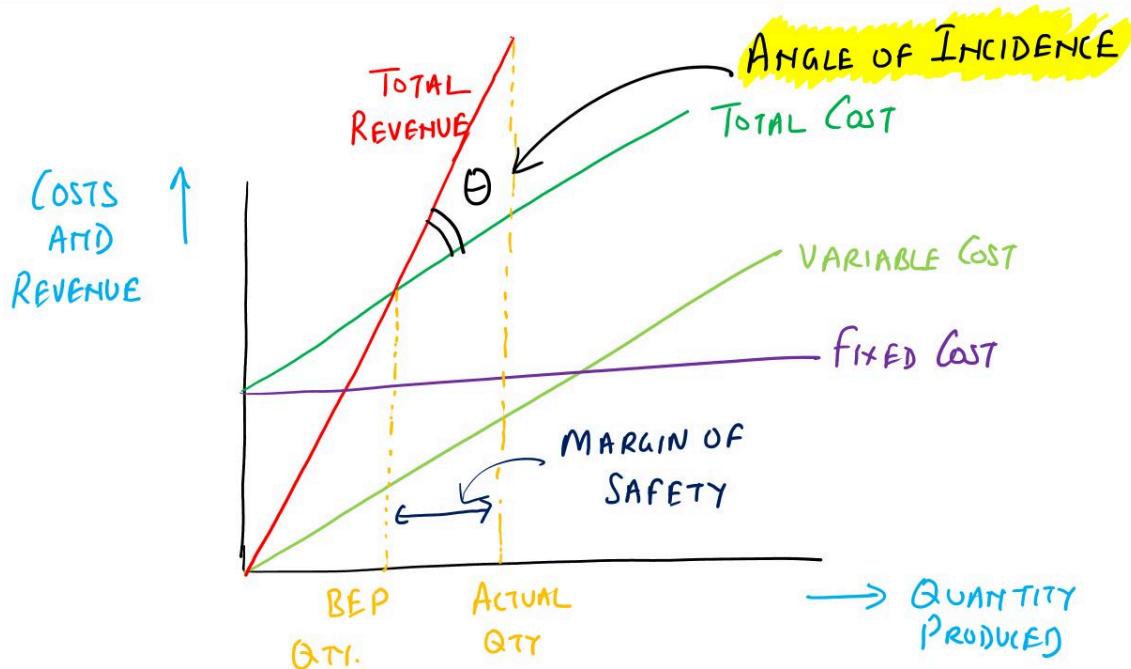


# Auditing Course Material

Part 12 of 61 (Chapters 1101-1200)

## 13. Angle of Incidence



The Angle of Incidence in break-even and cost-volume-profit (CVP) analysis refers to the angle formed by the intersection of the total sales line and the total cost line on a break-even chart.

The steeper the angle of incidence, the higher the profit margin per unit of sales beyond the break-even point. This indicates a more favorable profit situation, where an increase in sales results in a relatively higher increase in profits.

Conversely, a shallower angle indicates that profits increase more slowly as sales grow beyond the break-even point, suggesting lower profit margins.

In summary, the angle of incidence helps visualize the profitability of a company after reaching the break-even point—the steeper the angle, the faster the profits grow with increasing sales.

## 14. Assumptions of CVP analysis

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Cost Volume Profit (CVP) analysis is a short-term model that explores the relationships between key factors like selling price, variable costs, fixed costs, sales volume, and profit. It is an effective planning tool, providing insight into how changes in cost structure or sales levels can impact profitability.

However, to simplify the analysis, several important assumptions are made, which limit the precision of the results. These assumptions are as follows:

1. **Constant Revenue and Variable Cost Behavior:** The revenue and variable costs per unit remain constant and exhibit linear behavior within a relevant range of operations.
  2. **Proportional Contribution Margin:** The total contribution margin (calculated as total revenue minus total variable cost) increases proportionally with output, following from the assumption that revenue and variable costs are constant per unit.
  3. **Fixed Costs Are Constant:** Total fixed costs remain constant within the relevant range, meaning no additional capacity or changes in fixed costs are anticipated during the period under consideration.
  4. **Separation of Mixed Costs:** Mixed costs can be accurately divided into their fixed and variable components. While this separation may not always be exact, reliable estimates can be made using methods such as regression analysis or the high-low method.
  5. **Equal Sales and Production:** Sales and production levels are assumed to be equal, meaning no significant fluctuations in inventory occur. This assumption is necessary because inventory changes can affect how fixed costs are allocated, and CVP analysis focuses on cost behavior, making it compatible with variable costing.
  6. **Constant Sales Mix in Multiproduct Firms:** For companies selling multiple products, the sales mix is assumed to remain constant, allowing for the calculation of a weighted average contribution margin and contribution margin percentage.
  7. **No Changes in Productivity, Technology, or Market Conditions:** It is assumed that labor productivity, production methods, and market conditions will remain stable. Any significant changes would alter costs or selling prices, invalidating assumptions related to revenue, costs, and contribution margins.
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## 15. CVP for Multi-Products

Companies often produce and sell a range of products, some of which may be related (such as bats and baseballs, or sheets, towels, and bedspreads).

When conducting CVP (Cost-Volume-Profit) analysis for a multiproduct company, two key assumptions are necessary:

- (i) The product sales mix remains constant as the total sales volume changes, or
- (ii) The average contribution margin ratio stays constant as total sales volume changes.

The constant sales mix assumption is often described using the "bag" (or "basket" or "bundle") analogy. This analogy suggests that the sales mix can be viewed as a fixed bundle of products sold together. For instance, when product A is sold, specific quantities of products B and C are also sold in proportion. By assuming a constant sales mix, a weighted average contribution margin ratio can be calculated for the entire bundle of products. Without this assumption, it is not possible to calculate the break-even point (BEP) or use CVP analysis effectively.

BREAK EVEN POINT (IN BUNDLES)

$$= \frac{\text{FIXED COSTS}}{\text{CONTRIBUTION MARGIN PER BUNDLE}}$$

BREAK EVEN POINT (IN REVENUE / SALES)

$$= \frac{\text{FIXED COSTS}}{\text{CONTRIBUTION MARGIN \% PER BUNDLE}}$$

$$\frac{\text{CONTRIBUTION MARGIN PER BUNDLE}}{\text{REVENUE PER BUNDLE}}$$

In a multiproduct company, the contribution margin percentage (CM%) is weighted based on the quantities of each product in the "bundle." This means that the product with the largest share in the bundle will have the greatest influence on the overall average contribution margin of the product mix.

For example, if a company manufactures printers and ink cartridges, it might estimate that for every two printers sold, five ink cartridges will also be sold. In this case, the "bundle" has a 2:5 ratio of printers to cartridges.

A sports equipment company might sell running shoes along with accessories such as socks and shoe inserts. They estimate that for every pair of running shoes sold, two pairs of socks and one pair of inserts are also sold. This would form a 1:2:1 product bundle.

Let's consider Riya, who is planning her budget for an upcoming education fair in Delhi, where she intends to offer two different test-prep packages—"CAT Success" and "GRE Guarantee." Riya also has fixed costs of ₹4,500. The expected sales mix for these packages is shown below.

Products	Expected Sale	Selling Price	Variable Cost per unit
CAT Success	60	200	120
CAT Guarantee	40	100	70

Compute the Break Even Revenue in terms of both quantity and sales revenue.

Products	Units in One Bundle	Selling Price	Variable Cost per unit	Contribution Margin per unit	Contribution Margin of Bundle	Revenue of Bundle
CAT Success	3	200	120	80	240	600
CAT Guarantee	2	100	70	30	60	200
					<u>300</u>	<u>800</u>

$$\text{CONTRIBUTION MARGIN \%} = \frac{300}{800} = 0.375$$

$$\text{BREAK EVEN (REVENUE)} = \frac{4500}{0.375} = 12,000$$

$$\text{BREAK EVEN (UNITS)} = \frac{12,000}{800} = 15 \text{ BUNDLES}$$

	BEP(UNITS)	BEP(REVENUE)
CAT SUCCESS	$15 \times 3 = 45$	$45 \times 200 = 9000$
CAT GUARANTEE	$15 \times 2 = 30$	$30 \times 100 = 3000$

## 16. Illustration 1

EcoGrow is a small business that manufactures eco-friendly plant stands, which sell for ₹25 each. The company's annual production and sales volume is 1,20,000 units. Besides the fixed manufacturing overhead of ₹430,500 and fixed administrative expenses of ₹1,59,050, the following per-unit costs have been identified:

Direct material: ₹6.00

Direct labor: ₹3.00

Variable manufacturing overhead: ₹0.80

Variable selling expense: ₹2.20

Total variable cost per unit: ₹12.00

Compute the followings:

- a. Prepare a variable costing income statement for EcoGrow at the current level of production and sales.
- b. Calculate the unit contribution margin in rupees and the contribution margin ratio for each plant stand.
- c. Determine the break-even point in units of plant stands.
- d. Calculate the rupee break-even point using the contribution margin ratio.
- e. Determine EcoGrow's margin of safety in units, in sales rupees, and as a percentage.
- f. Compute the company's degree of operating leverage. If sales increase by 25%, by what percentage will before-tax income increase?
- g. How many plant stands must the company sell to earn ₹9,96,450 in before-tax income?
- h. If EcoGrow aims to earn ₹6,57,800 after taxes and is subject to a 20% tax rate, how many units must be sold?
- i. How many plant stands must be sold to break even if EcoGrow's fixed manufacturing cost increases by ₹7,865? (Use the original data for all other assumptions.)
- j. EcoGrow has received a special order from a client in Kerala to purchase 4,000 plant stands at ₹20 per unit. The per-unit variable selling cost of these additional units will be ₹2.80 (instead of ₹2.20), and the company will incur ₹18,000 in additional fixed administrative costs. This order will not affect regular domestic sales or costs. Based solely on quantitative factors, should EcoGrow accept this order?

### SOLUTION:

- a. Prepare a variable costing income statement for EcoGrow at the current level of production and sales.

Income Statement (Variable Costing)		
Sales	1,20,000 × 25	30,00,000
Less: Variable Costs		
Direct material	1,20,000 × 6	7,20,000
Direct labour	1,20,000 × 3	3,60,000
Overheads	1,20,000 × 0.80	96,000
Variable Selling Expenses	1,20,000 × 2.20	2,64,000
	Total Variable Costs	14,40,000
Contribution Margin		15,60,000
Less: Fixed Costs		
Fixed manufacturing Overheads	4,30,500	
Fixed Administrative	1,59,050	
	Fixed Costs	5,89,550
Net Profit		9,70,450

- b. Calculate the unit contribution margin in rupees and the contribution margin ratio for each plant stand.

