



NETAJI SUBHAS OPEN UNIVERSITY

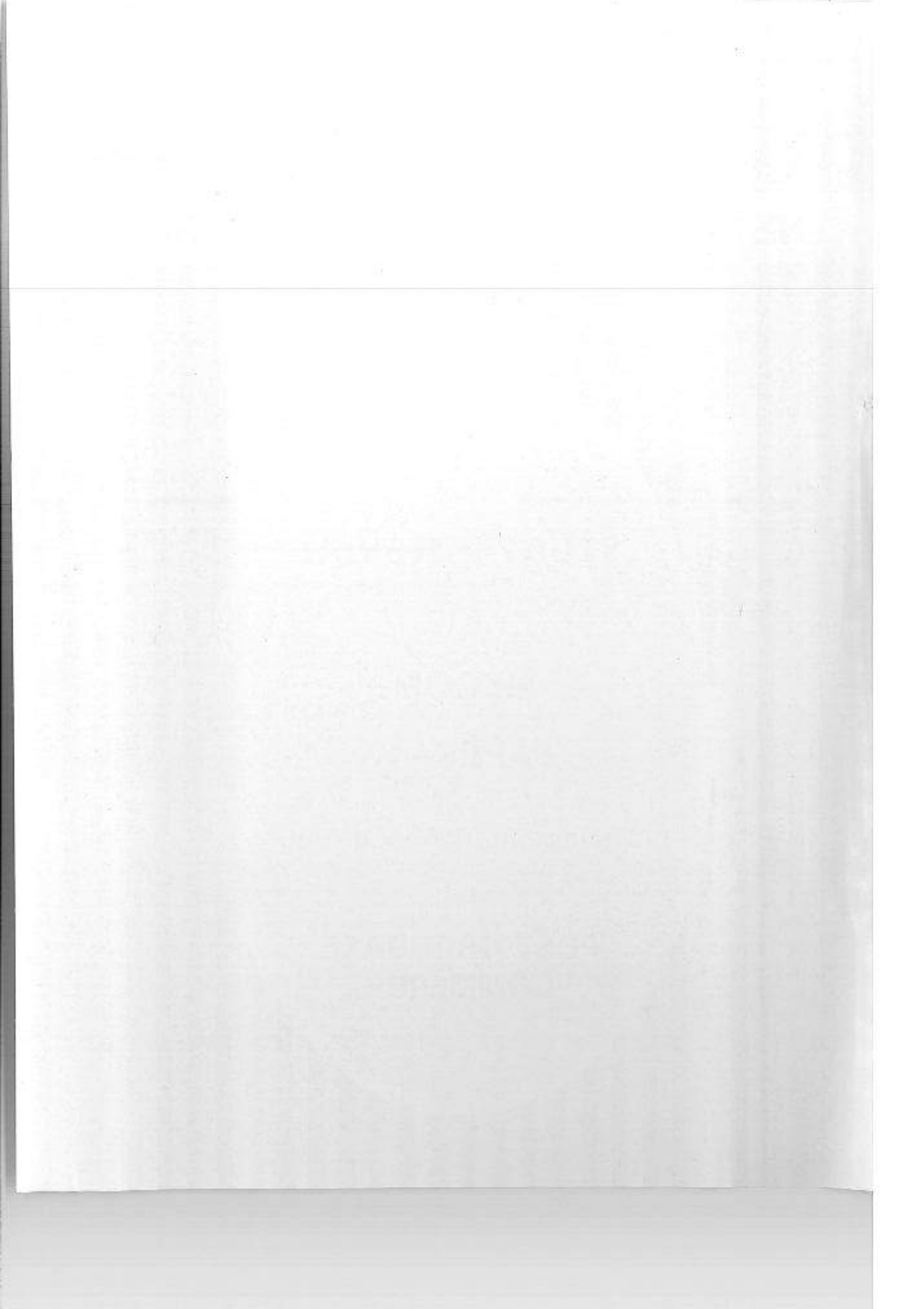
STUDY MATERIAL

M. COM.

PAPER - 17

Management Accounting

**POST GRADUATE
COMMERCE**



PREFACE

In the curricular structure introduced by this University for students of Post-Graduate degree programme, the opportunity to pursue Post-Graduate course in Subject introduced by this University is equally available to all learners. Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely in keeping with the objectives of open education which does not believe in artificial differentiation.

Keeping this in view, study materials of the Post-Graduate level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis.

The accepted methodology of distance education has been followed in the preparation of these study materials. Co-operation in every form of experienced scholars is indispensable for a work of this kind. We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing and devising of proper lay-out of the materials. Practically speaking, their role amounts to an involvement in invisible teaching. For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other.

The more a learner would seriously pursue these study materials the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self-learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University.

Needless to add, a great part of these efforts is still experimental—in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these to admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned.

Professor (Dr.) Subha Sankar Sarkar
Vice-Chancellor

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POST GRADUATE : COMMERCE

[M. Com.]

Paper : 17

Modules – 1 & 2

Management Accounting

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Notification

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Registrar

POST GRADUATE : COMMERCIAL

M. Com.

Robert D.
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Management Accounting

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Module

1

Unit 1	<input type="checkbox"/> Introduction	7-12
Unit 2	<input type="checkbox"/> Marginal Costing and Management Decisions	13-33
Unit 3	<input type="checkbox"/> Management Control System	34-75

Module

2

Unit 4	<input type="checkbox"/> Performance Measurement & Responsibility Accounting	76-92
Unit 5	<input type="checkbox"/> Transfer Pricing	93-101
Unit 6	<input type="checkbox"/> Activity Based Costing	102-116

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Unit 1 □ Introduction

Structure

- 1.0 Objectives
- 1.1 Definition
- 1.2 Functions and Scope
- 1.3 Management Accounting Vs. Financial Accounting
- 1.4 Management Accounting Vs. Cost Accounting
- 1.5 Role, Position and Responsibility of Management Accountant
- 1.6 Questions
- 1.7 Suggested Readings

1.0 Objectives

Accounting is considered as a language that communicates economic information to different stakeholders of an organization. Shareholders/owners, managers, investors, employees, creditors, governments, etc. who are the different stakeholders need various information for the decisions under their control. The objective of accounting is to provide reliable and relevant information to meet the needs of various users on time and at the lowest possible cost.

The various users of accounting information may be divided into (i) Internal (i.e., within the organization) and (ii) External (i.e., outside the organisation).

Management accounting serves by providing necessary information to the internal users while the external users get the required information through the audited financial accounting reports and statements.

1.1 Definition

According to the Institute of Cost and Works Accountants of India (ICWAI), Management Accounting is 'a system of collection and presentation of relevant economic information relating to an enterprise for planning, controlling and decision-making'.

The Management Accounting team of the Anglo-American Council of Productivity defines management accounting as 'the presentation of accounting information in such a way as to assist management in the creation of policy and in the day-to-day operations of an undertaking'.

One of the most comprehensive definitions of Management Accounting given by the International Federation of Accountants (IFAC) is 'the process of identification, measurement, accumulation, analysis, preparation, interpretation and communication of information both financial and operating used by management to plan, evaluate and control within the organization and to assure use of and accountability for its resources'.

Therefore, management accounting identifies, measures, accumulates, analyses, prepares, interprets and communicates both financial and non-financial information to the management in performing its functions effectively.

1.2 Functions and Scope

Scope of management accounting is very wide as management accounting is mainly concerned with providing both financial and non-financial information to the management for their decision-making purposes. Information may be quantitative as well as qualitative and it may cover any part or whole of the organization. Therefore, scope of management accounting is not only restricted to the different branches of accounting, viz., financial accounting, cost accounting, taxation, etc., but also to any other areas of the organization such as research & development, design, production, marketing, inventory control, etc.

The primary function of management accounting is to assist the management in performing its various functions like planning, organizing, directing, controlling, etc., effectively providing relevant information on time. For this purpose, different types of information—financial and non-financial, quantitative and qualitative—are collected, analysed, interpreted and communicated in an appropriate manner so as to help management in using such information for making various decisions. Therefore, important functions of management accounting may be listed in the following way :

- It collects data from different sources—both internal and external.
- It processes the data and generates necessary information as may be required by the management for discharging its various functions.
- It analyses, interprets and communicates the information meaningfully for effective planning, evaluating, coordinating and controlling the activities of the organization.

According to the 'Preface to Statements on International Management Accounting' issued by the IFAC, Management Accounting is used by the management to :

Plan—to gain an understanding to expected business transactions and other economic events and their impact on the organization, and to use this understanding as a basis for a course of action to be followed by the organization in the future;

Evaluate—to judge the implications of various past and/or future events;

Control—to ensure the integrity of financial information concerning an organisation's activities or its resources;

Assure accountability—to implement the system of reporting that is closely aligned to organizational responsibilities and that contributes to the effective measurement of management performance.

1.3 Management Accounting Vs. Financial Accounting

Financial accounting is concerned with recording, classifying and summarizing the financial transactions and ascertaining the periodical financial results and financial position of an organization by preparing financial statements—Profit & Loss Account (Income & Expenditure Account in case of a non-profit seeking organization), Balance Sheet and Cash Flow Statement (in some cases). For this purpose, different books of accounts like journal, ledger, cash book are maintained and some rules, regulations, concepts, conventions, accounting standards, etc. which are known as generally accepted accounting principles (GAAP) are followed. Financial accounting is focused at satisfying the needs of various external users like shareholders, investors, creditors, governments and other regulatory bodies, etc.

Management accounting, on the other hand collects the necessary information not only from financial accounting but also from cost accounting and other internal records from various units/departments of the organization, and also from the external sources like market and various govt. and non-govt. notifications/publications. No separate books are maintained for management accounting. Basically, management accounting is concerned with preparing various reports containing relevant information for assisting management in decision-making purposes. Though several methods, tools and techniques are followed in management accounting, there is no GAAP as in case of financial accounting. Further, management accounting is basically for satisfying the need of the internal management contrary to the financial accounting that primarily satisfies the need of the external users, i.e., management accounting is internally focused while financial accounting is externally focused.

1.4 Management Accounting Vs. Cost Accounting

Cost accounting is the process of accounting for costs. It uses different methods (Job Costing, Process Costing, Farm Costing) and techniques (Absorption Costing,

Marginal Costing, Standard Costing, Uniform Costing, etc.) in order to ascertain cost of products or services, fixing selling prices, preparing short term plans and budgets, providing information for planning and controlling activities. So, it is found that cost accounting like management accounting also provides information relating to cost of product/services that help in planning, executing, measuring, evaluating and controlling performance of an organization i.e., important management functions. Therefore, cost accounting may be considered as an essential part of management accounting. The Chartered Institute of Management Accountants (CIMA) of England defines cost accounting as 'that part of management accounting which establishes budgets and standard costs and actual cost of operations, processes, departments or products and the analysis of variances, profitability or social use of fund'. Management accounting has a wider scope comparing to cost accounting. Management accounting is concerned not only with cost information but also with financial information derived from financial accounting and other operational/non-financial information from internal and external sources.

However, it is difficult to draw a line of boundary between cost accounting and management accounting since they are complementary in nature. In fact, because of close association between these two, modern cost accounting is often called management accounting.

1.5 Role, Position and Responsibility of Management Accountant

Management Accounting assists management in discharging its functions by providing necessary information and Management Accountant is the channel through which such information flows to the management. So, Management Accountant is the person who performs this important function of providing relevant information in the manner and at the moment as and when it is required by the management.

Since the 1980s, the management accountants have been facing new challenges to meet the requirements of the management in the highly deregulated and competitive business environment. So Management Accountants should adapt themselves to the changing needs of the situation as there is no stereo typed proforma in discharging their duties.

Management accountants play a vital role in helping the management to perform almost all its important functions as follows :

Planning : In the planning process, the management accountant helps in formulating future plans/formulating business strategies.

Controlling : Management accountant helps the control process through providing performance reports that compare the actual results with that of the planned for each of the responsibility centres. By this process, management is made aware of the areas where attention is needed for plan not being achieved.

Organising : Organisational structure is concerned with authority, responsibility and specialization so as to assure effective performance. Management accounting—through responsibility accounting—represents the design and implementation of the accounting system for better definition and consolidation of these relations.

Communication : Management accounting helps the communication function by installing and maintaining an effective communication and reporting system. The performance reports prepared by the management accountant communicate important information to a manager how well he or she is managing his/her activities and highlights those items that require detailed investigation through the process of management-by-exception. Thus management accounting is coupled with both pre-mortem and post-mortem activities.

Motivation : Budgets and performance reports prepared by the management accountant have an important influence on the motivation of the employees of an organization. Budgets set the target, and performance report evaluates the actual performance in relation to the targets set and are intended to motivate desirable performances and provide valuable assistance in identifying potential managerial problem areas and highlighting the areas requiring attention.

Therefore, a management accountant has to perform a significant role in installation, development and functioning of a management accounting system for supplying reliable, relevant and timely information to the various levels of management. He has to play an important role in designing the framework of the financial and cost control reports for providing such information; has to administer tax policies and procedures; has to supervise and coordinate the preparation of reports to government and other regulatory bodies; has to ensure optimum use of and accountability for the resources of an organization; has to carry out continuous appraisal of economic and social forces, and the government influences, and their impact on the business.

Because of the important functions, involving the different departments/units across the organization, a management accountant has to perform, apart from the top management no one in the organization perhaps knows better about the various functions of the organization more than him/her. He is, therefore, sometimes called the chief intelligence officer of the management. In the age of globalization, the management accountant has to provide necessary assistance to the management towards formulating appropriate business strategies for gaining sustainable competitive

advantages. To perform their functions efficiently, the management accountants must develop their communication abilities, must be aware of the important changes taking place in the business environment through the world, and be acquainted with the latest methods and techniques being developed to meet the challenges of the changing business environment.

1.6 Questions

1. What do you mean by management accounting? Discuss the functions and scope of management accounting.
2. Distinguish between (i) management accounting and financial accounting and (ii) management accounting and cost accounting.
3. Discuss the role of management accountants in the changing business environment.

1.7 Suggested Readings

- Maheshwari, S. N., Management Accounting and financial control, Sultan Chand & Sons, New Delhi.
- Banerjee, B., Cost Accounting, World Press, Kolkata
- Banerjee, B., Financial Policy and Management Accounting, PHI, New Delhi
- Drury, C., Management and Cost Accounting, Chapman & Hall, London
- Horngren, Foster and Datar, Cost Accounting—A Managerial Emphasis, PHI, New Delhi
- Hilton, R. W., Managerial Accounting, Tata McGraw-Hill, New Delhi

Unit 2 □ Marginal Costing and Management Decisions

Structure

- 2.1 Concepts
- 2.2 Methods of Segregation of Semi-variable Costs
- 2.3 Examples
- 2.4 Application of Marginal Costing in Managerial Decisions
 - 2.4.1 Introduction of New Products
 - 2.4.2 Fixation of Selling Prices
 - 2.4.3 Selection of Profitable Product Mix or Sales Mix
 - 2.4.4 Alternative Methods of Manufacture
 - 2.4.5 Make or Buy
 - 2.4.6 Closing down or Suspending Activities
- 2.5 Differential/Incremental Cost Analysis
- 2.6 Questions
- 2.7 Suggested Readings

2.1 Concepts

Marginal Cost : *Accountants' view*—the cost of one unit of product or service which would be avoided if that unit were not produced or provided.

Note : In this context, a unit is usually either a single article or a standard measure such as the litre or kilogram, but may in certain circumstances be an operation, process or part of an organization.

Economists define marginal cost as the amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit.

Marginal Costing : The accounting system in which variable costs are charged to cost units and fixed costs of the period are written off in full against the aggregate contribution.

Under marginal costing, segregation of variable costs and fixed costs are essential because variable costs are charged to cost units to find out the contribution and then fixed costs are charged against the total contribution to find out of the profit.

2.2 Methods of segregation of Semi-Variable Costs

Intelligent estimates through analysis of part overhead expenses at various levels of activity adjusting for anticipated changes.

High or Low Points/Range Method : Change in the Expense level/Change in the output level

Equation method : $Y = MX + C$ (Y-total semi-variable exp; C-Fixed cost included in Y; M-VC per unit; X-output)

Graphical Method : Regression line drawn through the points representing semi-variable overheads relating to different activity levels will cut the ordinate and will represent the fixed costs. The slope of the line will indicate the degree of variability.

Method of Least Squares : $y = mx + c$; $\Sigma y = m \Sigma x + n.c$; $\Sigma xy = m \Sigma x^2 + c.\Sigma x$.

Concept of Profit under Marginal Costing

Profit or Net Margin is arrived at after deducting Fixed Costs from the total Contribution, also known as Gross Margin. The argument is that no one makes profit per unit manufactured but profit is made out of total activity during a period. It is generally said that products make contribution and business makes profit.

Marginal Cost Equation

$S - V = C$ (S = Sales, V = Variable Costs, C = Contribution)

$F + P = C$ (F = Fixed Costs, P = Profit, C = Contribution)

Therefore, $S - V = F + P$

At the break-even point (BEP), $C = F$ [because at BEP, Profit = 0 (Zero)].

Profit/Volume Ratio (P/V Ratio)

It is, the ratio between Contribution and Sales (at any selected level of activities). Symbolically,

$P/V \text{ Ratio} = C/S$

P/V Ratio can be used to find out Contribution or Sales at different levels of activities when the other is known.

$C = P/V \text{ Ratio} \times S$

$S = C \div P/V \text{ Ratio}$

Sales at BEP = $F \div P/V \text{ Ratio}$ (at BEP, $C = F$)

Margin of Safety

It is the excess of actual sales over the break-even sales. P/V Ratio may be used to find out the margin of safety at any level of activities.

Margin of Safety = Profit ÷ P/V Ratio.

CVP analysis is based on the relationship between sales revenue, costs and profit in the short run, the short run being a period of one year, or less, in which the output of a firm is restricted to that available from the current operating capacity.

The objective of CVP analysis is to establish what will happen to the financial results if a specified level of activity of volume fluctuates. This information is vital to the management, since one of the most important variables influencing total sales revenue, total costs and profits is output or volume. For this reason output is given special attention, since knowledge of this relationship will enable management to identify the critical output levels, such as the level at which profit will be maximized, or the level at which neither a profit nor a loss will occur (BEP).

A Break-even Chart or a Profit-Volume Graph/Profit Chart helps in CVP analysis to a great extent.

2.3 Examples

1. From the details given below, (a) calculate P/V Ratio, Break-even Point and Margin of Safety and (b) find the effect on P/V Ratio, Break-even Point and Margin of safety of the following :

- (i) 10% increase in selling price; (ii) 10% increase in variable cost;
(iii) 10% decrease in fixed cost and (iv) 10% decrease in sales volume.

Production and sales	10,000 units
Selling price per unit	Rs. 50
Variable cost per unit	Rs. 30
Fixed cost	Rs. 1,50,000

Solution :

Contribution (per unit) = $S - V = \text{Rs. } (50 - 30) = \text{Rs. } 20$

P/V Ratio = $C/S = 20/50 = 0.40$ or 40%

Break-even Sales (value) = $F \div \text{P/V Ratio} = \text{Rs. } 150000 \div 0.40 = \text{Rs. } 375000$

Break-even Sales Quantity = $F \div \text{Contribution per unit} = \text{Rs. } 150000 \div \text{Rs. } 20 = 7500$ units

Margin of Safety = Actual Sales - Break-even Sales = $(10000 - 7500)$ units = 2500 units or, $2500 \text{ units} \times \text{Rs. } 50 = \text{Rs. } 125000$

Now, effect of the changes in selling price, variable cost, fixed cost and sales volume may be find out one by one.

(i) *Effect of 10% increase in selling price*

Revised selling price per unit = Rs. 50 + 10% of Rs. 50 = Rs. 55

Variable cost per unit = Rs. 30

Contribution per unit = Rs. (55 - 30) = Rs. 25

P/V Ratio = $25/55 = 5/11 = 0.4545$ or 45.45%

BEP (quantity) = $F \div \text{contribution per unit} = \text{Rs. } 1,50,000 \div \text{Rs. } 25 \text{ per unit}$
= 6000 units

Margin of Safety = Actual Sales - Break-even Sales = 4000 units

So, it is seen that P/V Ratio increases, Break-even is reached at lower level and Margin of Safety increases due to increase in the selling price.

[(ii), (iii) and (iv) may be done in the same way]

2. The following data relate to A Ltd.

	Year 1	Year 2
Sales (Rs)	5,00,000	6,00,000
Profit/Loss (Rs)	(20000)	20000

Calculate (i) P/V ratio and Break-even Point

(ii) profit or loss when sales amount to Rs. 4,50,000

(iii) sales required to earn a profit of Rs. 30000.

Solution :

P/V Ratio = $\text{Change in Profit} / \text{Change in Sales} = 40000 / 100000 = 40\%$

Contribution at the Sales level of Rs. 6,00,000 = $\text{Rs. } 6,00,000 \times 40\% =$
Rs. 2,40,000

$C = F + P$, or $F = C - P = \text{Rs. } (240000 - 20000) = \text{Rs. } 220000$

(i) Break-even Sales = $F \div \text{P/V Ratio} = 220000 \div 40\% = \text{Rs. } 550000$

(ii) When sales = Rs. 4,50,000, Contribution = $\text{Rs. } 4,50,000 \times 40\% =$
Rs. 1,80,000

Fixed costs = Rs. 2,20,000

Profit = $C - F = \text{Rs. } (180000 - 220000) = - \text{Rs. } 40000$.

i.e., Loss of Rs. 40000

(iii) Required profit = Rs. 30000

Required contribution = $F + P = \text{Rs. } (220000 + 30000) = \text{Rs. } 250000$

Required Sales = $\text{Required Contribution} \div \text{P/V Ratio} = 250000 \div 40\%$
= Rs. 625000

3. A firm manufactures three products – P, Q & R. The selling price per unit of the products are Rs. 100, Rs. 115 and Rs. 125, and the variable costs per unit are Rs. 75, Rs. 80 and Rs. 85 respectively. The sales-mix of the products is 30%, 40% and 30% respectively. The total fixed costs are Rs. 6,70,000.

Calculate overall break-even quantity and the product-wise break-up of such quantity.

Solution : Contribution (Rs.) : 25, 35 and 40

Sales Mix : 30%, 40% and 30%

Avg. Contribution : $25 \times 30\% + 35 \times 40\% + 40 \times 30\% = 33.50$

Break-even sales (quantity) = $6,70,000/33.50 = 20000$

$P = 20000 \times 30\% = 6000$ units; $Q = 20000 \times 40\% = 8000$; $R = 20000 \times 30\% = 6000$

Check : Total Contribution = $6000 \times 25 + 8000 \times 35 + 6000 \times 40 = 6,70,000$
= Total Fixed Cost. Alternatively, let the break-even quantity be X

Product wise BEP = $.30X + .40X + .30X$

Contribution at BEP = $25 \times .30X + 35 \times .40X + 40 \times .30X = 33.50X$

At BEP, C = F. Therefore, $33.50X = 6,70,000$; $X = 670000/33.50 = 20,000$

4. A firm wants to introduce a new product for which it is considering the following two proposals. Products under both the proposals use the same production facilities.

	Proposal I	Proposal II
Annual Volume (units)	40000	30000
	Rs.	Rs.
Selling Price	130 p.u.	200 p.u.
Variable Production Costs	80 p.u.	100 p.u.
Fixed Production Costs	6,00,000	6,00,000
Fixed selling and administration costs	4,50,000	13,50,000

The firm has a minimum target of Rs. 2,00,000 profit per year for new products. The management recognizes the uncertainty in the above estimates and wishes to explore the sensitivity of the profit on each product to changes in the values of the variable (volume, price, variable costs per unit and fixed costs).

Calculate the expected profit from each of the proposals and

Calculate the critical value for each variable (i.e., the value at which the firm will earn Rs. 2,00,000), assuming that all other variables are as expected (express this as an absolute value and in percentage change from the expected value).

