a given change in volume. Therefore, the conceptual frame work of flexible budgeting relates to two important aspects. Such as measure of volume and cost behaviour with change in volume.

### 13.10 MEASURE OF VOLUME

Different departments may use different measures of volume. They may be expressed in terms of the activity that causes costs to vary. Ex. Labour Costs vary on the basis of number of hours worked. Material costs vary on the basis of quantity of material consumed. These volume measures should be related to factors controllable by management.

### COST BEHAVIOUR WITH CHANGE IN VOLUME

Costs do change with changes in the volume of activity. Three types of cost behaviour can be seen with changes in the volume of activity. They are:

a) Fixed Costs

b) Variable costs and

c) Semi-variable costs

### a) FIXED COSTS:

Fixed costs are those costs which do not vary with the changes in the volume of output. That is why they are termed as "non-variable costs". They remain fixed upto a certain range of volume but they fluctuate beyond that range. Fixed costs may be further classified into two parts. (1) Committed Fixed Costs and (2) Descritionary fixed costs. While the former costs are associated with the capacity, the latter costs aware the result of management decisions. The Committed fixed costs can be budgeted on the basis of past commitment. Descritionary fixed costs can be budgeted on the basis of an enquiry into the decisions of managers. These two types of fixed costs have different implications for budgeting pruposes.

### b) VARIABLE COSTS

Variable costs are those costs which vary with the level of output. Estimating this cost component is very easy because costs and volume are directly related with each other.

### c) SEMI-VARIABLE COSTS

They are mixed costs consisting of both fixed and variable elements. As stated earlier, the fixed part of semi-variable costs represents the cost of capacity, the variable element is influenced by change in the activity.

For budgeting purposes, semi-variable costs must be broken down into their fixed and variable components. Once this is due, the total amount of fixed cost and variable cost can be worked out for varying levels of output.

The important elements in the construction of a flexible budget have been explained above. To summarise, flexible budget means preparation of a series of fixed budgets for every increase/decrease in the level of volume of activity. Ex. A

budget may be prepared assuming that the expected level of activity would be 100% capacity. Under flexible budgeting, additional columns should depict the picture of costs what if the reality it 90% or 110% of capacity.

**ILLUSTRATION**

For production of 10,000 electrical Automatic Irons, the following are the budgeted expenses:

| | Per unit Rs. |
|---|---|
| Direct Material | 60 |
| Direct labour | 30 |
| Variable overhead | 25 |
| Fixed overhead (Rs.1,50,000) | 15 |
| Variable expenses (Direct) | 5 |
| Selling Expenses (10% fixed) | 15 |
| Administration Expenses (Rs.50,000 rigid at all the levels of production | 5 |
| Distribution Expenses (20% Fixed) | 5 |
| Total cost of sale per unit | 160 |

Prepare a Flexible Budget for production of 6,000; 7,000 and 8,000 Irons showing directly marginal cost and total cost.

**SOLUTION**

Working Notes:

Selling expenditure 10% Fixed i.e., 10% of 15 = Rs.1.50 x 10,000 units = 15,000 Fixed.

90% of 15 = Rs.13.50 per unit variable.

Distribution expenditure 20% fixed i.e. 20% of 5 = Re.1 x 10,000 units = Rs.10,000 Fixed.

80% of 5 = Rs.4 per unit variable.

| | Rs. |
|---|---|
| Fixed Costs | 1,50,000 |
| Fixed overheads | 15,000 |
| Selling expenses | 50,000 |
| Administration expenses | 10,000 |
| | 2,25,000 |

**FLEXIBLE BUDGET**

| | | 6,000 | 7,000 | 8,000 |
|---|---|---|---|---|
| Production of Iron (Nos.) | Per Unit Rs. | Rs. | Rs. | Rs. |
| Direct Material | 60 | 3,60,000 | 4,20,000 | 4,80,000 |
| Direct Labour | 30 | 1,80,000 | 2,10,000 | 2,40,000 |
| Variable expenses (Direct) | 5 | 30,000 | 35,000 | 40,000 |
| | 95 | 5,70,000 | 6,65,000 | 7,60,000 |
| Prime Cost | | | | |
| Variable overhead | 25 | 1,50,000 | 1,75,000 | 2,00,000 |
| Variable selling expenses | 13.50 | 81,000 | 94,500 | 1,08,000 |
| Variable Distribution expenses | 4.00 | 24,00 | 28,000 | 32,000 |
| | 137.50 | 8,25,000 | 9,62,500 | 11,00,000 |
| Marginal cost | | | | |
| Fixed Costs | | 2,25,000 | 2,25,000 | 2,25,000 |
| Total Cost | | 10,50,000 | 11,87,500 | 13,25,000 |
| Total cost per unit | | 175.00 | 169.64 | 165.625 |

**USES**

Budgets serve as a guide to the conduct of operations and a basis for evaluating actual results. They offer definite and tangible benefits relating to the basic functions of the management. Budgets may be used for different purposes of obtain greater control over costs. They are summarized below:

1. *Definies Objectives*: Budgets force the management to look ahead, to anticipate and prepare for the future. Budgetary control tends to help in deifining the objectives of the business. The advantages through the budgets is that by laying down targets, budgets deal with clear-cut statement expectations.

2. *Communication*: The primary purpose of budgeting is to communicate the goals and methods of achieving the same to all persons concerned. Mere preparation of budget will not ensure automatic realization of the goals set by the budget. To make this happen, all levels of employees should be aware well in advance of the level of performance expected of them.

3. *Co-ordination*: It is not uncommon that different departments may have conflicting interests in some organizations. The primary purpose of the budgetary control is to help and integrate the interest of various departments like purchasing, production, sales, finance etc. The budget provides the necessary mechanism for co-ordinating the various activities for the success of enterprise. If there is no co-

ordination, bottlenecks and imbalances will be created which inturn will hinder the smooth operations. That is why co-ordination is a major function of budgeting.

## 13.11 SUMMARY

Master comprises of all the budget activity that takes place in the organisation sales Budget will help us to know the sales on the particular month, week or year. Cash Budget tells us about the cash requirement and balance on a particular month. Flexible Budget will select various plant capacity level and their cost of production.

## REVIEW QUESTION

(1) What do you mean by Master Budget?

(2) Explain Cash Budget.

(3) Mention the advantages of flexible Budget?

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LESSON - 14

# FRAME WORK FOR JUDGING PERFORMANCE

**STRUCTURE**



## 11.4 INTRODUCTION

A budget acts as a frame-work for judging employee performance. It defines the goals, the means of obtaining the goals and the level of performance attained by the employees. The extent of success can be judged on the basis of a comparison of actual performance with that of budget. Thus, a budget serves as a frame-work/yardstick to measure performance and acts as a control device.

## 14.2 COST CONSCIOUSNESS

Budgets remove the cloud of uncertainty relating to the basic policies and objectives. Budgets tend to improve cost consciousness and thereby help minimize wastage and inefficiency at various levels.

## 14.3 FACILITATES DECENTRALISATION

Budgetary control facilitates decentralization of operations without loosing control. It pinpoints inefficiency among various departments and establishes responsibility. Management control system cannot be complete in any organisation without proper budgeting process.

## 14.4 MANAGEMENT BY EXCEPTION

Once budgetary control system is installed, the top management is free from routine and usual work. It can afford to devote its precious time on usual or out of line activities. This exercise is greatly helpful both in profit planning and cost control.

## 14.5 ADOPTION OF STANDARD COSTING

Budgetary control helps in adopting standard costing system. These techniques are not substitutes to each other. But, they are complements. These two techniques are of immense help to management in controlling costs.

### (a) LIMITATIONS

1. *Employee Resistance*: If the budgeted targets are unattainable, then, the employees become hostile and skeptical about budgets. Then, budgets become

unpopular devises in planning and control. Employee resistance and hostility can be overcome by employee training regarding the nee for and the use of budgets.

2. *Attitude of Top Management*: The success of any budget depends upon the willing and enthusiastic support of top management. Unless the top management co-operates, budgetary control will be reduced to a ritual.

3. *Ideal Standards*: Budgets provide yardsticks for measuring performance. Hence, they should be realistic. Ideal or unattainable targets, both in quantity or in value, demoralize the people at work.

4. *Time Consuming Process*: The installation of an effective budgetary control system is a time consuming exercise. It involves few steps. (a) Floating the idea and setting the same at different levels of management. (b) Educate people through proper training and guidance about the expectations. (c) Implement budgets with the co-operation of all the people.

## 14.6 DANGERS IN BUDGETING

Usually budgetary control technique is used for planning and control. But sometimes, anxiety to deal with complete and detailed information through budgets may often give rise to new problems. Ultimately budgets become cumbersome, meaningless and unduly expensive. Some of the dangers in budgeting are briefly explained below.

1. *Over-budgeting*: Going down to the minute details and spelling out the limits of expenditure may deprive managers of needed freedom. Expenses are so budgeted sometimes the cost of budgeting may exceed the expenses controlled.

2. *Hinding Inefficiences*: Budgets have their basis to past experience. Certain expenditure was made in the past. Though it is not required at present, it may become a precedent to claim the same. Executives may take shelter under the pretext that it is an established precedent. Hence budgets become an umbrella under which inefficient management can hide.

3. *Inflexibility*: It is the greatest danger in budgets. Any unanticipated change that substantially affects the cost will render the budget obsolete. The utility of budgets comes down when the management has to operate with in the straight jacket of budget and yet face such events or changing conditions in real life.

## 14.7 SUMMARY

Budget defines the goals and means of obtain of goal and this will help in to attain the level of performance by the employees.

## REVIEW QUESTIONS

(1) What do you mean by management by exception.

(2) Explain the disadvantage in Budgetary.

❐

LESSON-15

# STANDARD COSTING

**STRUCTURE**



## 15.1 INTRODUCTION

The main objective of any firm, in these days of fierce competition, is cost control. Every firm is trying to minimize the cost of production through various methods. Standard costing is a tool and technique in the hands of Management for cost control purpose. But, determination of standards is not a simple task. The management should consider different aspects like capacity, efficiency, skills of workers, wastage etc., at the time of fixing the standards. Standard cost is a predetermined cost. It is used as a basis for comparison and cost control.

Standard costing is one of the most recently developed concept of cost accounting. It has been gaining popularity because historical costing failed to control costs. Historical costing data projects information only about the past. Using this data the management cannot take corrective steps at adequate level and in appropriate time. Moreover, it does not give suitable yardstick for the measurement of actual performance.

Modern industrialization process makes the manufacturing methods are repetitive and continuous and products are more or less homogeneous. The application of standard costing is relatively easy in such industries. Physical standards formed by the engineer have been transformed into standard cost which inturn have replaced actual costs in product costing. Standard costs are the logical outgrowth of the general use of performance standards which are found in most areas of business management. Every business enterprise develops cost estimates. Some thought and the effort should precede in the scientific determination of these estimates. Thus, standard costing constitutes efficient planning and controlling of costs.