### UNIT CONTRIBUTION MARGIN

$$= \text{SELLING PRICE} - \text{VARIABLE COST PER UNIT}$$

$$= 25 - 12 = \text{Rs } 13$$

$$\text{CONTRIBUTION MARGIN \%} = \frac{\text{UNIT CONTRIBUTION MARGIN}}{\text{SELLING PRICE}}$$

$$= \frac{13}{25} = 0.52$$

c. Determine the break-even point in units of plant stands.

$$\text{BEP (UNITS)} = \frac{\text{F. C.}}{\text{UNIT CONTRIBUTION MARGIN}}$$

$$= \frac{5,89,550}{13} = 45,350 \text{ UNITS}$$

d. Calculate the rupee break-even point using the contribution margin ratio.

$$\text{BEP (REVENUE)} = \frac{\text{F. C.}}{\text{CONTRIBUTION MARGIN \%}}$$

$$= \frac{5,89,550}{0.52} = \text{Rs } 11,33,750$$

e. Determine EcoGrow's margin of safety in units, in sales rupees, and as a percentage.

MARGIN OF SAFETY (MoS)

$$\text{ACTUAL SALE} - \text{BEP SALE} = 1,20,000 - 45,350 = 74,650 \text{ (units)}$$

$$\text{ACTUAL SALE} - \text{BEP SALE} = 30,00,000 - 11,33,750 = 18,66,250 \text{ (Rs.)}$$

$$\frac{\text{MoS IN UNITS}}{\text{ACTUAL SALE}} = \frac{74,650}{1,20,000} = 0.62$$

$$= 62\%$$

f. Compute the company's degree of operating leverage. If sales increase by 25%, by what percentage will before-tax income increase?

### DEGREE OF OPERATING LEVERAGE (DOL)

$$= \frac{\text{CONTRIBUTION MARGIN}}{\text{EBIT (NET PROFIT)}} = \frac{15,60,000}{9,70,450} = 1.61$$

$$\text{INCREASE IN INCOME} = \text{DOL} \times \% \Delta \text{SALE}$$

$$= 1.61 \times 0.25 = 40.25\%$$

g. How many plant stands must the company sell to earn ₹9,96,450 in before-tax income?

$$\text{REQUIRED SALE} = \frac{\text{F. C.} + \text{EBIT (NET PROFIT REQUIRED)}}{\text{PER UNIT CONTRIBUTION MARGIN}}$$

$$= \frac{5,89,550 + 9,96,450}{13} = 1,22,000 \text{ UNITS}$$

h. If EcoGrow aims to earn ₹6,57,800 after taxes and is subject to a 20% tax rate, how many units must be sold?

$$PBT = \frac{PAT}{1 - \text{TAX RATE}} = \frac{6,57,800}{1 - 0.20} = \text{Rs } 8,22,250$$

$$\text{REQUIRED SALE (UNITS)} = \frac{5,89,550 + 8,22,250}{13}$$

$$= 1,08,600 \text{ UNITS}$$

- i. How many plant stands must be sold to break even if EcoGrow's fixed manufacturing cost increases by ₹7,865? (Use the original data for all other assumptions.)

$$\Delta FC = 7865$$

ADDITIONAL UNITS REQUIRED TO BE SOLD FOR BEP

$$= \frac{7865}{13} = 605$$

$$\text{NEW BEP} = 45,350 + 605 = 45,955 \text{ UNITS}$$

- j. EcoGrow has received a special order from a client in Kerala to purchase 4,000 plant stands at ₹20 per unit. The per-unit variable selling cost of these additional units will be ₹2.80 (instead of ₹2.20), and the company will incur ₹18,000 in additional fixed administrative costs. This order will not affect regular domestic sales or costs. Based solely on quantitative factors, should EcoGrow accept this order?

$$\text{REVISED PER UNIT CONTRIBUTION MARGIN} = 20 - 12.60 = 7.40$$

$$\text{TOTAL CONTRIBUTION MARGIN} = 7.40 \times 4000 = 29,600$$

$$\Delta \text{ PROFIT} = 29,600 - 18,000$$

$$\text{INCREMENTAL PROFIT} = 11,600$$

YES, ACCEPT THE ORDER

## 17. Illustration 2

Calculate BEP in units as well as in value, by considering the figures given below.

Sales 5000 units

Sales price per unit Rs. 50

Variable cost per unit Rs. 30

Fixed cost Rs. 35000

Solution:

$$\text{BREAK EVEN POINT (UNITS)} = \frac{\text{F.C.}}{\text{PER UNIT CONTRIBUTION}}$$
$$= \frac{35,000}{50 - 30} = 1750$$

$$\text{BREAK EVEN POINT (SALES)} = 1750 \times 50 = \text{Rs } 87,500$$

ANOTHER METHOD

$$\text{BREAK EVEN POINT (SALES)} = \frac{\text{F.C.}}{\text{CONTRIBUTION MARGIN \%}} = \frac{35,000}{\frac{20}{50}} = \text{Rs } 87,500$$

## 18. Illustration 3

A product's selling price (per unit) is Rs 20, the variable cost (per unit) is Rs 14, fixed factory overheads for the year is Rs 5,40,000 and fixed selling overheads is Rs 2,52,000. Calculate the sales (in value and number of units) in order to earn a profit of Rs 60,000.

SOLUTION:

UNIT SALES FOR TARGET OF RS 60,000

$$= \frac{F.C. + \text{TARGET INCOME} / \text{PROFIT}}{\text{PER UNIT CONTRIBUTION MARGIN}} = \frac{5,40,000 + 2,52,000 + 60,000}{20 - 14}$$
$$= 1,42,000 \text{ UNITS}$$

$$\text{SALES REQUIRED} = 1,42,000 \times 20 = \text{RS } 28,40,000$$

## 19. Illustration 4

The following figures for profit and sales are obtained from the accounts of ABC Ltd.

Period	Sales (Rs.)	Profit (Rs.)
2016	270000	6000
2017	300000	15000

Calculate the P/V Ratio, assuming the cost structure and selling price remains the same in both the years.

SOLUTION:

$$P/V \text{ RATIO} = \frac{\Delta \text{ PROFIT} / \text{CONTRIBUTION}}{\Delta \text{ SALE}}$$
$$= \frac{15000 - 6000}{3,00,000 - 2,70,000} = \frac{9000}{30000} = 0.30$$

## 20. Illustration 5

Calculate Break Even Sales and Fixed Costs from the information given below.

Sales = Rs. 9,00,000

Margin of Safety = 40%

P/V Ratio = 2/3

SOLUTION:

$$\text{MARGIN OF SAFETY \%} = \frac{\text{MARGIN OF SAFETY}}{\text{BUDGETED SALE}}$$
$$0.40 = \frac{9,00,000 - \text{BEP (REVENUE)}}{9,00,000}$$

$$\Rightarrow \text{BEP (REVENUE)} = 5,40,000$$

$$\begin{aligned} F.C_0 &= \text{BEP (REVENUE)} \times \text{P/V RATIO} \\ &= 5,40,000 \times \frac{2}{3} = \text{Rs } 3,60,000 \end{aligned}$$

## 21. Illustration 6

A product is sold at a price of Rs 120 per unit, and its variable cost is Rs 80 per unit. The fixed expenses of the business are Rs 8,000 per year. Find:

- (i) Break-even point (BEP) in Rs and units,
- (ii) Profits made when sales are 240 units,
- (iii) Sales to be made to earn a net profit of Rs 5,000 for the year.

SOLUTION:

- (i) Break-even point (BEP) in Rs and units

$$\begin{aligned} \text{BEP (UNITS)} &= \frac{\text{F.C.}}{\text{PER UNIT CONTRIBUTION}} \\ &= \frac{8000}{120 - 80} = 200 \\ \text{BEP (REVENUE)} &= \frac{\text{F.C.}}{\text{CONTRIBUTION MARGIN \%}} \\ &= \frac{8000}{\frac{120-80}{120}} = 8000 \times 3 = \text{Rs } 24,000 \end{aligned}$$

- (ii) Profits made when sales are 240 units

$$\text{TOTAL CONTRIBUTION} = 240 \times 40 = \text{Rs } 9600$$

$$\text{F.C.} = 8000$$

$$\text{PROFIT} = 9600 - 8000 = \text{Rs } 1600$$

- (iii) Sales to be made to earn a net profit of Rs 5,000 for the year.

$$\begin{aligned} \text{REQUIRED SALE} &= \frac{\text{F.C.} + \text{PROFIT}}{\text{CONTRIBUTION MARGIN \%}} = \frac{8000 + 5000}{\frac{120-80}{120}} \\ &= \text{Rs } 39,000 \end{aligned}$$

## 22. Illustration 7

Sales are ₹1,50,000, producing a profit of ₹4,000 in Period I. Sales are ₹1,90,000, producing a profit of ₹12,000 in Period II. Determine the Break-even Point (BEP).

SOLUTION:

$$\text{P/V RATIO} = \frac{\Delta \text{ PROFIT / CONTRIBUTION}}{\Delta \text{ SALES}} = \frac{12000 - 4000}{1,90,000 - 1,50,000}$$
$$= 0.20$$

$$\text{SALES} = ₹ 1,50,000$$

$$\text{CONTRIBUTION} = 0.20 \times \text{SALES} = 0.20 \times 1,50,000 = ₹ 30,000$$

$$\text{PROFIT} = ₹ 4,000$$

$$\text{F.C.} = 30,000 - 4000 = ₹ 26,000$$

$$\text{BEP} = \frac{26000}{0.20} = ₹ 1,30,000$$

## 23. Illustration 8

A Limited has two factories, X and Y, producing the same article with a selling price of Rs 150 per unit. The following are the particulars:

Particulars	Factory X	Factory Y
Capacity (units)	10,000	15,000
Variable cost/unit	₹100	₹120
Fixed expenses	₹3,00,000	₹2,10,000

Determine the Break-even Point (BEP) for the two factories and for the company as a whole, assuming Constant Sales Mix.

SOLUTION:

$$\text{BEP of Factory X} = \frac{3,00,000}{150 - 100} = 6000$$

$$\text{BEP of Factory Y} = \frac{2,10,000}{150 - 120} = 7000$$

$$\text{BUNDLE RATIO} = 10,000 : 15,000 \\ = 2 : 3$$

Products	Units in One Bundle	Selling Price	Variable Cost per unit	Contribution Margin per unit	Contribution Margin of Bundle	Revenue of Bundle
Factory X	2	150	100	50	100	300
Factory Y	3	150	120	30	90	450
					<u>190</u>	<u>750</u>

$$\text{CONTRIBUTION MARGIN \%} = \frac{190}{750} = 0.2533$$

$$\text{BEP (REVENUE)} = \frac{3,00,000 + 2,10,000}{0.2533} = 20,13,158$$

$$\text{BEP (UNITS)} = \frac{20,13,158}{750} = 2684 \text{ BUNDLES}$$

	BEP(UNITS)	BEP (REVENUE)
FACTORY X	$2684 \times 2 = 5368$	$5368 \times 150 = 8,05,263$
FACTORY Y	$2684 \times 3 = 8052$	$8052 \times 150 = 12,07,895$

# 1. Standard Costing



STANDARD  
COSTING  
and  
VARIANCE  
ANALYSIS

Standard costing is a cost accounting method used by businesses to estimate the expected costs of production. It involves setting predetermined or "standard" costs for various elements of production, such as direct materials, labor, and overhead. These standard costs are then compared to the actual costs incurred during production to determine variances, which help management analyze and control costs.