Solution :

(a)	I	II
Sales per unit	130	200
V.C.	80	100
C	50	100
Total Contribution (C × units)	20,00,000	30,00,000
F	10,50,000	19,50,000
P	9,50,000	10,50,000

(b)

Critical Factor : minimum target profit of Rs. 2,00,000

(i) Sensitivity due to changes in Volume :

$$\text{Required Volume} = \text{Required Contribution} / \text{Contribution per unit} \\ = (F + P) / C$$

$$\text{I } (1050000 + 200000) / 50 = 25000$$

$$(40000 - 25000) / 40000 = 37.5\%$$

$$\text{II } 21500 \text{ units or } 28.3\%$$

(ii) Change in Price :

$$\text{S.P. per unit} = (F + P + V) / \text{Volume} \quad [V = \text{variable cost}]$$

$$\text{I Rs. } 111.25 \text{ or } 14.4\%$$

$$\text{II Rs. } 171.67 \text{ or } 14.2\%$$

(ii) Change in Variable Cost per unit :

$$V \text{ (per unit)} = (\text{Sales} - \text{Contribution}) / \text{Volume}$$

$$\text{I } 20,00,000 - 2,00,000 = 18,00,000 \text{ or } 71.4\%$$

$$\text{II } 30,00,000 - 2,00,000 = 28,00,000 \text{ or } 43.6\%$$

The most critical factor is the price per unit, only 14% variation being sufficient to reduce profits to Rs. 200000. The most critical factors are for the proposal I, the variable cost per unit (23.4%) and for proposal II, the volume (28.3%) and the variable cost per unit (28.3%). The other factors are the growth potential of the two proposals, possible export sales, quality of the estimates, reaction of the competitors, etc.

2.4 Application of Marginal Costing in Managerial Decisions

A management accountant's primary role is to help the management in the decision making process by way of providing *relevant and accurate* information on

time. Relevant information involves costs and benefits concerning future period. Costs and benefits must satisfy the following two basic criteria in order to be considered as *relevant*.

- The costs and benefits relate to the future
- They differ among the alternatives.

Sunk costs (costs that have already been incurred) like book value of equipments, value of inventory in hand, etc. are *irrelevant*; hence, they are not considered for decision making. On the other hand, *opportunity costs* (the potential benefits given up when acceptance of one alternative precludes acceptance of the other) is a *relevant* cost for the decision.

The concepts of marginal costing may be applied to serve the day-to-day needs of the management in taking many important decisions. Some of the important areas are :

- Introduction of new products
- Fixation of selling prices
- Selection of profitable product mix
- Problems of limiting factor
- Alternative methods of manufacture
- Make or Buy (whether to go for outsourcing or not)
- Level of activity planning
- Closing down or suspending activities

2.4.1 Introduction of New Products

A new product may be introduced if it has a positive contribution so that such contribution may help recovering existing fixed costs and add to the profit. However, if some additional fixed costs are required to be incurred for the new product, such fixed costs must be subtracted from its contribution in order to decide whether the new product should be introduced.

Example :

A manufacturing firm want to introduce a new product for which variable costs per unit is estimated to be Rs. 50 per unit. Total fixed costs of the firm is expected to remain unchanged at Rs. 1,00,000 per annum. The new product is expected to be sold at Rs. 60 per unit. Whether it is advisable to introduce the new product.

Solution : Fixed costs, in this case, is not a relevant cost. Hence, it is ignored.

Selling Price per unit	Rs. 60
Less : Variable Costs per unit	<u>Rs. 50</u>
Contribution per unit	<u>Rs. 10</u>

If the firm wants to produce and sell 1000 units of the new product, the total contribution from the new product will be Rs. 10000 (1000 units \times contribution per unit of Rs. 10). Fixed costs remaining the same, the profit of the firm will increase by Rs. 10000. However, if the fixed costs also increase by Rs. 4000 (assumed), the profit will increase by Rs. 6000 (Contribution of Rs. 10000 minus increase in fixed costs of Rs. 4000)

Total contribution from 1000 units of the new product (1000 \times 10)	Rs. 10000
Less Additional fixed costs for the new products	Rs. 4000
Additional profit	<u>Rs. 6000</u>

Decision : The new product should be introduced as it is capable of increasing total contribution and profit by Rs. 10000 (or Rs. 6000 if fixed costs increase by Rs. 4000).

2.4.2 Fixation of Selling Prices

Decision concerning selling prices of the products/services is very important. Prices may have to be fixed under different situations like :

- Under normal circumstances
- Under competitive environment or under recession (trade depression)
- Acceptance of the new order (domestic or foreign) with or without idle facilities/ spare capacities, etc.

Under normal circumstances, prices should be fixed in such a way so as to recover the total costs. Otherwise, the business would not survive in the long run. However, in the short run, circumstances may demand that the prices be fixed at or even below the marginal costs. Circumstances may be as follows :

- To popularize the newly introduced product
- To explore the foreign market (particularly when government allows some subsidies for export)
- To drive out the weaker competitors
- To make use of the production facilities (particularly when heavy overhauling expenditure are incurred for proper maintenance of the plant and machineries)
- To reduce losses, particularly in case of perishable goods, etc.

Illustrations : A firm is producing only 1000 units of a product operating at 50% capacity due to business recession. Its cost structure is known to be as follows.

Direct Material	Rs. 20 per unit
Direct Labour	Rs. 15 per unit
Variable Overhead	Rs. 10 per unit
Total Fixed Overhead per annum	Rs. 20,000
Current Selling Price	Rs. 60 per unit

A customer approaches the firm for supplying 500 units of the product at Rs. 50 per unit. Should the firm accept the order?

Solution :	Per unit
Direct Material	Rs. 20
Direct Labour	Rs. 15
Variable Overhead	<u>Rs. 10</u>
Marginal Cost	<u>Rs. 45</u>
Selling Price (for the new customer)	Rs. 50
Contribution	Rs. 5

The order should be accepted as an additional contribution of Rs. 5 per unit could be received from the order. This would help recovering fixed costs and thereby reducing losses.

The position before and after acceptance of the order may be shown as follows.

	Before acceptance	After acceptance
Sales	$1000 \times 60 = 60000$	$[(1000 \times 60) + (500 \times 50)] = 85000$
Marginal Costs	$1000 \times 45 = 45000$	$1500 \times 45 = 67500$
Contribution	15000	17500
Fixed Overheads	<u>20000</u>	<u>20000</u>
Loss	(5000)	(2500)

The firm should accept the order as it would lead to earn profit of Rs. 2500.

2.4.3 Selection of Profitable Product Mix or Sales Mix

Profitable product or sales mix refers to the proportion/ratio of production or sales of different products. The most profitable product/sales mix may be determined on the basis of the contribution of the products in absence of limiting factors. If the production or sales are dependent on some factors that restrict or limit the production

or sales such as availability of raw material, labour, machine hours, etc. in case of production and demand for the product in case of sales, the selection of the most profitable product or sales mix will be made on the basis of contribution of the limiting factor.

(a) without limiting factor

A company produces and sells two products —X and Y. Cost structure of the products are as follows.

	X	Y
	Rs. per unit	Rs. per unit
Direct Materials	25	30
Direct Wages @ Rs. 5 per hour	15	20
Variable Overhead	10	15

Total Fixed Overhead Rs. 20000

Unit selling prices of X and Y are Rs. 60 and Rs. 80 respectively.

The company wants to produce and sell the products in any of the following combinations.

(i) 1000 units of X and 1200 units of Y

(ii) 1200 units of X and 1000 units of Y

(iii) 1100 units of X and 1100 units of Y

Suggest the most profitable product/sales mix.

Solution :

	X	Y
	Rs. per unit	Rs. per unit
Selling price	60	80
Marginal costs (materials, wages and variable overhead)	<u>50</u>	<u>65</u>
Contribution	<u>10</u>	<u>15</u>

Product having the highest contribution per unit should be produced and sold in maximum numbers so as to maximize profit. Therefore, combination (i) with 1200 units of Y and 1000 units of X should be produced and sold.

The amount of profit resulting from different combinations is shown below.

Combinations	Contribution	Fixed Costs	Profit
	Rs.	Rs.	Rs.
(i) 1000 units of X and 1200 units of Y	28000	20000	8000
(ii) 1200 units of X and 1000 units of Y	27000	20000	7000
(iii) 1100 units of X and 1100 units of Y	27500	20000	7500

(b) with limiting factor

A firm produces two products using same materials and labour force involving the costs as given below.

	Product I	Product II
	Rs. per unit	Rs. per unit
Raw materials @ Rs. 10 per kg	30	20
Direct wages @ Rs. 5 per hour	15	20
Variable overhead	25	30

Fixed costs (total) Rs. 30000

Product I and II are sold in the market at Rs. 100 and Rs. 95 per unit respectively.

The firm can produce 1500 units of each of the products using its production facilities subject to the availability of raw materials and direct labours.

Recommend the most profitable product/sales mixes of the firm :

- if 4500 kg of raw materials are available
- if 7500 direct labour hours are available

Solution :

		Product I	Product II
		Rs. per unit	Rs. per unit
Sales		100	95
Raw materials	30	20	
Direct wages	15	20	
Variable overhead	25	<u>70</u>	<u>70</u>
Contribution per unit		30	25
Contribution per kg of raw materials		$30 \div 3 = 10$	$25 \div 2 = 12.5$

(Raw materials per unit :

Product I : 3 kg & Product II : 2 kg)

Contribution per labour hour $30 \div 3 = 10$ $25 \div 4 = 6.25$

(Labour hours per unit :

Product I : 3 hrs & Product II : 4 hrs)

- (a) When raw materials are in short supply, maximum number of units of Product II should be produced and sold (because contribution per kg of raw materials in case of Product II is more than that of Product I) to generate maximum profit. 1500 units of Product II should be produced at first and balance raw materials should be used to produce Product I

Production and sales	Raw materials requirement	Contribution (Rs)
Product II : 1500 units	$1500 \times 2 \text{ kg/unit} = 3000 \text{ kg}$	37500
Product I : 500 units	$500 \times 3 \text{ kg/unit} = 1500 \text{ kg}$	15000
(using balance raw materials)		
[(4500 - 3000) ÷ 3]		
	Total <u>4500 kg</u>	<u>Rs. 52500</u>

- (b) When direct labour hours are limited, maximum number of units of Product I should be produced and sold (because contribution per direct labour hour in case of Product I is more than that of Product II) to generate maximum profit.

Production and sales	Labour hours requirement	Contribution (Rs)
Product I : 1500 units	$1500 \times 3 \text{ hrs/unit} = 4500 \text{ hrs}$	45000
Product II : 750 units	$750 \times 4 \text{ hrs/unit} = 3000 \text{ hrs}$	18750
(using balance raw materials)		
[(7500 - 4500) ÷ 4]		
	Total <u>7500 kg</u>	<u>Rs. 63750</u>

2.4.4 Alternative Methods of Manufacture

Methods of manufacture from amongst different alternatives may be selected following marginal costing approach. Decision regarding selection of a particular machine out of two or more alternatives, or using machine in place of manual system or vice versa, etc., may be made on the basis of relative *contributions* of the different alternatives. However, if fixed cost differs from alternative to alternative, fixed costs are also to be considered.

Example : A firm can produce one of its products using any of the two machines— X & Y.

Machine X and Y can produce 25 units and 15 units per hour respectively. Each of the machines can work for 3000 hours per annum. The costs per unit of the product and its selling price are given below.

	Machine X	Machine Y
	Rs.	Rs.
Direct materials	30	30
Direct wages	20	15
Variable overhead	15	10
Fixed overhead	<u>5</u>	<u>5</u>
Total costs	<u>70</u>	<u>60</u>
Selling price	100	100

Which of the two machines the firm should select.

Solution :

	Machine X	Machine Y
	Rs.	Rs.
Per unit of the product :		
Selling price	100	100
Marginal costs (Materials, wages and variable overhead)	65	55
Contribution per unit	<u>35</u>	<u>45</u>

Contribution per unit of the product is more if it is produced in Machine Y. But the output per hour of the machines is different and total machine hours are limited. Therefore, *contribution per machine hour* should be considered, machine hours being *limiting factor* in this case.

	Machine X	Machine Y
Output per hour	25 units	15 units
Contribution per unit	Rs. 35	Rs. 45
Contribution per hour (Rs.)	$25 \times 35 = 875$	$15 \times 45 = 675$
Machine hours p.a.	3000	3000
Annual contribution (Rs.)	$3000 \times 875 = 28,25,000$	$3000 \times 675 = 20,25,000$

The annual contribution from the machine X is more than that of machine Y. Therefore, machine X should be selected.

2.4.5 Make or Buy

A firm has to often decide whether it is profitable to make any component or part in its own factory or it is profitable to buy the same from outside. If the firm has the *idle/unused capacity*, the decision should be based on marginal cost of the component

or part i.e., if the marginal cost is less than the purchase price, it is profitable to produce. Fixed cost is not considered because it will remain same whether the component is produced or not. However, if fixed cost is increased due to production of the component, it should be considered. Minimum volume to justify the production may be determined in the following way :

Minimum No. to be produced = Increase in fixed cost ÷ (Purchase price – Variable cost) p.u. If the firm has *no idle or unused capacity*, the production of the component will not be possible without reducing the production of some other component(s). Therefore, the contribution from the existing product(s)/component(s) must be lost because of production of any new component. So, such loss of contribution, known as opportunity cost, must be considered for decision concerning 'make' or 'buy'. In other words, aggregate of the variable costs, loss of contribution and additional/avoidable fixed costs are to be compared with the purchase costs.

Example (With idle/unused capacity) :

A firm is manufacturing a product using some components one of which may be purchased from outside at Rs. 20 per unit or it may be manufactured using the idle capacity with an additional fixed costs of Rs. 9000. Annual requirement of the component is estimated at 5000 units. The costs of manufacture of 5000 units of the component in its own factory is estimated as follows :

	Rs. per unit
Direct material	10
Direct wages	5
Variable overhead	2
Fixed overhead (avoidable)	1.8
General Fixed overhead (allocated)	2.2
Total	<u>21.0</u>

Advise the firm whether to 'make' or 'buy' the component.

Solution :

	Rs.
Purchase price per unit of the component	20

Variable cost per unit of the component :

Direct material	10
Direct wages	5
Variable overhead	<u>2</u>
	<u>17</u>
Contribution per unit	<u>3</u>

Avoidable fixed costs (total) 9000

Minimum number of units to be manufactured : $9000 \div 3 = 3000$ units.

In fact, cost of manufacturing as well as cost of purchase for 3000 units will be same.

Therefore, it is profitable to manufacture the component if the requirement of the component is more than 3000 units. While if the requirement is less than 3000 units, it is profitable to buy.

	Requirement of the component		
	2000 units	3000 units	4000 units
Cost of purchase @ Rs. 20 per unit (Rs.)	<u>40000</u>	<u>60000</u>	<u>80000</u>
	Rs.	Rs.	Rs.
Variable cost of production @ Rs. 17 p.u.	34000	51000	68000
Additional fixed costs (avoidable)	<u>9000</u>	<u>9000</u>	<u>9000</u>
Total costs, if manufactured	<u>43000</u>	<u>60000</u>	<u>77000</u>
Decision	BUY	Make/Buy	MAKE

Example (Without idle/unused capacity) :

A firm is currently manufacturing 5000 units per annum of a product operating at its full capacity. The product is sold at Rs. 100 per unit and its marginal cost per unit is Rs. 60. Each unit of the product takes 4 machine hours. The firm wants to produce a component for another product that can be manufactured with the existing facilities. Estimated marginal cost per unit of the component is Rs. 15 and machine-hour requirement is one hour per unit. However, the component can be purchased from outside at Rs. 20 per unit. Considering the machine hours as the limiting factor advise whether the firm should make or buy the component.

Solution : Contribution per unit of the existing product (Rs. 100 - Rs. 60) = Rs. 40

Contribution per machine hour = $\text{Rs. } 40 \div 4 = \text{Rs. } 10$

(each unit of the product requires 4 hours)

Marginal cost of the new component per unit, if produced Rs. 15

Opportunity cost (contribution to be forgone) Rs. 10

(if new component is produced in place of existing product)

Total cost per unit, if purchased Rs. 25

Purchase price per unit of the new component Rs. 20

Purchase price being less than the cost of production, it is advisable to buy the component from outside.

Note : Fixed costs will remain unchanged whether the new component is purchased or manufactured.

2.4.6 Closing down or Suspending Activities

Decisions concerning shut down of an entire plant, or discontinuance or suspension of any product line or some of the activities may be necessary in order to increase profitability or minimize losses. Marginal costing approach is more helpful than that of absorption costing in this regard. Marginal costs and specific/identifiable/avoidable fixed costs are to be considered and decision is to be taken on the basis of contribution. If there is any positive contribution, activity should be continued otherwise it should be discontinued (in case of negative contribution). General fixed overhead, that is expected to remain unchanged irrespective of the decision, is ignored not being a *relevant cost*.

Example :

A firm manufactures three products—P, Q and R. The following data are related to the immediately preceding year.

	P	Q	R
	Rs.	Rs.	Rs.
Sales	300000	200000	100000
Marginal costs	150000	140000	60000
Fixed costs (10% avoidable)	100000	80000	25000
Profit/Loss	50000	(20000)	15000

The firm wants to discontinue product Q as it incurs losses.

Offer your suggestions as to whether product Q should be discontinued.

Solution :

	Product Q
	Rs.
Sales	200000
Less : Marginal costs	140000
Avoidable fixed costs	<u>8000</u>
(10% of 80000)	148000
Contribution	<u>52000</u>

Since the product Q is contributing Rs. 52000, it should be continued. If it is discontinued, the total profit of the firm will be reduced by Rs. 52000.

Position before and after discontinuance may be shown as follows :

	Existing (before discontinuance)		After discontinuance of Q	
	(P + Q + R)		(P + R)	
	Rs.		Rs.	
Sales		600000		400000
Less : Marginal costs	350000		210000	
Avoidable fixed costs	<u>20500</u>	<u>370500</u>	<u>12500</u>	<u>222500</u>
Contribution		229500		177500
Less : General fixed costs		<u>184500</u>		<u>184500</u>
Profit/Loss		45000		(7000)

If product Q is discontinued, the firm will incur a loss of Rs. 7000 as a whole. On the contrary, it will earn a profit of Rs. 45000 if Q is continued. So it is prudent to continue product Q.

2.5 Differential/Incremental Cost Analysis

In the decisions relating to how much to produce, simple approach of comparing incremental/differential costs with incremental revenue may be followed. General principle is : *it is profitable to go on producing till differential cost does not exceed incremental revenue.*

Example :

A firm is manufacturing 42000 units of a product per annum utilizing 60% capacity. The selling price per unit of the product is Rs. 20, variable cost per unit is Rs. 12 and total fixed cost is Rs. 100000. The firm can sell more units by reducing its selling price. Selling price and variable cost per unit at different levels are expected to be as follows.

Capacity utilization	Selling price per unit
	Rs.
70%	19.50
80%	18.75
90%	18.00
100%	17.00

Recommend the appropriate level of operations.

Solution :

Capacity Utilization (units)	Variable Costs Rs.	Fixed Costs Rs.	Total Costs Rs.	Differential Costs Rs.	Total Revenue Rs.	Incremental Revenue Rs.
42000	504000	100000	604000	—	840000	—
49000	588000	100000	688000	84000	955500	115000
56000	672000	100000	772000	84000	1050000	94500
63000	756000	100000	856000	84000	1134000	84000
70000	840000	100000	840000	84000	1190000	56000

Incremental revenue is exceeding differential costs up to the level of 56000 units (80% capacity) and these are equal at the level of 63000 units (90% capacity). At the level of 70000 units (100% capacity), incremental revenue is less than the differential costs. Therefore, the firm should operate at the level of 63000 units (90% capacity).

2.6 Questions

1. What do you mean by Cost-Volume-Profit (CVP) analysis? Discuss the inter-relation among the factors involved.
2. 'In times of trade depression, selling below the total costs but above the marginal costs may increase profit.' Discuss.
3. Mention the situations under which management may decide to sell the products at or below marginal cost and also state the implications of selling a product of a multi-product firm at a price below the marginal cost.
4. Identify the decision areas where marginal costing approach may be very much useful. Briefly state the principles underlying such decisions.
5. A Management Institute conducts competitive examination every year for selection of candidates for admission to the MBA Course. Each candidate is charged an entrance fee of Rs. 150 for the examination. The related data for the last two years are given below :

	2004 Rs.	2005 Rs.
Fees collected	600000	750000
Expenses :		
Setting and printing of Questions	160000	200000
Exam. Hall hire charges	24000	24000
Invigilation charges	32000	40000

(one invigilator for every 50 students
at Rs. 100 per day for two days)

Honorarium to Exam. Superintendent	20000	20000
Evaluation of answer scripts	240000	300000
General expenses	<u>24000</u>	<u>24000</u>
Net Income	<u>100000</u>	<u>142000</u>

In 2006, it is expected that 6000 candidates will appear for the admission test. The hall hire and general expenses are expected to increase by Rs. 6000 and Rs. 16000 respectively. Calculate for 2006 :

- (i) Budgeted income
 - (ii) Break-even number of candidates
 - (iii) Number of candidates required to sit for the examination to earn a net revenue of Rs. 200000.
6. A company engaged in the manufacture of sophisticated products uses high grade raw materials which are in short supply. During the year 2004, the company earned a profit of 12% before interest and depreciation on a turnover of Rs. 10 crores. Interest and depreciation which are fixed amounted to Rs. 75 lakhs and Rs. 50 lakhs respectively. The product-mix was as under.

Product Group	P/V Ratio	Raw Materials as a % of Sales Value	% of Turnover to Total Turnover
A	30%	40	30
B	40%	50	20
C	25%	36	50

During 2005, the priced of the raw materials is expected to increase by 10%. The company has been able to make arrangements for the procurement of raw materials of a total value of Rs. 561 lakhs at 2005 prices. The sales potential of each product group can be increased in 2005 by 50% of 2004 sales.

Show (i) the optimal product mix for 2005 and (ii) what increase in overall price is required to raise the sales value of 2005 to maintain the Margin of Safety at 10%.

7. X Ltd. seeks your advice on the most profitable production and sales mix in respect of its three products—P, Q and R. The following information are supplied to you.

	P	Q	R
Direct Materials (Rs.)	160	120	80
Variable Overhead (Rs.)	8	20	12

Direct Labour Hours :

Department A	6	10	5
Department B	6	15	11

Direct Labour Rate per hour :

Department A—Rs. 4.00

Department B—Rs. 8.00

Current Year's Budget :

	P	Q	R
Annual Production (Nos.)	5000	6000	10000
Selling Price per unit (Rs.)	312	400	240
Fixed Overhead Rs. 8,00,000			
Estimated Sales for the Next Year. (No. of units)	6000	8000	12000

It is known that manpower of department A cannot be increased beyond the current year's level.

8. A company is engaged in the production of an electronic product and also an electronic component. It manufactures 24000 units of the product as well as 24000 units of the component. The annual expenses for manufacturing the products and the components are as follows.

	Rs.
Direct Materials	38,40,000
Direct Labour	15,36,000
Indirect Labour	7,20,000
Inspection and Testing	4,80,000
Lighting	40,000
Power	4,80,000
Insurance	30,000
Depreciation (fixed)	96,000
Misc. Fixed Expenses	54,000

If the company stops production of the components and purchases from the market, savings in costs may be as follows :

Direct Materials	20%
Direct Labour	25%

Indirect Labour	20%
Inspection and Testing	25%
Power	25%

The components are available in the market at Rs. 70 per unit.

(i) State whether the company should make or buy the component.

(ii) The company has received an offer from a new customer for 12000 units of the product at a price of Rs. 245 per unit. If the order is accepted, the components that were being manufactured so far, cannot be produced due to lack of manufacturing capacity and therefore, are to be purchased from outside. Should the company accept the order and buy the component, or reject the order and continue to make the component?