Setting of standards is usually done by technical experts. One has to consider three important aspects at the time of setting standards. They are: (1) Past experience (2) Present position and future targets and (3) Future changes and challenges. Management cannot increase the firm's efficiency and profitability without sound knowledge in the above said areas.

## 15.2 TERMINOLOGY

The work 'standard' indicates some norm, specification or target. While some view as a reference point or bench mark, others treat it as a model or yeardstick for comparison. Standard costs are, therefore, predetermined and specific cost of each

manufacturing element i.e., material, labour and overhead. They establish desirable relationship between inputs and outputs. Therefore standards are performance expectations. That is why standard costing deals with the preparation and use of standard cost, their comparison with actual cost and the analysis of variance to their causes and points of incidence.

Blocker and Veltmer define the standard costs as "Pre-determined costs based upon engineering specifications and representing highly efficient production for quantity standards and forecast of future market trends for price standards, with a fixed amount expressed in dollars for material, labour, and overhead for an estimated quantity of production". Thus, the standard cost of a finished product is the composite total of specific standards relating to each material item, labour operation and different overhead costs. Hence, it is rightly said that standard cost is a planned cost of a product under current and anticipated conditions.

ICWAI defines standard costing as "the preparation and use of standard cost, their comparison with actual costs and analysis of variances to their causes and points of incidence."

DECOSTER & SCHAFER explains standard costs as costs which are attainable but their achievement requires that operations and activities are efficient.

ICWAI define standard cost as "a predetermined cost which is calculated from management's standards of efficient operation and relevant necessary expenditure".

Thus, standard costing is a figure which represents an amount that can be taken as a typical of the cost of an article/factor/service. Standard costing constitutes the efficient way to plan and control the cost of activities on the basis of predetermined cost.

### 15.3 STANDARD COST Vs ESTIMATED COST

Both are pre-determined costs. Estimated cost is, more or less, a reasonable assessment of what a cost will be. This is based upon loosely gathered information viz., guess work, opinions and averages. Estimated cost is based on the assumption that costs are more or less free to move. In simple, it means the best estimate of the cost conditions. Whereas a standard cost is a clear specification of what cost should be. This is based upon scientific study of data. They are safe for the measurement of performance. Any deviation of actual from the standard cost can be reasonably explained. Therefore, it is more reliable and useful instrument for cost control. To conclude, both standard cost and estimated cost are predetermined costs and they differ in degree only.

### OBJECTIVES OF STANDARD COSTING

i) Determining the production costs at each stage and for each component on the basis of engineering estimates and scientific evaluation.

ii) Comparing the actual costs with standard costs.

iii) Analysing the variances together with causes.

iv) Reporting to Management for taking appropriate action where necessary.

v) Providing yardstick to Management in respect of each cost component so as to reap the fruits of cost control.

## 15.4 SUMMARY

Standard costing is a cost which are attainable but their achievement requires that operations and activities are efficient. Estimated cost is based on the assumption that costs are more or less tree to move.

**REVIEW QUESTIONS**

(1) Define standard costing.

(2) Explain the objectives of standard costing.

❐

LESSON-16

# TYPES OF STANDARDS

**STRUCTURE**



## 16.1 INTRODUCTION

Standards may be developed on the basis of some criteria. Usually, they are related to performance levels. Conceptually, standards may be classified according to their degree of "tightness" and "looseness" in the purpose for which they are designed.

1. *Ideal Standards*: Ideal standard cost refers to estimates of cost under ideal or perfect or most favourable condition. The assumptions would be that there would be no wastage, on scrap, no idle time, no machine break-down and so on. Ideal denote absolute minimum cost that are possible under the best conceivable operating conditions. The primary advantage of these standards is that they can be used for relatively long period of time without adjustment. But, in reality, it is impossible to achieve ideal standards because factors like power breakdown and machinery breakdown are virtually beyond the control of management.

2. *Basic Standards*: They are also known as normal standards. They are ascertained on the basis of certain assumed levels of efficiency and other economic conditions. They are unaltered at least for a period of one year. It means with the passage of time, they need revision. The advantage is that they do not require frequent adjustments. They are useful to the management in planning and controlling.

3. *Historical Standards*: They owe their origin to past cost experience relating to production. In other words, they represent an average of actual costs under average conditions. The merit of these standards is that they summarise the results of good and bad period. As a result, they are bound to be loose and dangerous because they do not isolate controllable costs from uncontrollable costs. In a way, they are not standards but reference points reflecting the changes of conditions over a period of time.

4. *Expected Standards*: They are anticipated standards representing attainable levels for a given future period. They are widely used because they are consistent, realistic and capable of attainment. They provide incentive to improve performance and get the better out of adverse conditions.

5. *Current Standards*: They are purely meant for a short period of time. They are anticipated on the basis of current conditions. They are useful to the management in absorbing the changes in the market conditions.

## 16.2 ADVANTAGES

Modern managements are increasingly using the standard costing technique as a tool of controlling costs. It helps in ascertaining whether the operating are carried out in conformity with plants. If not, it assists the management in probing the reasons and initiating corrective action.

Standard costing has got all the advantages of predetermined costs. They are summarized below:

1. *Yardstick for Performance Evaluation*: Standard cost serves as a measure of comparison. Actual cost is compared with standard cost. This comparison reveals variances. They are further investigated to ascertain the real reasons for their occurrence. Thus, standard costs are used to compare and measure actuals and to analyse results.

2. *Reduction of Cost*: Variance analysis projects adequate attention on out of control areas. Once the management knows the weak areas, it may improve the methods through better combination of men and materials. Standards may encourage employees to attain efficient levels of performance.

3. *Simple Costing Techniques*: Standard costing reduces the paper work, forms and records because, standardization of products or jobs or operations or processes may facilitate easy flow of work without unnecessary and cumbersome clerical work.

4. *Facilitates Decision - Making*: Standards make available cost information for various decisions such as filling tenders, quotations, choosing between alternatives etc., Advanced information relating to consumption and utilization of resources before hand will enable the management to take vital decisions on cost aspects.

5. *Encourages Delegation of Authority*: Fixation of standards for each cost bottom. Once standards of performance is fixed, the individual manager is not only expected to attain the same but also accountable for its realization.

6. *Helps in Making Budgets*: Budgets are future production forecast. Standard costing reveals valuable data to the management for formulating and developing budgets. Suitable yardsticks are provided by the standard costing for a tight and more effective budgeting for succeeding years.

7. *Incentive to Employees:* Reasonable and attainable standards encourage the workers to reach the targets. Once the workers know the standards, they evince greater interest in the accomplishment of tasks. In the absence of recognized minimum standards of performance management cannot even punish/reward the poor/better/performers.

8. *Improves Productivity*: The process of setting standards involves the effective utilization of money, men, material and machines. This situation leads to economies to scale and thereby productivity is improved.

9. *Management by Exception*: This principle assumes that only those activities are worthy of management attention which fail to come up to minimum standards.

Standard costing provides yardstick for measuring actual performance and comparing with standards. Thus, it draws the attention of the management primarily in case of below and/or above standard performance.

10. *Cost Consciousness*: It creates an atmosphere of cost consciousness among executives, foremen and workers. Standard costing is a valuable tool in the hands of management in formulating prices and policies of various jobs/operations.

## 16.3 LIMITATIONS

Standards costs are not without their short comings. There are some limitations and objections for the use of standard costing technique as a valuable tool in the hands of the management. Knowledge of these limitations is highly essential in order to use this technique with great care to obtain maximum effectiveness.

1. *Practical Difficulties*: Standards are developed assuming certain hypothetical conditions. These conditions may not exist in reality. The degree of tightness or looseness in ascertaining the standards cannot be conveniently calculated.

2. *Revision is Difficult*: Owing to the change sin practical conditions, standards are to be revised. This process is both expensive and time consuming. Engineering estimates and other specifications have to be initiated a fresh. If revision is not done, then, standards become futile.

3. *Behavioural Consequences*: Arbitrary and unattainable standards tend to develop attitudes of resistance, a sense of despair and frustration among workers. That is why some companies are hesitating to try standard costing techniques in controlling operations/jobs/processes.

## 16.4 SUMMARY

Normally standards will be developed on the basis of some criteria like Performance levels. The main advantages of standards is it is a yardstick for evaluation. Similarly the limation of standard is Revision may be difficult while it is proves.

## REVIEW QUESTIONS

(1) Explain the various types of standards.

(2) State the advantage of standards.



❐

LESSON-17

# ESTABLISHMENT OF STANDARD

**STRUCTURE**



## 17.1 INTRODUCTION

The effectiveness of standard costing will ultimately depend upon the cost standard. Therefore, all relevant factors such as resources, technology, workers abilities and aspirations, degree of control etc. are to be considered. There are mainly four ways to determine the cost standard. (1) Engineering estimates (2) Observed behaviour and (3) Predicted behaviour and (4) Desired behaviour.

1. *Engineering Estimates*: They are mainly technical specifications of machinery and material that are used as inputs for producing a given output. Cost standards can be set only on the basis of such specifications.

2. *Observed Behaviour*: It is always related to past experience. If the conditions of the past have not changed and/or likely to continue in future, then, past experience acts as a reliable guide for the future. In other words, achievements of the past are practically considered as standards for future.

3. *Predicted Behaviour*: Changes in the conditions that have a bearing on the working of the firm, it anticipated in advance, may reasonably help in adjusting the past standards to suite present conditions.

4. *Desired Behaviour*: managements expectations, desires and ambitions will affect this functions. These standards must be so tuned so as to reflect this functions. These standards must be so tuned so as to reflect the thinking of management.

There may be several ways that are available to establish cost standards. There standards should be set at the predetermined level, if they are too high, there may be difficulty to reach and leads to demoralization. If they are set at low level, there may not be sufficient motivation among the employees to achieve the same. Hence, setting cost standards is basically a matter of judgement.

## 17.2 COMPONENTS OF STANDARD COSTS

There are three elements in any standard cost. They are

a) Standard direct material cost

b) Standard direct labour cost

c) Manufacturing overheads

An attempt is made to explain the above components in the following paragraphs.

a) *Standard Material Cost*: It directly depends upon price and quantity standards.

i.e. Standard direct Material cost = Price standard of direct material x Quantity standards of direct material

While developing the price standards of direct material; quality, freight charges and discounts available should be taken into account. In a similar way, normal loss of materials in the production process and the input-output relationships should be taken into considerations at the time of developing quantity standards.

b) *Standard Direct Labour Cost* This component of standard cost is computed by multiplying labour rate standards by labour time standards. Method of payment (time basis or piece basis), degree of skill and negotiations between Management and labour, must be considered at the time of fixing standard labour cost.

c) *Manufacturing Overhead Standards*: There is a basic difference between overhead standard and the other standards. While there is a functional relationship between production, material and labour, there is no such relationship between production and overheads. That is why manufacturing overheads standards are not in conformity with the production/output. Manufacturing overheads is not directly related to production in the same way, as direct material and labour.