The Chartered Institute of Management Accountants (CIMA) in London defines standard costing as a "control technique that reports variances by comparing actual costs to pre-set standards, facilitating management action by exception."

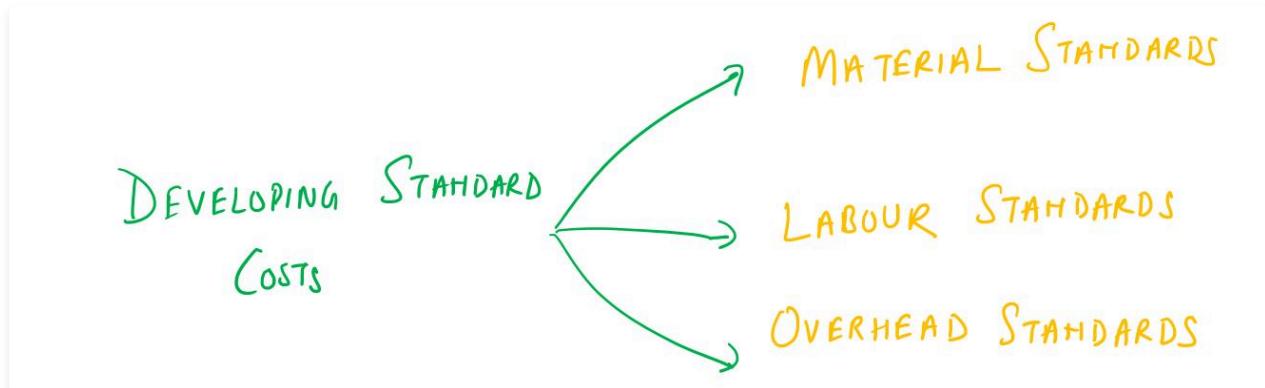
According to CIMA, a standard cost is defined as "the planned unit cost of the product, component, or service produced in a period." Standard costs can be determined using various bases and are primarily used for performance measurement, cost control, stock valuation, and establishing selling prices.

It is important to differentiate between standard costs and estimated costs. Although both are predetermined, their purposes differ significantly:

- *Objective:* Estimated costs project what costs "will" be, while standard costs indicate what costs "should" be.
- *Basis:* Estimated costs rely on averages of past actual figures adjusted for expected future changes, including anticipated waste and inefficiencies. In contrast, standard costs are planned based on scientific analysis under assumed efficient conditions.
- *Focus:* Estimated costing emphasizes pricing decisions rather than cost control, while standard costing is a powerful tool for managing and controlling costs effectively.

## 2. Developing Standard Costs

Establishing standard costs is an essential component of effective cost management and accounting. It enables organizations to set performance benchmarks, control expenses, and streamline budgeting processes. Standard costs reflect the anticipated expenses for producing goods or delivering services under typical conditions.



This development process necessitates a thorough analysis of material, labour, and overhead costs.

## 2. Developing Standard Costs

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Material standards define the expected costs and specifications for the materials used in production or service delivery. Developing these standards involves several key steps:

1. **Identify Types of Material Inputs:** Management must specify the exact types of materials necessary for producing the product or delivering the service.

A company manufacturing electric vehicles may need lithium for batteries, steel for the chassis, and glass for windows.

2. **Determine Quality of Material Inputs:** Establishing quality standards ensures that the materials meet the required performance criteria. This is critical for maintaining product quality and customer satisfaction.

The steel used in the chassis must meet specific tensile strength requirements to ensure safety and durability.

3. **Calculate Quantity of Material Inputs:** Accurately estimating the quantity of each material required is vital for cost calculations. This can involve analyzing historical data or using engineering specifications.

To produce one electric vehicle, the company might require, 300 kg of lithium, 500 kg of steel and 50 kg of glass

4. **Estimate Prices of Material Inputs:** Management should gather information on the expected prices for these materials, taking into account normal purchasing conditions, such as bulk orders and market fluctuations.

If lithium costs Rs 15 per kg, steel costs Rs 2 per kg, and glass costs Rs 5 per kg, the BOM will reflect these prices.

### Bill of Materials (BOM)

A Bill of Materials (BOM) is a detailed list that specifies all material inputs, including their quantities and quality standards, required to manufacture one unit (or batch) of the product.

Example of a BOM for an Electric Vehicle:

Material Type	Quantity Required	Unit Price (Rs)	Total Cost (Rs)
Lithium	300 kg	15	4,500
Steel	500 kg	2	1,000
Glass	50 kg	5	250
<b>Total Material Cost</b>			<b>5,750</b>

### Total Cost of Ownership (TCO)

In addition to direct purchase prices, managers must consider the Total Cost of Ownership (TCO), which provides a more comprehensive view of material costs. TCO includes:

- *Freight/Duty/Tax Charges:* The costs associated with shipping materials to the facility.
- *Payment and Discount Terms:* Financial terms that can affect cash flow and overall cost.
- *Inventory Storage Costs:* Expenses related to storing materials until they are used.
- *Scrap Rates:* Expected losses during production processes due to defects or waste.
- *Rebates or Special Incentives:* Financial benefits offered by suppliers that can lower overall costs.
- *Warranties and Disposal Costs:* Costs related to product returns or the disposal of unusable materials.

For the electric vehicle manufacturer, the TCO might look like this:

Direct Material Costs: Rs 5,750 (from BOM)

Freight Costs: Rs 500

Storage Costs: Rs 200

Scrap Rate (10%): Rs 575

Total TCO = Rs 5,750 + Rs 500 + Rs 200 + Rs 575 = Rs 7,025

Incorporating TCO into price standards allows managers to better understand the true costs associated with material inputs. This comprehensive approach enables them to identify and analyze any significant variances between actual costs and standard prices, facilitating improved cost control and decision-making.

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## 2. Developing Standard Costs

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To create accurate labor standards, management must identify several key factors:

1. **Types of Labor Tasks:** Management should specify the various labor tasks required to produce the product or deliver the service.

In a manufacturing setting, tasks may include assembly, quality control, and packaging.

2. **Amount of Labor Time:** It is crucial to estimate the time needed for each task to accurately calculate labor costs.

If assembling a product takes 30 minutes, this time must be documented.

3. **Skill Levels of Personnel:** Identify the necessary skill levels for each task to ensure that the right personnel are assigned. Some tasks may require skilled labor, while others may be performed by unskilled workers.

4. **Wage Rates or Salary Levels:** Determine the wage rates or salary levels associated with different labor classifications to accurately reflect labor costs.

Skilled labor might be paid Rs 250 per hour, while unskilled labor is paid Rs 150 per hour.

Labor Task	Amount of Time Required	Skill Level	Wage Rate (Rs)	Total Labor Cost (Rs)
Assembly	30 minutes (0.5 hours)	Semi-skilled	250	125
Quality Control	20 minutes (0.33 hours)	Skilled	250	83.33
Packaging	15 minutes (0.25 hours)	Unskilled	150	37.50
<b>Total</b>				<b>Rs 245.83</b>

An **Operations Flow Document** is created to outline all labor operations necessary to produce a single unit (or batch) of output or to perform a specific service. This document serves as a detailed guide for labor standards.

To develop effective labor standards, organizations gather quantitative data for each production operation. This information can be obtained through various methods, including:

- *Industrial Engineering Techniques:* These methods assess workflows and identify optimal task sequences.
- *In-House Time-and-Motion Studies:* These studies analyze the time taken for specific tasks to establish realistic time standards.
- *Historical Data:* Past performance data can provide insights into typical labor times and productivity rates.

One widely used method for assessing labor tasks is **Methods-Time Measurement (MTM)**. This industrial engineering process evaluates work tasks to determine the time a trained worker needs to complete a given operation while maintaining a sustainable pace for an 8-hour workday.

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## 2. Developing Standard Costs

To effectively establish overhead standards, management must consider the following components:

1. **Identification of Overhead Costs:** First we need to identify fixed and variable overheads.

• **Variable Overhead Costs:** These costs fluctuate with production levels. Examples include utilities, indirect materials, and supplies.

• **Fixed Overhead Costs:** These costs remain constant regardless of production levels. Examples include rent, salaries of administrative staff, and insurance.

2. **Estimated Level of Activity:** Management should estimate the level of activity that will be used to compute the predetermined overhead rates. This could be based on anticipated production volume, machine hours, or labor hours.

If a company expects to produce 10,000 units in a month, this figure will serve as the basis for calculating overhead rates.

3. **Estimation of Variable and Fixed Overhead Costs:** Management needs to estimate the total variable and fixed overhead costs at the estimated level of activity. This involves analyzing historical data, market trends, and input from various departments.

If variable overhead is estimated at Rs 30,000 and fixed overhead at Rs 50,000, the total estimated overhead cost would be Rs 80,000.

4. **Determination of Predetermined Overhead Rates:** A predetermined overhead rate is calculated to allocate overhead costs to products or services. This rate is derived by dividing the total estimated overhead costs by the estimated level of activity.

PREDETERMINED OVERHEAD RATE

$$= \frac{\text{TOTAL ESTIMATED OVERHEAD COST}}{\text{ESTIMATED LEVEL OF ACTIVITY}}$$

### 3. Standard Cost Card

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Once the Bill of Materials (BOM), operations flow document, and predetermined overhead rates have been developed, a Standard Cost Card is prepared.

A **standard cost card** summarizes the standard quantities and costs required to produce one unit of a product or deliver a specific service. It details the expected amounts of materials, labor, and overhead, along with their associated costs, allowing organizations to establish benchmarks for budgeting and performance measurement. By comparing actual costs against these standards, businesses can identify variances, control expenses, and enhance operational efficiency.

Example of a Standard Cost Card for a Product is given in the table.

Cost Component	Quantity Required	Rate (Rs)	Total Cost (Rs)
Materials			
Aluminum	2 kg	10	20
Steel	3 kg	5	15
Labor			
Labor (Assembly)	1 hour	20	20
Overhead			
Variable Overhead	-	-	8
Fixed Overhead	-	-	10
<b>Total Cost</b>			<b>Rs 73</b>

This Standard Cost Card serves as a vital tool for managers to compare actual costs against standard costs, analyze variances, and make informed decisions regarding pricing, budgeting, and operational efficiency. By developing accurate standard costs, organizations can enhance their cost management practices and improve overall financial performance.

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## 4. Introduction to Variance

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A **variance** is the difference between actual results and expected performance. Expected performance, often called *budgeted performance*, serves as the benchmark for evaluating whether operations are proceeding as planned. Variance analysis allows managers to assess how well the organization is performing and where adjustments are needed.