9. The budgeted position of a manufacturing company for the year 2006 is given below.

	Products			
	A	B	C	D
	Rs.	Rs.	Rs.	Rs.
Variable costs	20000	32000	23000	26000
Fixed costs (apportioned)	12000	8000	8000	4000
Sales	40000	30000	28000	40000
Profit/Loss	8000	(10000)	(3000)	10000

The management wants to drop both the products B and C to improve the profitability of the company. Offer your recommendations as to which product(s) should be dropped and show the position of the company on the basis of your recommendations. Assume that fixed costs will remain unaffected whether any of the products is discontinued or not.

2.7 Suggested Readings

- Maheswari, S. N., Management Accounting and financial control, Sultan Chand & Sons, New Delhi.
- Banerjee, B., Cost Accounting, World Press, Kolkata
- Banerjee, B., Financial Policy and Management Accounting, PHI, New Delhi
- Horngren, Foster and Datar, Cost Accounting—A Managerial Emphasis, PII, New Delhi
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Unit 3 Management Control Systems

Structure

3.0 Standard Costing and Variance Analysis

3.1 Definitions

3.2 Objectives

3.3 Standard Costing and Budgetary Control

3.4 Variance Analysis

3.4.1 Material Cost Variance or Material Total Variance

3.4.2 Direct Labour Cost Variance

3.4.3 Variable and Fixed Overhead Variance

3.4.4 Sales Variance

3.5 Reconciliation of Budgeted Profit and Actual Profit

3.6 Planning and Operating Variances

3.7 Budgetary Control

3.8 Questions

3.9 Suggested Readings

3.0 Standard Costing and Variance Analysis

In order to control costs, managers often have to make decisions relating to prices to be paid and quantities to be used. Generally, attempts are made to pay the lowest possible prices and consume minimum quantity of resources that are consistent with the quality of output. Standard costing and budgetary control techniques help to a great extent in this regard by setting standards and budgets, and comparing them with the actual results, analysing the differences (variances), if any, and taking corrective actions accordingly.

3.1 Definitions

Standard : A standard is a carefully predetermined price, cost or quantity. It is generally expressed on a per unit basis.

Ideal Standard : Standard that can be attained only under the best circumstances. It does not allow for any machine breakdown or other work interruptions. Through a worker may not be able to attain the ideal standard, it may act as a constant

reminder of the need for ever-increasing efficiency and effort. In short, ideal standard is set under ideal condition.

Practical Standard : Standards that are tight but attainable. They allow for normal machine downtime, employee rest periods, and are such that they can be attained through sincere efforts by an efficient worker. i.e. practical standard is set under attainable condition.

Standard Cost : A predetermined calculation of how much costs should be under specified working conditions. It is built up from an assessment of the value of cost elements and correlates technical specifications and the quantification of materials, labour and other costs to the prices and/or usage rates expected to apply during the period in which the standard cost is intended to be used. Its main purpose is to provide bases for performance measurement, control by exception reporting, valuing stock and establishing selling prices.

Standard Costing : A control technique which compares standard costs and revenues with actual results to obtain variances which are used to stimulate improved performance.

Quantity and cost standards are set by managers for the three elements of cost input—materials, labour and overhead. Quantity standards indicate how much of a cost element should be used in manufacturing a unit of product or in providing a unit of service. Cost standards indicate what cost of the input (labour time, material, etc.) should be. Actual quantities and costs are measured against these standards, attention is directed towards the differences (variances), thereby permitting the managers to focus their attention/efforts to such areas only. This process is known as **management by exception**.

3.2 Objectives

The major objectives of standard costing may be identified as follows.

- Controlling costs by establishing standards and analysis of variances
- Providing a basis for evaluating performance and efficiency
- Enabling the practice of 'management by exception'
- Providing the basis for stock and work-in-progress valuation, budget preparation, profit planning and for decision making e.g., pricing where cost-plus system is followed, cost based transfer pricing, etc.
- **Advantages**

Standard costing system, if implemented properly, can provide many advantages. Some of the advantages, as mentioned in the previous section, may be stated as follows :

(i) it provides a basis for performance evaluation and efficiency measurement, (ii) it enables the management to identify the areas requiring special attention (referred to as 'management by exception'), (iii) it provides basis for stock and work-in-progress valuation and helps in many important management decisions, (iv) it finds out the variances and analyses the variances into their root causes and helps in taking corrective actions and guides in future actions, and (v) it helps controlling and reducing costs.

● Limitations

Some of the criticisms of standard costing are :

- (i) Setting standard is not an easy task. Moreover, various factors like technological changes, economic and political changes, inflation, etc., may necessitate the changes in the standards. Therefore, the standards need to be constantly updated. This may involve high cost which small firms may not be able to afford.
- (ii) Defective or inaccurate standards are likely to mislead providing a wrong basis for planning and controlling decisions, performance evaluation, efficiency measurement etc.
- (iii) Variance analysis may be taken as a basis for fixing the blames on the persons though the reasons for the variances may not be within the control of the persons concerned e.g., adverse material cost variances may arise due to increase in material prices which is beyond the control of the purchase manager.
- (iv) All forms of variance analysis are post mortem in nature. It can guide only if similar situation prevails in future also.

3.3 Standard Costing and Budgetary Control

Both Standard Costing and Budgetary Control are techniques of controlling costs. Both of them are primarily concerned with comparison with the actual, finding out the deviations, and taking the corrective measures analyzing the reasons for the deviations. But there are certain differences also between the two.

- Standard costing techniques are applied primarily to the manufacturing of a product or providing a service. But budgetary control techniques are applicable to any area of operation like production, marketing, research and development, etc., or business as a whole. Therefore, standard costing is intensive while budgetary control is extensive in nature and scope. In short standard costing is a micro concept whereas budgetary control is a macro-concept.

- In standard costing, actual figures are compared with standards, variances are found out and such variances are analysed into their causes. In budgetary control, deviations are found out comparing actual figures with the budgeted figures. But techniques of analyzing the variances are not available under budgetary control. Therefore, budgetary control and standard costing systems are usually operated simultaneously in the organizations.
- In standard costing, both adverse as well as favourable variances are analysed. But under budgetary control, attention is paid mainly towards the unfavourable deviations i.e., excess costs over the budget or lower income than the budget.
- In standard costing, standards are expressed both in monetary and quantitative terms while in budgetary control, budgets are primarily expressed in terms of money.

3.4 Variance Analysis

Variance is the difference between the standard cost and the actual cost (or similar difference in case of sales/revenues and profit). Cost may differ due to changes in the prices of inputs and/or quantities used. Accordingly, variance may be price variance and/or quantity variance. Variance may be Favourable (F) or Adverse (A). If actual cost is *more* than the standard, or if actual revenue or profit is *less* than the standard, it leads to the adverse variance. On the other hand, if actual cost is less than the standard, or actual income is more than the standard, it will result in favourable variance.

Variance analysis in standard costing is the analysis of the differences/variances between the standard and the actual into their originating causes. It may help identifying the reasons for the variations, and management may take appropriate remedial measures so as to prevent adverse variances from occurring in future.

As mentioned earlier, the basic variances are (i) Price Variance and (ii) Quantity Variance.

However, names of the variances differ from one cost element to the other. Price variance in case of material is known as 'Material Price Variance', in case of labour it is known as 'Labour Rate Variance' while in case of overhead, it is known as 'Overhead Expenditure or Spending Variance'. Similarly, quantity variance in case of material is known as 'Material Usage Variance', in case of labour and overhead it is known as 'Labour/Overhead Efficiency Variance'.

A general model for variance analysis may be shown as follows.

(a)	(b)	(c)
Actual Quantity of inputs at Actual Price $AQ \times AP$	Actual Quantity of input at Standard Price $AQ \times SP$	Standard Quantity allowed (for Actual Output) at Standard Price : $SQ \times SP$
Price Variance (a - b) $AQ \times AP - AQ \times SP$ = $AQ (AP - SP)$		Quantity Variance (b - c) $AQ \times SP - SQ \times SP$ = $SP (AQ - SQ)$
Material Price Variance Labour Rate Variance Overhead Spending Variance		Material Usage Variance Labour Efficiency Variance Overhead Efficiency Variance

3.4.1 Material Cost Variance or Material Total Variance

It is the difference between the standard cost of materials and actual cost of materials used.

$$\begin{aligned} \text{i.e., } & (\text{Standard Quantity} \times \text{Standard Price}) - (\text{Actual Quantity} \times \text{Actual Price}) \\ & = (SQ \times SP) - (AQ \times AP) \end{aligned}$$

Material Cost Variance can be further analysed into Material Price and Material Quantity Variances.

Material Price Variance

It is the difference between standard cost of materials used (Standard Price \times Actual Quantity) and actual cost of materials (Actual Price \times Actual Quantity).

$$\text{i.e., } (\text{Standard Price} \times \text{Actual Quantity}) - (\text{Actual Price} \times \text{Actual Quantity})$$

or, Actual Quantity (Standard Price - Actual Price)

$$\text{or, } AQ(SP - AP)$$

So, it measures the difference in cost of materials due to change in price of materials for actual quantity used.

Material Quantity or Usage Variance

It is the difference between standard cost of material allowed for actual output and standard cost of materials used.

$$\text{i.e., } (\text{Standard Price} \times \text{Standard Quantity}) - (\text{Standard Price} \times \text{Actual Quantity})$$

$$\text{or, } (SP \times SQ) - (SP \times AQ) = SP(SQ - AQ)$$

So, it measures the difference in cost of materials due to change in quantity used at standard price.

Material Mix Variance

If different materials are used and the use of such materials can be specified in a standard proportion, Mix Variance can be calculated and may be treated as a part of Usage Variance.

It is the difference between standard price of total quantity in standard proportion and standard price of actual quantity of materials used.

Material Yield Variance

It is the difference between standard quantity of raw materials required at standard price for actual production and the actual quantity of raw-materials used at standard price.

Example : A firm manufactures a product using two materials—A and B. Calculate the material variances from the following information.

	Standard Mix	Standard Price per kg.
Material A	40%	Rs. 4.00
Material B	60%	Rs. 6.00

The standard loss in processing is 20%. During a particular month the firm produced 2500 kg of the finished product. Opening and closing stock of the materials and actual price and quantity of the materials used during the month is given below.

	Opening Stock (kg)	Closing Stock (kg)	Price per kg.	Purchases Quantity (kg)
Material A	120	180	5.00	1200
Material B	160	40	5.50	1800

Solution :

For actual output of 80 kg, total input required as per standard is 100 kg, 20% being normal loss. So, for actual output of 2500 kg, total input requirement is $(100 \times 2500)/80 \text{ kg} = 3125 \text{ kg}$.

Material A (as per standard) should have been used : $3125 \text{ kg} \times 40\% = 1250 \text{ kg}$.

Material B (as per standard) should have been used : $3125 \text{ kg} \times 60\% = 1875 \text{ kg}$.

Actual quantity used (Opening Stock + Purchase - Closing Stock) :

Material A : $(120 + 1200 - 180) = 1140 \text{ kg}$ (120 kg @ Rs. 4 & 1020 kg @ Rs. 5)

Material B : $(160 + 1800 - 40) = 1920 \text{ kg}$. (160 kg @ Rs. 6 & 1760 units @ Rs. 5.50)

(FIFO principles have been followed)

Material	Standard			Actual		
	Quantity(kg)	Price/kg	Cost(Rs)	Quantity(kg)	Price/kg	Cost(Rs)
A	1250	4.00	5000	120	4.00	5580
				1020	5.00	
B	<u>1875</u>	6.00	<u>11250</u>	160	6.00	10640
				<u>1760</u>	5.50	
Total	3125		16250	3060		16220
Less Normal Loss	625			560		—
Output	<u>2500</u>		<u>16250</u>	<u>2500</u>		<u>16220</u>

(i) Material Cost Variance : Standard Cost - Actual Cost = Rs. (16250 - 16220) = Rs. 30 (F)

(ii) Material Price Variance : AQ (SP - AP)

Material A : Rs. [120 (4.00 - 4.00) + 1020 (4.00 - 5.00)] = Rs. 1020 (A)

Material B : Rs. [160 (6.00 - 6.00) + 1760 (6.00 - 5.50)] = Rs. 880 (F)

Total Rs. 140 (A)

(iii) Material Usage Variance : SP (SQ - AQ)

Material A : Rs. [4.00 (1250 - 1140)] = Rs. 440 (F)

Material B : Rs. [6.00 (1875 - 1920)] = Rs. 270 (A)

Total Rs. 170 (F)

(iv) Material Mix Variance : SP [(Standard Proportion × AQ) - AQ]

Material A : Rs. 4.00 [(3060 × 40%) - 1140] = Rs. 336 (F)

Material B : Rs. 6.00 [(3060 × 60%) - 1920] = Rs. 504 (A)

Total Rs. 168 (A)

(v) Material Yield Variance : Std. Rate of Output (Actual Yield - Std. Yield of actual input)

$16250/2500 [2500 - (3060 \times 80\%)] = 338 (F)$

Check : Material Cost Variance = Material Price Variance + Material Usage Variance = Rs [140 (A) + 170 (F)] = Rs. 30 (F)

Material Usage Variance = Material Mix Variance + Material Yield Variance = Rs [168 (A) + 338 (F)] = Rs. 170 (F)

3.4.2 Direct Labour Cost Variance

It is the difference between standard labour cost and actual labour cost incurred for actual production.

i.e., $(\text{Standard Labour Hours for Actual Production} \times \text{Standard Rate per Hour}) - (\text{Actual Labour Hours worked} \times \text{Actual Rate per Hour})$

Direct Labour Rate Variance

It arises because of the difference between the standard hourly rate and actual hourly rate for the total actual hours worked, i.e., $\text{Actual Labour Hours worked} \times (\text{Standard Rate per Hour} - \text{Actual Rate per hour})$ or $\text{AH} (\text{SR} - \text{AR})$.

Direct Labour Efficiency Variance

It is the difference between the standard hours for actual output and actual hours worked, valued at standard hourly rate, i.e., $\text{Standard Labour Hour Rate} \times (\text{Standard Labour Hours for Actual output} - \text{Actual Hours worked})$ or $\text{SR} (\text{SH} - \text{AH})$.

Efficiency Variance may be decomposed into (i) Labour Mix/Gang Variance, (ii) Labour Yield Variance and (iii) Labour Idle Time Variance.

Labour Mix/Gang Variance

This variance arises due to change in the composition of actual labour force from that of the standard. It is the difference between standard cost of standard mix and standard cost of actual mix, i.e., $\text{Standard Rate per hour} \times (\text{Standard Mix/Proportion} \times \text{total hours worked} - \text{Actual Hours Worked})$, for each of the grades of labour force (e.g., skilled, semi-skilled, unskilled, etc.).

Labour Yield Variance

This variance arises due to the difference in the standard output specified and the actual output achieved, valued at standard cost.

i.e., $\text{Standard Cost of Output per Unit} \times (\text{Actual Output} - \text{Standard Output for Actual Hours})$.

Idle Time Variance

It represents the standard cost of abnormal idle time i.e., idle time for which the workers may not be held responsible like machine breakdown, lack of materials, etc. It is always an unfavourable or adverse variance and determined as :

$\text{Abnormal Idle Time (hours)} \times \text{Standard Rate per hour}$

Example : Standard as well as actual number of workers, labour hours for each of the workers, their hourly rates for a job are given below. Compute the labour variances.

Category of Labour	Standard			Actual		
	No. of Workers	Hours	Rate/hour	No. of Workers	Hours	Rate/hour
Skilled	10	30	8	9	35	8.50
Semi-skilled	6	30	7	6	35	6.50
Unskilled	4	30	6	5	35	6.00

Solution :

Category	Standard			Actual		
	No. of Workers	Total Labour Hours	Amount	No. of Workers	Hours	Rate/hour
Skilled	10	300	2400	9	315	2677.5
Semi-skilled	6	180	1260	6	210	1365.0
Unskilled	4	120	720	5	175	1050.0
Total		600	4380		700	5092.5

(i) Labour Cost Variance = total standard labour cost – total actual labour cost
= Rs. (4380.00 – 5092.50) = Rs. 712.50 (A)

(ii) Labour Rate Variance = AH (SR – AR)

Skilled : 315 (8.00 – 8.50) = 157.50 (A)

Semi-skilled : 210 (7.00 – 6.50) = 105.00 (F)

Unskilled : 175 (6.00 – 6.00) = Nil

Total **52.50 (A)**

(iii) Labour Efficiency Variance = SR (SH – AH)

Skilled : 8.00 (300 – 315) = 120 (A)

Semi-skilled : 7.00 (180 – 210) = 210 (A)

Unskilled : 6.00 (120 – 175) = 330 (A)

Total **660 (A)**

Labour Efficiency Variance may be further analysed into Mix Variance and Revised Standard Efficiency Variance.

(iv) Labour Mix Variance = SR (total actual hours × standard mix – actual hours)

Skilled : 8.00 (700 × 50% – 315) = 280 (F)

Semi-skilled : 7.00 (700 × 30% – 210) = Nil

Unskilled : 6.00 (700 × 20% – 175) = 210 (A)

Total **70 (F)**

(v) Labour Revised Standard Efficiency Variance = SR [Standard time specified - total actual hours × standard mix (i.e., revised standard time)]

Skilled :	8.00 (300 - 700 × 50%) = 400 (A)	
Semi-skilled :	7.00 (180 - 700 × 30%) = 210 (A)	
Unskilled :	6.00 (120 - 700 × 20%) = <u>120 (A)</u>	
Total		730 (A)

Example :

A firm manufactures a product using different grades of labour working as a team. The following information relate to a particular month. Calculate labour variances.

Standard :

Types of Labour	Number of Workers	Standard Rate per hour (Rs.)
I	2	8
II	2	7
III	16	6
IV	4	4

Output is measured in standard hours and 90 standard hours are expected for every 100 clock hours.

Actual for the month :

Types of Labour	Actual Hours	Actual Wages (Rs.)
I	170	1394
II	230	1725
III	1240	7482
IV	<u>280</u>	<u>1120</u>
	1920	11721

1620 standard hours were produced during the month.

Solution : Standard Mix/Composition of different types of labours :

Type I : 2/24 : Type II : 2/24; Type III : 16/24; Type IV : 4/24.

Standard Hours for Actual Production : 1620 × (100/90) = 1800 hours

Standard Labour Cost for Actual Production :

Type of Labour	Standard Hours	Std. hourly rate (Rs)	Amount (Rs)
I	$1800 \times (2/24) = 150$	8	1200
II	$1800 \times (2/24) = 150$	7	1050
III	$1800 \times (16/24) = 1200$	6	7200
IV	$1800 \times (4/24) = 300$	4	1200
	1800		10650

(i) Labour Cost Variance : Standard Cost – Actual Cost

$$= \text{Rs. } (10650 - 11721) = \text{Rs. } 1071 \text{ (A)}$$

(ii) Labour Rate Variance : AH (SR – AR) = AH × SR – Actual Wages

$$\text{Type I : } 170 \times 8 - 1394 = 34 \text{ (A)}$$

$$\text{Type II : } 230 \times 7 - 1725 = 115 \text{ (A)}$$

$$\text{Type III : } 1240 \times 6 - 7482 = 42 \text{ (A)}$$

$$\text{Type IV : } 280 \times 4 - 1120 = \text{Nil}$$

Total

Rs. 191 (A)

(iii) Labour Efficiency Variance : SR (SH – AH)

$$\text{Type I : } 8(150 - 170) = 160 \text{ (A)}$$

$$\text{Type II : } 7(150 - 230) = 560 \text{ (A)}$$

$$\text{Type III : } 6(1200 - 1240) = 240 \text{ (A)}$$

$$\text{Type IV : } 4(300 - 280) = 80 \text{ (F)}$$

Total

Rs. 880 (A)

(iv) Labour Mix Variance : SR (Standard Mix for Actual Hours – Actual Mix)

$$\text{Type I : } 8(1920 \times 2/24 - 170) = 80 \text{ (A)}$$

$$\text{Type II : } 7(1920 \times 2/24 - 230) = 490 \text{ (A)}$$

$$\text{Type III : } 6(1920 \times 16/24 - 1240) = 240 \text{ (F)}$$

$$\text{Type IV : } 4(1920 \times 4/24 - 280) = 160 \text{ (F)}$$

Total

Rs. 170 (A)

(v) Labour Yield Variance : Standard Rate per unit (Actual Yield – Standard Yield)

$$= 10650/1620 (1620 - 1920 \times 90\%)$$

$$= \text{Rs. } 710 \text{ (A)}$$

3.4.3 Variable and Fixed Overhead Variance

Variable Overhead Variance : It is the difference between the standard variable overhead for actual hours worked/output produced and actual variable overhead incurred. Therefore, it represents the over or under-absorption of variable overhead.

Standard Variable Overhead = Actual Production \times Standard Rate

- (i) **Variable Overhead Spending/Expenditure Variance :** It is the difference between the standard rate and actual rate of variable overhead, for the actual production, i.e., $AP (SR - AR)$
- (ii) **Variable Overhead Efficiency Variance :** It is the difference between the standard production and actual production, valued at standard rate of variable overhead.

If only standard rate of variable overhead is available (if budgeted production is unknown), variable overhead expenditure variance may be found out. However, in case of budgeted production differs from the actual production, variable overhead efficiency variance may also be found out.

Example : Standard variable overhead per unit	Rs. 2.00
Actual production	1000 units
Actual variable overhead incurred	Rs. 2500

- (i) Variable overhead variance : Standard Overhead - Actual Overhead
Rs. $[(1000 \times 2) - 2500] = \text{Rs. } 500 \text{ (A)}$
- (ii) Variable overhead expenditure variance : $AP (SR - AR)$
Rs. $[1000 (2 - 2500/1000)] = \text{Rs. } 500 \text{ (A)}$

In this case, efficiency variance cannot be found because budgeted production is not known. Therefore, expenditure variance represents the variable overhead total variance.

Example :	Budget	Actual
Production (units)	2500	2000
Variable Overhead (Rs.)	25000	22000

- (i) Variable overhead variance Standard Overhead - Actual Overhead
Rs. $[(2000 \text{ units} \times 25000/2500) - 22000] = \text{Rs. } 2000 \text{ (A)}$
- (ii) Variable overhead expenditure variance : $AP(SR - AR) = \text{Rs. } [2000 (2 - 2.50)] = \text{Rs. } 1000 \text{ (A)}$

(iii) Variable overhead efficiency/volume variance : $SR (SP - AP)$

$$Rs. 2(2500 - 2000) = Rs. 1000 (A)^*$$

Check : Total Variance = Expenditure Variance + Efficiency Variance

*If actual production is less than the standard, it represents unfavourable or adverse situation.

Fixed Overhead Variance : It is the difference between standard fixed overhead and actual fixed overhead, where standard fixed overhead = actual production \times standard recovery rate.

- (i) **Fixed Overhead Expenditure Variance (also known as Budget Variance)** : It is the difference between budgeted fixed overhead and actual fixed overhead, where budgeted fixed overhead = budgeted production \times standard recovery rate.
- (ii) **Fixed Overhead Volume Variance** : It is the difference between standard fixed overhead and budgeted fixed overhead, i.e.,
 $Standard\ Recovery\ Rate \times (Actual\ Production - Budgeted\ Production)$
Volume Variance can be further decomposed into (i) Efficiency Variance, (ii) Capacity Variance.
- (iii) **Fixed Overhead Efficiency Variance** : It is the difference between the actual production and standard production, valued at standard recovery rate, i.e.,
 $Standard\ Recovery\ Rate \times (Actual\ Production - Standard\ Production)$.
- (iv) **Fixed Overhead Capacity Variance** : It is the difference between standard production and budgeted production, valued at standard rate, i.e.,
 $Standard\ Recovery\ Rate \times (Standard\ Production - Budgeted\ Production)$.
Capacity variance may further be subdivided into (i) *Revised Capacity Variance* and (ii) *Calendar Variance*.
- (v) **Revised Fixed Overhead Capacity Variance** : It is the difference between standard production and revised budgeted production for actual number of working days, valued at standard rate, i.e., $Standard\ Recovery\ Rate \times (Standard\ Production - Revised\ Budgeted\ Production)$.
 $Revised\ Budgeted\ Production = Budgeted\ Production\ (per\ day) \times Actual\ no.\ of\ days$.
- (vi) **Fixed Overhead Calendar Variance** : This variance arises due to change in the actual number of working days from the planned number of working

days due to intervening holidays, different number of days in different months, etc. It is calculated as follows :

Calendar Variance = (Budgeted Fixed Overhead/Standard number of days in the budget period) × (Standard number of working days – Actual number of working days) or

Standard Recovery Rate × (Revised Budgeted Production – Budgeted Production).