### 17.3 PROCEDURE

The success of standard cost systems depends upon the reliability and accuracy of standards. All factors must be taken into consideration while setting standards. The strengths and weaknesses of the production department are particularly important for the development of scientific standards. Usually, most effective standards are set by industrial engineering department on the basis of careful study of all aspects relating to operation and production. Sometimes, past experience also matters in setting standards. A carefully developed procedure for establishing standards should be followed for reaping full advantage of standard costing. The procedure for establishing standards is briefly explained below:

1. The organisation is to be so designed that the level of authority is properly defined and clearly identified to each cost centre. Standard costing system gives maximum results when the organisation chart establishes clear links of authority between cost centres or sub-divisions.

2. The pre-requisite for establishing the standard costing system is the setting of physical as well as financial standards for material.

3. Similarly, standard cost of direct labour is to be determined on the basis of standard time and standard rate. It means that the working conditions must be standardized first so that all workers perform task under uniform conditions. Time study and motion study methods may be applied while developing standards for

labour costs. They consist of three elements, namely (a) Time necessary to complete the job, (b) skills of labour and (c) Rate paid.

4. All manufacturing charges which are not directly identified with the products are said to be factory overhead. Expenditures, like rent, insurance, power charges etc. should be accurately estimated and are to be fully recovered either on the basis of machine hours or labour hours. Determination of standard rates for recovery of factory overhead is a difficult exercise.

a) The first step in this regard is the preparation of factory overhead budget. Number of shifts, duration of time, services of the operating department, must invariably be taken into account at the time of preparation of the overhead budget.

b) The 2nd step is the determination of overhead rate. It must be realistic in the sense that over-head is fully absorbed into the product cost. Moreover, it should provide the best operating information on overheads to the management.

### 17.4 REVIEW OF STANDARDS

Standard costs are not permanent. They must reflect current position as closely as possible, last, they become out dated. The management should review the current situation and revise standards from time to time. It is a matter of necessity in these days of dynamic conditions. Failure to revise standards periodically may result in standards becoming unfair and unrealistic for evaluating worker's level of performance. Factors necessitating revision of standard cost is briefed as under:

i) Detecting all errors in ascertaining the current standards;

ii) Unexpected changes in the cost of either material or labour that have forced the present standards to become out dated;

iii) Substantial changes in the existing manufacturing process;

iv) Induction of new machinery;

v) Change of factory premises;

vi) Change in the pattern of working conditions. (Exchange from 2nd shift to 3rd shift).

When any one or more of the above changes occur, existing standards must be reviewed thoroughly. A typical policy as to the revision of standards must be developed by the Management so as to avoid constant revision because it would upset comparison.

### ACCOUNTING FOR STANDARD COST AND ANALYSIS OF VARIANCES

Once the standards are set, the next step is to determine an appropriate accounting method for recording costs. This accounting enables us to compare the actual costs with standard cost to obtain the variances. A good number of accounting methods are available for recording costs. It is upto the firm to choose an appropriate accenting method which it finds suitable to the firm. Variances are

principal outputs of the standard costing system. A detailed explanation of variance analysis is as under.

## 17.5 SUMMARY

There are four ways of determines the cost standard engineering standard is technical specification observed behaviour is related to past experience. The success of standard cost is based on reliability and accuracy of standards.

## REVIEW QUESTIONS

(1) Explain material cost.

(2) State the components of standard costing.

❐

LESSON-18

# VARIANCE ANALYSIS

**STRUCTURE**



## 18.1 INTRODUCTION

The difference between standard cost and actual cost is termed as 'Variance'. It indicates the divergence from some stipulated expectation. If the actual cost is less than standard cost, then, it is a sign of efficiency. This variance is termed as favourable on the other hand, if the actual cost is more than the standard cost, then, it is a sign of inefficiency and the difference is treated as unfavourable/adverse variance.

**ADVANTAGES OF VARIANCE ANALYSIS**

1. Variances indicate the overall efficiency of the organisation.
2. They also indicate the success or failure of the efforts of workers in attaining the standards.
3. They assist in more accurate estimating and budgeting for future.
4. It acts as a means of control and evaluation of each cost centre.

## 18.2 TYPES OF VARIANCES

There are three types of variances such as (a) Profit variance (b) Cost variance and (c) Sales variance;

a) Profit variance is the difference between the sales and cost variance.
b) Cost variance is the difference between the standard cast and actual cost.
c) Sales variance shows either changes in sales turnover or prices obtain for sales.

All the above variances should be calculated to derive the full benefits of standard costing.

The primary objective of variance analysis is to determine and investigate the causes of variances and to report to the management those situations which can be corrected or controlled. That is why variances can also be distinguished as (a) Controllable and (b) Uncontrollable.

From the view point of the controllability, the important variances identified are (a) Material Price Variance. (b) Material Usage Variance (c) Direct Labour rate variance and (d) Direct Labour efficiency variance.

Usually, variances relate to costs of manufacturing process. But, each cost is comprised of three elements i.e., (1) Material (2) Labour and (2) Overhead.

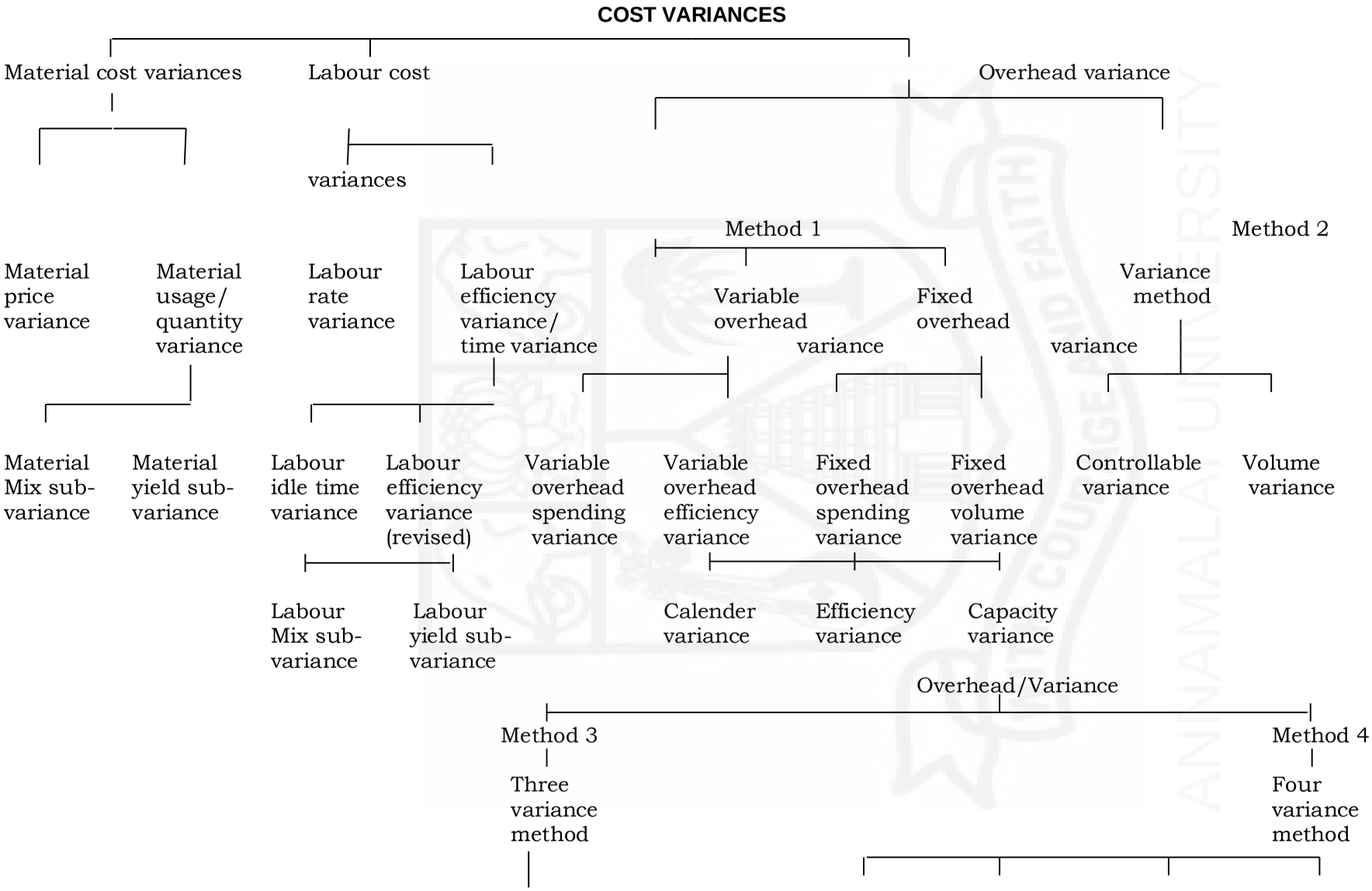
A detailed list of all types of variances is presented in the chart for a thorough understanding. Each variance can be calculated by using the formula stated against each item. It is also interesting to find the reasons for the occurrence of such variances at any time. This helps the management in taking corrective action in a planned way.

**STANDARD COST CARD**

The focal point of standard costing system is the preparation of standard cost card or sheet. It contains scientific estimates of predetermined cost of each unit of production under efficient operating conditions. It includes full details of quantities and prices of material and labour. It also covers the rate of apportionment of factory overheads. The details serve as a yardstick for measuring the actuals. The type and contents of standard cost card varies from firm to firm depending upon the requirements.