Variances are at the heart of management's planning and control functions. They enable management by exception, which means focusing attention on areas where performance is not meeting expectations. By concentrating on significant deviations, managers can prioritize their efforts, ensuring that time and resources are spent where they're most needed.

For instance, imagine a car manufacturing company has a budgeted production cost of Rs 15,000 per vehicle. If the actual cost turns out to be Rs 17,000, the negative variance of Rs 2,000 per vehicle signals that something is wrong. The company could investigate and discover that supplier prices for steel have gone up unexpectedly. Armed with this knowledge, management might negotiate new contracts or consider alternative suppliers to control costs.

Conversely, consider an IT firm developing software with a projected budget of Rs 1,00,000 for labor. If actual labor costs come in at Rs 80,000, there's a positive variance of Rs 20,000. Upon investigation, management might find that improved team productivity—perhaps due to new software tools—enabled the project to finish ahead of schedule. This variance can lead to a review of whether the new tools should be used across other projects.

Variances also play a key role in performance evaluation and motivating managers. For example, in a retail chain, store managers might have quarterly bonuses linked to controlling operational costs. If a store's electricity costs are budgeted at Rs 10,000 but come in at Rs 8,000, the favorable variance may be attributed to the manager's energy-saving initiatives, such as installing energy-efficient lighting. The store manager might receive a performance bonus as a reward for keeping costs below the budget, motivating further cost-saving efforts.

Sometimes, variances reveal deeper strategic issues that go beyond day-to-day operational concerns. Let's take a tech startup that recently launched a new smartphone model. If the expected sales volume was 100,000 units in the first quarter, but actual sales were only 60,000 units, this negative sales variance could indicate a problem with product-market fit. The company might investigate whether customers found the phone too expensive, or whether features didn't match expectations. If the issue lies in product design or pricing, management may decide to revisit their product strategy or tweak marketing campaigns.

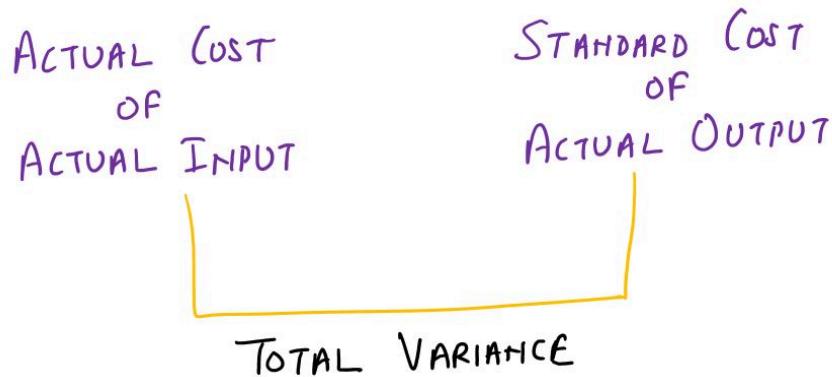
Another example could be in a food manufacturing company that experiences a significant positive variance in packaging costs because it switched to a new packaging material. While this initially looks favorable, further investigation might reveal that the new material is less durable, leading to increased product returns and complaints. This highlights how variances can serve as early warnings for unintended consequences.

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## 5. Variance Analysis

Variance is the difference between the actual costs incurred for production inputs and the standard costs allocated for the production output. It measures how much actual performance deviates from expected performance in terms of costs.

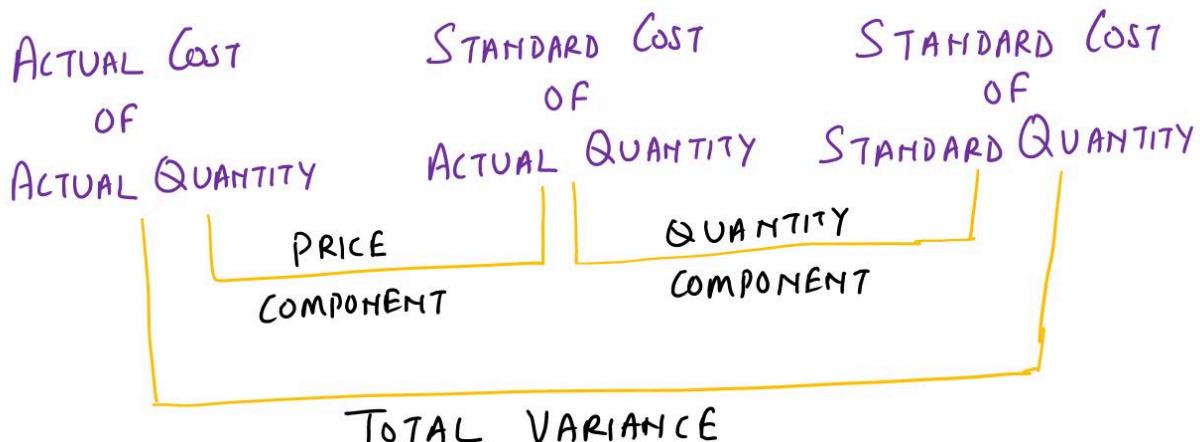
The Total Variance can be shown as below.



Unfortunately, the Total Variance does not provide useful information for determining why standard and actual costs differed. It does not indicate whether the variance was caused by price factors, quantity factors, or both. To provide additional information, total variances are subdivided into price and quantity components.

$$\text{PRICE VARIANCE (RATE)} + \text{QUANTITY VARIANCE (EFFICIENCY)} = \text{TOTAL VARIANCE}$$

The Price Variance is also called Rate Variance or Cost Variance. The Quantity Variance is also called Usage Variance or Efficiency Variance.



### Price Variance

The Price variance indicates the difference between what was actually paid for inputs and the amount expected to be paid for inputs. The price (or rate variance) variance is calculated as the difference between the actual price (AP) and the standard price (SP) per unit of input multiplied by the actual input quantity (AQ).

## PRICE VARIANCE (RATE VARIANCE)

$$= (AP - SP) \times AQ$$

AP = ACTUAL PRICE

SP = STANDARD PRICE

AQ = ACTUAL QUANTITY OF INPUT

## Quantity Variance

The Quantity (usage) Variance shows the efficiency of results or the relationship of input to output. The diagram's far right column shows total standard cost, which reflects a measure of output known as the standard quantity. This quantity translates actual production output into the standard input quantity: the quantity that should have been used to achieve that output.

The quantity/efficiency variance is calculated as the difference between the AQ and standard quantity of input allowed (SQ) multiplied by the standard price per unit of input.

## QUANTITY VARIANCE (EFFICIENCY/USAGE VARIANCE)

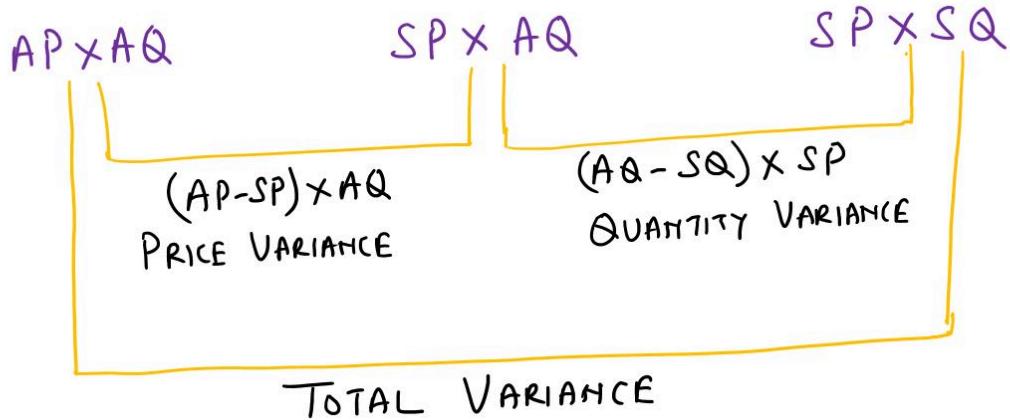
$$= (AQ - SQ) \times SP$$

AQ = ACTUAL QUANTITY OF INPUT

SQ = STANDARD QUANTITY OF INPUT

SP = STANDARD PRICE

Thus we can redraw our diagram of total variance, as below.



## 6. Favorable and Unfavorable Variance

If the actual price or quantity amounts are higher than the standard price or quantity amounts, the variance is **unfavorable (U)**; if the actual amounts are lower than the standard amounts, the variance is **favorable (F)**.

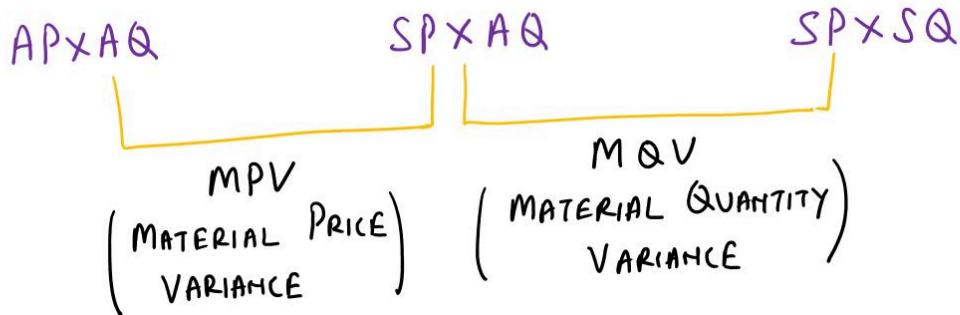
An unfavorable variance has a negative effect on income, and a favorable variance has a positive effect on income.

<u>RELATIONSHIP</u>	<u>VARIANCE</u>	<u>EFFECT ON INCOME</u>
$AP > SP$	UNFAVOURABLE	-ve
$AP < SP$	FAVOURABLE	+ve
$AQ > SQ$	UNFAVOURABLE	-ve
$AQ < SQ$	FAVOURABLE	+ve
$AP = \text{ACTUAL PRICE}$	$AQ = \text{ACTUAL QUANTITY}$	
$SP = \text{STANDARD PRICE}$	$SQ = \text{STANDARD QUANTITY}$	

It may be noted that unfavorable is not necessarily equated with bad nor is favorable equated with good. Determination of "bad" or "good" must be made after identifying the cause of the variance and the implications of that variance for other cost elements.

## 7. Material Variances

Just like any variance model, the Material Variances can be categorized into two main components: Material Price Variance (MPV) and Material Quantity Variance (MQV).



### 1. Material Price Variance (MPV)

MPV assesses the difference between the actual price paid for materials and the standard price that was expected.

$$\begin{aligned} & \text{MATERIAL PRICE VARIANCE (MPV)} \\ & = (AP - SP) \times AQ \end{aligned}$$

*Favorable Variance (F):* Occurs when the actual price is less than the standard price, indicating cost savings. A favorable MPV reduces the overall cost of production. A negative value represents favorable variance.

*Unfavorable Variance (U):* Occurs when the actual price exceeds the standard price, leading to higher production costs. A positive value represents unfavorable variance.