The result of the Variance calculated with reference to output or production will be reverse.

Example : The information are available from cost records of a manufacturing organization. Calculate the overhead variances.

Number of budgeted working days	25
Budgeted man-hours per day	6000
Budgeted output per man-hour (units)	2
Budgeted fixed overhead (Rs)	150000
Actual number of working days	27
Actual man-hours per day	6300
Actual output per man-hour (units)	1.8
Actual fixed overhead incurred (Rs)	156000

Solution :

Budgeted Production = Budgeted days × Budgeted man-hours per day × Budgeted Production per man-hour = $25 \times 6000 \times 2 = 300000$ units

Standard Rate (per unit) = Budgeted overhead ÷ Budgeted Production = Rs. $(150000 \div 300000) = \text{Rs. } 0.50$

(i) Fixed Overhead Variance : Standard Fixed Overhead – Actual Fixed Overhead

= Actual Production × standard rate – actual overhead

= Rs. $(6300 \times 27 \times 1.8 \times 0.50 - 156000) = \text{Rs. } 2910 \text{ (A)}$

(ii) Fixed Overhead Expenditure Variance : Budgeted Overhead – Actual Overhead

= Rs. $(150000 - 156000) = \text{Rs. } 6000 \text{ (A)}$

(iii) Fixed Overhead Volume Variance : Standard Fixed Overhead – Budgeted Overhead

= Rs. $(6300 \times 27 \times 1.8) \times 0.50 - 150000 = \text{Rs. } 3090 \text{ (F)}$

- (iv) Fixed Overhead Efficiency Variance : SR (SP – AP)
 = Re 0.50 [(6300 × 27 × 2) – (6300 × 27 × 1.8)]
 = Rs. 17010 (A)
- (v) Fixed Overhead Capacity Variance : SR (BP – SP)
 = Re. 0.50 [(6000 × 25 × 2) – (6300 × 27 × 2)] = Rs. 20100 (F)
- (vi) Revised Fixed Overhead Capacity Variance : SR (RBP – SP)
 = 0.50 [(27 × 6000 × 2) – (27 × 6300 × 2)] = Rs. 8100 (F)
- (vii) Fixed Overhead Calendar Variance :
- (Budgeted Fixed Overhead/Standard number of days in the budget period)
 × (Standard number of working days – Actual number of working days)
 = Rs (150000 ÷ 25) × (25 – 27) = Rs. 12000 (F)

or

$$\text{SR (BP – RBP)} = 0.50 [(25 \times 6000 \times 2) - (27 \times 6000 \times 2)] = \text{Rs. } 12000 \text{ (F)}$$

$$\begin{aligned} \text{Check : Total Variance} &= \text{Expenditure Variance} + \text{Volume Variance} \\ &= 6000 \text{ (A)} + 3090 \text{ (F)} = 2910 \text{ (A)} \end{aligned}$$

$$\begin{aligned} \text{Volume Variance} &= \text{Efficiency Variance} + \text{Capacity Variance} \\ &= 17010 \text{ (A)} + 20100 \text{ (F)} = 3090 \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{Capacity Variance} &= \text{Revised Capacity Variance} + \text{Calendar Variance} \\ &= 8100 \text{ (F)} + 12000 \text{ (F)} = 20100 \text{ (F)} \end{aligned}$$

3.4.4 Sales Variance

Sales variances are generally found out in two ways—(i) on the basis of Profit and (ii) on the basis of Sales Value.

Sales Variances based on Profit (also known as Sales Margin Variance)

- (i) **Total Sales Margin Variance** : It is the difference between the *actual profit and budgeted profit*, i.e., (Actual Quantity of Sales × Actual Profit per unit) – (Budgeted Quantity of Sales × Budgeted Profit per unit).
- (ii) **Sales Price Variance** : It is the difference between actual profit and standard profit i.e.,
 Actual Quantity of Sales × (Actual Profit per unit – Standard/Budgeted Profit per unit)
- (iii) **Sales Volume Variance** : It is the difference between standard profit and budgeted profit, i.e.,

Standard/Budgeted Profit per unit (Actual Quantity of Sales—Budgeted Quantity of Sales)

Sales Volume Variance may be subdivided into (i) Sales Mix Variance and (ii) Sales Quantity Variance.

(iv) **Sales Mix Variance** : Mix variance arises due to variation of actual mix and budgeted mix when more than one type of product is sold, i.e.,

Standard Profit per unit \times (Actual Mix – Standard Mix)

Or, Standard Profit – Revised Standard Profit

(v) **Sales Quantity Variance** : It is the difference between revised standard profit and budgeted profit, i.e.,

Standard Profit per unit \times (Standard Mix – Budgeted Mix).

Example : From the following sales and cost data relating to an organization, calculate the sales variances based on profit.

Product	Budgeted Sales (units)	Budgeted Selling Price per unit (Rs.)	Actual Sales (units)	Actual Sales Value (Rs.)	Standard Cost/unit	Actual Cost/unit
A	1280	20	650	12350	Rs. 16	Rs. 18
B	3200	12	3900	50700	10	12
C	1920	16	1950	29250	13	13

Solution :

Product	Budgeted Sales (units)	Budgeted Sales Margin per unit (Budgeted S.P. – Standard Cost)	Total Budgeted Sales Margin (Actual Profit)
		Rs.	Rs.
A	1280	4	5120
B	3200	2	6400
C	1920	3	5760
	<u>6400</u>		<u>17280</u>

Product	Actual Sales (units)	Actual Sales Margin per unit (Actual S.P. – Standard Cost)	Total Budgeted Sales Margin (Actual Profit)
		Rs.	Rs.
A	650	3	1950
B	3900	3	11700
C	1950	2	3900
	<u>6500</u>		<u>17550</u>

(i) Sales Margin Variance : Actual Sales Margin (Profit) – Budgeted Sales Margin (Profit)

$$= \text{Rs. } (17550 - 17280) = \text{Rs. } 270 \text{ (F)}$$

(ii) Sales Price Variance : Actual Profit – Standard Profit

$$\text{A : } 1950 - (650 \times 4) = 650 \text{ (A)}$$

$$\text{B : } 11700 - (3900 \times 2) = 3900 \text{ (F)}$$

$$\text{C : } 3900 - (1950 \times 3) = \underline{1950 \text{ (A)}} \quad 1300 \text{ (F)}$$

(iii) Sales Volume Variance : Standard Profit – Budgeted Profit

$$\text{A : } (650 \times 4) - 5120 = 2520 \text{ (A)}$$

$$\text{B : } (3900 \times 2) - 6400 = 1400 \text{ (F)}$$

$$\text{C : } (1950 \times 3) - 5760 = \underline{90 \text{ (F)}} \quad 1030 \text{ (A)}$$

(iv) Sales Mix Variance : (Standard Profit – Revised Standard Profit)

or, Standard Profit (Actual Mix – Standard Mix)

$$\text{A : } 4 [650 - (6500 \times 1280/6400)] = 2600 \text{ (A)}$$

$$\text{B : } 2 [3900 - (6500 \times 3200/6400)] = 1300 \text{ (F)}$$

$$\text{C : } 3 [1950 - (6500 \times 1920/6400)] = \underline{\text{NIL}} = 1300 \text{ (A)}$$

(v) Sales Quantity Variance : Revised Standard Profit – Budgeted Profit

or, Standard Profit per unit \times (Standard Mix – Budgeted Mix)

$$\text{A : } 4 [(6500 \times 1280/6400) - 1280] = 80 \text{ (F)}$$

$$\text{B : } 2 [(6500 \times 3200/6400) - 3200] = 100 \text{ (F)}$$

$$\text{C : } 3 [(6500 \times 1920/6400) - 1920] = \underline{90 \text{ (F)}} = 270 \text{ (F)}$$

Sales Variances based on Sales Value (Turnover)

Classification and techniques of finding out sales variances on the basis of turnover or sales value are similar to that of sales variances based on profit. Structure of the variances may be shown as follows.

AQ is actual quantity of sales; BQ is budgeted quantity of sales; RBQ is revised budgeted quantity of sales (i.e., actual quantity expressed in terms of budgeted proportion); AP is actual selling price per unit; BP is budgeted/standard selling price per unit.

(AQ \times AP) is the actual sales; (AQ \times SP) is the standard sales; (BQ \times BP) is the budgeted sales; BP \times RBQ is the revised standard sales.

Sales Value Variance

$$(AQ \times AP - BQ \times BP)$$

Sales Price Variance

$$AQ (AP - BP)$$

Sales Volume Variance

$$BP (AQ - BQ)$$

Sales Mix Variance

$$BP (AQ - RBQ)$$

Sales Quantity Variance

$$BP (RBQ - BQ)$$

Example : Calculate the sales variances from the following information.

Product	Budget			Actual		
	Sales (units)	Selling Price per unit (Rs)	Total Sales Rs.	Sales (units)	Selling Price per unit (Rs)	Total Sales Rs.
P	5000	10	50000	5400	11	59400
Q	3000	12	36000	2400	12	28800
R	4000	8	32000	4800	7	33600
	<u>12000</u>		<u>118000</u>	<u>12600</u>		<u>121800</u>

Solution :

Standard Sales : Actual Quantity of Sales \times Standard/Budgeted Selling Price per unit.

Revised Standard/Budgeted Sales (RBS) : Standard Sales in Budgeted Proportion ($RBQ \times BP$).

Product	Actual Sales (units)	Budgeted Price per unit (Rs)	Standard Sales Rs.	Revised Budgeted Quantity (units)	Revised Bud. Sales (Rs)
P	5400	10	54000	$12600 \times 5/12 = 5250$	52500
Q	2400	12	28800	$12600 \times 3/12 = 3150$	37800
R	4800	8	38400	$12600 \times 4/12 = 4200$	33600
			<u>121200</u>		<u>123900</u>

(i) Sales Value Variance : $(AQ \times AP) - (BQ \times BP)$ Actual Sales - Budgeted Sales = Rs. (121800 - 118000) = Rs. 3800 (F)

(ii) Sales Price Variance : $AQ (AP - BP) =$ Actual Sales - Standard Sales = Rs. (121800 - 121200) = Rs. 600 (F)

(iii) Sales Volume Variance : $BP (AQ - BQ) =$ Standard Sales - Budgeted Sales = Rs. (121200 - 118000) = Rs. 3200 (F)

(iv) Sales Mix Variance : $BP (AQ - RBQ) = \text{Standard Sales} - \text{Revised Standard Sales}$

$$= \text{Rs. } (121200 - 123900) = \text{Rs. } 2700 \text{ (A)}$$

(v) Sales Quantity Variance : $BP (RBQ - BQ) = \text{Revised Standard Sales} - \text{Budgeted Sales}$

$$= \text{Rs. } (123900 - 118000) = \text{Rs. } 5900 \text{ (F)}$$

Profit variance : Actual profit may differ from the budgeted profit primarily due to the change in the selling price, sales quantity. Therefore, it may also be analysed into (i) profit price variance and (ii) profit volume variance. In case of dealing with more than one type of products, profit volume may further be subdivided into (i) profit mix variance and profit quantity variance. Such variances have already been shown in the previous section dealing with Sales Variances based on Profit.

For recapitulation :

- (i) **Profit Variance :** it is the difference between actual profit and budgeted profit.
- (ii) **Profit Price Variance :** it is the difference between actual profit and standard profit.
- (iii) **Profit Volume Variance :** it is the difference between standard profit and budgeted profit.
- (iv) **Profit Mix Variance :** it is the difference between standard profit and revised standard profit.
- (v) **Profit Quantity Variance :** it is the difference between revised standard profit and budgeted profit.

Standard Profit : Actual Quantity \times Standard Rate of Profit

Revised Standard Profit : Revised Standard Sales \times Standard Rate of Profit

Revised Standard Sales : Actual Sales \times Standard Proportion (Mix).

3.5 Reconciliation of Budgeted Profit and Actual Profit

A statement may be prepared after finding out all variances showing therein the impact of such variances on actual profit. In other words, a reconciliation between the actual profit and the budgeted profit may be made through adjustment of all the variances.

Example : Budgeted Profit Rs. 21600; Actual Profit Rs. 14750;

Sales Margin Variance Rs. 2850 (A); Material Cost Variances Rs. 2600 (A) Labour Cost Variance Rs. 5600 (A); Variable Overhead Variance Rs. 1200 (F); Fixed Overhead Variance Rs. 3000 (F).

Reconciliation Statement

	Rs.	Rs.
<i>Budgeted Profit</i>		21600
Less Unfavourable Sales Margin Variance		<u>2850</u>
Standard Profit		18750
Add Favourable Cost Variances		
Variable Overhead Variance	1200	
Fixed Overhead Variance	<u>3000</u>	<u>4200</u>
		22950
Less Unfavourable Cost Variances		
Material Variances	2600	
Labour Variances	<u>5600</u>	<u>8200</u>
<i>Actual Profit</i>		<u>14750</u>

3.6 Planning and Operating Variances

Planning variances seek to explain the extent to which the original standard needs to be adjusted in order to reflect changes that have taken place in respect of the operating conditions between the time interval of standard setting and variance analysis. In other words, standards are to be adjusted/updated/revised considering the current situation so as to make it a realistic and attainable standard (ex-post standard) under the prevalent situation.

A planning variance is the difference between the standard cost using an ex-ante standard (original standard) and the standard cost using ex-post standard (revised standard).

An operating variance is the difference between the ex-post standard and the actual results.

Investigation and Control of Variances : Analysis of variances highlights the areas of strengths and weaknesses and reveals the causes of such variances. The causes may be classified as :

- Implementation deviation—due to human or mechanical failure to achieve the standard
- Prediction deviation—due to errors in specifying parameter values in decision models
- Measurement deviation—due to errors in measuring the actual outcome
- Model deviation—due to erroneous formulation in a decision model
- Random deviation—fluctuation to which no proper reasons can be assigned.

Such analysis help the management to decide which areas need further investigation in order to take appropriate corrective measures. The approaches may be useful in deciding the areas to be investigated.

- (i) Rule of Thumb Method : Management may decide to investigate the variances greater than a specified percentage or an absolute value. For example, it may be decided that variance to the extent of '10% or more' or involving an amount of Rs. 10000 should be investigated.
- (ii) Cost-benefit analysis : Any investigation would involve time and cost. Therefore, cost of investigation and benefit out of that must be analysed. For this purpose, decision tree analysis may be helpful.
- (iii) Statistical Quality Control Chart : Tolerance limits may be set so that the variances that exceed the tolerance limits may be investigated for further action. It would help control through the principle of 'management by exception'.

3.7 Budgetary Control

Budget : Budget is a plan expressed in monetary and/or quantitative terms, prepared and approved prior to a defined period of time, in respect of the policy to be pursued during that period for the purpose of attaining a given objective.

A budget may involve short period or long period of time, i.e., short-term and long-term budget. Budgets may be prepared relating to different functions of an organization, e.g., research & development, production, administration, etc. A budget may be for a given level of activity only (fixed budget) or it may be prepared for different level of activities (flexible budget).

Budgeting : Budgeting is the whole process of designing, implementing and operating budgets.

Budgetary Control : The establishment of budgets relating the responsibilities of executives to the requirements of a policy, and the continuous comparison of actual with budgeted results, either to secure by individual action, the objective of

that policy or to provide a basis for its revision (CIMA, London). Therefore, the steps involved in budgetary control are :

- Establishment of budgets
- Measurement of actual results
- Comparison of actual results with the budgeted figures
- Finding out the deviations or variances (differences between the actual and the budgeted)
- Analysis of variances to reveal the root causes and reporting to the management.

Budgetary control may help greatly in planning, coordinating and controlling activities through the processes or steps mentioned above.

Budget Period : It is period for which a budget is prepared. There is no hard and fast rule as to what should be the budget period. It depends on the nature and types of the business, and purpose for which the budget is prepared. The period may be long or short. Usually, short-term budgets are prepared for a period of one year or less (weekly, monthly, quarterly, half-yearly, etc.)

Budget Manual : It sets out policies and procedures involved in the implementation of the budgetary control system. It acts as a guide in preparing budgets and implementing the budgetary control system as a whole.

Principal Budget Factor : It is defined as a factor which, at a particular time or over a period, will limit the activities of an undertaking and which is, therefore, taken into account in preparing budgets. It is also known as 'Key Factor' or 'Limiting Factor' or 'Governing Factor'. For example, non-availability of skilled labour or supply of raw materials may restrict the production of certain items, even if there may be adequate demand for them and other production facilities are available. In such cases, skilled labour and raw materials are to be considered as principal budget factor. For preparing budgets, principal budget factor is the starting point, i.e., budget(s) concerning the principal budget factor(s) to be prepared at first and all other budgets there-after.

Functional Budgets : Budgets relating to different functions like sales, purchases, production, administration, research & development, etc. are known as functional budgets. A function may refer to a department or a process. Different functional budgets that are usually prepared are as follows.

- Sales Budget
- Purchase Budget

- Production Budget
- Plant Utilisation Budget
- Production Cost Budget
- Research & Development Cost Budget
- Administration Cost Budget
- Selling & Distribution Cost Budget
- Repairing and Maintenance Cost Budget
- Capital Expenditure Budget

Master Budget : A budget which is prepared from, and summarises the functional budgets is known as master budget. It is also referred to as summary budget. A master budget usually includes the budgeted profit and loss account, budgeted balance sheet and also it includes the budgeted fund flow statement.

Cash Budget : It forecasts the cash position for a period. It is a budget of cash receipts and cash payments during a particular period. This budget is prepared after all functional budgets when all information relating to income and expenditure are available. The cash budget is very important because it helps efficient cash management. It helps making necessary arrangements for procuring funds in case of cash shortage and also for investing idle funds, if any.

Flexible Budget : A budget which, by recognizing different cost behaviour patterns, is designed to change as volume of output changes. On the other hand, Fixed Budget is designed to remain unchanged irrespective of the volume of output or turnover attained.

A flexible budget is designed to change in relation to the level of activity attained. It takes into account a range of possible outcomes, known as relevant range. It helps an organization in predicting its performance at different levels of activity and thereby fixing a target of achieving the optimum level. However, flexible budgets are prepared assuming linearity of costs, that may not be true in all cases. Moreover, fixed costs may not remain fixed over all the level of activities. Therefore, while preparing flexible budgets, cost behaviour should be properly analysed and costs should be ascertained taking into consideration all the relevant factors like possible changes in variable costs, e.g., discounts for bulk purchases, changes in fixed costs for exceeding a particular level, etc.

● **Zero Base Budgeting (ZBB) :** It is a method of budgeting whereby all activities are re-evaluated each time a budget is formulated. The basic premise of this type of budgeting is that no spending will be allowed unless demand is justified. In other words, a manager has to justify why any money should be spent and what

would happen if nothing were spent. Therefore, each manager has to carry out cost-benefit analysis in respect of the activities under his/her control.

ZBB may be referred to as 'de novo budgeting' or budgeting from the beginning without any reference to the past. It may be defined as a planning and budgeting process which requires each manager to justify his entire budget proposal in detail from scratch (i.e., zero base) and the burden of proof lies with the manager concerned why any money should be spent at all.

The traditional budgeting approach considers the expenditure of the previous year as base and only incremental expenses in the current budget requires justification. But under the ZBB, the base is taken as zero, i.e., every year a budget is prepared from scratch without taking the past expenditure as base.

ZBB may help identifying inefficient and obsolete operations and eliminating wasteful expenditure. So it may help increasing operational efficiency. Since all managers have to justify their budget proposals, they have to carry out cost-benefit analysis and evaluate different alternatives in respect of each of the activities, it involves active participation of all the managers which in turn may help achieving the organizational objectives through successful implementation of the budgetary system.

Some of the criticisms are : ZBB emphasis is on short-term benefits. It may encourage the false idea that all decisions have to be made in the budget; management should not be restricted from carrying out new ideas simply because they were not approved from the cost-benefit point of view. Sometimes it is very difficult to quantify the benefit that may be derived out of some expenditure like research & development expenses, market promotion expenses, etc. where ZBB may not offer any significant advantage of control.

• **Performance Budgeting (PB) :** The concept of performance budgeting was innovated in the U.S.A. in 1949 and a formal recognition was accorded in 1956 when the U.S. Government passed a law in 1956. A performance budget presents the purposes and objectives for which funds are required, the costs of the programmes proposed for achieving those objectives, and quantitative data measuring the accomplishments and work performed under each programme. Performance budgeting may be described as a budgetary system where input costs are related to the performance i.e., output or end results. PB is the process of analyzing, identifying, simplifying and crystallizing specific performance objectives of a job to be achieved over a period in the framework of the organizational objective.

PB aims at establishing a relationship between the inputs and outputs whereas the traditional budgeting gives more emphasis on the financial aspects than the

physical aspects or performance. The traditional budgets highlight the objects or items of expenditure like salaries, rent, rates and taxes, etc., while PB focuses on the purpose for which the expenditure is required to be spent. Therefore, PB emphasizes on the functions of the organization, the programmes required to discharge these functions and the activities involved in these programmes.

Some of the requirements for PB may be stated as follows :

- Identification of the objectives of the organization clearly
 - Translating the objectives into specific functions, programmes, activities and tasks for different levels of management taking into account the financial constraints
 - Identification of appropriate performance indicators and their quantification in physical terms
 - Developing an accounting and reporting system to facilitate monitoring, analysis and review of actual performance in relation to budgets.
- **Programme Budgeting (PPBS)** : It was first introduced in the US department of defence in 1961. In Britain it is referred to as Output Budgeting. It is also known as Planning, Programming, Budgeting System, which has been introduced into non-commercial organizations to enable them to make more informed decisions about resource allocation. It is a system for analyzing expenditure with reference to particular objectives. It emphasizes on formulation of different budgets for different programmes.

The PPBS has been devised for proper utilization of public funds through improved allocation of resources, the objective being to make the government activities and operations more effective and efficient.

Planning part of PPBS requires the determination and review of objectives with reference to the present and future needs of an organization. *Programming* part refers to the definition and ranking of the alternative methods for allocating resources with a view to achieving the desired objectives. The decisions are presented in the form of a programme and financial plan.

Budgeting part translates the programme and financial plan to a more detailed and precise annual budget which sets targets for performance. *System* part emphasizes the co-ordination of planning, programming and budgeting within one system.

Therefore, identification of the programmes, their objectives and selecting performance measures are very important steps for preparing a Programme Budget. Identification of alternative methods and cost-benefit analysis of the alternatives for selection of the best alternative are also required. As a programme may extend over

a number of years, performance should be carefully monitored so as to ensure that actions are consistent with the plans.

Functional Budgets

Example : A Ltd. produces and sells three products—Chairs, Tables and Benches. The company wants to prepare a budget for the quarter ending 31st March 2006. The following information are made available for this purpose.

	Chairs	Tables	Benches	
Estimated Sales for the quarter (numbers)	4500	1000	600	
Expected selling price per unit (Rs.)	300	600	800	
Material and labour requirements :				
Timber per unit (cu.ft)	0.5	1.2	1.5	
Upholstery per unit (in sq. yds.)	0.5	—	—	
Carpenter's time (hour per unit)	1.0	1.5	1.75	
finishing time (hour per unit)	0.5	0.75	1.0	
Inventory levels : (planned)	Chairs nos.	Upholstery Sq. yds	Tables nos.	Benches nos.
Opening	500	400	200	100
Closing	300	300	400	100

Timber costs Rs. 300 per cu. ft, Upholstery costs Rs. 60 per sq. yds. and Finishing material costs 5% of costs of timber and upholstery. Rate of wages for carpenter is Rs. 10 per hour and that for finishing is Rs. 5 per hour. Fixed overhead per month is estimated to be Rs. 100000 per month.