**SPECIMEN COPY OF STANDARD COST (OR) SHEET STANDARD COST CARD**

| | Cost per kg. | Quantity | Total cost | Cost per kg of output |
|---|---|---|---|---|
| Material | | | | |
| X | | | | |
| Y | | | | |
| Loss of Material in process standard material cost | | | | |


COST VARIANCES
Material cost variances
Labour cost
Overhead variance
variances
Method 1
Method 2
Material price variance
Material usage/ quantity variance
Labour rate variance
Labour efficiency variance/ time variance
Variable overhead variance
Fixed overhead variance
Variance method
Material Mix sub-variance
Material yield sub-variance
Labour idle time variance
Labour efficiency variance (revised)
Variable overhead spending variance
Variable overhead efficiency variance
Fixed overhead spending variance
Fixed overhead volume variance
Controllable variance
Volume variance
Labour Mix sub-variance
Labour yield sub-variance
Calender variance
Efficiency variance
Capacity variance
Overhead/Variance
Method 3
Method 4
Three variance method
Four variance method

| Spending variance | Efficiency variance | Capacity variance | Spending variance | Fixed variance | Variable efficiency variance | Capacity variance |
|---|---|---|---|---|---|---|

| | Cost per hour | Hours | Total cost | Cost per kg of output |
|---|---|---|---|---|
| Direct Labour | | | | |
| Skilled | | | | |
| Unskilled | | | | |
| | | | | |
| Factory Overhead | | | | |
| Variable | | | | |
| Fixed | | | | |
| Total Cost | | | | |

**STANDARD COSTING Vs BUDGETARY CONTROL**

Both standard costing and budgetary control have the common philosophy and aim of improving managerial control over expenditure. Both deal with the establishment of predetermined targets, measuring actual performances and comparing it with the target for control purposes. Usually both these systems are inter-related. They are not interdependent. A system of standard costing in conjunction with budgetary control is more useful to the management from the point of view of control of costs. However, there are some basic differences in between these two concepts. They are briefly explained below:

| STANDARDS | BUDGETS |
|---|---|
| 1. It is a unit idea. Because standard costing is meant for each unit product/ service | 1. It is a total idea in the sense that budgetary control is meant for each department section. |
| 2. Standards show that costs could be or ought be if desirable performance was attained. | 2. Budgets are mere statements of expected costs under normal conditions |
| 3. Standards emphasize the levels which costs should be reduced. | 3. Budgets emphasize cost levels beyond which they should not exceed. |
| 4. Usually, standard cover only manufacturing costs | 4. Customarily, budgets cover all departments of the company (i.e. from manufacturing to sales) |
| 5. All positive and negative variances are to be thoroughly investigated. | 5. Budget savings need not be investigated. |
| 6. Standards are generally set by Management Accountants in consultation with production engineers and executives | 6. Budget committee prepares budgets. |
| 7. Standards are developed primarily for control purpose | 7. Budgets are used for planning and coordination of various activities. |

**TABLE SHOWING MATERIAL VARIANCES**

| VARIANCE | FORMULA | SIMBOLOIC FORMULA | REASON |
|---|---|---|---|
| 1. Material Price variance | Actual quantity X (Standard Rate – Actual Rate) | AQ (SR – AR) = MPV | 1. Change in basic purchase price<br>2. Reduction of trade discount owing to purchase of smaller lots which may arise from<br>a. Restriction of supplied<br>b. Limitations of storage capacity<br>c. Wrong buying policy<br>3. Purchase of quality of material different from standard owing to<br>a. Non-availability of standard quality<br>b. Errors is buying<br>c. Change of manufacturing specifications<br>4. Failure to place contracts. |
| 2. Material cost variance | (Standard Rate X Standard Quality) – (Actual Rate X Actual Quantity) | MCV = (SR X SQ) – (AR X AQ) | 1. Differences between material quantity and prices |
| 3. Material usage variance | Standard Rate (Standard Quantity – Actual Quantity) | MUV = SR(SQ – AQ) | 1. Greater/lesser storage losses.<br>2. Greater/lesser handing losses.<br>3. Greater scrap or spoilage.<br>4. Low quality<br>5. Unskilled workers<br>6. Improper production procedure |
| 4. Material Yield Variance:<br>Note: When there is difference between standard input and actual input, standard yield is to be calculated for the actual | Standard per unit X (Standard output – Actual output for actual input)<br>(or)<br>Standard yield rate X (Standard yield – Actual | MYN = SYR (SY – AY) | 1. Less quality material<br>2. Negligence<br>3. Lack of proper supervision<br>4. Changes in prices<br>5. Change sin market |

| | | | |
|---|---|---|---|
| input and then the adjacent formula is to be applied to find out the material yield variance. | yield)<br>(or)<br>(Standard input – Actual input) X Average standard price input<br>(or)<br>(Standard Loss – Actual Loss) X Average standard and input price Algebraically<br>Yield variance = (Standard yield specified – Actual yield) X Standard cost per unit | | 6. Deficiency |
| 5. Material Mix variance | Standard Rate X (Revised standard quantity – Actual Quantity)<br>$= \frac{\text{Total actual Mix}}{\text{Totalstandard Mix}}$ X Standard Quantity<br>(or) | MYN = (SY – AY) X SC<br>MMV = SR (SPPAU – AQ)<br>SPPAU – Standard Proportion for actual usage<br>SPPAU = Revised standard quantity | 1. Changes in prices<br>2. Changes in market |
| 6. Material sub-usage | Standard Rate X (Standard Quantity – Revised standard Quantity) | MSUV = SR(SQ – RSQ) | |
| 7. Material usage other causes variance | Standard Rate X (Standard proportion for actual usage – Standard Quantity) | MUOCY = SR(SPPAU – SQ) | |

Reconciliation: (1) Material cost variance – Material Usage variance.

(2) Material Usage Variance = Material Mix + Material Sub-usage Variance

**TABLE SHOWING LABOUR (WAGES VARIANCES)**

| VARIANCE | FORMULA | SYMBOLIC FORMULA | REASONS |
|---|---|---|---|
| 1. Labour cost variance | Standard Labour cost – Actual Labour cost<br>(or)<br>Standard cost of actual production – Actual Cost | LCV = SC – AC<br><br>LCV = SCAP – AC | 1. Paying move wages<br>2. Time Waste |
| Note: When the actual output differs from standard output, standard labour cost of actual output is to be worked out and then the formula is applied. | | | |
| 2. Labour Rate variance | Actual working hours x (Standard Wages – Actual Wages) | LRV = AH (SW – AW) | 1. Shortage of highly or lower skilled jobs.<br>2. Difference in actual mixture of skills and wage rates<br>3. Awards of rate increase<br>4. Temporary vetention of labour surplus<br>5. Changes in the wage structure of the industry<br>6. Overtime in excess of standard. |
| 3. Labour efficiency volume variance | Standard Rate x (Standard Hours – Actual Hours paid)<br>(or)<br>Standard Wage x (Standard Hours – Actual Hours) | LEV = SR(SH – AHP)<br><br>LITV = SW (SH – AH) Reasons of efficiency variance | 1. In accurate selection of employees<br>2. Inadequately trained operatives<br>3. Labour turnover<br>4. Inferior working conditions<br>5. Overtime hours<br>6. Length of productive<br>7. Interruptions (or) delays in work |

| | | | |
|---|---|---|---|
| | | | 8. Changes in method of production<br>9 Inaccurate recording of time or output. |
| 4. Idle time variance | Standard Rate x (Actual Hours paid – Actual Hours worked)<br>(or)<br>Standard Rate x Hours lost<br>(or)<br>Idle hours x Standard hourly rate | LITV = SR(AHP – AHW)<br><br>LITV = SR x HL | 1. Materials not supplied in proper time<br>2. Lack of power<br>3. Machines are not working<br>4. Abnormal circumstances like strike, lock-outs and power failure |
| 5. Labour Mix Variance<br>(or)<br>Labour composite variance | Standard Rate x Standard Mix – Standard cost of Actual Mix<br>(or)<br>Standard Rate x (Revised Standard Hours – Actual Hours) | LMV = SCSM – SCAM<br><br>LMV = SR(RSH – AH) | 1. Recruit of expected Grade Workers more or less improportionally. |
| Note: In case where standards are revised and total standard time of labour differs from the actual time of labour then follow above formula. | | | |
| 6. Calendar variance | Hours lost in holidays x Standard labour rate | | 1. Wages paying in holidays without work. |
| 7. Labour efficiency sub-variance | Standard Rate x (Standard hours – Actual Hours worked)<br>(or)<br>Standard Rate x (Standard | LESV = SR (SH – AHW)<br><br>LESV = SR (SH – RSH) | |

| | | |
|---|---|---|
| | Hours – Revised standard hours) | |
| 8. Labour yield variance | Standard labour cost per unit x (Actual output – Standard output in actual hours)<br>(or)<br>Standard cost per unit x (Standard production for actual Mix – Actual production) | |

**TABLE SHOWING OVERHEAD VARIANCES**

| VARIANCE | FORMULA | FORMULA SYMBOLIC | REASONS |
|---|---|---|---|
| 1. Variable overhead variance | (Standard variable overhead – Actual variable overhead) | VOH. Variance = SVO – AVOs | 1. Change rate |
| 2. Expenditure variance | (Standard variable overhead on standard production – Actual variable overhead) | Expr. Variance = SVOSP – AVO | |
| 3. Efficiency variance | Standard Rate x (Standard quantity – Actual quantity) | Effy. variance = SR (SQ – AQ) | |
| Fixed overhead variances: Quantity/output Basis: | | | |
| 1. Fixed overhead variance | (Standard Fixed overhead – Actual fixed overhead) | FOH Variance = SFO – AFO | |
| 2. Expenditure variance | (Budget fixed overhead – Actual fixed overhead) | Expr. Variance = BFO – AFO | |
| 3. Volume variance | Standard rate x (Budget quantity – Actual Quantity) | Vol. Variance = SR (BQ – AQ) | 1. Time waste<br>2. Machine fault<br>3. Materials was not apply in proper time |
| 4. Capacity variance | Standard rate x (Budget | COP Variance = SR (BQ – SQ) | |

| | | |
|---|---|---|
| | quantity – Standard quality) | |
| 5. Efficiency variance | Standard Rate x (Budget quantity – Revised Budget Quantity) | Effy. Variance SR (SQ – AQ) |
| 6. Calendar variance | Standard Rate x (Revised Quantity – Revised Budget quantity ) | Col. Variance – SR (BQ – RBQ) |
| 7. Revised Capacity variance | Standard Rate x (Revised Budget quantity – Standard Quantity) | RCV = SR(RBQ – SQ) |
| Fixed overhead (Hours basis) | | |
| 1. & 2. Total fixed overhead and expenditure overhead Variance: Same formula as mentioned in Quantity/output basis | | |
| 3. Volume variance | Standard Rate x (Budget Hours – Standard Hours) | Vol. Variance = SR (BH – SH) |
| 4. Capacity Variance | Standard Rate x (Budget Hours – Actual Hours) | Cap. Variance = SR (BH – AH) |
| 5. Efficiency Variance | Standard Rate x (Budget Hours – Actual Hours) | Effy. Variance = SR (SH – AH) |
| 6. Calendar Variance | Standard Rate x (Budget Hours – Possible Hours) | Cal. Variance = SR(BH – PH) Announced more holidays |
| 7. Revised Capacity Variance | Standard Rate x (Possible Hours – Actual Hours) | RCV = SR (PH – AH) |
| 8. Idle time Variance | Standard Rate x Lost hours | |