### 2. Material Quantity Variance (MQV)

MQV evaluates the difference between the actual quantity of materials used and the standard quantity allowed for the actual output produced. It is calculated as follows.

$$\begin{aligned} & \text{MATERIAL QUANTITY VARIANCE (MQV)} \\ & = (AQ - SQ) \times SP \end{aligned}$$

*Favorable Variance (F):* Happens when the actual quantity used is less than the standard quantity allowed, indicating efficiency in material usage. A negative value in this context signifies a favorable outcome.

*Unfavorable Variance (U):* Arises when the actual quantity used exceeds the standard quantity, suggesting inefficiencies or waste. A positive value in this context signifies an unfavorable outcome.

### Total Material Variance (TMV)

The Total Material Variance (TMV) combines both MPV and MQV, providing a comprehensive view of material-related cost performance.

$$\begin{aligned} & \text{TOTAL MATERIAL VARIANCE (TMV)} \\ & = MPV + MQV \end{aligned}$$

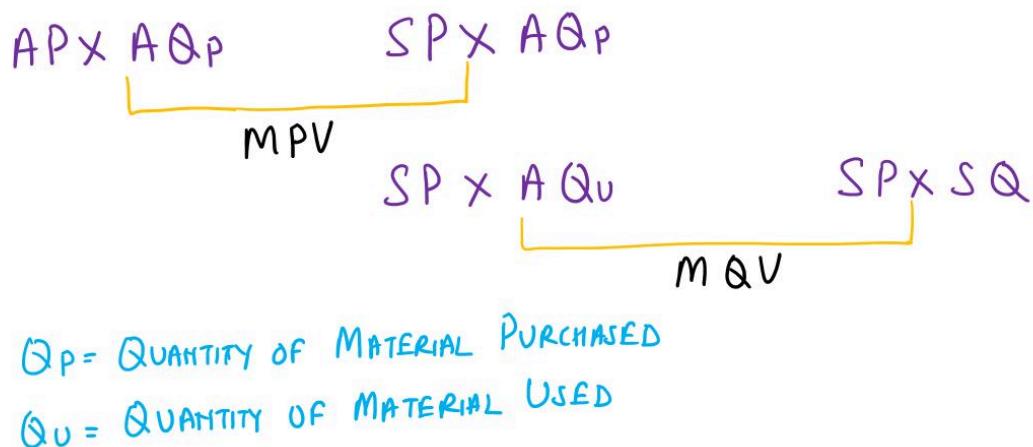
To accurately assess TMV, calculations must be conducted for each direct material component involved in production. Once individual price and quantity variances are determined, they are summed to yield the overall total variances. This analysis helps management identify specific areas of cost control and efficiency improvements in material usage, ultimately enhancing the production process and profitability.

## 8. Point of Purchase Material Variance

A total variance for a cost component generally equals the sum of the price and usage variances. An exception to this rule occurs when the quantity of material purchased is not the same as the quantity of material placed into production.

Because the material price variance relates to the purchasing (rather than the production) function, the point of purchase approach calculates the material price variance using the quantity of materials PURCHASED rather than the quantity of materials USED.

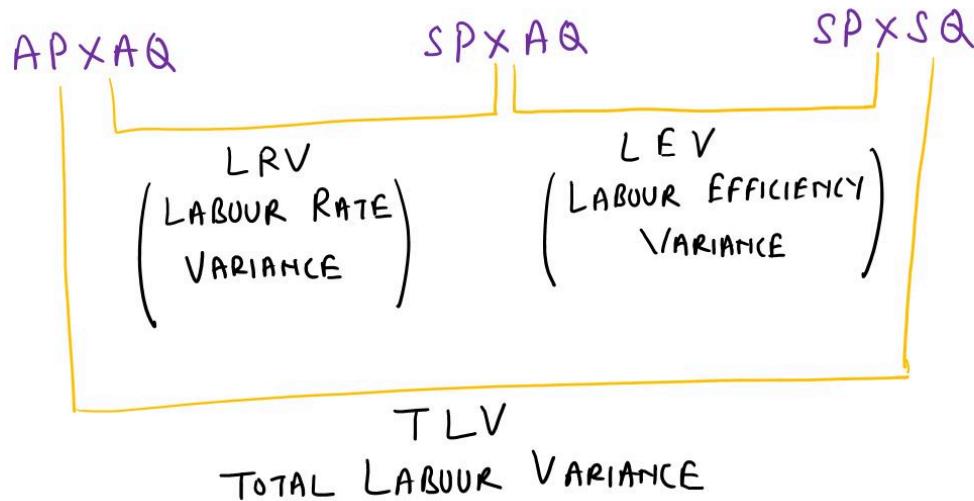
Using the point of purchase variance model, the computation for the material price variance is adjusted, but the computation for the material quantity variance remains the same. The point of purchase material variance model is a "staggered" one as given below.



Because the price and quantity variances have been computed using different bases, they should not be summed. Thus, no total material variance (TMV) can be meaningfully determined when the quantity of material purchased differs from the quantity of material used.

## 9. Labor Variances

Just like Material Variances can be categorized into Material Price Variance (MPV) and Material Quantity Variance (MQV), the Labor Variances can be categorized into Labor Rate Variance (LRV) and Labor Efficiency Variance (LEV).



### 1. Labor Rate Variance (LRV)

Labor Rate Variance (LRV) measures the difference between the actual wages paid to employees and the standard wage rate expected for the actual hours worked.

$$\text{LABOUR RATE VARIANCE (LRV)} \\ = (AP - SP) \times AQ$$

*Favorable Variance (F):* If the actual wage rate is less than the standard rate, it results in a favorable variance, indicating cost savings in labor expenses.

*Unfavorable Variance (U):* Conversely, if the actual wage rate exceeds the standard rate, it leads to an unfavorable variance, indicating higher labor costs than anticipated.

### 2. Labor Efficiency Variance (LEV)

Labor Efficiency Variance (LEV) assesses the difference between the actual hours worked and the standard hours allowed for the actual output produced.

$$\text{LABOUR EFFICIENCY VARIANCE (LEV)} \\ = (AQ - SQ) \times SP$$

*Favorable Variance (F):* If the actual hours worked are less than the standard hours allowed, this indicates efficiency, resulting in a favorable variance.

*Unfavorable Variance (U):* If actual hours worked exceed the standard hours allowed, it suggests inefficiency or potential issues in the production process, leading to an unfavorable variance.

### Total Labor Variance (TLV)

The Total Labor Variance is the sum of the Labor Rate Variance and the Labor Efficiency Variance. It provides a comprehensive view of labor cost performance for a specific department, such as the Painting Department.

## TOTAL LABOUR VARIANCE (TLV)

$$= LRV + LEV$$

This total helps management identify areas where labor costs deviate from expectations, allowing for better planning and control over labor resources. By analyzing these variances, organizations can pinpoint issues and make informed decisions to enhance productivity and reduce costs.

## 10. Overhead Variances

Because total variable overhead changes in direct relationship with changes in activity and fixed overhead per unit changes inversely with changes in activity, a specific capacity level must be selected to compute budgeted overhead costs and to develop a predetermined overhead (OH) rate.

$$\text{VARIABLE OH RATE} = \frac{\text{BUDGETED VOH COSTS}}{\text{BUDGETED DIRECT LABOUR HOURS}}$$

$$\text{FIXED OH RATE} = \frac{\text{BUDGETED FOH COSTS}}{\text{BUDGETED DIRECT LABOUR HOURS}}$$

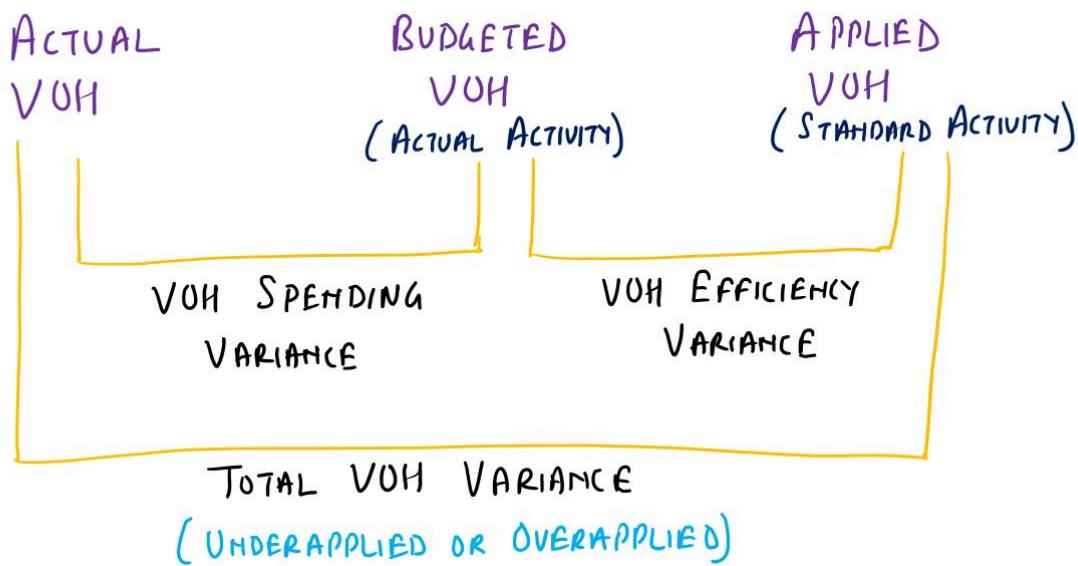
If the company uses separate variable and fixed overhead application rates, separate price and usage components can be calculated for each type of overhead. This four-variance approach provides managers with the greatest detail and, thus, the greatest flexibility for control and performance evaluation.

Let us understand computations for Variable OH variances and Fixed OH variances.

## 10. Overhead Variances

The actual variable overhead (VOH) costs incurred during the period are debited to the Variable Manufacturing Overhead Control account. This entry reflects the actual expenses related to variable overhead, such as utilities, indirect materials, and labor costs that fluctuate with production levels.

The applied VOH costs are debited to the Work in Process (WIP) Inventory account. This entry represents the overhead costs allocated to products that are currently being manufactured. The applied VOH is credited back to the Variable Manufacturing Overhead Control account. This reflects the overhead allocated based on a predetermined overhead rate.



At the end of the accounting period, the balance in the Variable Manufacturing Overhead Control account represents the total VOH variance. This variance indicates whether overhead was underapplied or overapplied.

- *Underapplied VOH:* Occurs when actual VOH costs exceed applied VOH, meaning not enough overhead was allocated to cover actual expenses.
- *Overapplied VOH:* Happens when applied VOH exceeds actual costs, indicating that more overhead was allocated than was actually incurred.