Prepare (i) Production Budget, (ii) Raw Materials Purchase Budget (in quantities and value), (iii) Direct Wages Cost Budget, (iv) a statement showing variable cost of production per unit and (v) a statement showing Budgeted net profit for the quarter.

Solution :

(i) Production Budget

	Chairs	Tables	Benches
Estimated Sales (units)	4500	1000	600
Add Closing Inventory	300	400	100
	<u>4800</u>	<u>1400</u>	<u>700</u>
Less Opening Inventory	500	200	100
Units to be manufactured	<u>4300</u>	<u>1200</u>	<u>600</u>

(ii) (a) Material Purchase Budget (in quantities)

	Timber (cu.ft)	Upholstery (sq.yd)
Materials required for production (working note 1)	4490	1075
Add Closing Stock	<u>700</u>	<u>300</u>
	5190	1375
Less Opening Stock	<u>600</u>	<u>400</u>
Materials to be purchased	4590	975

(ii) (b) Material Purchase Budget (in quantities)

	Timber	Upholstery
Materials to be purchased	4590 cu. ft	975 sq. yds
Rate (Rs.)	300 per cu. ft.	60 per sq. yd
Amount Required (Rs.)	Rs. 13,77,000	Rs. 58,500
Total amount required for purchasing timber and upholstery = Rs. 14,35,500		

(iii) Direct Wages Cost Budget

	Carpenting	Finishing
Time (hours) [working note 2]	7150	3650
Rate (Rs. per hour)	10	5
Direct Wages (Rs.)	71500	18250

Total Direct Wages (Carpenting + Finishing) = Rs. 89750

(iv) Statement of Variable Cost of Production per units

	Tables	Chairs	Benches
Raw Materials	Rs.	Rs.	Rs.
Timber	$0.5 \times 300 = 150$	$1.2 \times 300 = 360$	$1.5 \times 300 = 450$
Upholstery	$0.5 \times 60 = 30$	—	—
Finishing	9	18	22.50

(5% of timber & upholstery)

Direct Wages :

Carpenting	$1.0 \times 10 = 10$	$1.5 \times 10 = 15$	$1.75 \times 10 = 17.50$
Finishing	$0.5 \times 5 = 2.5$	$0.75 \times 5 = 3.75$	$1.00 \times 5 = 5$
Total Variable Cost	201.50	396.75	495

(v) Statement of Budgeted Net Profit for the Quarter ending 31.03.2006

	Chairs	Tables	Benches	Total
	Rs.	Rs.	Rs.	Rs.
Selling Price p.u.	300	600	800	
Less Variable Cost p.u.	201.50	396.75	495	
Contribution p.u.	<u>98.50</u>	<u>203.25</u>	<u>305</u>	
Total Contribution	443250	203250	183000	829500

(units to be sold × contribution p.u.)

Less Fixed Costs				300000
Net Profit				<u>529500</u>

Working notes :

1. Raw materials requirement

	Chairs	Tables	Benches	Total
Production (nos.)	4300	1200	600	
Timber per unit (cu. ft)	0.5	1.2	1.5	
Timber required (cu. ft)	2150	1440	900	4490
Upholstery per unit (sq. yds)	0.5	—	—	
Upholstery required (sq. yds)	1075	—	—	1075

2. Time required for Carpentry and Finishing

Carpentry time per unit (hours)	1.0	1.5	1.75	
Total carpentry time (hours)	4300	1800	1050	7150
Finishing time per unit (hours)	0.5	0.75	1.00	
Total finishing time (hours)	2150	900	600	3650

Master Budget

Example : Prepare a Forecast Profit and Loss Account for the year ended 31.03.2006 and a Forecast Balance Sheet as on that date considering the information given below.

Profit & Loss Account for the year ended 31.03.2005

	Rs.		Rs.
Material consumed	50000	Sales	300000
Direct wages	10000		
Production overhead (60% variable)	100000		
Administration overhead (fixed)	50000		
Selling & Distribution overhead (60% fixed)	50000		
Net Profit c/d	40000		
	<u>300000</u>		<u>300000</u>
Provision for Income Tax	16000	Net Profit b/d	40000
Proposed Dividend	10000		
Balance c/d	14000		
	<u>40000</u>		<u>40000</u>

Balance Sheet as on 31.03.2005

	Rs.		Rs.
Share Capital (10000 shares of Rs. 10 each)	100000	Fixed Assets (cost less depreciation)	144000
Reserves and Surplus	60000	Stock of materials	20000
Creditors	20000	Debtors	25000
Provision for Tax	16000	Cash & Bank	17000
Proposed Dividend	10000		
	<u>206000</u>		<u>206000</u>

Additional information :

- (i) The activity level of the company during 2004-05 was 60%. It wants to operate at 80% in 2005-06. It is estimated that increased volume can be sold if selling price of the entire volume is reduced by 5%.
- (ii) Material prices, Labour cost and overheads (except depreciation) are expected to go up by 5%.
- (iii) There will be no inventory except for raw materials which is equal to three month's requirement.
- (iv) Debtors are usually allowed two months credit and creditors normally allow one month's credit.
- (v) Monthly wages and other expenses are paid on the last day of each month.

(vi) An order for a machinery costing Rs. 20000 has already been placed. The company expects to get it by 30th september 2005 when the payment has to be made on delivery. The company charges depreciation @ 10% p.a. on reducing balance method.

(vii) The company wants to make a provision for income tax @ 40%, and propose dividend @ 20% subject to the availability of profit.

Solution :

Forecast Profit and Loss Account for the year ended 31st March, 2006

Dr		Rs.	Cr	
		Rs.		
To Materials Consumed			By Sales	380000
Opening stock	20000			
Add Purchases	60167			
Less Closing stock	<u>15824</u>	64333		
To Direct wages		14000		
To Production overhead		124600		
To Administration overhead		52500		
To Selling & distribution overhead		59500		
To Net Profit c/d		65067		
		<u>380000</u>		<u>380000</u>
To Provision for taxation (40% of 65067)		26067	By Net Profit b/d	65067
To Proposed dividend (20% of share capital)		20000		
To Balance c/d		19000		
		<u>65067</u>		<u>65067</u>

Forecast Balance Sheet as on 31st March, 2006

Liabilities	Rs.	Assets	Rs.
Share Capital (1000 shares of Rs. 10 each)	100000	Fixed Assets (cost less depreciation)	148600
Reserves & Surplus (60000 + 19000)	79000	(144000 + 20000 - 15400)	
Sundry Creditors (one month's purchase)	5014	Stock of materials	15834
Provision for Taxation	26067	Sundry Debtors	63333
Proposed Dividend	20000	(2 months' sale)	
		Cash & Bank	2314
	<u>230081</u>		<u>230081</u>

Working Notes

1. Sales Budget

	Rs.
Sales for the year 2004-05 (at 60% capacity)	300000
Sales for the year 2005-06 (at 80% capacity) (at the price of 2004-05) $[300000/60 \times 80]$	400000
Less expected decrease in selling price (5%)	20000
Expected sales for 2005-06	<u>380000</u>

2. Materials Purchase Budget

Raw materials consumed in 2004-05 (at 60% capacity)	50000
Raw materials to be consumed in 2005-06 (60% capacity) (at the price of 2004-05) $[(50000/60) \times 80]$	66667
Add Closing Stock (3 months requirement i.e., 1/4 th) (at the price of 2004-05)	<u>16667</u>
	83334
Less Opening Stock	<u>20000</u>
Purchase of Materials (at 2004-05 price)	63334
Add Increase in price in 2005-06 (5%)	<u>3167</u>
Materials to be purchased	<u>60167</u>

3. Closing Stock of Materials (at the price of 2004-05)

Add Increase in price in 2005-06 (5%)	<u>833</u>
Closing Stock of Materials in 2005-06	<u>15834</u>

4. Labour Cost in 2004-05 (at 60% capacity)

Labour cost in 2005-06 (at 80% capacity) (at the price of 2004-05) $[(10000/60) \times 80]$	13333
Add Increase in the rate in 2005-06 (5%)	<u>667</u>
Direct wages	<u>14000</u>

5. Production Overhead

Variable production overhead in 2004-05 (at 60% capacity) (60% of Rs. 100000)	60000
Variable production overhead in 2005-06 (at 80% capacity) (at the price of 2004-05) $[(60000/60) \times 80]$	80000
Add Increase in the rate in 2005-06 (5%)	<u>4000</u>
Variable production overhead in 2005-06	<u>84000</u>

Fixed production overhead in 2004-05 (40% of 100000)	40000
Less Depreciation included in fixed overhead	16000
Fixed overhead (excluding depreciation)	<u>24000</u>

(Fixed assets represents 90%, after depreciation of 10%)

[i.e., 90% = Rs. 144000 ;

∴ depreciation (10%) = $144000/90\% \times 10\%$]

Fixed production overhead in 2004-05 (excluding depreciation)	Rs. 24000
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Add Increase in 2005-06 (5%)	<u>1200</u>
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Fixed production overhead in 2005-06	<u>25200</u>
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Depreciation on old fixed assets (10% of Rs. 144000)	14400
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Add Depreciation on new machine (10% of Rs. 20000 for 6 months)	<u>1000</u>
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Depreciation for 2005-06	<u>15400</u>
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Total Production Overhead in 2005-06 (84000 + 25200 + 15400)	<u>124600</u>
--	----------------------

6. Fixed administration overhead in 2004-05 (at 60% level)	Rs. 50000
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Add Increase in 2005-06 (5%)	<u>2500</u>
------------------------------	-------------

Administration overhead for 2005-06	<u>52500</u>
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7. Selling & Distribution Overhead

Variable selling and distribution overhead in 2004-05 (at 60% level) (40% of Rs. 50000)	<u>20000</u>
--	--------------

Variable selling and distribution overhead (at 80% level) (at the price of 2004-05) [$(20000/60) \times 80$]	26667
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Add Increase in 2005-06 (5%)	<u>1333</u>
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Variable selling and distribution overhead in 2005-06	<u>28000</u>
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Fixed production overhead in 2004-06 (60% of Rs. 50000)	30000
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Add 5% increase in 2005-06	<u>1500</u>
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Fixed selling and distribution overhead in 2005-06	<u>31500</u>
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Total selling & distribution overhead (28000 + 31500)	<u>59500</u>
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8. Cash Budget for the year ended 31st March 2006

Opening Balance		17000
Receipt from debtors (opening debtors + sales – closing debtors)		<u>341667</u>
Less :		358667
Payment to creditors		
(opening creditors + purchases – cl. creditors)	75153	
Wages	14000	
Production overhead (excluding depreciation)	109200	
Administration overhead	52500	
Selling & distribution overhead	59500	
Income Tax (2004-05)	16000	
Dividend (2004-05)	10000	
New machinery	<u>20000</u>	
		<u>356353</u>
Cash & Bank balance as on 31.03.2006		<u>2314</u>

Cash Budget

Example : The following information are available in respect of a manufacturing concern. Prepare a cash budget for three months ending 31st December, 2005.

(Rs. '000)

	Sales Incl. VAT	Wages & Salaries	Purchases of materials	Production overhead	Selling & dist. overhead
2005 July	2400	110	420	1120	250
Aug	2200	100	560	1000	250
Sept	2000	130	480	1280	250
Oct	2800	120	420	1120	250
Nov	2400	120	480	1000	260
Dec	2200	120	460	1120	260

- (i) All sales are made on credit and debtors are allowed 30 days credit. However, only 60% of the debtors pay within the due date; 30% pay after two months from the date of sale; 5% pay after another month and remaining 5% become bad.
- (ii) Creditors are paid within one month from the date of purchase.
- (iii) Wages and salaries are paid within the month itself.

- (iv) 40% of the production overhead is variable which are paid in the month after they are incurred. Fixed production overhead includes depreciation of Rs. 150000 per month. Fixed production overhead and selling & distribution overhead are paid in the month in which they are incurred.
- (v) Income Tax of Rs. 150000 is payable in October.
- (vi) Interim Dividend of Rs. 100000 is payable in December.
- (vii) Value Added Tax (VAT) of one month is payable in the first week of the next month. VAT is calculated as follows :

Output Tax @ 10%

Less Credit for Input Tax : Rs. 1,40,000 for October, Rs. 1,60,000 for November and Rs. 120000 for December.

- (viii) Capital expenditure commitments for Oct. Rs. 100000 and for Dec. Rs. 700000.
- (ix) The cash and bank balances on 30th September is Rs. 30000.

Solution :

Cash Budget for three months ended 31st December 2005

	October Rs. '000	November Rs. '000	December Rs. '000
Opening balance	30	(184)	388
Receipt from debtors	1980	2390	2380
Total receipts (A)	<u>2010</u>	<u>2206</u>	<u>2768</u>
Payments :			
Payment to creditors	480	420	480
Wages & salaries	120	120	120
Production overhead	1034	898	922
Selling & dist. Overhead	250	260	260
Income Tax	150	—	—
Interim Dividend	—	—	100
VAT	60	120	120
Capital Expenditure	100	—	700
Total Payments (B)	<u>2194</u>	<u>1818</u>	<u>2702</u>
Closing balance (A - B)	(184)	388	66

Working Notes :

(Rs. '000)

1. Receipt from debtors :

	July	Aug	Sept	Oct	Nov	Dec
Sales	<u>2400</u>	<u>2200</u>	<u>2000</u>	<u>2800</u>	<u>2400</u>	<u>2200</u>
60% in the next month	—	1440	1320	1200	1680	1440
30% after 2 months	—	—	720	660	600	840
5% after 3 months	—	—	—	120	110	100
Receipt from debtors				<u>1980</u>	<u>2390</u>	<u>2380</u>

2. Payment to Creditors

	Sept	Oct	Nov	Dec
Purchase of materials	480	420	480	460
Payable in the next month		<u>480</u>	<u>420</u>	<u>480</u>

3.

	Sept	Oct	Nov	Dec
Production overhead	<u>1280</u>	<u>1120</u>	<u>1000</u>	<u>1120</u>
Variable (40%)	512	448	400	448
Variable prodn. OH. payable after one month		<u>512</u>	<u>448</u>	<u>400</u>
Fixed (60%)	768	672	600	672
Depreciation included	<u>150</u>	<u>150</u>	<u>150</u>	<u>150</u>
Fixed Prodn. OH. payable in the month		<u>522</u>	<u>450</u>	<u>522</u>
Total production overhead payable		<u>1034</u>	<u>898</u>	<u>922</u>

4. Value Added Tax (VAT)

	Sept	Oct	Nov	Dec
Sales including VAT	2000	2800	2400	2200
Output Tax @ 10%	<u>200</u>	<u>280</u>	<u>240</u>	<u>220</u>
Payable in the next month		200	280	240
Less Input Tax Credit		140	160	120
VAT payable		<u>60</u>	<u>120</u>	<u>120</u>

Flexible Budget

Example : A manufacturing firm is currently producing 10000 units operating at 50% capacity. The goods are sold at Rs. 100 per unit. The cost incurred at the current level is as follows.

	Rs.
Direct material	500000
Direct wages	150000
Factory overheads (40% fixed)	150000
Administration overheads (40% variable)	<u>100000</u>
Total	900000

The firm expects that (i) at 60% level, material and labour cost would increase by 5% and selling price would decrease by 5% and (ii) at 80% level, material and labour cost would increase by 10% and selling price would decrease by 10%.

Prepare a flexible budget for 50%, 60% and 80% levels showing the profit at each of these levels and suggest the optimum level for the firm.

Solution :

Flexible Budget

	Capacity Levels		
	<u>50%</u>	<u>60%</u>	<u>80%</u>
Production and Sales (units)	10000	12000	16000
	Rs.	Rs.	Rs.
Direct material	500000	630000	880000
Direct wages @ Rs. 15 per unit	150000	180000	240000
<i>Variable overheads :</i>			
Factory @ Rs. 9 per unit	90000	108000	144000
Administration @ Rs. 4 per unit	<u>40000</u>	<u>48000</u>	<u>64000</u>
Total Variable Costs (A)	<u>780000</u>	<u>966000</u>	<u>1328000</u>
<i>Fixed overheads :</i>			
Factory (40% of Rs. 150000)	<u>60000</u>	<u>60000</u>	<u>60000</u>
Administration (60% of Rs. 100000)	60000	60000	60000
Total Fixed Costs (B)	<u>120000</u>	<u>120000</u>	<u>120000</u>
Total Costs (A+B)	900000	1086000	1448000
Sales	1000000	1140000	1440000
Profit (Sales - Cost)	<u>100000</u>	<u>54000</u>	<u>(8000)</u>

The current operating level i.e. 50%, may be considered as the optimum level because the profit is the highest at this level.

Working Notes :

	For 10000 units	per unit
	Rs.	Rs.
1. Expenses at the current level (50%)		
Direct material	500000	50
Direct wages	150000	15
Factory overheads :		
Variable (60%)	90000	9
Fixed (40%)	60000	
Administration overheads		
Variable (40%)	40000	4
Fixed (60%)	60000	

2. Selling price and expenses at the level of 60% and 80%

	60% (12000 units)		80% (16000 units)	
	Per unit	Total	Per unit	Total
Sales	$100 - 5 = 95$	1140000	$100 - 10 = 90$	1440000
Direct Material	$50 + 2.5 = 52.5$	630000	$50 + 5 = 55$	880000

3.8 Questions

- Define 'standard cost' and 'standard costing'. Discuss briefly the uses and limitations of standard costs. State the advantages of standard costing.
- 'Budgets and Standards are similar but they are not the same.' Explain the statement mentioning similarities and differences.
- State the differences between standard costing and budgetary control. Explain the advantages of operating both the systems for cost control.
- Define and explain briefly the following terms :
 - Material yield variance
 - Labour efficiency variance
 - Fixed overhead capacity variance
 - Fixed overhead calendar variance.
- (a) Explain the differences between a fixed budget and a flexible budget, stating which is more appropriate for budgetary control. (b) The following details have been extracted from standard cost card of a product that is manufactured by X Ltd. which uses an absorption costing system.

	Rs. per unit
Direct Materials	16.80
Direct Wages	15.20
Variable Overhead	7.80
Fixed Overhead	<u>10.20</u>
	50.00

The Fixed overhead is charged to each unit on the basis of a budgeted monthly production of 2000 units.

During a particular month, the actual production amounted to 2150 units and costs incurred were as follows.

	Rs.
Direct Materials	36200
Direct Wages	29960
Variable Overhead	16320
Fixed Overhead	19900

Calculate the following total cost variances :

- (i) Direct Materials
- (ii) Direct Labour
- (iii) Variable Overhead
- (iv) Fixed Overhead.

6. The following information is available from the records of S Ltd. Which produces only one product.

Budgeted Income Statement for January 2005

	Rs.	Rs.	Rs.
Sales revenue (20000 units @ Rs. 5)			100000
Production costs (for 20000 units) :			
Direct Materials			
A (10000 kg. @ Re. 0.30)	3000		
B (10000 kg. @ Re. 0.70)	<u>7000</u>	10000	
Direct labour			
Skilled (9000 hrs. @ Re. 0.3)	27000		
Un-skiled (5200 hrs. @ Rs. 2.50)	<u>13000</u>	40000	
Production overhead			
Variable (20000 units @ 0.50)	10000		
Fixed	<u>20000</u>	<u>30000</u>	
		80000	
Add : Opening stock (1000 units @ Rs. 4)		+ 4000	
Less : Closing stock (1000 units @ Rs. 4)		<u>- 4000</u>	
			<u>80000</u>
Budgeted Profit			<u>20000</u>

During the month, 24000 units were produced and 22000 units were sold. Actual Income statement is given below.

	Rs.	Rs.	Rs.
Sales revenue			
(14000 units @ Rs. 5)			70000
(8000 units @ Rs. 4.75)			<u>38000</u>
			108000
Production costs (for 24000 units) :			
Direct materials			
A (16000 kg. @ Re. 0.20)	3200		
B (10000 kg. @ Re. 0.80)	<u>8000</u>	11200	
Direct labour			
Skilled (13000 hrs. @ Rs. 2.95)	38350		
Un-skilled (6300 hrs. @ Rs. 2.60)	<u>16380</u>	54730	
Production overhead			
Variable (24000 units @ 0.625)	15000		
Fixed	<u>18020</u>	33020	
			98950
Add : Opening stock (1000 units @ Rs. 4)		+ 4000	
Less : Closing stock (3000 units @ Rs. 4)		<u>- 12000</u>	
			90950
Budgeted Profit			<u>17050</u>

- (i) Calculate sales volume and sales price variances; direct material price, mix, yield, and usage variances; direct labour rate, idle time and efficiency variances; overhead expenditure and volume variances and (ii) prepare a statement showing reconciliation of budgeted profit and actual profit.
7. Define 'budget' and 'budgetary control'. State the advantages of budgetary control in an organization. Mention the important steps in budgetary control.
 8. What do you mean by 'principal budget factor'? Mention some of the principal budget factors and state the effect of existence of two or more budget factors in an organization.
 9. What is performance Budgeting? How is it different from the Traditional or Conventional Budgeting? State the main features of Performance Budgeting.
 10. 'Zero-base Budgeting is a planning, resource allocation and control tool.' Explain. What are the advantages of Zero-base Budgeting?

11. (a) What is a Flexible Budget and what are its advantages?

(b) From the following data prepare a flexible budget for 70%, 80% and 100% activity levels when the sales are Rs. 45 lakhs, Rs. 50 lakhs and Rs. 60 lakhs respectively. Fixed expenses remain constant up to 100% level, but semivariable expenses vary by 10% in amount between 75% and 90% activity and 20% between 90% and 100%. The expenses and sales at 60% activity are as follows.

A. Variable Expenses	Rs. lakhs
Materials	8.0
Labour	6.0
Other Expenses	1.0
Total	<u>15.0</u>
B. Semi-Variable Expenses	
Repairs and Maintenance	1.0
Indirect Labour	3.0
Selling and Distribution Expenses	1.5
Others	1.0
Total	<u>6.5</u>
C. Fixed Expenses	
Wages and Salaries	4.0
Rent, Rates and Office Expenses	1.0
Depreciation	1.5
Sundry Expenses	3.5
Total	<u>10.0</u>
D. Sales	<u>40.0</u>

Calculate the cost of sales, profit and percentage of profit to sales for each level of activity.

12. A new manufacturing company is going to be incorporated on January 1, 20x6. Its authorized capital will be of Rs. 2 crore, divided into 20 lakh equity shares of Rs. 10 each. It intends to raise capital by issuing equity shares of Rs. 1 crore (fully paid) on 1st January. Besides, a loan of Rs. 13 lakh @ 12% interest per annum will be obtained from a financial institution on 1st January and further borrowings will be made at the same rate of interest on the first day of the subsequent months when it will be required. All borrowings will be repaid

alongwith interest on the expiry of one year. The company will make payment for the following assets in January.

	Rs. in lakh
Plant and Machinery	20
Land and Building	40
Furniture and Fittings	10
Motor Vehicles	10
Stock of Raw Materials	10

The following further details are available.

(i) Projected sales (January—June) :

	January	February	March	April	May	June
Sales (Rs. in lakh)	30	35	35	400	40	45

- (ii) Gross profit margin will be 25% on sales.
- (iii) The company will make credit sales only and these will be collected in the second month following sales.
- (iv) Creditors will be paid in the first month following credit purchases. There will be credit purchases only.
- (v) The company will keep minimum stock of raw materials of Rs. 10 lakhs.
- (vi) Depreciation will be charged @ 10% per annum on cost on all fixed assets.
- (vii) Payment of preliminary expenses of Rs. 1 lakh will be made in January.
- (viii) Wages and salaries will be Rs. 2 lakhs each month and will be paid on the first day of the next month.
- (ix) Administrative expenses of Rs. 1 lakh per month will be paid in the month of their incurrence.

Assume no minimum cash balance is required to be maintained.

Prepare the monthly cash budget for six months (January—June), the projected income statement for the above six months and the projected balance sheet as on 30th June, 2006.

3.9 Suggested Readings

- Kishore, Ravi M., Advanced Management Accounting Tax mann, Allied Services (P) Ltd. New Delhi.
- Banerjee, B., Cost Accounting, World Press, Kolkata.