**TABLE SHOWING SALES VARIANCES VALUE METHOD (OR) TURNOVER METHOD**

| VARIANCE | FORMULA | SHORT FORM |
|---|---|---|
| 1. Total sales value variance | Budget sales – Actual Sales | TSVV = BS – AS |
| 2. Sales Rate Variance | Actual Quality x (Standard Rate – Actual Rate) | SRV = AQ (SR – AR) |
| | (OR) | (OR) |
| | Standard Sales – Actual Sales | SRV = SS – AS |
| 3. Sales Volume Variance | Standard Rate x (Budget Quantity – Actual Quantity) | SVV = SR (BQ – AQ) |
| | (OR) | (OR) |
| | Budget Sales – Standard Sales | SVV = BS – SS |
| 4. Sales Quantity Variance | Budget Sales – Revised Standard Sales | SQV = BS – RSS |
| 5. Sales Mix Variance | Revised Standard Sales – Standard Sales | SMV = RSS – SS |
| **SALES MARGIN METHOD** | | |
| 1. Total Sales Margin Variance | Total Actual Margin – Total Budgeted Margin | |
| | (OR) | |
| | (Actual Sales – Standard Cost Sales) – Budgeted Margin | |
| 2. Sales Margin Volume Variance | (Actual units sold – Budgeted units) x Standard Margin per unit | |
| 3. Sales Margin Mixture Variance | Total actual quantity sold x (Standard Margin per unit of Standard Mix – Standard Margin per unit of actual Mix) | |
| **SALES VARIANCES PROFIT METHOD** | | |
| 1. Total Sales Profit Variance | Budget Profit – Actual Profit | SPV = BP – AP |
| 2. Sales Rate of Profit Variance | Actual Quantity x (Standard Rate of Profit – Actual Rate of Profit) | SRPV = AQ(SRP – ARP) |
| | (OR) | (OR) |
| | Standard Profit – Actual Profit | SP - AP |
| 3. Sales Volume Variance | Standard Rate of Profit x (Budget Quantity – Actual Quantity) | SVV = SRP (BP – AQ) |
| | (OR) | |
| | Budget Profit – Standard Profit | = BP – SP |
| 4. Sales Quantity Variance | Budget Profit – Revised Standard Profit | SQV = BP – RSP |
| 5. Sales Mix Variance | Revised Standard Profit – Standard Profit | SMV = RSP – SP |

Note: Cost of Expenses: If actual is more than the standard, it is adverse variance (A) and Vice versa
Production
Sales Quantity
Sales Price
Sales
Profit or Income

If actual is more than the standard it is favourable variance (F) and Vice-Versa.

**Problems**

1. The standard cost card shows the following details relation to material needed to produce 1kg of ground nut oil

   Quantity of groundnut 3 kg

   Price of groundnut Rs. 2.28 per kg

   Actual production date:

   Production during a week 1,000 kg

   Quantity used 3500 kg

   Price of groundnut Rs.3 per kg

Calculate:

1. Material Cost Variance
2. Material Price Variance
3. Material Usage Variance

**SOLUTION**

i. Material Cost Variance = (SP x SQ) – (AP x AQ)
= (2.28 x 3000) – (3.0 x 3500)
= Rs.6,840 – 10,500
= Rs.3,660 (Adverse)

ii. Material Price Variance = SP – AP x AQ
= Rs.(2.28 – Rs.3000) x 3500
= Rs.0.72 x 3500
= Rs.2520 (A)
= (SQ – AQ) x SP
= (3000 – 3500) x Rs.2.28
= Rs.1140 (A)

Note: Here SP = Standard price

SQ = Standard Quantity

AP = Actual price

AQ = Actual Quantity

Check: Material Price Variance – Material Cost Variance

Material Usage Variance

Rs.3,660 – Rs.2,520 = Rs.1,140/-

2. A factory specializes in the production of a single component for an imported equipment. The accounts for February 1989 showed

| | Rs. |
|---|---|
| Material used 1,000 units @ Rs.5-20 | 5,200 |
| Labour for 1,000 hours @ Rs.3-00 | 3,000 |
| Overheads for 1,000 hours @ Rs.2-00 per hour | 2,000 |

The output at the close of the month was 90 units of the components (completed) and 100 units for which materials were drawn fully but only 50% completed with reference to labour and overhead. Find out the average cost of completed units under each element of cost and in total.

| The standard cost of the product was | Rs. |
|---|---|
| Material (single item) | 5/- |
| Labour 1 hour @ Rs.3/- per hour | 3/- |
| Overheads for 1 hour @ Rs.2/- per hour | 2/- |

**CALCULATE THE**

(a) Material price variance

(b) Labour efficiency variance

**SOLUTION**

| | | |
|---|---|---|
| (a) Material Price Variance | = | (SP – AP) x AQ |
| | = | (Rs.5 – Rs.5-20) x 1000 |
| | = | Rs.200 (A) |
| (b) Labour efficiency Variance | = | (SH – AH) x SW |
| | = | (1000 hours – 950 hours) x 3 |
| | = | Rs.150 (A) |

3. Standard Chemical Company Limited produces a certain chemical

The standard material cost being:

40% Material 'X' at Rs.45/- per kg.

60% Material 'Y' at Rs.120/- per kg.

A standard of loss 10% is expected in production. During January, 200 kg of Material 'X' and 'Y' were mixed:

84 kg. Material 'X' at Rs.45/- per kg.

116 kg. Material 'Y' at Rs.118/- per kg. and produced 182 kg. of chemical.

Calculate the following variances for the month:

i) Material Price Variance

ii) Material Mixture Variance

iii) Material Yield Variance

**SOLUTION**

| i) Material Price Variance = (SP – AP) x AQ | Rs. |
|---|---|
| Material X (45 – 46) x 84 | 84 (A) |
| Material Y (120 – 118) x 118 | 232 (F) |
| Total Material Price Variance | 148 (F) |

ii) Material Mix Variance:

| Standard Material | Actual Material |
|---|---|

| | |
|---|---|
| X – 80 kg | X 84 kg |
| Y – 120 kg | Y 116 kg |
| 200 kg | 200 kg |

Since the actual weight of Mix and standard and weight of Mix do not differ, material mix would be found out with the help of the following formula:

Material Mix Variance = (SQ – AQ) x SP

| | | |
|---|---|---|
| Material X (80 – 84) x 45 | = | Rs.180 (A) |
| Material Y (120 – 116) x 120 | = | Rs.480 (F) |
| Material Mix Variance | | Rs.300/- |

iii) Material Yield Variance:

Formula: (Standard Loss – Actual loss on actual input) x Average standard Price

= (20 – 18) x Rs.100 = Rs.100 = 200 (F)

OR

(Actual output – Expected output) x ASP

= (182 kg – 180 kg) x Rs.100 = Rs.200 (F)

**WORKING NOTES**

i) Standard Quantity or Input of actual production Material x if 84 kg is output standard material x = 40 kg. if 182 kg is output Standard material

$$= \frac{40}{84} \times 182 = \frac{1820}{21}$$

$$\text{Material Y} = \frac{60}{110} \times 182 = \frac{1092}{11}$$

ii) Standard loss on actual input

$$= \frac{200 \times 10}{100} = 20 \text{ kg}$$

iii) Average Standard Price:

| | | Rs. |
|---|---|---|
| 60 | kg of Material X @ Rs.45/- | 1800 |
| 40 | kg of Material Y @ Rs.120/- | 7200 |
| 100 kg | | 9000 |

Normal Loss:

Loss 10 kg.

(100 – 10 = 90kg)

Average Standard Price per kg. $= \frac{900}{90}$ = Ra.100/-

4. In a factory the normal number of workers in a department is 50, the normal number of hour paid for a week are, 40, and standard rate of pay hour is Rs.0.80. The standard output of the department per hour, taking into account normal idle time is 20 units.

In a particular week, it was ascertained that 1,000 units were produced despite 20% of the time paid for was lost owing to break down of machinery and that actual rate of pay as Rs.0.90 per hour.

You are required:

i) To calculate the wages variance and

ii) To show its division into: Wage rate variance, abnormal idle time variance and labour efficiency variance.

**SOLUTION**

i) Wage Rate Variance = (SW – AW) x AH
= (0.80 – 0.90) x 2000
= 0.10 x 2000
= 200 (A)

ii) Labour efficiency variance = (SH – AH) x SW
= (2000 – 1600) x Rs.0.80
= 320 (F)

iii) Abnormal idle time = Idle time x Standard Wage
= Idle time = 20% of 2000 hours = 400 hours
= (400 x 0.80) = 320 (A)

iv) Wage Variance = (SH x SW) – (AH x AW)
= (2000 x 0.80) – (1600 x 0.90)
= 1,600

Note: Here SW = Standard Wage
AW = Actual Wage
SH = Standard Hours
AH = Actual Hours

5. From the following records of X Limited you are required to compute the:

i) Material Variances and

ii) Labor Variances

1 tonne of material input yields a standard output of 1 lakh units.

Number of employees is 200

The standard wage rate per employee per day is Rs.6/-

The standard price of material is Rs.20/- per kg. Actual quantity of material issued and used by production department 10 tonnes.

Actual price of material is Rs.21/- per kg.

Actual output is 9,00,000 units

Actual wage rate per day is Rs.6.50

Standard daily output for per employee is 100 units

Total number of days worked is 50

Idle time paid for and included above is ½ day.