### Variable Overhead Spending Variance

The Variable Overhead Spending Variance measures the difference between actual variable overhead (VOH) costs and budgeted VOH costs based on actual hours worked. This variance can arise from both price and volume differences.

$$\begin{aligned} & \text{VARIABLE OVERHEAD SPENDING VARIANCE} \\ & = \text{ACTUAL VOH} - \text{BUDGETED VOH} \end{aligned}$$

(i) *Price Differences:* Spending variances related to price can happen when changes in VOH prices, such as indirect labor wages or utility rates, are not reflected in the standard rate. Managers typically have limited control over external pricing changes and should not be held accountable for variances stemming from these adjustments. In such cases, it is advisable to update the standard rates.

(ii) *Quantity Differences:* Spending variances associated with quantity may result from waste or shrinkage of production inputs, like indirect materials. For example, deterioration during storage or improper handling may only become apparent once materials are in production. These issues generally have little correlation with the input activity basis used but do impact the VOH spending variance. If waste or spoilage leads to the variance, managers should be accountable and encouraged to implement better controls.

#### Variable Overhead Efficiency Variance

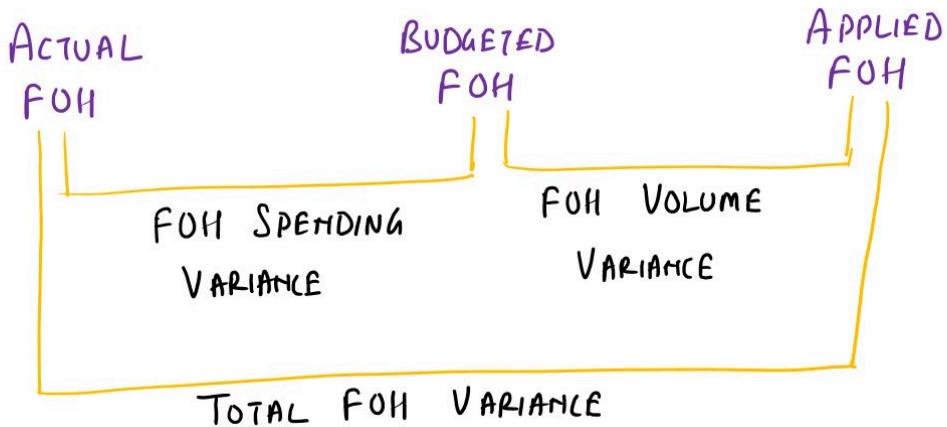
The Variable Overhead Efficiency Variance measures the difference between the budgeted VOH for actual hours worked and the applied VOH. This variance quantifies the effect of using more or less of the resource or activity that serves as the basis for VOH application.

$$\begin{aligned} & \text{VARIABLE OVERHEAD EFFICIENCY VARIANCE} \\ & = \text{BUDGETED VOH} - \text{APPLIED VOH} \end{aligned}$$

For example, if a company applies VOH based on direct labor hours and uses those hours inefficiently, it will incur higher variable overhead costs. When the actual input exceeds the standard input allowed, it indicates inefficiency in production operations. Additionally, excessive input suggests a need for an increased VOH budget to support the higher level of activity being utilized.

## 10. Overhead Variances

The total fixed overhead (FOH) variance is analyzed by dividing it into price and volume components based on the budgeted FOH.



The Actual FOH cost is debited to the Fixed Manufacturing Overhead Control account and credited to various other accounts.

Budgeted FOH remains constant within the relevant range of activity and is the figure used to calculate the predetermined FOH rate. Therefore, the budgeted FOH is fixed, regardless of the actual quantity of input or the standard quantity of input allowed.

Applied FOH is debited to Work in Process Inventory and credited to Fixed Manufacturing Overhead Control. This applied FOH represents the standard predetermined FOH rate multiplied by the standard quantity of activity for the actual output during the period.

The total FOH variance is determined by the balance in the Fixed Manufacturing Overhead Control account at the end of the period and reflects the amount of underapplied or overapplied FOH.

### Fixed Overhead Spending Variance

The difference between actual and budgeted fixed overhead (FOH) is known as the fixed overhead spending variance, also referred to as the fixed overhead price variance. This variance typically arises from discrepancies between the budgeted and actual costs of the various FOH components, though it can also indicate resource mismanagement. The company's flexible overhead budget would outline the individual FOH components, and spending variances should be calculated separately for each component.

$$\begin{aligned} &\text{FIXED OVERHEAD SPENDING VARIANCE} \\ &= \text{ACTUAL FOH} - \text{BUDGETED FOH} \end{aligned}$$

### Fixed Overhead Volume Variance

The fixed overhead volume variance is the difference between budgeted and applied FOH. Similar to variable overhead, applied FOH is determined by the predetermined rate and the standard quantity for the actual production level achieved. In terms of FOH, the standard input allowed for the achieved production level reflects capacity utilization for the period. This variance occurs solely due to production levels differing from the level used to calculate the predetermined FOH rate.

$$\begin{aligned} &\text{FIXED OVERHEAD VOLUME VARIANCE} \\ &= \text{BUDGETED FOH} - \text{APPLIED FOH} \end{aligned}$$

### **Capacity Utilization**

If actual capacity usage differs from that used in determining the predetermined FOH rate, a volume variance will arise because, by using a predetermined rate per unit of activity, fixed overhead is treated as if it were a variable cost even though it is not.

Although capacity utilization is controllable to some degree, the volume variance is the variance over which production managers have the least influence and control, especially in the short run. Thus, a volume variance is also called a noncontrollable variance.

Although managers cannot control the capacity level chosen to compute the predetermined FOH rate, they do have the ability to control capacity utilization. Capacity utilization should be viewed in relation to inventory level and sales demand. Underutilization of capacity is not always undesirable; it is more appropriate to properly regulate production than to produce inventory that ends up in stockpiles.

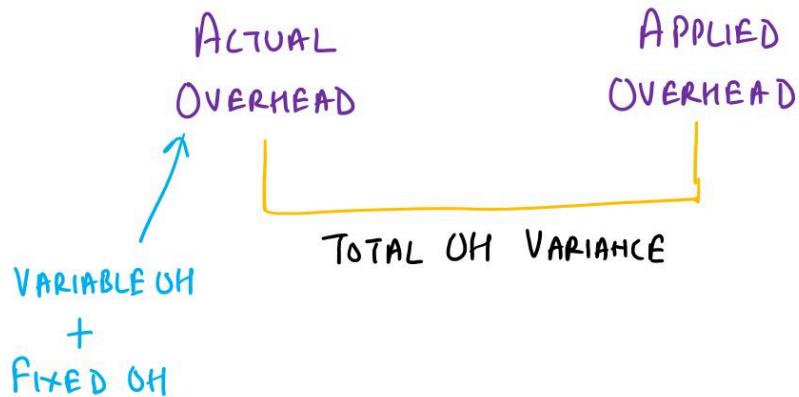
Managers can influence capacity utilization by:

- modifying work schedules,
  - taking measures to relieve any obstructions to or congestion of production activities,
  - carefully monitoring the movement of resources through the production process, and
  - acquiring needed, or disposing of unneeded, space and equipment.
-

## 10. Overhead Variances

### One Variance model

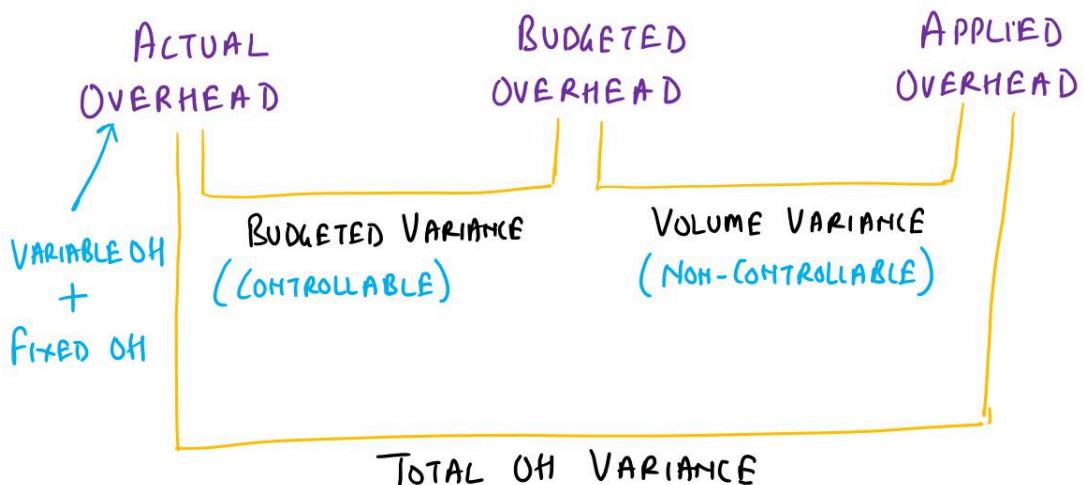
If the accounting system does not separate variable and fixed overhead costs, insufficient data will be available to compute separate overhead variances. Use of a combined (variable and fixed) predetermined OH rate requires alternative overhead variance computations.



One approach is to calculate only the total overhead variance, which is the difference between total actual overhead and total overhead applied to production. The amount of applied overhead is found by multiplying the combined rate by the standard quantity allowed for the actual production.

### Two Variance model

A two variance analysis is performed by inserting a column of Budgeted OH in the middle of the one variance model. The Budgeted OH is the expected total overhead cost for the period's actual output.



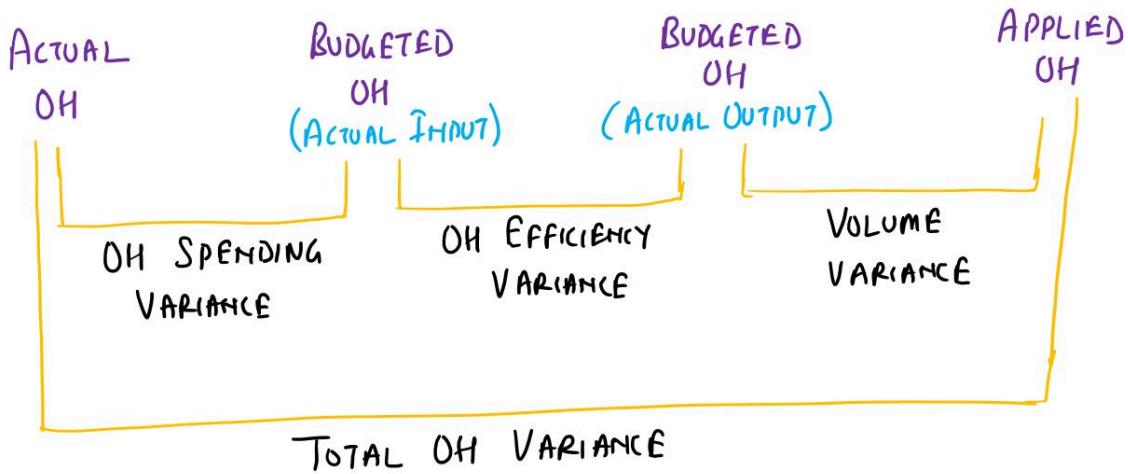
This amount represents total budgeted VOH at the standard quantity measure allowed plus the budgeted FOH, which is constant at all activity levels in the relevant range.