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Unit 4 □ Performance Measurement and Responsibility Accounting

Structure

- 4.1 Performance Measurement
- 4.2 Performance Measurement Techniques
 - 4.2.1 Return on Investment (ROI)
 - 4.2.2 Residual Income and Economic Value Added
 - 4.2.3 Balance Scorecard
- 4.3 Responsibility Accounting
 - 4.3.1 Responsibility Reporting
- 4.4 Questions
- 4.5 Suggested Readings

4.1 Performance Measurement

Performance measurement is one of the important techniques of controlling various activities in an organization. The process of control usually involves setting a performance target, measuring performance, comparing performance with the target, finding out the differences between the actual performance and the target (i.e., variance), if any, and taking appropriate actions in response to the variance.

Organisations traditionally used financial measures for evaluating overall organisational performance and a few non-financial measures for supplementing financial measures. However, interest in non-financial measures of performance reflected an understanding that financial measures of performance are, by their nature, (i) short-run measures of results and (ii) neither familiar nor intuitive ways for people to manage operations. On the other hand, non-financial measures like quality, productivity, etc., not only provide an explanation to current performance but also are potential indicators of future performance. Unfortunately, very few organisations have undertaken a systematic consideration of how non-financial measures such as quality or productivity rates affect profitability levels.

4.2 Performance Measurement Techniques

4.2.1 Return on Investment (ROI)

ROI, also known as accounting rate of return, expressed as a ratio between accounting measure of income and accounting measure of investment, is the most popular approach to incorporating investment base into a performance measure. However, income (the numerator) and investment (denominator) may be defined in many ways. For example, income may mean earning before interest and taxes (EBIT) or net income after taxes. Similarly, investment may mean total assets employed or net assets employed (total assets employed minus current liabilities). For measuring the performance of the organization as a whole, EBIT and Net Assets may be taken into consideration and for measuring performance of a subunit, total assets employed in that subunit may be considered as investment base in order to obviate the possibility of inflating ROI by decreasing the investment base (through increasing current liabilities that may be influenced by the manager of the subunit concerned). However, to avoid confusion, two ratios—one based on total assets (ROTA) and the other based on net assets (RONA) may be used.

$$\text{ROI (based on total assets)} = \text{EBIT} \div \text{Total Assets}$$

$$\text{ROI (based on net assets)} = \text{EBIT} \div \text{Net Assets}$$

$$\text{Net Assets} = \text{Total Assets} - \text{Current Liabilities}$$

ROI measure, originally developed in the DuPont Company of the U.S.A., was further extended by Donaldson Brown, the chief financial officer of that company (who later joined General Motors), ROI was expressed as a product of *Profitability* (income divided by sales) and *Turnover* (sales divided by investment) with a view to providing more insight into performance recognizing the two basic ingredients in generating and increasing income : (i) increasing income per unit of sales value (*Profitability*) and (ii) using assets (investments) to generate more revenues (*Turnover*).

$$\text{ROI} = \text{Profitability} \times \text{Turnover} = (\text{EBIT} \div \text{Sales}) \times (\text{Sales} \div \text{Total Assets or Net Assets})$$

The decomposition of ROI into P and T would help the organization taking appropriate measure for improving its ROI. For example, an organization may try to improve its ROI either by increasing *Profitability* or by increasing *Turnover* or by increasing *both Profitability and Turnover*.

Example :

	Division A	Division B
	Rs.	Rs.
Sales	200000	300000
EBIT	50000	60000
Investments	100000	100000

Return on Investment (ROI) = $\text{EBIT} \div \text{Investment}$

Division A : $50000 \div 100000 = 0.50$ or 50%

Division B : $60000 \div 100000 = 0.60$ or 60%

ROI may be shown as product of Profitability and Turnover i.e., $P \times T$

	Profitability (P) (EBIT \div Sales)	Turnover (T) (Sales \div Investment)	ROI = P \times T
Division A	$50000 \div 200000$ = 0.25	$200000 \div 100000$ = 2	$0.25 \times 2 = 0.50$
Division B	$60000 \div 300000$ = 0.20	$300000 \div 100000$ = 3	$0.20 \times 3 = 0.60$

ROI may be further decomposed into several components incorporating almost all the items of Income Statement and Balance sheet in order to recognize that each and every item of the financial statements has its influence on ROI. Therefore, ROI may be considered as a means of controlling the activities of different subunits as well as organization as a whole.

However, ROI suffers from certain limitations that must be kept in mind while using the measure for evaluating performance and controlling the activities of the subunits or managers of the subunits. ROI being a ratio between income and investment, the items/components with which the numerator and denominator are computed need careful considerations depending on the purpose for which ROI is calculated. For example, if the purpose is to evaluate the performance of the divisional manager then only those assets that can be directly traced to the division and controlled by the divisional manager should be included in the asset base. Similarly, any liabilities that are within the control of the divisional manager should be deducted from the asset base. The term *Controllable Investment* is used to refer to the net asset base that is controllable by the division manager. On the other hand, if the purpose is to evaluate the economic performance of the division, the investment base should include the corporate assets allocated to the division concerned because a division could not operate without the benefit of corporate assets such as buildings,

cash and debtors managed at the corporate level. A possible reason for including non-controllable assets in the investment base to evaluate managerial performance is the central management wish to signal to managers that, overall, they should earn a return that is also sufficient to cover the cost of capital on a share of corporate assets.

While evaluating and controlling the performances of the divisional managers through ROI, it must be kept in mind that overemphasis on ROI may lead to sub-optimal decisions. Divisional managers may be tempted to reject the new investment opportunities *giving a return more than the cost of such investments* but less than the *existing ROI* of the division as the acceptance of such investment project is likely to result in the decrease in ROI. Similarly, there is a possibility that divisional managers may make an attempt to dispose off any part of the existing investment giving a return less than the existing ROI, though earning more than the cost of investment, in order to improve its ROI. In both the situations, the optimum course of action would have been to accept or retain the investment opportunities giving a return higher than the cost of capital but the action of the divisional managers in order to improve its ROI, as mentioned above, may result in sub-optimal decisions and consequently, the organization as a whole would be the sufferer.

Example :

Existing operating income of a division	Rs. 20000
Investment	Rs.100000
Cost of capital	12%

An investment opportunity come before the divisional manager with an expected return of Rs. 7000 on an additional investment of Rs. 50,000. What is the possibility of accepting the new investment by the divisional manager?

Solution :

Existing ROI of the division = $20000 \div 100000 = 0.20$ or 20%

If the new investment is accepted by the divisional manager, the divisional ROI will be as follows :

EBIT after accepting the investment opportunity = $(20000 + 7000) \div (100000 + 50000) = 0.18$ or 18%.

As the ROI decreases after accepting the new investment opportunity, the manager is likely to reject the same.

However, the company's overall profitability will be adversely affected due to rejection of the investment by the divisional manager. New investment should be accepted because incremental ROI ($7000 \div 50000$ or 14%) is more than the cost of

capital (12%), i.e., the company may gain by having 2% additional return on the new investment or additional income of Rs. 1000 (2% of 50000).

Similarly, divisional manager may think of disposing off a part of the existing investment if it contributes less than the existing ROI in order to increase its ROI.

Example :

Existing ROI of division	Rs. 25000
Investments	Rs.100000
Cost of Capital	12%

Divisional manager identifies that an investment of Rs. 40000 included in the above generates an income of Rs. 8000.

Under the circumstances, the divisional manager is likely to dispose off the part of investment (Rs. 40000) which is generating a lower rate of return ($8000 \div 40000$ or 20%) than the existing ROI ($25000 \div 100000$ or 25%) and thereby increase its ROI.

ROI after disposing off the investment of Rs. 40000 that earns an income of Rs. 8000 :

$$(25000 - 8000) \div (100000 - 40000) = 17000 \div 60000 = 28.33\%$$

It may be noticed that ROI of the division will increase by 3.33% due to disposing off the investment. But the divisional manager's action will result in decrease in the overall income of the company because the investment that is being disposed off earns an income more than its cost of capital.

Income from the part of investment (Rs. 40000) that may be disposed off	Rs. 8000
Cost of Capital	Rs. 40000 \times 12% <u>Rs. 4800</u>
Loss to the company because of disposing off the investment	Rs. 3200

Businesses, such as General Electric in the 1950s and academics have shown how to overcome such limitations of ROI measure by using an alternative performance measure, originally called Residual Income (RI) and further refined in the late 1980s/early 1990s as Economic Value Added (EVA).

4.2.2 Residual Income (RI) and Economic Value Added (EVA)

Origin of the concept of RI may be traced back to 1890s when economists Alfred Marshall stated, 'what remains after deducting interest on his capital at the current rate may be called his earnings of undertaking or management'. RI is the difference between Net Income before Taxes (NIBT) and Capital Charge. Capital Charge is usually taken as the product of Opening Capital Employed and the Risk-adjusted

Cost of Capital (also known as Required Rate of Return). Therefore, RI may be expressed as follows :

$$\text{RI} = \text{NIBT (or EBIT)} - \text{Required Rate of Return} \times \text{Opening Capital employed}$$

The move towards the RI measure received even greater publicity when it was renamed into a far more accessible and acceptable term—**Economic Value Added (EVA)**—by the Stern Stewart Consulting organization, a prime advocate for the EVA concept. Their ideas were publicized in the Fortune Magazine (1993) and Journal of Applied Corporate Finance (1994) describing the success stories of many companies who used EVA measure to motivate and evaluate corporate and divisional managers.

EVA is the difference between the Net Operating Profit after Tax (NOPAT) before interest and the Capital Charge. To arrive at NOPAT, after-tax but before interest accounting income is required to be adjusted for non-operating incomes and expenditures, and also for certain adjustments (like Research & Development Expenses, Employee Training Expenses, Business Re-structuring Expenses, Goodwill, Depreciation, Stock Valuation, etc.) as suggested by Stern Stewart & Co. Capital Charge for EVA is determined by taking the product of Weighted Average Cost of Capital (WACC) and Average Capital Employed (Avg. CE). Further, Cost of Equity is derived on the Capital Asset Pricing Model. EVA may be expressed as follows :

$$\text{EVA} = \text{NOPAT (before Interest on Debt)} - \text{WACC} \times \text{Average Capital Employed} \quad \dots\dots (i)$$

$$= \text{Avg. CE} \{(\text{NOPAT} \div \text{Avg. CE}) - \text{WACC}\}$$

$$= \text{Avg. CE (Return on Capital} - \text{Cost of Capital)}$$

$$= \text{Avg. CE} \times \text{Spread} \quad \dots\dots (ii)$$

Differences between RI and EVA

EVA may be considered as refined version of RI, the basic concept behind both the measures being difference between *Income* and *Capital Charge*. However, there are certain differences between these two measures :

- (i) RI is derived on the basis of 'Income before Taxes' while EVA is determined on the basis of 'After Tax Income';
- (ii) For determining Capital Charge under RI, usually Opening Capital Employed is used while Average Capital Employed is considered for EVA;
- (iii) In case of RI, 'Required Rate of Return' used for calculating Capital Charge may be WACC or may be somewhat different depending on the adjustment for risk factor; but only WACC is considered for EVA.

- (iv) Companies that employ ROI or RI, generally use total assets available as the definition of investment. When top management directs a subunit manager to carry extra assets, total assets employed can be more informative than total assets available. Companies that adopt EVA define investment as total assets employed minus current liabilities.

Example :

EBIT	Rs. 100000
Investments	Rs. 300000
12% Debentures	Rs. 50000
Shareholders' Equity	Rs. 250000
Risk-free rate of return	6%
Market rate of return	15%
Beta factor (β)	1.2
Tax Rate	40%

Calculate Residual Income and EVA.

Solution :

Residual Income (RI) =

$$\begin{aligned} & \text{NIBT (or EBIT) - Required Rate of Return} \times \text{Opening Capital employed} \\ & = \text{Rs. 100000} - 12\% \text{ of Rs. 300000} = \text{Rs. 64000} \end{aligned}$$

[In absence of information relating to the required rate of return, it is assumed that 12% is the required rate of return. Alternatively, weighted average cost of capital may also be taken as required rate of return.

Moreover, opening capital employed is not available. Therefore, calculation is made with reference to the investments as given.]

$$\begin{aligned} \text{EVA} &= \text{NOPAT (before Interest on Debt) - WACC} \times \text{Average Capital Employed} \\ \text{Net Operating Profit After Tax (NOPAT)} &= \text{Rs. 100000} - 40\% \text{ of Rs. 100000} = \\ & \text{Rs. 60000} \end{aligned}$$

$$\text{Cost of Debt Capital} = 12\% (1 - \text{tax rate}) = 12\% (1 - 0.40) = 7.2\%$$

$$\begin{aligned} \text{Cost of Equity (under CAPM)} &= \text{Risk-free rate} + \beta(\text{Market rate} - \text{Risk-free rate}) \\ &= 6\% + 1.2(15\% - 6\%) = 6\% + 10.8\% = 16.8\% \end{aligned}$$

$$\begin{aligned} \text{Weighted average cost of capital} &= (16.8\% \times 250000 + 7.2\% \times 50000) \div 300000 \\ &= (42000 + 3600) \div 300000 = 0.152 \text{ or } 15.2\% \end{aligned}$$

$$\text{Therefore, EVA} = \text{Rs. 60000} - 15.2\% \text{ of Rs. 300000} = \text{Rs. 14400}$$

All the above measures focus into the financial performance of the organizations. But the concept of *Balanced Scorecard* has been developed in 1990s to supplement the traditional financial measures with criteria that measure performance from the other perspectives like customer loyalty, business capabilities, employee skills, etc.

4.2.3 Balance Scorecard (BSC)

The BSC was developed to communicate the multiple, linked objectives that companies must achieve to compete on the basis of capabilities and innovation, not just tangible physical assets. The BSC translates mission and strategy into objectives and measures, organized into four perspectives :

- Financial
- Customer
- Internal Business Process and
- Learning and Growth

The four perspectives of BSC permit a balance between (i) short-term and long-term objectives, (ii) external measures—for shareholders and customers, and internal measures of critical business processes, innovation, and learning and growth, (iii) outcomes desired and the performance drivers of those outcomes, and (iv) hard objective measures and softer, more subjective measures.

Financial measures in the Financial Perspective of the BSC indicate whether the company's strategy, implementation, and execution are contributing to bottom-line improvement.

In the Customer Perspective, the customer and market segment in which the business unit competes, and the business unit's performance in the targeted segments are identified. The core outcome measures include customer satisfaction, customer retention, new customer acquisition, customer profitability, market share in the targeted segments, etc.

In the Internal Business Process Perspective, executives identify the critical internal processes in which the organization must excel in order to deliver the value propositions that will attract and retain customers in targeted market segments and satisfy shareholder expectations of excellent financial returns.

The fourth perspective, Learning and Growth, identifies the infrastructure that the organization must build to create long-term growth and improvement. Business must invest in re-skilling employees, enhancing information technology and systems, and aligning organizational procedures and routines in order to close the gap between existing capabilities of people, systems and organizational procedures—the three principal sources of learning and growth, and what will be required to achieve targets for breakthrough performance.

BSC is not only a comprehensive performance measurement system but it may also be used as the foundation of a strategic management system. In the words of Kaplan and Norton, 'companies are using the scorecard to

- Clarify and update strategy,
- Communicate strategy throughout the company,
- Align unit and individual goals with the strategy,
- Link strategic objectives to long-term targets and annual budgets,
- Identify and align strategic initiatives, and
- Conduct periodic performance reviews to learn about and improve strategy.

The balance scorecard enables a company to align its management processes and focuses the entire organization on implementing long-term strategy'.

It may be noted that each of the financial measures—ROI, RI and EVA—discussed above, focuses on a different aspect of performance. *ROI* indicates which investment yields the highest return while *RI* and *EVA* produce goal congruence between evaluation of the division (sub unit) and the actions that maximize the economic wealth of the division and the organization as a whole. An organization always prefers the divisions to have a higher rather than lower *RI* or *EVA*. In this regard, *RI* or *EVA* offers significant advantages over *ROI* (it has already been discussed earlier that actions of the divisional manager for increasing the divisional *ROI* may make the organization worse off). Again, *EVA* explicitly considers tax effects while pre-tax *RI* measure does not. However, many managers favour *RI* because it is easier to compute, and in most cases it leads to the same conclusion as *EVA*. But financial measures alone may not be sufficient for guiding and evaluating how organizations in the present information age create future value through investment in customers, suppliers, employees, processes, technology, and innovation. *Balanced Scorecard* help measure how the business units create value for current and future customers, how they must develop and increase internal capabilities, and the investment in people, system, and procedures necessary to improve future performance. The *Balanced Scorecard* incorporates both financial and non-financial perspectives into its fold and captures the critical value creating activities. Hence, a properly constructed *Balanced Scorecard* may be used in measuring total business unit performance.

4.3 Responsibility Accounting

Concepts

Responsibility accounting is a system that measures the plans (by budgets) and actions (by actual results) of each responsibility center.

Each manager, irrespective of the level, is in charge of a responsibility center.

A responsibility center is a part, segment, or sub unit of an organization whose manager is accountable for a specified set of activities. The higher the manager's level, the broader the responsibility center he or she manages and, generally, the larger the number of subordinates who report to him or her.

Four major types of responsibility centers are :

1. Cost Centre—manager responsible/accountable for costs only.
2. Revenue Centre—manager accountable for revenues only.
3. Profit Centre—manager accountable for revenues & costs only.
4. Investment Centre—manager accountable for investments, costs and revenues.

Example : The maintenance department of a hotel would be cost center because the maintenance manager is responsible for costs only.

The sales department would be a revenue center because the sales manager is accountable for revenues/sales only.

The hotel manager would be in charge of a profit center because the hotel manager is accountable for both revenues and costs.

The regional manager responsible for investments in new hotel projects, and for revenues and costs would be in charge of an investment center.

Responsibility and Controllability

Controllability is the degree of influence that a specific manager has over costs, revenues, or other items in question.

A controllable cost is any cost that is primarily subject to the influence of a given manager of a given responsibility center for a given time span.

A responsibility accounting system could either exclude all uncontrollable costs from a manager's performance report or segregate such costs from the controllable costs.

In practice, controllability is difficult to pinpoint :

- (a) few costs are clearly under the sole influence of one manager; for example, costs of direct material may be influenced by the purchase manager but such costs also depend upon market conditions beyond the manager's control.
- (b) In the long run, all costs will come under someone's control. However, most performance reports focus on periods of a year or less. A current manager may have inherited problems and inefficiencies from his or her predecessor.

Emphasis on Information and Behaviour

Managers should avoid overemphasizing controllability. Responsibility accounting is more far-reaching. It focuses on information and knowledge, not control. The key

question is, who is the best informed? Put another way, who is the person who can provide the maximum information about the specific item in question, regardless of that person's ability to exert personal control? For instance, purchasing managers may be held accountable for total purchase costs, not because of their ability to influence the market price, but because of their ability to predict uncontrollable prices and explain uncontrollable price changes.

Basic Processes in Implementation of Responsibility Accounting

The basic process underlying implementation of responsibility accounting are :

- Identifying the responsibility centers within the organization
- Setting up the plans in terms of targets, budgets, standards, or estimates in respect of the responsibility centers and communicating the concerned level of management
- Specifying controllable and non-controllable activities at various levels of responsibility
- Specifying accounting system for accumulating information by areas of responsibility
- Preparing performance reports for providing information to the users
- Ascertaining the results of actual operations for each responsibility center
- Finding out the variances (difference between the actual results and the planned, if any, and analyse such variances
- Taking corrective action and communicating the managers of the responsibility centers.

An appropriate reporting system should be designed to fit into the responsibility accounting concept. The manager in charge of the responsibility centers should receive information concerning his/her area of operation or responsibility and his/her performance should be evaluated taking into consideration the events within his/her control. For successful implementation of the system, the manager in charge of the responsibility center :

- Must know what is expected of him to achieve
- Must be able to control or influence the items/events under consideration
- Must know the result of his/her performance.

Budgets coupled with responsibility accounting provide systematic help for managers, particularly if managers interpret the feedback carefully. Instead of using variances to play the blame game—to pinpoint fault—managers should focus on whom they should ask and not on whom they should blame. Variances only suggest questions or direct attentions to persons who should have the relevant information.

4.3.1 Responsibility Reporting

Responsibility reporting is an accounting and management reporting system directed towards controlling costs of the responsibility centers. It involves in defining and grouping of responsibilities within an organization structure, determination and assignment of costs to appropriate levels of activities, and strong emphasis and controllability. It emphasizes control on the persons who are responsible for executing the plans, and their performance evaluation is done through evaluation of results in a responsibility report. Responsibility report forms a logical framework within which the management evaluates the performance of the managers of responsibility centers and which helps taking remedial measures to improve performance towards achieving goal of the organization as a whole.

Example 1. A company has 20 cars in operation in its transport department. The budget based on 50000 km of run for a month is Rs. 2,00,000 of which Rs. 50,000 is fixed.

During the last month, the total km run all the 20 cars were 45000 km and the actual costs incurred were Rs. 1,90,000.

The company could hire a car @ Rs. 4.25 per km run.

Evaluate the performance of the transport department on the basis of (a) cost center, (b) profit center.

Solution :		Rs.
Total budgeted expenditure		2,00,000
Less : Fixed Costs		<u>50,000</u>
Variable Costs		1,50,000
Variable costs per km	$1500000/50000 = 3.00$	
Cost Centre Basis		
Allowed Costs : Variable	45000×3	1,35,000
Fixed		<u>50,000</u>
Total		1,85,000
Actual Costs		<u>1,90,000</u>
Budget Variance		5,000 (A)
Profit Centre Basis		
Hire Charge	45000×4.25	1,91,250
Actual expenditure		<u>1,90,000</u>
Profit Variance		1,250 (F)

Example 2. In a cotton textile mill, the spinning superintendent, weaving superintendent and the processing superintendent report to the Mill Manager who along with the Chief Engineer reports to Director (Technical). The sales manager along with publicity manager reports to Director (Marketing) who along with the Director (Technical) report to the Managing Director. The following data have been extracted from the books for a particular period.

	Budget (Rs.)	Variance (Rs.)
Travelling Expenses	40,000	2,000 A
Salaries and Administration (Publicity Department)	1,20,000	10,000 A
Sales Commission	2,50,000	10,000 F
Labour :		
Spinning Dept	8,00,000	40,000 A
Weaving Dept	6,00,000	20,000 A
Processing Dept	5,00,000	12,000 A
Maintenance Dept	2,60,000	5,000 F
Raw Materials	28,00,000	1,20,000 A
Process House Materials	7,00,000	60,000 F
Weaving Materials	1,00,000	5,000 A
Maintenance Stores	2,00,000	10,000 F
Utilities :		
Spinning Dept	1,50,000	15,000 A
Weaving Dept	2,00,000	10,000 F
Processing Dept	3,00,000	50,000 A
Maintenance Dept	50,000	10,000 A
Publicity Expenses	2,00,000	2,000 F
Sales Dept Salaries and Administration	1,00,000	5,000 F
Director (Tech) office salaries and Admn	1,75,000	25,000 A
Director (Marketing) office salaries and admn	2,00,000	10,000 F
Managing Director's office salaries and admn	2,50,000	20,000 A
Mill Manager's salaries and admn	1,00,000	5,000 A
Sales	1,00,00,000	12,00,000 A

Prepare responsibility accounting reports for the Managing Director, Director (Marketing), Director (Technical) and Mill Manager.