**SOLUTION**

1. Material cost variance = (SQ x SP) – (AQ x AP)
   = (9 tonnes x Rs.20,000) – (10 tonnes x Rs.21,000)
   = (1,80,000 – 2,10,000) – Rs.30,000 (A)
2. Material Price Variance = (SP – AP) x AQ
   = Rs.(20 – 21) x 10,000 kg.
   = 1 x 10,000 = 10,000 (A)
3. Material usage variance = (SQ – AQ) x SP
   = (9 tonnes – 10 tonnes) x Rs.20,000
   = 1 x 20,000 = 20,000 (A)
4. Labour Cost Variance = (SW – AW) x AH
   = (Rs.6 x 10,000) – (Rs.6.50 x 9900)
   Rs.60,000 – Rs.64,350
   Rs.4350 (A)
5. Labour Rate Variance = (SW – AW) x AH
   = (Rs.6/- Rs.6.50) x 49,000
   = Rs.50 x 49,000 = 24,500 (A)
6. Labour efficiency variance = (SH – AH) x SW
   = (10000 – 9000) x Rs.6
   = 1000 x 6 = (F)
7. Idle time variance = Idle time variance x Standard Rate
   = 100 hours x Rs.6
   = Rs.600/-

**PROBLEM – 6**

Data relating to a job one thus Standard rate of wages per hour – Rs.10/-
Standard hours 300
Actual Rate of Wages per hour – Rs.12/-
Actual hours 200

You are required to calculate

1. Labour Cost Variance
2. Labour Rate Variance
3. Labour Efficiency Variance

**SOLUTION**

Standard Cost (SC) 300 x 10 = Rs.3000/-

Actual Cost (AC) 200 x 12 = Rs.2400/-

| | | |
|---|---|---|
| i) Labour Cost Variance (LCV) | = | SC – AC |
| | = | 3000 – 2400 = 600 (F) |
| ii) Labour Rate Variance (LRV) | = | AHP (LR – AR) |
| | = | 200 (10 – 12) = 400 (A) |
| iii) Labour Efficiency Variance (LEV) | = | SR (SH – AHP) |
| | = | 10 (300 – 200) = 100 (F) |

**PROBLEM – 7**

A company produces one product and the standard cost card contains the following information.

| | Budget | Actual |
|---|---|---|
| Output for the month | 2,000 units | 2,200 units |
| Fixed overhead | Rs.13,000 | Rs.11,000 |
| Variable overhead | Rs.12,000 | Rs.17,000 |

Calculate the overhead variances:

**SOLUTION**

i) Total overhead cost variance:

Actual units x Standard Rate – Actual Overhead Cost

2,200 units (Rs.6.50 + Rs.6,000) – Rs.13,000 + Rs.17,000

= Rs.2500 (A)

$$\text{Standard Rate} = \frac{\text{Standard overhead}}{\text{Standardoutput}}$$

$$\text{Standard Rate – Fixed} = \frac{\text{Rs.13000}}{\text{Rs.2000}} = \text{Rs.6.50}$$

$$\text{- Variable} = \frac{\text{Rs.12000}}{\text{Rs.2000}}$$

Actual overhead cost = Fixed overhead + Variable overhead

= Rs.13,000 + Rs.17,000 = Rs.30,000

ii) Variable overhead expenditure variance

= Budgeted Variable Overhead – Actual Variable Overhead

= Rs.12,000 – Rs.17,000 = Rs.5,000 (A)

iii) Fixed overhead expenditure variance

= Budget fixed overhead – Actual fixed overhead

Rs.13000 – Rs.13000 = Nil

iv) Variable overhead efficiency variance:

(Actual production – Budget production) x Standard Rate

(2200 – 2000) x 6/-

200 x 6 = Rs.1200 (A)

v) Fixed overhead volume variance

= (Budgeted output – Actual output) x Standard Rate

(2000 – 2200) Rs.6.50

200 x 6.50 = 1300 (F)

vi) Fixed overhead efficiency variance

= (Budgeted units/hours – Actual units) x Standard Rate

(2000 – 2200) x Rs.6.50

200 x 6.50 = Rs.1300 (F)

8. The following information relating to a products is given by a cost of card of the company, calculate overhead variances

| | Actual | Budgeted |
|---|---|---|
| Overhead | Rs.1,800 | Rs.2,000 |
| Period | 4,300 hours | 4,000 hours |
| Number of days | 22 | 20 |

Production – 425 units

Standard hours per unit: 10 labour hours

Standard overhead per hour = Rs.0.50

**SOLUTION**

1. Total overhead cost variance:

Standard Fixed overhead for actual production –

Actual Fixed Overhead for production

Actual Units x Standard Rate – Actual Overhead Cost

(425 units x Rs.5) – Rs.1,800

(425 2,185 – Rs.1800) = Rs.325 (F).

ii) Overhead expenditure variance:

Budgeted fixed overhead – Actual fixed overhead

Budgeted period x Budgeted Rate per hour – Actual overhead

Rs.2,125 – Rs.1,800 = Rs.325 (F)

(4000 x Rs.50) – 1800

Rs.2000 – Rs.1800 = Rs.200 (F)

iii) Calendar Variance:

Fixed budgeted overhead cost – (Standard Rate Budgeted)

Per hour x Working hours of the month

2000 – (0.50 x 4,400)

2000 – 2200 = 200 (F)

iv) Capacity Variance:

(Budgeted working hour for the month – Actual hours) x Standard Rate

(4,400 – 4,300) x 0.50

100 x 0.50 = 50 A

v) Overhead Efficiency Variance:

Budgeted overhead for actual production – Actual working hours for the month x Standard Rate per hour

(425 units x Rs.5) – (4,300 x 0.50)

(Rs.2,125 – Rs.2,150) = Rs.24 (A)

vi) Overhead Volume Variance:

Budget output – Actual output x Standard Rate per unit

(400 units – 425 units) x Rs.5

25 x 5 = 125 (F)

**VERIFICATION**

Total overhead variance = Expenditure variance + Volume variance

325 (F) = 200 (F) + 125 (F)

Volume Variance = Calendar variance + Capacity variance+ Efficiency variance

= 200 (F) = 50(A) = 25 (A) = 125 (F)

9. A group of workers usually consists of 10 Men, 5 Women and 5 boys in a factory. They are paid at standard hourly rates of Rs.1-20, 0.80, 0-70 respectively. In normal working week of 40 hours the group is expected to produced 1000 units of output.

In a certain week the group consisted of 13 Men, 4 Women and 3 boys. Actual wages was paid at the rate of Rs.1-20, 0-85, 0.65 respectively. Two hours were lost due to abnormal idle time and 960 units of output were produced. Calculate the labour variances.

**SOLUTION**

| | Standard | | | Actual | | |
|---|---|---|---|---|---|---|
| | Hours | Rate | Total Rs. | Hours | Rate | Total Rs. |
| Men | 400 | 1.25 | 500 | 520 | 1.20 | 624 |
| Women | 200 | 0.80 | 160 | 160 | 0.85 | 136 |
| Boys | 200 | 0.70 | 140 | 120 | 0.65 | 78 |

i. Labour cost variance: Standard Cost for actual output – Actual Cost

960 x 0.80 – 838 = 70 (A)

ii. Labour Rate Variance: AH (SR – AR)

| | | | | |
|---|---|---|---|---|
| Men | 520 (1.25 – 1.20) | = | 26.00 | (F) |
| Women | 160 (0.80 – 0.85) | = | 8.00 | (A) |
| Boys | 120 (0.70 – 0.65) | = | 6.00 | (F) |
| | | | 24.00 | (A) |

iii) Labour efficiency variance: SR (SH for actual output – AH worked)

| | | | | |
|---|---|---|---|---|
| Men | 1.20 (384 – 494) | = | 137.50 | (A) |
| Women | 0.80 (192 – 152) | = | 32.00 | (F) |
| Boys | 120 (0.70 – 144) | = | 54.60 | (F) |
| | | | 50.90 | (A) |

iv) Idle time variance = SR x Time Lost

| | | | | |
|---|---|---|---|---|
| Men | 1.25 x 26 | = | 32.50 | (A) |
| Women | 0.80 x 8 | = | 6.40 | (A) |
| Boys | 0.70 x 6 | = | 4.20 | (F) |
| | | | 43.10 | (A) |

v) Labour yield variance: Standard Labour | Actual output in actual hours | St. output cost per unit |

0.80 (960 – 1000) = 32.00 (A)

10. From the following records of the Appollo Bott. Nut manufacturing company, you are required to compute material and labour variances.

Input 100 kg. of Material yields at standard output of 10,000 units. Standards price per kg. of material Rs.20/- Actual quantity of material issued and used by production department -10,000 kg.

Actual price per kg. of Material Rs.21/-

Actual output – 9,00,000 units

Number of employees – 200

Standard wage rate per employee per day Rs.4/-

Standard daily output per employee – 100 units.

Total number of days worked – 50 days

Idle time paid for included in above ½ day (Half day)

Actual wage rate per day – Rs.4.50

**SOLUTION**

For standard output of 10,000 units, standard input 100 kg of material

For output of 9,00,000 units = $\frac{90,00,000 \times 100}{10,000}$ = 9000 kg standard input

| | | |
|---|---|---|
| 900 x 20 = | Rs.1,80,000 | Standard Cost (SC) |
| 1000 x 2 = | 2,10,000 | Actual Cost (AC) |

i) Material Cost Variance = SC – AC

= 1,80,000 – 2,10,000

= 30,000 (A)

ii) Material Price Variance = AC (SR – AR)

= 10,000 (20 – 21)

= Rs.10,000 (A)

iii) Material Usage Variance = SR (SQ – AQ)

= 20 (9000 – 10,000)

= Rs.20,000 (A)

iv) Material Yield Variance = SYR (SY – AY)

= 0.20 (10,00,000 – 9,00,000)

= Rs.20,000 (A)

**LABOUR VARIANCES**

For Standard output of 1000 units One man-day

For output of 9,00,000 units – ?

$\frac{9,00,000}{100}$ = 9000 Man–days

(SC) Standard Cost = 9000 x 4 = Rs.36,000/-

| Actual Cost (AC) = 200 x 50 = 10,000 hours at Rs.4.50 | Rs. 45000 |
|---|---|
| Actual Man-days paid 200 x 50 | 10000 |
| Less: Idle time 200 x ½ day | 100 |
| | 9900 |

i) Labour Cost Variance = SC – AC

= 36000 – 45000 = Rs.9000 (A)

ii) Labour Rate Variance = Actual days paid (SR – AR)

= 10,000 (4 – 4.50) = 5000 (A)

iii) Labour efficiency Variance = SR (Standard days – Actual days paid)

= 4(9000 – 10,000)

= Rs.4000 (A)

**VERIFICATION I**

LCV = LRV + LEV

9000 (A) = 5000 (A) + 4000 (A)

Note: Due to difference between the actual days paid and Actual days worked, Labour Idle Variance and Labour efficiency sub-variance will arise and these are calculated as follows:

iv) Labour Idle time Variance = SR x No. of days lost

4 x 100 = Rs.400 (A)

v) Labour efficiency sub – variance

= SR (Standard days – Actual days worked)

= 4 (9000 – 9900) = Rs.3600 (A)

**VERIFICATION II**

LEV = LITV + LESU

4000 (R) = 400 (A) + 2600 (A)

**VERIFICATION III**

LCV = LRV + LITV + EESV

9000 (A) = 5000 (A) + 400 (A) + 3600 (A)

## 18.4 SUMMARY

The difference between standard cost and actual cost is termed as variance. The variance analysis and indicate the efficiency of the organizations profit variance will tell the difference between sales and cost variance.

**REVIEW QUESTIONS**

(1) Define variance analysis.

(2) How will you prepare the standard cost card.

❐

LESSON - 19

# EVOLUTION OF COST AUDIT

**STRUCTURE**



## 19.1 INTRODUCTION

Audit function deals with need for protecting the shareholders interest. It refers to verification of the corrections of cost accountants, cost reports cost data, and other cost records.