The budget variance equals total actual overhead minus budgeted overhead for the period's actual output.

This variance is also referred to as the controllable variance because managers are able to exert influence on this amount during the short run. The difference between total applied overhead and budgeted overhead for the period's actual output is the volume variance.

### Three Variance model

Inserting another column between the left and middle columns of the two-variance model provides a three variance analysis by separating the budget variance into spending and efficiency variances. The new column represents the flexible budget based on the actual input measure(s).



The total overhead spending variance is computed as total actual overhead minus total budgeted overhead at the actual input activity level; this amount equals the sum of the VOH and FOH spending variances of the Two Variance model.

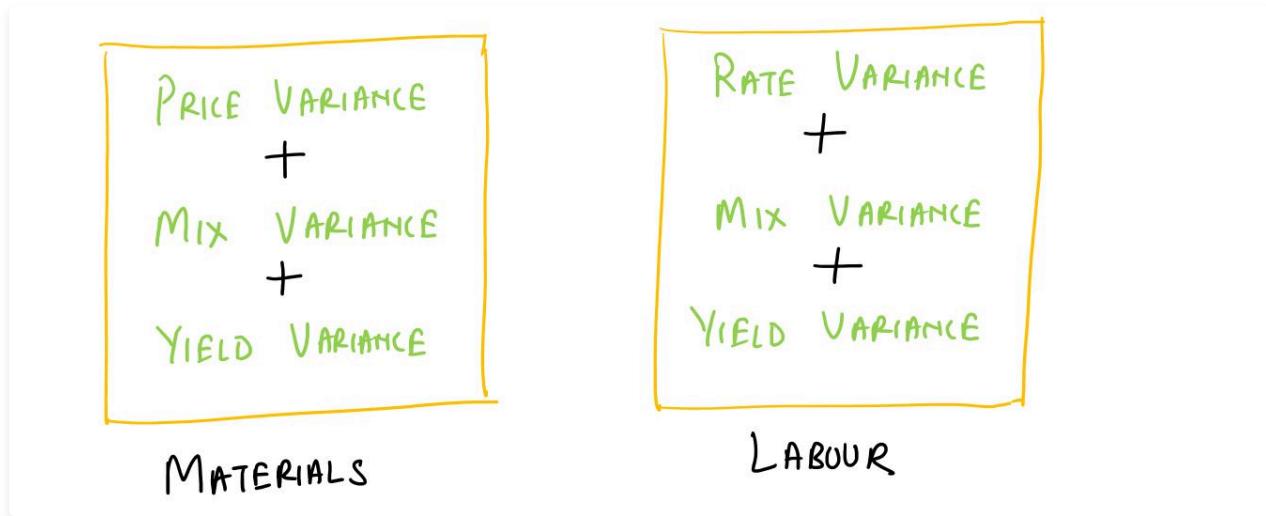
The overhead efficiency variance is related solely to variable overhead and is the difference between total budgeted overhead at the actual input activity level and total budgeted overhead at the standard activity level. This variance measures, at standard cost, the effect on VOH from using more or fewer inputs than standard for the actual production.

The sum of the overhead spending and overhead efficiency variances of the three-variance model equals the budget variance of the two-variance model. The volume variance is the same amount as that calculated using the two-variance model.

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## 11. Mix and Yield Variances

When companies make products, they often use multiple types of materials. The goal is to use a combination of materials that produces the best quality product at the lowest cost. In some cases, materials can be substituted (like using oak or maple in furniture without affecting quality). In other cases, specific materials are required (such as a specific fragrance oil for perfume).



Similar to materials, labor can also be combined in various ways to create a product. Some combinations of labor are more efficient or less expensive. However, not all labor is interchangeable—for example, unskilled workers cannot replace skilled workers in certain tasks (like making fine crystal). The goal is to use the right workers for the right tasks in the most efficient way.

Each combination of materials or labor used to make a product is called a **mix**. Companies use their experience and testing to determine the best mix for producing their goods.

**Yield** refers to the amount of product (output) generated from a certain amount of materials and labor (input).

### Mix and Yield Variances

Mix and Yield Variances are calculated to measure how well a company is using materials and labor.

A mix variance shows the difference in cost or efficiency when a different combination of materials or labor is used.

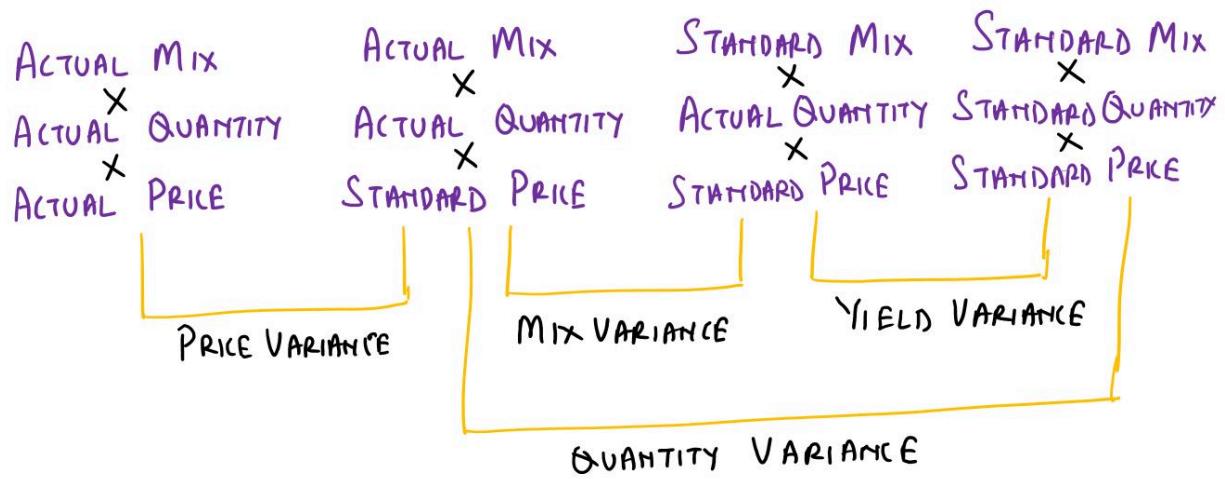
A yield variance shows the difference between the actual output and the expected output based on the standard mix.

The Mix and Yield Variances are computed in addition to price (for materials) variances and rate (for labor) variances.

## 11. Mix and Yield Variances

A material price variance shows the financial impact of paying a different price than the standard set for raw materials.

The material mix variance measures the effect of using a nonstandard mix of materials during production.



The material yield variance measures the difference between the actual total quantity of inputs used and the standard total quantity allowed, based on the output. This variance reflects the standard mix and standard prices.

When you add the material mix and yield variances together, you get the **material quantity variance**. The key difference here is that the sum of the mix and yield variances is related to multiple materials, rather than just a single one (as in the case of a material quantity variance).

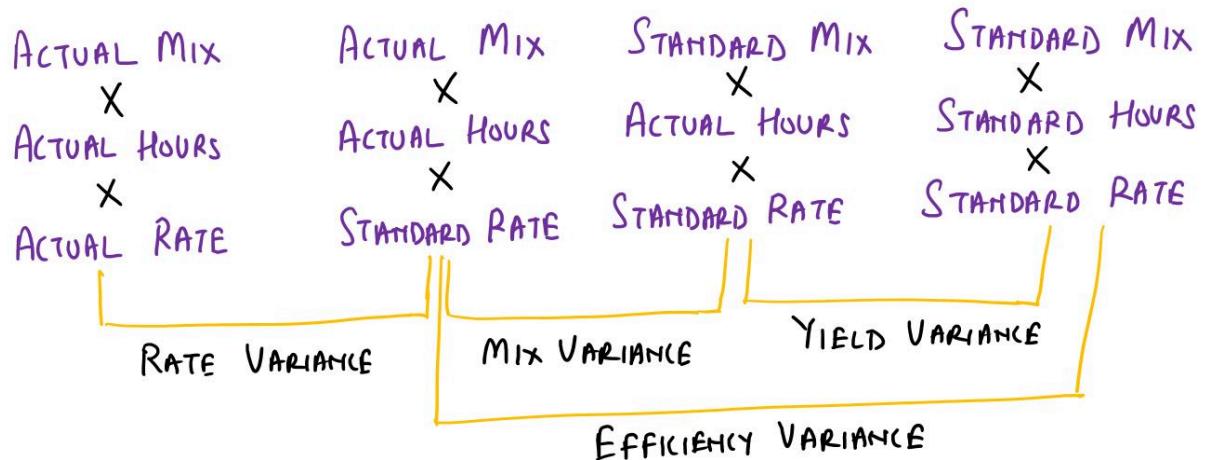
$$\begin{aligned} & \text{MATERIAL QUANTITY VARIANCE} \\ & = \text{MATERIAL MIX VARIANCE} + \text{MATERIAL YIELD VARIANCE} \end{aligned}$$

It's important to note that a company can experience a mix variance without having a yield variance.

## 11. Mix and Yield Variances

When labor standards are set, the types of labor needed to perform various tasks and the expected time for each task are defined. During production, variances occur if workers are not paid the standard rate, don't work in the standard mix of labor categories, or don't complete tasks within the standard time.

The *labor rate variance* measures the cost impact of paying workers at rates different from the standard.



The **labor mix variance** represents the financial effect of changing the proportion of higher- or lower-paid workers in production.

The **labor yield variance** reflects the financial impact of using more or fewer hours than the standard allowed.

The sum of the labor mix and yield variances equals the **labor efficiency variance**.

$$\begin{aligned} &\text{LABOUR EFFICIENCY VARIANCE} \\ &= \text{LABOUR MIX VARIANCE} + \text{LABOUR YIELD VARIANCE} \end{aligned}$$

## 12. Illustration

A chips manufacturing company has the following standards for one unit of product:

Direct material: 80 pounds  $\times$  Rs. 6 = Rs. 480

Direct labor: 3 hours  $\times$  Rs. 16 per hour = Rs. 48

Variable overhead: 1.5 hours of machine time  $\times$  Rs. 50 per hour = Rs. 75

Fixed overhead: 1.5 hours of machine time  $\times$  Rs. 30 per hour = Rs. 45

The predetermined overhead rates were developed using a practical capacity of 6,000 units per year. Production is assumed to occur evenly throughout the year.