Solution :**Responsibility Accounting Report**

1. For Mill Manager	Budget Rs.	Actual Rs.	Variance Rs.
A. Spinning Superintendent			
Raw Materials	28,00,000	29,20,000	1,20,000 A
Labour	8,00,000	8,40,000	40,000 A
Utilities	1,50,000	1,65,000	15,000 A
Total A	<u>37,50,000</u>	<u>39,25,000</u>	<u>1,75,000 A</u>
B. Weaving Superintendent			
Materials	1,00,000	1,05,000	5,000 A
Labour	6,00,000	6,20,000	20,000 A
Utilities	2,00,000	1,90,000	10,000 E
Total B	<u>9,00,000</u>	<u>9,15,000</u>	<u>15,000 A</u>
C. Processing Superintendent			
Raw Materials	7,00,000	6,40,000	60,000 F
Labour	5,00,000	5,12,000	12,000 A
Utilities	3,00,000	3,50,000	50,000 A
Total C	<u>15,00,000</u>	<u>15,02,000</u>	<u>2,000 A</u>
D. Mill Manager's Sal. & Adam	<u>1,00,000</u>	<u>1,05,000</u>	<u>5,000 A</u>
Total for Mill Manager (A+B+C+D)	<u>62,50,000</u>	<u>64,47,000</u>	<u>1,97,000</u>
2. For Chief Engineer			
Maintenance Stores	2,00,000	1,90,000	10,000 F
Maintenance Labour	2,60,000	2,55,000	5,000 F
Maintenance Utilities	50,000	60,000	10,000 A
Total for Chief Engineer	<u>5,10,000</u>	<u>5,05,000</u>	<u>5,000 F</u>
3. For Director Technical			
Mill Manager	62,50,000	64,47,000	1,97,000 A
Chief Engineer	5,10,000	5,05,000	5,000 F
Office Salary and Administration	1,75,000	2,00,000	25,000 A
Total for Director (Technical	<u>69,35,000</u>	<u>71,50,000</u>	<u>2,17,000 A</u>

4. For Director Marketing

A. Sales Manager

Income : Sales	1,00,00,000	88,00,000	12,00,000 A
Expenditure : Travelling	40,000	42,000	2,000 A
Sales Commission	2,50,000	2,40,000	10,000 F
Salary & Admn.	1,00,000	95,000	5,000 F
Total Expenditure (A)	<u>3,90,000</u>	<u>3,77,000</u>	<u>13,000 F</u>

B. Publicity Manager

Publicity expenses	2,00,000	1,98,000	2,000 F
Salary and Admn.	1,20,000	1,30,000	10,000 A
Total (B)	<u>3,20,000</u>	<u>3,28,000</u>	<u>8,000 A</u>

C. Director (Marketing) office

Salaries & Admn. (C)	2,00,000	1,90,000	10,000 F
Total Expenses (A+B+C)	<u>9,10,000</u>	<u>8,95,000</u>	<u>15,000 F</u>

5. For Managing Director

Managing Director's Office Sal. & Admn	2,50,000	2,70,000	20,000 A
Director (Marketing)	9,10,000	8,95,000	15,000 F
Director (Technical)	69,35,000	71,52,000	2,17,000 A
Total Expenses	80,95,000	83,17,000	2,22,000 A
Director (Marketing): Sales	1,00,00,000	88,00,000	12,00,000 A
Profit	<u>19,05,000</u>	<u>4,83,000</u>	<u>14,22,000 A</u>

4.4 Questions

1. What do you mean by 'return on investment', 'residual income' and 'economic value added'? Illustrate how you would measure financial performance of an organization using the above measures.
2. What is 'return on investment'? Discuss the advantages and limitations of ROI?
3. Define RI and EVA. Are they same? If not, bring out the essential differences between them.
4. Define 'Responsibility Centre' and 'Responsibility Accounting'. State the basic steps involved in the process of implementing Responsibility Accounting System.
5. Calculate ROI, RI and EVA from the information given below.

Balance Sheet as on 31st march, 2005

	Rs.		Rs.
Share Capital (Rs. 10 each)	500000	Fixed Assets (cost less depreciation)	540000
Reserves & Surplus	150000	10% Investment	150000
12% Debentures	100000		
Current Liabilities	<u>50000</u>	Current Assets	<u>110000</u>
	<u>800000</u>		<u>800000</u>

Further information :

- (i) Net profit for the year (before tax, interest and depreciation) was Rs. 200000.
 - (ii) Depreciation was charged on all the fixed assets @ 10% on reducing balance method.
 - (iii) The cost of equity and rate of income tax of the company are 14% and 40% respectively.
6. The production department of a large organization has furnished the following information relating to the month of March 2005.

	Budget Rs.	Actual Rs.
Direct materials	400000	510000
direct wages	250000	325000
Repairs and Maintenance (Rs. 1 lakh fixed)	200000	220000
Supervision (fixed)	100000	110000
Consumable stores (variable)	75000	95000
Factory Rent (fixed)	50000	50000
Depreciation (fixed)	100000	100000
Tools (variable)	25000	30000
Power and Fuel (variable)	150000	180000
Administration (fixed)	250000	265000

The budgeted and actual productions of the department for March 2005 are 10000 and 12500 units respectively. It is estimated that, instead of using own machines in the department, if machine hire services were used, the cost of production would have been Rs. 150 per unit.

- (i) Prepare the reports showing the evaluation of the performance of the department based on the concept of (a) Cost Centre, (b) Profit Centre and (c) Responsibility Centre.

- (ii) The management of the company is thinking of using the machine hire services. If the budgeted expenses and level of production remain unchanged in April 2005 also, calculate the volume of output to justify the continuance of using own machines in lieu of using hire services.

4.5 Suggested Readings

- Banerjee, B., Financial Policy and Management Accounting, PHI, New Delhi.
- Drury, C., Management and Cost Accounting, Chapman & Hall, London.
- Horngren, Foster and Datar, Cost Accounting—A Managerial Emphasis, PHI, New Delhi.
- Hilton, R. W., Managerial Accounting, Tata McGraw-Hill, New Delhi.
- Kishore, R. M. Advanced Management Accounting, Taxmann, New Delhi.
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Unit 5 □ Transfer Pricing

Structure

- 5.1 Introduction
- 5.2 Objectives of a Sound Transfer Pricing System
- 5.3 Principles determining Transfer Pricing Methods
- 5.4 Questions
- 5.5 Suggested Readings

5.1 Introduction

A large business concern is usually decentralized into several sub-units, like segments or departments or divisions, etc. for managing the organization efficiently. A person, known as manager of a sub-unit, is given the charge of all operations of the sub-units (segments, departments, divisions, etc.) act as independent units in a decentralized set-up. In such decentralized organizations, output of one sub-unit is often transferred to the other subunit(s), and the price charged by the supplying units on the receiving units for goods supplied is referred to as transfer price.

Therefore, transfer price may be defined as the price charged by one sub-unit (transferor) on the other sub-unit (transferee) *of the same organization* for goods supplied or service provided.

Transfer price denotes **income/revenue** for the **transferor/supplier/selling** sub-units and **cost** to the **transferee/purchasing** sub-units. Higher transfer price will result in the higher income or higher profit for the supplying sub-unit and lower income or profit for the receiving sub-unit and vice versa. However, the total profit of the company as a whole will remain same. Therefore, transfer price policy should be framed in such a way that lead to the achievement of optimum level of production by both the divisions—supplying and receiving, so as to achieve the overall objective of the organization.

In a decentralized set up, a conflicting situation may arise in setting transfer prices. As mentioned earlier, supplying units will be interested to charge higher transfer prices with a view to increasing profit of their units while receiving units will be interested in a lower transfer price. Under these circumstances, if the central office/top management interfere, divisional autonomy will be hampered. On the other hand, conflict between the supplying and receiving division may have an adverse impact on the overall organizational performance. Goal congruence should be the guiding factor to settle such conflict, i.e., divisional autonomy in setting transfer price should be utilized to fulfill the overall goal of the organization.

Transfer pricing would help evaluating the performance of the sub-unit managers as it provides the basis for the same (*revenue* for the supplying sub-units and *costs* for the receiving sub-units).

If the market is available for the output of the supplying sub-units, they may sell their products in the market because they enjoy such autonomy in a decentralized organization. Similarly, the receiving sub-units may purchase their requirements from the market, if available, or purchase from the internal sub-units. Under this situation, every sub-unit would try to achieve its efficiency and that, in turn, would help achieving the organizational objectives.

Therefore, management control system in a decentralised set-up often uses transfer prices to co-ordinate actions and to evaluate performance of the sub-units.

It may be noted that goods transferred by the supplying sub-units (transferor) to the receiving sub-units (transferee) are known as *Intermediate Product* while goods sold the sub-units to the outside organizations are known as final Product. Therefore, the term 'transfer price' is applicable to the intermediate products only.

5.2 Objectives of a Sound Transfer Pricing System

- A sound transfer pricing system should motivate the managers of the sub-units to make sound decisions.
- Transfer price mechanism should not only help achieving the goal of the sub-unit concerned but also help achieving the overall objectives of the organization as a whole through *goal congruence*.
- It should provide a reasonable basis for measuring managerial performances of the sub-units.
- It should ensure that *divisional autonomy* is not undermined.

5.3 Principles Determining Transfer Pricing Methods

1. **Market Price base approach** : if a perfectly competitive market for the intermediate products exists, the best method is to follow the market price as the transfer price. The supplying division may transfer its output either to the sub-unit that requires the same or it may sell in the outside market. On the other hand, receiving sub unit is also at liberty to purchase from the supplying sub unit or it may purchase from the outside market. However, the supplying sub unit may offer some price concession to the extent of selling and distribution expenses it has to incur for outside sale but which is not required for internal transfer.

The main difficulties in following market price based transfer price are :

- a perfectly competitive market is very rare
- a market for intermediate products may not be available
- even if the markets are available, market price may vary from market to market
- quality and supply of the products that receiving/purchasing division may have to buy from the market, may be uncertain.

2. **Cost price based approach** : The supplying sub-unit may follow a transfer price based on either *full cost or marginal cost*. The main problem of following cost based approach is that there may not have any motivation on the part of the supplying division to achieve optimum level. Because of following cost based transfer price, revenue and cost will be same and no profit will be shown in the supplying divisions performance reports. The entire profit will be shown in the report of the receiving division selling the final products in the outside market.

In this connection, it may be mentioned that *standard cost* should be considered as the basis and performance may be evaluated comparing the standard cost (i.e., transfer price in this case) with the actual costs and efficiency or inefficiency of the supplying division can be evaluated accordingly.

3. **Cost-plus based approach** : To overcome some of the limitations of Cost price based transfer price, Cost-plus approach (like cost plus 10% or 20% etc.) may be followed. This will allow the supplying units to have some margin. But it may create the problems of stock valuation of the company because of adding some amount to the cost by the supplying units and this additional amount is included in the stock of the receiving units.

4. **Dual Pricing** : Revenue of the supplying units and cost of the receiving units depend on the Transfer price. Therefore, it is natural that supplying units will try to charge a higher transfer price and receiving units will be interested to get the goods at a lower price preferably at cost. To satisfy both the supplying and receiving units, dual price i.e., a higher price (cost plus something) for supplying units and a lower price (cost price) may be followed.

5. **Negotiated Price** : Transfer price may be fixed on the basis of negotiation or bargaining between the managers of supplying units and receiving units. In a decentralized organization, managers of the sub-units are independent and they have the freedom of bargaining or negotiation with the managers of other sub-units just like they can do so with the outsiders.

General Principle

To fix up a transfer price, a general principle may be followed as given below:

Minimum Transfer Price per unit =

Incremental Cost per unit + Opportunity Cost per unit

In absence of a market for the intermediate products (output of the supplying units) or in case of availability of idle capacity or the supplying units, opportunity cost may be taken as zero. Therefore, in such situations, minimum transfer price may be taken as incremental or marginal costs only.

Example :

A manufacturing company has two divisions— X and Y. The output of X, which may be sold in the market at Rs. 300 per unit, is also used as a component by Y for manufacturing a product. Y requires one unit of the component from X for producing every one unit of the final products which is sold in the market at Rs. 500 per unit. The budgeted production for X and Y are 3000 and 1000 units respectively. The cost data for the budgeted level of production in respect of the two divisions are as follows:

	Division X	Division Y
	Rs.	Rs.
Materials (per unit)	100	?
Wages (per unit)	60	50
Variable Overhead (per unit)	40	30
Fixed Overhead (per unit)	50	40

Show the divisional profits and the profit of the company in case of the following transfer pricing policies :

- (i) Market Price based, (ii) 110% of Full Cost and (iii) Negotiated Price of Rs. 290 per unit.

Solution :

Statement showing the divisional profits and profit of the company

(i) *Market Price Based Transfer Price*

	Division X		Division Y	Company
	Rs.		Rs.	Rs.
Revenue (3000 × 300)	900000	(1000 × 500)	500000	1400000
Less : Costs				
Variable (3000 × 200)	600000	Transferred-in-costs + other variable costs (300 + 80) × 1000	380000	980000
Fixed Costs (3000 × 50)	150000	(1000 × 40)	40000	190000
Profit	150000		80000	230000

(ii) 110% of Full Cost Based Transfer Price

	Division X Rs.		Division Y Rs.	Company Rs.
Revenue (2000 × 300)	600000	(1000 × 500)	500000	1375000
(1000 × 275*)	275000			
	<u>875000</u>			
Less : Costs				
Variable (3000 × 200)	600000	Transferred-in-costs + other variable costs (275* + 80) × 1000	355000	955000
Fixed Costs (3000 × 50)	<u>150000</u>	(1000 × 40)	<u>40000</u>	<u>190000</u>
Profit	<u>125000</u>		<u>105000</u>	<u>230000</u>

*Full Cost per unit of the component in Division X = Rs. (100 + 60 + 40 + 50) = Rs. 250, 110% of Full Cost = 110% × Rs. 250 = Rs. 275

(iii) Negotiated Price Based Transfer Price

	Division X Rs.		Division Y Rs.	Company Rs.
Revenue (2000 × 300)	600000	(1000 × 500)	500000	1390000
(1000 × 290*)	290000			
	<u>890000</u>			
Less : Costs				
Variable (3000 × 200)	600000	Transferred-in-costs + other variable costs (290* + 80) × 1000	370000	970000
Fixed Costs (3000 × 50)	<u>150000</u>	(1000 × 40)	<u>40000</u>	<u>190000</u>
Profit	<u>140000</u>		<u>90000</u>	<u>230000</u>

*Negotiated price of the component is Rs. 290 (as given)

** It may be noted that the profit of the company as a whole is the same irrespective of the transfer pricing policy followed. Only divisional profits differ on the basis of the transfer prices being charged—profit of the supplying division i.e., X is more when transfer price is higher [as in (i) above], and profit of the receiving division i.e., Y is more when transfer price is lower [as in (ii) above].

Transfer Pricing and Optimum Level of Production

In absence of any market for intermediate products and if there is no capacity constraints in the supplying units, the transfer price for achieving the organizational optimality will be the marginal cost of producing the intermediate product at the optimal output level for the company as a whole, and the optimum output level will occur when *marginal cost of the supplying division will be equal to the net marginal revenue of the receiving division.*

Example :

Supply Division			Receiving Division			Company
Units Produced	Total Costs Rs.	Marginal Costs Rs.	Units Produced	Total Net Revenue* Rs.	Marginal Net Revenue Rs.	Profit** Rs.
1000	8000	8000	1000	20000	20000	12000
2000	14000	6000	2000	38000	18000	24000
3000	20000	6000	3000	54000	16000	34000
4000	22000	2000	4000	68000	14000	46000
5000	26000	4000	5000	80000	12000	54000
6000	30000	4000	6000	90000	10000	60000
7000	38000	8000	7000	98000	8000	60000
8000	48000	10000	8000	104000	6000	56000
9000	62000	14000	9000	108000	4000	46000

[*Total Net Revenue is the difference between the Total Revenue from the sale of final products and the Conversion Costs (excluding transferred-in-costs), i.e.,

$$\text{Total Net Revenue} = \text{Total Revenue} - \text{Conversion Costs.}$$

**Company Profit = Total Net Revenue of the Receiving Division - Total Costs of the Supplying Division.]

In the above table, it is seen that at the output level of 7000 units, the marginal cost of the supplying division and the marginal net revenue of the receiving division is equal and the total profit of the company as a whole is the maximum.

Therefore, 7000 units may be considered as the *optimum output level*, and

Transfer Price is the marginal cost of the supplying unit at the optimum level, i.e., Rs. 8000 for 1000 units or Rs. 8 per unit.

Profitability of the Divisions and the Company, taking transfer price as Rs. 8 per unit may be shown as follows.

Supply Division				Receiving Division		Company	
Units Produced	Total Costs Rs.	Revenue (Transfer Price) Rs.	Profit	Total Net Revenue Rs.	Transferred -in-Costs Rs.	Profit Rs.	Profit Rs.
1000	8000	8000	—	20000	8000	12000	12000
2000	14000	16000	2000	38000	16000	22000	24000
3000	20000	24000	4000	54000	24000	30000	34000
4000	22000	32000	10000	68000	32000	36000	46000
5000	26000	40000	14000	80000	40000	40000	54000
6000	30000	48000	18000	90000	48000	42000	60000
7000	38000	56000	18000	98000	56000	42000	60000
8000	48000	64000	16000	104000	64000	40000	56000
9000	62000	72000	10000	108000	72000	36000	46000

It may be seen from the above table that both the divisions' profit is increasing up to the output level of 6000 units. At the level of 7000 units it is same as at the previous level. After the level of 7000 units, profit is decreasing. Therefore, the output level of 7000 units is considered as optimum level.

International Transfer Pricing

Different sub-units of an organization may be located in different countries and intermediate products may be transferred from one sub unit located in one country to the other sub unit located in another country. International transfer price is the price charged on transfer of intermediate products across national boundaries. Additional factors such as differences in the rate of taxes, freights, duties; government policies in respect of exports, imports, dividend repatriation etc. in different countries are to be considered for fixing the transfer prices in such cases. The transfer prices are set up in such a way as to reduce the total burden of taxes, freight and duties, etc., in order to increase the profit of the organization as a whole. The organization would try to show lower income in the units located in a country having a very high tax rates by charging a higher transfer price for the goods purchased by these units so as to reduce the tax liability and increase profit. Again, if there are restrictions on the repatriation of dividend in some countries, the company would try to show lower income in the units located in such countries.

Example :

Two divisions of a company, P and Q, are located in two different countries having different income tax rate—30% in P and 20% in Q. Operating income of the

divisions under different transfer price methods are given below. Suggest the most appropriate transfer price method that will maximize the operating income of the company as a whole.

Transfer Price Methods	Operating Income (Rs.)	
	Division P	Division Q
Market Price	40000	20000
110% of Full Cost	25000	35000
Negotiated Price	32000	28000

Solution :

Transfer Price Methods	Operating Income (Rs.)			Tax Payable (Rs.)		
	Divn P	Divn Q	Company	P	Q	Total
				30%	20%	
Market Price	40000	20000	60000	12000	4000	16000
110% of Full Cost	25000	35000	60000	7500	7000	14500
Negotiated Price	32000	28000	60000	9600	5600	15200

Total tax payable is the lowest in case of transfer price based on 110% of Full Cost. So, after tax income will be the maximum if a transfer price based on 110% of Full Cost is followed. (It may be noted that only the effect of income tax has been shown here for the sake of simplicity. However, international transfer pricing policy would involve consideration of many other factors like government rules and regulations, duties, freights, other taxes like VAT, environmental taxes etc.)

5.4 Questions

1. What do you mean by 'Transfer Price'? Discuss briefly the different methods of transfer pricing indicating their applicability, advantages and limitations.
2. State the objectives of a sound transfer pricing system. Explain the principle(s) that may be followed for setting a transfer price in general.
3. 'Transfer pricing is a widely debated and controversial topic'—discuss with reference to the different methods of transfer pricing.
4. Write short notes on :
(a) Dual Pricing, (b) Negotiated Price and (c) International Transfer Pricing.
5. A company has two divisions—A and B. Division A has a budget of selling 200000 units of a component 'X' with a return of 20% on the average assets employed. The following particulars of Division are also available.

Total fixed overhead	Rs. 5 lakhs
Variable cost per unit	Rs. 1.00
Average Debtors	Rs. 2 lakhs
Average Inventory	Rs. 5 lakhs
Average Plant and Equipment	Rs. 5 lakhs

Division A can sell only 150000 of the components in the market at the proposed price and remaining 50000 units may be taken up by the Division B. However, Division A wants a transfer price of Rs. 4 per unit while Division B is willing to pay only Rs. 2 per unit of the component.

Alternatively Division A may produce only 150000 units and sell them in the outside market. In this case, Division A may reduce its asset base by Rs. 2 lakhs and as a result, fixed overhead is likely to be reduced by Rs. 25000.

You are requested to advise the most profitable course of action for Division A.

6. X Ltd. manufactures a product 'P' by its two divisions—A & B. P is first processed in division A and then in division B. Consider the following information and determine the optimum level of output, transfer price and divisional profit at the optimum level of output.

Output (units)	Total Costs (Rs.)		Net Revenue (Rs.) Division B	Profit (Rs.) Company
	Division A			
1000	2700		12000	9300
1100	3000		12900	9900
1200	3360		13620	10260
1300	3750		14190	10440
1400	4200		14700	10500
1500	4740		15150	10350
1600	5400		15330	9930

Note : Net Revenue for division B means the sale proceeds minus costs incurred in Y (except the costs of transfer).

5.5 Suggested Readings

- Drury, C., Management and Cost Accounting, Chapman & Hall, London
- Horngren, Foster and Datar, Cost Accounting—A Managerial Emphasis, PHI, New Delhi
- Kishore, R. M., Advanced Management Accounting, Taxmann, New Delhi
- Saxena, V. K. and Vashist, C. D., Advanced Cost and Management Accounting, Sultan Chand & Sons, New Delhi.

Unit 6 □ Activity Based Costing (ABC)

Structure

- 6.1 Introduction
- 6.2 Traditional Cost System vs. ABC
- 6.3 Activity-based Profitability Analysis
- 6.4 Selection of Activity Cost Drivers
- 6.5 Advantages and Limitations of ABC
- 6.6 Factors influencing application of ABC
- 6.7 Activity Based Management
- 6.8 Questions
- 6.9 Suggested Readings

6.1 Introduction

Traditional product costing systems were developed long ago when products were manufactured in a narrow range, direct labour and materials formed the major proportion of the factory costs, overheads were relatively small. Therefore, distortion in appropriation of overheads was insignificant. Moreover, information processing costs were too high.

On the contrary, companies today are engaged in producing a wide range of products, overhead costs are increasing significantly, direct labour costs are gradually decreasing so also information processing costs because of advancement of technologies. In addition, globalisation leading to the intense competition has necessitated the more accurate cost information for different important strategic decision-making purposes. With this background, Activity-based Costing (ABC) system emerged.

6.2 Traditional Cost System vs. ABC

Traditional systems measure accurately volume-related resources that are consumed in proportion to the number of units produced of the individual products. Such resources include direct labour, materials, energy and machine-related costs. However, many organizational resources exist for activities that are unrelated to physical volume. Non-volume-related activities consist of support activities such as material handling, material procurement, set-ups, production scheduling and first-item inspection

activities. Traditional product cost systems, which assume that products consume all resources in proportion to their production volumes, thus report distorted product costs. Such distortions are more pronounced in organizations which produce a diverse range of products which differ in volume and complexity.

ABC system was developed to provide more accurate ways of assigning the costs of indirect and support resources to activities, business processes, products, services, and customers. ABC system recognizes that many organizational resources are required not for physical production of units of product but to provide a broad array of support activities that enable a variety of products and services to be produced for a diverse group of customers. The goal of ABC is to measure and then price out all the resources used for activities that support the production and delivery of products and services to customers.

ABC system emphasizes the need to obtain a better understanding of the behaviour of overhead costs, and thus ascertains what causes overhead costs and how they relate to products. ABC recognizes that in the long run most manufacturing costs are not fixed, and it seeks to understand the forces that cause overhead costs to change over time.

ABC system assume that activities cause costs and that products (and customers) create the demands for each activity. ABC systems simply recognizes that businesses must understand the factors that drive each major activity, the cost of activities and how activities relate to products.

Outline of an ABC system :

1. Identify the major activities that take place in the organization
2. Determine the cost driver for each major activity
3. Create a cost center/cost pool for each major activity
4. Trace the cost of activities to products according to a product's demand for activities.