## 19.2 EVOLUTION OF AUDIT FUNCTION

The term 'audit' was derived from 'Latin work' 'audire'. I means learning. Originally auditor was appointed by the business-men to detect errors and frauds in accounting moneys Luca Paciolo, (Italy) who suggested double-entry book-keeping for accounting business transactions, has also successfully explained the functions and responsibilities of an auditor. The audit function has undergone a good number of changes with the advent of industrialization. Reasons for the development of audit functions are summarized below:

i. Emergence of company form of organisation to carryout economic activities.

ii. Need for protecting the shareholders' interest.

iii. Global activities of modern corporations and the need for constant vigil.

iv. Increasing role of public financial institutions through lending huge sums to companies.

v. Adjustment of errors

vi. Checking malpractices and manipulation.

vii. Legislation making 'audit' compulsory.

Auditing is an age old art in India. Kautilya, in his book 'Arthasastra' specifically highlightened the need for adequate checks over Government spending. Even modern audit was made statutory in India way back in 1913. The Chartered Accountants Act, 1948 and Companies Act, 1956 have clearly dealt with the qualifications, functions and responsibilities of an auditor. Statutory audit in India refers to systematic examination of books of accounts to find out whether they reflect true and fair picture of the business concern or not.

**GROWTH OF COST AUDIT**

Due to the growth in the volume of operations, business houses and corporations started keeping separate sets of accounts for cost information. Cost records help the management in taking timely decisions since they help in

ascertaining costs and prices. It is natural therefore that they should also be subjected to audit. This sort of independent examination and verification of cost records help the management in taking certain crucial decisions, viz., make or buy decisions, cost reduction programmes, value analysis etc., It is immaterial whether such audit is conducted by internal staff or by professional auditors. Cost audit in India is unique in nature. For the first time in the world cost audit is made compulsory only in India. The Companies (Amendments) Act 1965 empowered the Government of India to enforce cost audit in any industry which it deems fit.

**DEFINITION OF COST AUDIT**

The Institute of Cost Management Accountants, London defines cost audit as "The verification of cost accounts and a check on the adherence by the cost accounting plan". It comprises mainly two aspects:

i. Verification of the corrections of cost accounts, cost reports, cost data and other cost records.

ii. Thorough examination of these records to ensure that they adhere to the accounting principles, plans, procedure and objectives.

Like financial audit, cost audit is also an attest function professionally performed by qualified and independent authority. Cost audit is gaining popularity with the increasing complexities in competitive environment faced by the modern corporations. Cost audit, in simple, refers to the examination of cost accounting records in a detailed way to certify the worth of cost incidence at every stage. Hence it has become effective tool of control in the hands of the management for protecting the interests of share holders, consumers and the Government.

## 19.3 ASPECTS OF COST AUDIT

There are two aspects to the cost audit function viz.,

Propriety audit or Higher audit.

Efficiency audit or performance audit.

1. *Propriety audit*: It mainly deals with the audit of executive plans and actions which have a bearing on company's expenditure and finances. In simple, it is an audit of management actions and decisions. It tries to judge the soundness of managerial decisions in avoiding wastage of expenditure. It reviews the future of present decisions and suggests alternatives to get the best results.

2. *Efficiency audit*: It deals with the flow of resources. This audit ensures the application of a basic economic principle i.e., whether the investment made in a particular cost centre is worth remunerative. Therefore, it emphasizes on matters relating to cost control, inventory control, productivity, profitability, utilization of installed capacity etc. It may suggest ways and means for the improvement of cost data and other related matters. Its primary concern is to evaluate the plans and results so as to ensure that they have been carried out efficiently. The main aim of this exercise is to see that the capital invested in the business is getting maximum yield.

## 19.4 TYPES OF COST AUDIT

Cost audit is initiated for different purposes. They are explained below:

i. *Cost Audit for Management*: The aim of this audit is to verify the reliability and acceptability of cost data and help the management in taking appropriate decisions.

ii. *Cost Audit for Customers*: Customers must be well protected from exploitation. To safeguard the interest of customers, some producers may charge reasonable profit to the cost in deciding the price. This kind of cost audit helps the accurate ascertainment of cost for implementing cost plus pricing.

iii. *Cost Audit by Government*: The Government may order for cost audit in respect of some industrial undertakings either for the purpose of granting protection or for giving subsidies. Cost audit explores the total cost details and help the industrial units in securing necessary support in a genuine manner.

iv. *Cost Audit by Trade Associations*: Sometimes a trade association may ask its member units to submit the cost information for thorough examination to keep the prices as a particular level. Cost audit provides full details on the cost data, level of performance, utilization of capacity etc., of the member units.

v. *Statutory cost Audit:* Section 233(B) of the Companies Act made it compulsory in respect of certain companies to conduct cost audit. This is known as statutory cost audit.

### KINDS OF OTHER AUDITS

i. *Financial Audit*: Every company which is incorporated under the Companies Act 1956 shall audit the books of accounts compulsorily. That is why it is also known as statutory audit. It certifies the true and fair picture of operating results of the company through its books of accounts.

ii. *Internal Audit*: It is an independent appraisal activity within the organisation. It is a continuous audit conducted by qualified accountants who are normally employee of the company. This internal audit ensures proper working of internal control system. It checks misappropriation of funds. It is carried out throughout the year.

iii. *Operational Audit*: Now-a-days business is done by large corporations in a big way. Thus it necessitates continuous audit of operations. A team of engineers, accountants and internal auditors constantly keep vigil over the total flow of operations of the company.

There is neither need for rule that a single company should try all the above kinds of audits. It is upto the company to go for a given type of audit depending upon the needs. Out of all the audits, cost audit is gaining momentum since it help the management in a great way.

**DISTINCTION BETWEEN COST AUDIT AND FINANCIAL AUDIT**

| | **COST AUDIT** | **FINANCIAL AUDIT** |
|---|---|---|
| 1. *Coverage:* | Cost audit is mainly concerned with cost aspects of accounts | Financial audit is concerned with financial aspects of accounts. |
| 2. *Purpose*: | It suggests ways and means, to avoid wastage and to maximize profits. | It certifies whether the accounts give true and fair picture of operating results of a given company. |
| 3. *Job*: | Cost auditor's job in the factory. | Financial auditor's job is in office. |
| 4. *Service*: | It is mainly concerned to serve the interest of management. | It is mainly concerned to serve the interest of shareholders. |
| 5. *Duration*: | It is undertaken only for a particular period and that only in respect of some companies. | It is conducted every year in respect of all companies. |
| 6. *Compulsory* | It is compulsory in respect of companies notified u/s 209 (d) of the companies act. | It is compulsory in respect of all companies. |
| 7. *Report*: | A copy of the report is submitted to Company Law Board. | Report is submitted to shareholders. |

## 19.5 SUMMARY

Audit deals with the detection of errors and travels with the help of a special persons called as Auditor. Cost Audit means verification of cost accounts.

## REVIEW QUESTIONS

(1) Define Cost Audit.

(2) Explain the different types of cost audit.

❐

LESSON - 20

# FUNCTIONS AND OBJECTIVES OF THE COST AUDIT

**STRUCTURE**



## 20.1 OBJECTIVES

1. The main function of the Cost audit is the verification of the cost accounting records viz., the accuracy of the cost accounts, cost reports, cost data and the costing techniques. The cost audit checks all types of transactions relating to cost in order to ascertain their accuracy and also to ensure that cost accounting plans are carried out carefully and efficiently.

2. Cost audit establishes the accuracy of costing data. This is done by verifying the arithmetical accuracy of cost accounting entries in the books of accounts.

3. Cost audit serves the interests of the management by projecting unworthy expenditure. The cost auditor submits his audit report to the Company and Company Law Board.

4. Cost audit suggests ways and means to eliminate wastage thereby contributes to profits.

5. It helps to management in taking correct decisions on certain important matters viz., determining the actual cost of production, cost of closing stock etc.

6. It evaluates the general working of the costing department of the organisation and makes suggestions for its improvement.

7. It checks the correctness and reliability of the cost accounts. It also detects errors, frauds and malpractices in the existing system.

8. It reveals the errors and omissions and give suggestions to remove the same.

9. It provides accurate information relating to all cost aspects to the management for fair pricing policy.

10. It reduces the detailed checking of all transactions by the external auditor. It eases out the work-load of Financial Auditor.

11. It ensures that Cost accounting principles are governed by the management objectives and the same are strictly adhered to in practice.

Cost audit should examine each aspects of cost incidence to project a fair and free opinion about the working of the company. It gives valuable suggestions to the

management for the smooth and effective functioning of the company. The report of cost audit must be precise, concise and clear.

## 20.2 ADVANTAGES AND DEMERITS OF COST AUDIT

Cost audit confers many socio-economic benefits. All parties interested in business are immensely benefited. The important advantages of cost audit are briefly explained as under.

1. *Improves Performance*: Cost audit reveals the strengths and weaknesses of the internal control system. It checks the cost books and suggests corrective action. This inturn tones up the smooth functioning of the company and increases productivity and efficiency of the organisation.

2. *Assists Financial Audit*: Cost audit aims at correct valuation of closing stock of raw material, work-in progress and finished goods. It also evaluates rates and usages of different components of cost. The work of financial audit is generally facilitated by cost audit. The financial auditor can safely depend upon those aspects which have been verified by the cost audit.

3. *A Desirable Basis of Contracting*: Cost audit report provides a highly desirable basis to Government and public agencies for entering into Rate Contracts, their negotiation and termination. This is particularly true in respect of cost plus contracts whereas agreed profit is added to the actual cost of production in deciding the price.

4. *Indicates Centres of Excessive Cost*: It reveals facts about the centres or divisions where costs are excessive when compared to budgets, standards or operating results of the other firms. Management may initiate corrective steps.

**(5) Fair Pricing Policy**

Once the true cost of production has been computed through the cost data, a fair price structure can be built by the firm. This kind of exercise is necessary in respect of controlled items.

(6) *Intra and Inter-firm Comparisons*: Cost audit further enables comparison of a firms' current operating data with that of the past and also with the data of other firms within an industry or a group. This technique goes a long way in suggesting the areas where corrective action is called for by a firm.

The society by and large is benefited by cost audit since it helps in removing inefficiency, wastage and under-utilisation of valuable resources like money, material and land. If a company can run effectively with the help of cost audit, it can offer products services at reasonable cost to the members of the society. This cost audit indirectly helps our society so as to reap the fruits of low cost operation of successful companies.

## 20.3 BENEFITS TO THE MANAGEMENT

### (1) BENEFITS OF COST AUDIT

(1) Cost audit gives reliable data for managerial decisions. (2) It helps management to regulate the production. (3) It detects the errors, frauds, inconsistencies, irregularities, and omissions; and then offer suggestions for

smooth functioning of the companies. (4) It reduces cost of production through plugging loopholes relating to wastage of material, labour and overheads. (5) It can fix the responsibility of an individual wherever irregularity or wastage is found. (6) It improves efficiency of the whole organisation through checking and verification of routine procedure and methods. (7) It helps in comparing actual results with budgeted and points out the areas where management action is more wanted and essential. (8) It also enables comparison among different units of the factory in order to findout the profitability of the different units. (9) It creates cost consciousness among employees and this makes them efficient and alter at work.