An activity is a process or procedure that causes work and consume resources. In relation to ABC, activities mean the activities of the support or service departments, such as material handling, machine set-up, engineering change, quality testing, inspection, etc. This means that ABC differs from the traditional system only in respect of allocation of overhead or indirect costs. Direct costs are identified with, or assigned to, the cost objects in the same manner as done in case of traditional costing system.

The linkage between activities and cost objects, such as products, services, and customers, is done by activity cost drivers. An activity cost driver is a quantitative

measure of the output of an activity. ABC system requires, in addition to traditional unit-level drivers such as labour and machine hours, the use of activity cost drivers that can trace batch, product-sustaining, and customer-sustaining activity costs to products and customers. For each individual activity, the designer selects an appropriate activity cost driver.

ACTIVITY	ACTIVITY COST DRIVER	BATCH LEVEL (B)/ PRODUCT SUSTAINING LEVEL (P)
Run machines	Number of machine hours	B
Set up machines	No. of set-ups or set up hours	B
Schedule production jobs	No. of production runs	B
Receive materials	No. of material receipts	B
Support existing products	No. of products	P
Introduce new products	No. of new products introduced	P
Modify product characteristics	No. of engineering change notices	P

To assign activity costs to individual products requires knowledge of the quantity of the activity cost driver for every individual product. That is, in addition to knowing the material contents, and the direct labour and machine hours required at each production cost center, the ABC system must know, product by product, the quantity of each activity cost driver; for example, for each product, the system must have information on drivers such as :

- Number of setups
- No. of material purchases
- No. of material moves
- No. of engineering change notices

Thus, there is a need for a large amount of information that must be collected in order to operationalise ABC system. However, the increased availability of integrated information systems, particularly newly installed enterprisewide systems, enables activity cost driver information to be much more accessible, at a lower cost than in the past.

Activities may be classified into three major categories that drive expenses at the product level. They are Unit-related activities, Batch-related activities and Product-sustaining activities.

Unit-related activities are performed each time a unit of the product is produced. They are consumed in direct proportion to the number of units produced. Expenses

in this category include direct labour, direct materials energy cost and expenses that are consumed in proportion to machine processing times (such as machine depreciation and maintenance). Unit level activities consume resources in proportion to the number of units produced. For example, if a firm produces 10% more units, it will consume 10% more labour hours, 10% more machine hours and 10% more energy costs.

Batch-related activities are performed each time a batch of goods is produced, e.g., setting up a machine or processing a purchase order. The cost of batch-related activities varies with the number of batches made, but is common (or fixed) for all units within the batch. As more batches are produced, more set up resources are consumed. It costs the same to set up a machine for 10 or 1000 units. Thus the demands for the set up resources are independent of the number of units produced after completing the set up. Other examples are purchase order, production scheduling, material movement.

Product-sustaining activities are performed to support different products in the product line. They are performed to enable individual products to be produced and sold, but the resources consumed by these activities are independent of how many units or batches of the product are produced.

One additional expense category that cannot be directly attributed to individual products may be identified as *Facility-sustaining activities*. They are performed to sustain a facility's general manufacturing process. Examples of facility sustaining activities include administration, plant management, accounting services, and lighting and heating of the factory. These activities are necessary to sustain the manufacturing process, and are common and joint to all products manufactured in the plant. Therefore, these costs are not assigned to products made in the plant and deducted in a lump sum from the total of operating margins from all product lines.

6.3 Activity-based Profitability Analysis

A *unit level contribution* margin is calculated for each individual product by subtracting unit level expenses from revenues. From this unit-level margin, *batch related and product sustaining expenses* are deducted to compute a *product-level contribution* margin for each individual product in the product line. No allocations are required to obtain this product-level margin.

Some expenses are incurred at the **product-line level**, and are common to all products within the product line. The activity-based analysis classifies these expenses as *product-line-sustaining expenses*, and traces them to product lines but not to

individual products within the line. Examples include advertising, research and development activities and distribution expenses. A **product-line contribution margin** is computed by deducting *product-line-sustaining expenses* from the sum of the *individual product-level contributions* sold within the line. This calculation shows whether the products sold within the line earn a sufficient contribution to cover the expenses of activities performed to sustain the product-line.

At the final level a **profit for the plant** is computed by deducting the **facility-sustaining expenses** from the *product-line contribution*.

	Product line 1			Product line 2			Product line 3		
	P1	P2	P3	P4	P5	P6	P7	P8	P9
Revenue									
Less : Unit-level expenses									
Unit-level Contribution									
Less Batch-related expenses									
Less Product-sustaining expenses									
Product Contribution									
Less Product-line-sustaining expenses									
Product-line Contribution									
Less Facility-sustaining expenses									
Plant Profit									

6.4 Selection of Activity Cost Drivers

The selection of an activity cost driver reflects a subjective tradeoff between accuracy and the cost of measurement. Because of the large number of potential activity-to-product linkages, designers attempt to economize on the number of different activity cost drivers. For example, activities triggered by the same event—prepare production orders, schedule production runs, perform first part inspections, or move materials—can all use the same activity cost driver : number of production runs or lots produced.

ABC system designers can choose from different types of activity cost drivers :

1. Transaction
2. Duration
3. Intensity or direct charging

Transaction Drivers : These can be used when all outputs make essentially the same demands on the activity, e.g., scheduling a production run, processing a purchase order, or maintaining a unique part number may take the same time and effort independent of which product is being scheduled; which material is being purchased, or which part is being supported in the system. *Transaction drivers count how often an activity is performed*, such as number of set ups, number of receipts, number of products supported, etc. Transaction drivers are the least expensive type of cost driver but could be the least accurate, because they assume that the same quantity of resources is required every time an activity is performed. For example, the use of transaction driver such as the number of setups assumes that all setups take the same time to perform. If, however, the amount of resources required to perform the activity varies considerably from product to product, then more accurate and more expensive cost drivers are required.

Duration Drivers : These represents the amount of time required to perform an activity. Duration drivers should be used when significant variation exists in the amount of activity required for different outputs. For example, simple products may require a few minutes to set up, whereas complex, high precision products may require a few hours for set up. Using a transactin driver, such as number of setups, will overcost the resources required to set up simple products and will undercost the resources required for complex products. ABC designers would use a duration driver, such as setup hours, to assign the cost of setups to individual products. Examples of duration drivers include setup hours, inspection hours, and direct labour hours. They are more accurate than transaction drivers, but they are much more expensive to implement because the model requires an estimate of the duration each time an activity is performed. The choice between a duration and a transaction driver is, as always, one of economics, balancing the benefits of increased accuracy against the costs of increased measurement.

Intensity Drivers : These directly charge for the resources used each time an activity is performed. A particularly complex product may require special setup and quality control people, as well as special gauging and test equipment each time the machine is set up to produce the product. A duration driver, such as setup cost per hour, assumes that all set up hours on the machine are equally costly, but it does not reflect extra personnel, especially skilled personnel and extensive equipments that may be required on some setups but not on others. Intensity drivers using direct charging are the most accurate activity cost drivers but are the most expensive to implement; in effect they require a job order costing system to keep track of all the resources used each time an activity is performed. They should be used only when the resources associated with performing an activity are both expensive and variable each time an activity is performed.

The choice among a transaction, duration and intensity cost driver can occur for almost any activity. For example, for performing engineering change notices (to upgrade and support existing products), we could use :

- Cost per engineering change notice (assumes that all engineering change notices consume the same quantity and cost of resources).
- Cost per engineering change hour used for the engineering change notice done for an individual product (allows for engineering change notices to use different amounts of time to perform but assumes that all engineering hour costs are the same).
- Cost of engineering resources actually used (number of engineering hours, price per hour of engineers used, plus cost of equipment such as engineering workstations) on the job.

Similarly, for a sales activity, such as support existing customers, we could use either a transaction, a duration, or an intensity driver. For example.

- Cost per customer (assumes that all customers cost the same).
- Cost per customer hour (assumes that different customers use different amount of sales resource time, but each hour of support time costs the same).
- Actual cost per customer (actual or estimated time and specific resources committed to specific customer).

Activity cost drivers are the central innovation of activity-based cost system, but they are also the most costly aspects of ABC systems. The important message is to make an appropriate trade off between accuracy and the cost of measurement.

6.5 Advantages and Limitations of ABC

Advantages

- Overheads or indirect costs constitute a significant proportion of total costs. Under ABC such costs are identified on the basis of activities rather than products. As costs are incurred for the activities involved in the manufacture of products/services, ABC helps ascertaining more accurate costs of the products/services.
- Under ABC costs are ascertained for activities. Therefore, costs are accumulated by activities. As a result, costs can be easily obtained for different activities of the organization that helps controlling costs.
- Managers manage activities, not products. Activities drive costs. ABC

identifies the cause-effect relationship between activities and costs, and reveals the areas that deserve management's attention.

- ABC helps, as mentioned earlier, ascertain costs of the products more accurately, thereby identify the unprofitable products, and management may take appropriate actions paying attention to the problem areas and increase the profitability of the organization.

Limitations or weaknesses

- ABC system involves more costs than the traditional system.
- Using ABC for short-run decision-making may affect the long-term profitability of the organization. For example, ABC may reveal that customers placing orders in small lots increase the sales order handling costs and accordingly, management may take decisions to cancel such orders in order to increase the profitability. However, in the competitive business environment where customer is considered as 'king', such decision may prove very costly to the organization.
- ABC emphasizes on the cost reduction without much regard to the identification and elimination of constraints that causes delays.

6.6 Factors influencing application of ABC

If the enterprise is engaged in the manufacture of a single product, or a few products involving similar activities, or overhead incurred is not very high, the traditional costing system may be providing necessary information. However, in case of *product diversity or complexity* involving different activities in different proportions and *high volume of overhead expenditure*, the cost ascertainment under traditional costing system may be misleading. ABC system would help tracing costs more accurately linking costs with the activities that drive such costs.

6.7 Activity Based Management

An activity-based cost analysis, in which the costs of indirect and support resources (i.e., overheads) are applied on the basis of activities performed and the demand for the activities by the individual products may reveal a different picture about the profitability of many of the company's products. It is not uncommon to find that a small number of products (say, 20-30%) may contribute most of the profits while remaining products (70-80%) may contribute either a little amount of profit or even incur losses. ABC analysis may reveal true costs; hence, true

profitability of the products, and management may take appropriate actions to increase the profitability. Some of the actions that may be taken to increase the profitability are :

- Reprice products
- Substitute products
- Redesign products
- Improve processes and operations strategy
- Technology investment
- Eliminate products

The actions mentioned above, if implemented successfully, will reduce the resources required to manufacture products and to provide service to the customers. Re-pricing of products and substitutes of products will shift the product mix from the products that are difficult to produce to those are simple to produce. Redesign, process improvement, new and improved manufacturing facilities will enable the same products to be produced with fewer organizational resources. And by eliminating unprofitable products, the fewer resources may be utilized for the remaining products. To derive benefits from the above actions, management must eliminate the spending associated with the resources that are no longer required and also eliminate the unused capacity, if any, or use the same for more profitable alternatives. Therefore, activity-based management should be combined with capacity management to derive desired benefits.

Example 1 :

	Product I	Product II
Production (units)	500	500
Labour hours per unit	2	2
No. of times of material movement	5	10

Apportionment of material handling costs under traditional system (volume based) :

	Product I	Product II
Total labour hours worked	1000	1000
Material handling costs [(30000/2000) per hr.] (apportioned to the products)	1000×15 = 15000	1000×15 = 15000
Material movement cost per unit	$15000/500 = 30$	$15000/500 = 30$

Apportionment under ABC system :

	Product I	Product II
No. of material movements	5	10
Rate per movement (30000/15)	2000	2000
Material movement costs	5×2000	10×2000
(apportioned to the products)	= 10,000	= 20,000
Material movement cost p.u.	$10000/500$	$20000/500$
	= 20	= 40

Example 2 :

	Product I	Product II
Production (Units)	1000	500
Machine hours per unit	3	3
Machine set up hours per product line	20	20
Budgeted machine set up related costs :	Rs. 18,000	

Traditional system :

	Product I	Product II
Total machine hours worked	3000	1500
Set up cost per machine hr. worked (18000/4500)	4	4
Total set up cost	$3000 \times 4 = 12000$	$1500 \times 4 = 6000$
Set up cost per unit	$12000/1000 = 12$	$6000/500 = 12$

ABC system :

	Product I	Product II
Machine set up hours	20	20
Set up cost per machine set up hour (18000/40)	450	450
Machine set up costs	$20 \times 450 = 9000$	$20 \times 450 = 9000$
Machine set up cost per unit of product	$9000/1000 = 9$	$9000/500 = 18$

In the first case, the number of units produced was same; but the no. of material movements of Product II was twice that of Product I. Under Traditional System, material handling cost would be same but ABC would recognize the fact that such cost is dependent on number of movements not on volume of production. Therefore, material movement costs per unit under ABC System has been twice that of Product I for Product II.

Example 3 :

	Product I	Product II
Production (units)	50	100
Inspection per product line	25	5
Machine hours per unit	15	20
Total budgeted inspection costs Rs. 33,000		

What is the inspection cost per unit under traditional system and ABC system?

Solution :

(a) Machine hour rate : Rs. 33000/(50 × 15 + 100 × 20) = Rs. 12

	Product I	Product II
Machine hours worked	50 × 15 = 750	100 × 20 = 2000
Inspection cost @ Rs. 12 per hour	9,000	24,000
Units produced	50	100
Inspection cost per unit	9000/50 = 180	24000/100 = 240

(b) Cost per inspection : Total inspection costs/No. of inspections = 33,000/33 = 1,100

	Product I	Product II
No. of inspections per product line	25	5
Inspection costs @ 1,100	27,500	5,500
Units produced	50	100
Inspection costs per unit	550	55

It may be noticed that there is both the product diversity as well as volume diversity so far as Product I and Product II are concerned.

Both the Traditional product costing system and ABC system trace overhead costs to products using the two-stage allocation process.

1. At the first stage, costs are assigned to the cost centers.
2. The second stage of the allocation process allocates costs from costs centers to products.

Traditional costing system traces overhead costs to products using a small number of allocation bases, usually two—direct labour hours and machine hours—which vary directly with the volume of production, i.e., volume related bases. So, traditional system normally uses only two volume related allocation bases in the second stage of the cost allocation system.

But ABC system uses many cost drivers as allocation bases in the second stage of the cost allocation system. Therefore, ABC cost driver rates should be more closely related to the causes of overhead costs.

Example : A company produces two products : X and Y. Both the products are produced on the same equipment and use the similar processes. Consider the following data.

	<i>Machine hrs Per unit</i>	<i>Direct Labour hours per unit</i>	<i>Actual output (units)</i>	<i>No. of Purchase orders</i>	<i>No. of set-ups</i>
Product X	2	4	1000	80	40
Product Y	2	4	10000	160	60

Cost of the activities :

Volume-related Rs. 1,10,000; Purchase-related Rs. 1,20,000; Set-up-related Rs. 2,10,000

(a) **Traditional System :**

Cost center allocated costs : $110000 + 120000 + 210000 = 4,40,000$

Machine hour rate : $440000 / (1000 \times 2 + 10000 \times 2) = \text{Rs. } 20$

Direct labour hour rate : $440000 / (1000 \times 4 + 10000 \times 4) = \text{Rs. } 10$

Overhead costs per unit of—

X : $\text{Rs. } 20 \times 2$ or $\text{Rs. } 10 \times 4 = \text{Rs. } 40$

Y : $\text{Rs. } 20 \times 2$ or $\text{Rs. } 10 \times 4 = \text{Rs. } 40$

Total costs allocated—X : $1000 \text{ units} \times 40 = 40,000$; Y : $10000 \times 40 = 4,00,000$

(b) **ABC System :**

	Activities		
	Volume-related	Purchasing-related	Set-up-related
Costs traced to activities (Rs.)	1,10,000	1,20,000	2,10,000
Consumption of activities (cost drivers)	22000 mach. hrs.	240 Purchase orders	100 set-ups
Cost per unit of consumption (Rs.)	5	500	2100
X (1000 units)	$2000 \times 5 = 10000$	$80 \times 500 = 40000$	$40 \times 2100 = 84000$
Y (10000 units)	$20000 \times 5 = 100000$	$160 \times 500 = 80000$	$60 \times 2100 = 126000$
Overhead cost per unit :	X = $(10000 + 40000 + 84000) / 1000 = 134$		
	Y = $(100000 + 80000 + 126000) / 10000 = 30.60$		

Example :

A company produces a large number of products including product I and Product II. Product I is a complex product and Product II is a simple product requiring 2 hours and 1 hour of direct labour respectively for its production.

There are 12 support staff and the company uses 100000 direct labour hours p.a. and incurs Rs. 2,00,000 p.a. towards overhead costs.

Support staff are engaged in the following activities :

Activities	No. of transactions per annum	No. of staffs engaged
Receiving components	1000 consignments	6
Receiving raw materials	400 consignments	3
Disbursements of kits of components and raw materials	200 production runs	3

Activities involved in relation to the production of 1000 units and 10000 units of Product I & II respectively are given below :

Activities	No. of transactions	
	Product I	Product II
Receiving components (no. of consignments)	200	100
Receiving raw materials (no. of components)	30	10
Disbursements of components and raw materials (no. of production runs)	10	5

Calculate overhead costs of Product I and II under (i) traditional system and (ii) ABC system, and explain which gives the most appropriate product costs.

Solution :

Traditional System :

Direct labour hour rate = Total overheads/total direct labour hours
 = Rs. 200000/100000 hours = Rs. 2 per hour

Overhead costs per unit : Product I = 2 hrs × Rs 2 per hr = Rs. 4

Product II = 1 hr × Rs. 2 per hr = Rs. 2.

ABC system :

Activity	Cost Driver	Overhead apportioned (Activity Costs)	Absorption Rate Rs.
Receiving components	No. of receipts of consignments of the components	6/12 of Rs. 200000 = 100000	100000/1000 = 100
Receiving raw materials	No. of receipts of consignments of the components	3/12 of Rs. 200000 = 50000	50000/400 = 125
Disbursements of Raw materials & components	No. of production runs	3/12 of Rs. 200000 = 50000	50000/200 = 250

Activity	Absorption rate	No. of transactions		Costs traced	
		Product I	Product II	Product I	Product II
Receiving components	Rs. 100	200	100	20000	10000
Receiving components	Rs. 125	30	10	3750	1250
Disbursements of raw materials & components	Rs. 250	10	5	2500	1250
				<u>Total</u> 26250	<u>12500</u>

Overhead costs per unit : Product I-Rs. $26250/1000 = \text{Rs. } 26.25$; Product II-Rs. $12500/10000 = \text{Rs. } 1.25$

Comparison of overhead costs :

	Product I	Product II
Traditional system (Rs.)	4	2
ABC System (Rs.)	26.25	1.25

The relative cost impact of the activities involved in producing the two products are more clear under the ABC system.

6.8 Questions

1. What is Activity-based Costing (ABC)? How does it differ from the Traditional/Conventional Costing System?
2. Critically examine the benefits of ABC system comparing with the Traditional system.
3. Briefly discuss the steps involved in ascertaining costs under ABC system.
4. What is Activity-based Management (ABM)? How does ABC help ABM?
5. (a) When do you recommend activity-based cost allocation?
(b) The following information are available from the records of a multi-product manufacturing company.

	Products		
	X	Y	Z
Production and Sales (units)	30000	20000	8000
Raw material consumption (kg. per unit)	5	5	11
Direct material costs per unit	Rs. 25	Rs. 20	Rs. 11
Direct labour hours per unit	$1\frac{1}{3}$	2	1
Machine hours per unit	$1\frac{1}{3}$	1	2

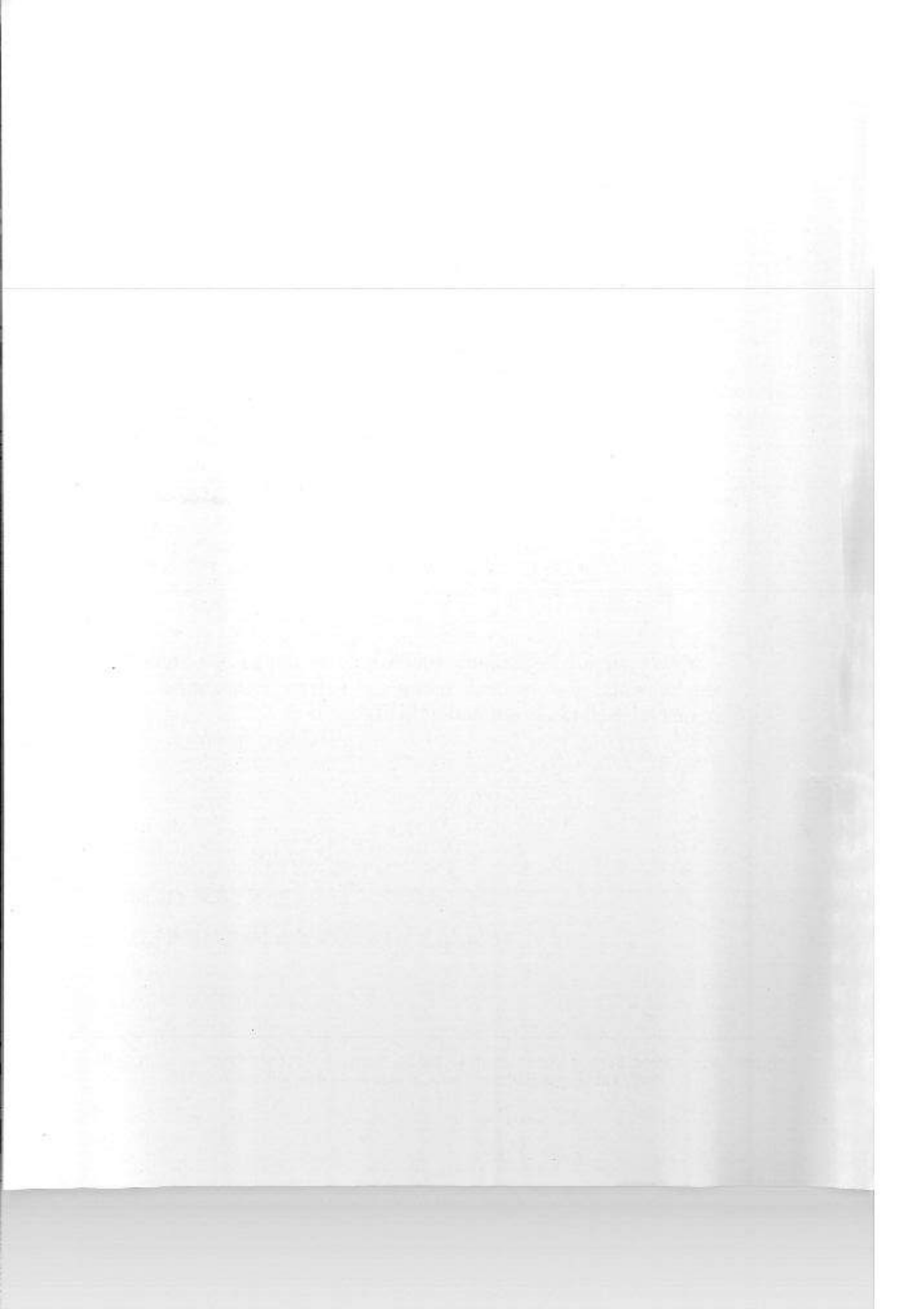
Direct labour cost per unit	Rs. 8	Rs. 12	Rs. 6
Number of production runs	3	7	20
Number of deliveries	9	3	20
Number of receipts	15	35	220
Number of engineering change notices	15	10	25

Overhead costs :	Rs.
Set-up	30000
Machines	760000
Receiving	435000
Packing	250000
Engineering	373000
	<u>1848000</u>

- (a) Determine the manufacturing cost per unit of each product using :
- a single-volume (direct labour hours) based allocation method of cost allocation;
 - two-volume (machine hours and material handling) based allocation methods of overhead costs;
 - activity-based costing.
- (b) Present a summary of the product costs for each of the three approaches and briefly state the reasons for differences of costs, if any.

6.9 Suggested Readings

- Kishore, Ravi M., Advanced Management Accounting, Taxmann, New Delhi
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