**(2) BENEFITS TO THE SHAREHOLDERS**

(1) Cost audit ensures that proper records are maintained viz., purchases, utilization of materials, expenses, wages and overheads etc. So it becomes easy to shareholders to know wherever the company is working efficiently and economically. (2) It enables shareholders to understand whether or not they are getting a fair return on their investments. (3) It reveals a true picture of company's state of affairs. It tells whether the investment in plant, equipment and other resources is being properly utilized or not.

**(3) BENEFITS TO THE GOVERNMENT**

(1) Cost audit assists the "Tariff Board" in deciding whether tariff protection should be extended to a particular industry or not. (2) It helps in ascertaining the need for granting any subsidy to develop any industry ex: Fertilizers. (3) It provides reliable data to the Government for fixing up the ceiling prices of the various commodities and to curb profiteering by the manufacturing concerns. (4) It assists Government to take necessary measures and steps to improve the efficiency of sick industrial units. (5) It also reveals the fraudulent intentions of the management. (6) It enables the Government to ascertain the cost of work under 'Cost Plus Contract'. (7) Cost audit may be helpful to authorities in levying tax or duty on the cost of finished goods, and (8) Cost audit helps in settlement of trade disputes of the companies.

**COST AUDIT UNDER THE COMPANIES ACT**

Two new amendments have been made (Claused of Sec 209 and Clause b of Sec 233) to the Companies Act, 1965 in connection with cost audit. They are summarized below:

**SECTION 209 (d)**

Every company shall keep proper books of account, relating to cost data at its registered office. The Central Government acquired powers to order cost audit in any one of those companies which are required to maintain cost accounts under section 209 (d). These companies are usually engaged in production, processing or mining activities etc. But, it should be noted that all such companies which are engaged in such types of business are not subject to cost audit but only those companies which may be specifically ordered by the Central Government will have to get their cost accounts audited.

**SECTION 233 (b)**

Under section 233 (b) of Companies Act, 1956, the Central Government may direct audit of cost accounts by a Cost Accountant within the meaning of Cost and Works Accountants Act, 1959. Cost audit is ordered only on selective basis and becomes statutory requirement only when Central Government orders such audit in respect of a given Company. This follows, that though maintenance of cost accounts by companies covered in section 209 (1) of the Companies Act 1956, is a continuous affair, its audit under section 233 (b) is not a regular annual feature unless so specified by the Government.

**QUALIFICATIONS OF A COST AUDITOR**

As per section 233(b) of the Companies Act, 1956, a cost auditor must be a Cost Accountant within the meaning of Cost and Works Accountants Act, 1959. But after the amendment to the Companies Act in 1974, a Chartered Accountant possessing the prescribed qualifications have been permitted to do cost audit only for such period is notified by the Central Government if the Central Government feels that sufficient number of Cost Accountants are not available to conduct cost audit.

**APPOINTMENT, POWERS, DUTIES AND LIABILITIES OF COST AUDIT**

According to Sub-Section (2) of the Section 233 (B) of the Act, Cost auditor shall be appointed by the Board of Directors of the Company with prior approval of the Central Government. At present, only a cost accountant within the meaning of the Cost and Works Accountants Act, 1959, can be appointed as a cost auditor. The cost auditor will enjoy the same rights and powers which can be enjoyed by an auditor appointed under section 227 (1) of the Companies Act. He has to submit the report to the Central Government. A copy of the report can also be sent to the Company. It may be noted that a person appointed under section 224 of the Companies Act as an auditor of the company cannot be appointed or reappointed to conduct cost audit of the company. The qualifications and disqualifications prescribed for a statutory auditor under section 226(3) and (4) are also applicable to a cost auditor. The cost auditor should be independent, detached and impersonal in his reporting. He is expected to carryout his audit work by applying reasonable skill and care. Individuals in their capacity as practicing cost accountants are eligible, so that they can take a detached and impartial view of the state of cost affairs. A person who has been appointed as a cost auditor by a Company shall, within 30 days of the receipt of the intimation, inform the Registrar of Joint Stock Companies in writing that he has accepted or refused to accept the appointment.

Regarding the powers and duties, Section 223 B (4) lays down that he enjoys the same powers and duties as given in subsection (1) of 227. he shall make his report to Company Law Board and also to the Company.

**COST AUDIT PROGRAMME**

An auditor should keep in view the following factors while carrying out cost audit programme for any company.

(1) Objects of cost audit; (1) The organizational details of costing system employed. (3) The efficiency of internal control system in operation. (4) Managerial decisions taken and their alternatives.

Above points will help the auditor in arranging and distributing the audit work among the various members of the audit team.

## 20.4 COST AUDIT PROCEDURE

Companies Act has not laid down the procedure in which the cost audit is to be conducted by the cost auditor. However, the Central Government may issue instructions regarding the points to be covered by the cost auditor from time to time at the time of appointment of the cost auditors. A cost auditor follows more or less the same procedure as the financial auditor. An audit programme is laid down and observed. A cost auditor should pay special attention to the following books and records.

1. *Records of Material*: First, the cost auditor examines all type of material records and ledgers, books and vouchers. The cost auditor should compile the data relating to raw material. He should also enquire whether the minimum quantity or the ordering level has been fixed so that orders for raw material follow in time to avoid shortage of raw material. He should also examine the system of inviting tenders or quotations by the purchasing department. He should check the stores ledger with the help of goods received book or delivery notes. He should vouch the payment of cash made to the suppliers of raw materials with the help of material received notes. Any wastages in storage, transits or for any other reasons should be shown separately. He should examine the procedure of purchase, issue, inspection of materials and return by sale of scrap, obsolete and surplus materials.

### LABOUR RECORDS

The cost auditor should see that a proper system should be followed for recording the attendance of workers at the main gate of the factory and in the respective departments. If the company pays wages on piece rate basis, he should compare the piece work cards of the workers in the stock register and wage sheets. He should look into the system of overtime work put in by the workers and the payment made thereof. He should check the calculations relating to wages, salaries, overtime payment and bonus etc., and study payroll accounting and procedure of wage disbursements among workers. He should also calculate the idle time of workers and impact on the efficiency. He should compare the standard performance and efficiency of labour with the actual performance. He helps management in taking vital future decisions relating to payroll.

### RECORDS OF OVERHEAD CHARGES

The cost auditor should examine the overhead expenses like power consumed, rent and salaries etc., to ensure that proper allocation has been made thereof to the jobs concerned. He should also examine the overheads relating to manufacture, administrative, selling and distribution activities. It will enable him to know whether overhead charges have been properly and correctly allocated to each job or not. He should see that allocation of overhead expenditure between finished and unfinished products is based on correct principles. He should check that indirect

actual expenditure does not exceed budgeted or standard expenditure and that any variation in this area is satisfactory explained and accounted for.

**DEPRECIATION**

The cost auditor should examine the Company's depreciation records. He should also check:

a) the original cost of each asset

b) the date of purchase

c) additions and improvements during the year

d) the rate of depreciation

e) the total amount of depreciation charged for each asset.

The rates of depreciation on the assets of different department should be in accordance with section 205 (2) of the Companies Act. He should also see that the rates of depreciation adopted year after are followed consistently. If the company has not determined depreciation for each department separately, then, he takes total depreciation on the basis of the predetermined percentage.

**WORK-IN-PROGRESS**

The work which has not been completed at the time of preparation of the balance sheet is known as work-in-progress. In order to find out the value of this asset on the date of the balance sheet, all expenses incurred directly or indirectly should be debited. The cost auditor is to satisfy himself with the basis on which work-in-progress has been valued. He should compare the overhead charges used with the actual rate for that year. He should see that the total of work-in-progress is not disproportionate to the value of finished goods. He should see that there has been no under valuation or over valuation of the opening work-in-progress. If it is so, it leads to either over statement or under statement of actual profits.

**STORES AND SPACE PARTS RECORD**

The cost auditor should check the records of the spares and stores which are required for manufacturing purposes in order to find out the date of receipt, issue and balances; and their proper valuation. He should verify the value of issues and balances of stores and spare parts with the purchases records. He should verify the existence of stores and spare parts by personal inspection and should compare the balance with the stores stock record. The loss on account of breakage, wastage transist or otherwise should be shown separately. The systems of dealing with such wastage or loss in the calculation of costs of spare parts and stores should be shown in the cost records by the way of footnote. In case of those items which have become obsolete, they should be written off. Suggestions to contain the surplus stocks should be made in the report.

**COST AUDIT REPORT**

According to section 233 B of the Companies Act, the cost auditor has to submit his report to the Central Government in the prescribed form and has to forward a copy of the report to the company concerned, but not to members. If the auditor's report contains any reservation or qualification, the company must

furnish to the Central Government full particulars and explanation on every reservation or qualification within 30 days of the receipt of such a report. The Central Government after considering the cost auditor's report may ask for any information and explanation from the company within prescribed time.

According of the Cost Audit (Report) Rules, 1971, the cost auditor should submit his report to the Central Government in the prescribed form within 120 days from the closing of the financial year of the company, (to which the cost audit report relates). The cost auditor should give a fair and true opinion about the working of the company. He should not hesitate to report irregularities and acts of omission and commission which have come to his notice. His report must be self-explanatory simple and clear.

The important aspects of the cost audit are given below:

1. General Information
2. System of cost accounting
3. Financial position of the company
4. Production particulars
5. Process of manufacture
6. Raw material
7. Fuel and power
8. Wages
9. Stores and spare parts
10. Depreciations
11. Overhead charges
12. Sales
13. Abnormal expenditure and
14. Royalty and Technical aid

In addition to the detailed information in regard to the above points, the cost auditor has to express his own opinion and conclusion to the following aspects:

a) What matters appear to him as wrong, in principle,

b) Inefficient use of company's fund.

c) Negligence on the part of the company's officers and other employees resulting in increase in the cost of production.

d) Contracts and agreements, if any, between the Company and other parties which had resulted in heavy loss.

e) Factors responsible for loss of production and waste.

He should also make his suggestions and recommendations in order to improve the overall working of the company by ensuring further utilization of production and improved inventory policies. All aspects of cost audit shall be duly authenticated by the cost auditor.

## 20.6 SUMMARY

The main function of cost audit is verification of data and it will give accuracy. Cost audit will help management by projecting unworthy expenditure cost audit will improve the performance.

**REVIEW QUESTIONS**

(1) What are advantages of cost audit.

(2) Explain the cost audit procedure.

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