During Jan 2025, the company produced 525 units. Actual data for the month are as follows:

Direct material purchased: 45,000 pounds  $\times$  Rs. 5.92 per pound

Direct material used: 43,020 pounds (all from given month's purchases)

Total labor cost: Rs. 24,955 for 1,550 hours

Variable overhead incurred: Rs. 43,750 for 800 hours of machine time

Fixed overhead incurred: Rs. 22,800 for 800 hours of machine time

Compute the followings:

1. Material price variance based on purchases
2. Material quantity variance
3. Labor rate variance
4. Labor efficiency variance
5. Variable overhead spending and efficiency variances
6. Fixed overhead spending and volume variances
7. Overhead variances using a three-variance approach
8. Overhead variances using a two-variance approach
9. Overhead variance using a one-variance approach

SOLUTION:

1. Material price variance based on purchases

$$\begin{aligned} \text{MATERIAL PRICE VARIANCE (MPV)} \\ &= (AP - SP) \times AQ = (5.92 - 6.00) \times 45000 = -3600(F) \end{aligned}$$

2. Material quantity variance

$$\begin{aligned} SQ &= 525 \times 80 = 42,000 \text{ Pounds} \\ \text{MATERIAL QUANTITY VARIANCE (MQV)} \\ &= (AQ - SQ) \times SP = (43020 - 42000) \times 6 = 6120(U) \end{aligned}$$

3. Labor rate variance

$$AP = \frac{24995}{1550} = Rs\ 16.10\ PER\ HOUR$$

LABOUR RATE VARIANCE (LRV)

$$= (AP - SP) \times AQ = (16.10 - 16) \times 1550 = 155 (U)$$

4. Labor efficiency variance

$$SQ = 525 \times 3 = 1575\ HOURS$$

LABOUR EFFICIENCY VARIANCE (LEV)

$$= (AQ - SQ) \times SP = (1550 - 1575) \times 16 = -400 (F)$$

5. Variable overhead spending and efficiency variances

VOH SPENDING VARIANCE = ACTUAL VOH - SP × AQ

$$= 43750 - 50 \times 800$$

$$= 3750 (U)$$

↑  
BUDGETED VOH

$$SQ = 525 \times 1.5 = 787.5\ HOURS$$

VOH EFFICIENCY VARIANCE

$$= SP \times AQ - SP \times SQ$$

$\uparrow$   
BUDGETED VOH

$$= 50 \times 800 - 50 \times 787.5$$

$$= 625 (U)$$

6. Fixed overhead spending and volume variances

$$\text{BUDGETED FOH} = 6000 \times 1.5 \times 30 = \text{Rs } 2,70,000$$

$$\text{MONTHLY BUDGETED FOH} = 2,70,000 \div 12 = \text{Rs } 22,500$$

$$\begin{aligned}\text{FOH SPENDING VARIANCE} &= \text{ACTUAL FOH} - \text{BUDGETED FOH} \\ &= 22800 - 22500 = -300 \text{ (U)}\end{aligned}$$

$$\begin{aligned}\text{FOH VOLUME VARIANCE} &= \text{BUDGETED FOH} - \text{SP} \times \text{SQ} \\ &= 22500 - 30 \times 787.50 \\ &= -1125 \text{ (F)}\end{aligned}$$

7. Overhead variances using a three-variance approach

ACTUAL VOH + ACTUAL FOH 43750 + 22800 <u>66,550</u>	VOH RATE $\times$ AQ + BUDGETED FOH 50 $\times$ 800 + 22,500 <u>62,500</u>	VOH RATE $\times$ SQ + BUDGETED FOH 50 $\times$ 787.5 + 22,500 <u>61,875</u>	APPLIED OH (SP $\times$ SQ) (50 + 30) $\times$ 787.5 <u>63,000</u>
<u>4050 (U)</u>	<u>625 (U)</u>	<u>-1125 (F)</u>	

SPENDING VARIANCE      EFFICIENCY VARIANCE      VOLUME VARIANCE

8. Overhead variances using a two-variance approach

ACTUAL VOH + ACTUAL FOH 66,550	VOH RATE $\times$ SQ + BUDGETED FOH 61,875	APPLIED OH (SP $\times$ SQ) 63,000
<u>4675 (U)</u>	<u>-1125 (F)</u>	

BUDGET VARIANCE      VOLUME VARIANCE

9. Overhead variance using a one-variance approach

ACTUAL OH

66,550

APPLIED OH

63,000

3550 (U)

TOTAL OH VARIANCE  
(UNDER APPLIED)

# 1. Introduction



## PROCESS COSTING

Companies select product costing systems based on the nature of their products and the specific needs of their customers.

### Job Order Costing

Job order costing is used by businesses that produce goods or offer services tailored to the unique specifications of individual customers. This system is ideal for situations where products are custom-made or produced in small, distinct batches. Each job or project has its own set of costs that need to be tracked separately.

A construction company building custom homes would use job order costing because each house is designed and built according to specific client requirements. Materials, labor, and overhead costs are recorded for each individual project (or job) to ensure accurate billing and cost management.

Similarly, law firms or advertising agencies, where services are personalized for each client, would track the costs of time and resources spent on each case or campaign separately.

In job order costing, each job or product can vary significantly, and businesses need to accumulate and assign costs based on the specifics of each job. As a result, job order costing offers detailed insight into the profitability and costs associated with individual projects or products.

### Process Costing

Process costing, on the other hand, is used by companies that manufacture large volumes of identical or similar products. This system works well when products flow continuously through the production process or are produced in large batches where the units are essentially the same.

A company like PepsiCo, which manufactures soda, would use process costing. Each bottle of soda in a batch is identical, so costs (such as ingredients, labor, and manufacturing overhead) are averaged and allocated evenly across all units in that batch.

Unilever, which produces soap, or General Mills, which makes cereals, would also use process costing because their products are mass-produced in large quantities, and the cost per unit is consistent across the entire production run.

In process costing, since the products are homogeneous, the costs are accumulated by department or process over a period, and then divided by the total units produced. This results in an average cost per unit, making it an efficient system for industries that produce standardized goods.

In conclusion, the choice between job order costing and process costing depends on the nature of the product. Custom and unique products call for job order costing, while standardized, mass-produced goods require process costing. Both systems ensure that companies can accurately allocate and track production costs to maintain profitability and efficiency.

## 2. Process Costing System

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In a process costing system, the unit cost of a product or service is determined by dividing the total costs incurred by the number of identical or similar units produced. Essentially, this system averages the costs over all units, which ensures each unit bears the same cost. In manufacturing, every unit goes through the same stages of production, receiving similar amounts of direct materials, direct labor, and manufacturing overhead (indirect costs).

Consider a company like Coca-Cola that produces soft drinks in large quantities. Every can of soda in a production batch is nearly identical. The total costs for ingredients (sugar, water, flavoring), labor (workers operating machines), and overhead (electricity, depreciation on machinery) are summed up, and then divided by the total number of cans produced. As a result, each can is assigned the same unit cost, regardless of when it was produced during the batch.

### Process Costing vs. Job Costing

The primary difference between process costing and job costing lies in how unit costs are computed.

In a job-costing system, each job or project uses different amounts of resources, so costs are tracked individually for each job. It wouldn't make sense to average the cost across all jobs because they vary significantly in terms of materials, labor, and time.

For example, a company like Boeing building custom airplanes would use job costing. Each airplane is designed according to specific client requirements, and the materials, labor, and overhead costs for each airplane are tracked separately.

In process costing, when similar units of products or services are mass-produced rather than handled as individual jobs, the costs are averaged across all units.

For example, a company like Procter & Gamble manufacturing soap bars would use process costing. Every bar of soap in a batch goes through the same production stages, so the total costs of production are divided equally among all bars.

### Hybrid Costing

In some industries, aspects of both job costing and process costing are needed. These industries use hybrid costing systems, which combine elements of both methods to accurately allocate costs.

In clothing manufacturing, some processes follow process costing principles. For instance, in the cutting and sewing stages, all pieces of fabric in a batch receive the same treatment, so the cost per unit in these operations is identical. However, in terms of materials, different batches may use different fabrics (e.g., wool versus cotton). The cost of these materials varies, so the company would track the costs of each batch separately, similar to job costing.

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### 3. Physical Units and Equivalent Units

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#### Physical Units

Physical units refer to the total number of items being processed in a production system, regardless of whether they are fully complete or still in progress.

Physical units help answer two key questions:

(i) *Where did the units come from?* This refers to units in beginning inventory and any units that were started during the production period.

(ii) *Where did the units go?* This tracks whether the units were completed and transferred out or if they are part of the ending work-in-process (WIP) inventory.

For example, in a bicycle manufacturing plant, the physical units would include both the fully assembled bikes ready for sale and those still at different stages of assembly, such as bikes that only have the frames but no wheels or handlebars yet.

#### Equivalent Units

Equivalent units are a concept used in process costing to account for partially completed units by converting them into a number of fully completed units. This allows for better cost allocation, especially when units are only partially complete at the end of an accounting period.

For instance, imagine a company has 100 units in progress at the end of the month, but only 50 of these are complete. The remaining 50 are only 70% complete with respect to conversion costs (labor and overhead). The idea of equivalent units helps determine how much work has been completed.

To calculate this, you multiply the 50 incomplete units by the percentage of completion (70%):

Equivalent units for conversion costs =  $50 \text{ units} \times 70\% = 35 \text{ equivalent units}$ .

This means that the work done on those 50 incomplete units is equivalent to fully completing 35 units.

Let's consider another example:

A bakery started making 200 cakes during the month.

By the end of the month, 150 cakes are fully baked and decorated, but the remaining 50 cakes are only half-baked (50% complete).

For the fully completed cakes, we have 150 physical units (fully completed).

For the partially completed cakes, you calculate the equivalent units based on the 50% completion:

$50 \text{ cakes} \times 50\% = 25 \text{ equivalent units}$ .

Thus, for cost purposes, the bakery has worked the equivalent of 175 completed cakes (150 fully completed cakes + 25 equivalent units from the partially baked cakes).

#### Purpose of Equivalent Units

The concept of equivalent units is crucial for allocating costs appropriately between units that are completed and those still in process. Instead of treating partially completed units as though they are fully completed, companies can assign costs based on the actual work done.

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## 4. Inventory Valuation in Process Costing

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In process costing, assigning costs to each cost component (direct materials, direct labor, and manufacturing overhead) requires choosing an inventory valuation method.

Two widely used methods are the Weighted-Average (WA) Method and the First-In, First-Out (FIFO) Method. Each method calculates costs differently, and this can result in varying amounts for the cost of completed units and ending work-in-process (WIP) when the unit cost of inputs changes between periods.

### 1. Weighted-Average (WA) Method

The Weighted-Average Method combines costs from the current and previous periods. It calculates the cost per equivalent unit by considering all the work done to date, regardless of when that work was done (current or past period). This method pools together the costs from the beginning WIP inventory with the costs added during the current period, and then divides the total by the number of equivalent units produced during the period.

Weighted Average (WA) Method combines the beginning WIP Inventory and current period production activity and costs.

WA determines Equivalent Units (EU) by adding the physical units in beginning WIP Inventory, physical units started and completed during the period, and equivalent units in the ending WIP Inventory.

WA determines average unit cost (per cost component) by dividing total cost (equal to beginning-of-the-period costs plus current period costs) by EU.

WA determines transferred-out value by multiplying total units transferred out by total average cost per EU.

WA determines ending WIP Inventory value by multiplying the EUP for each cost component by the related cost per EUP.

### 2. First-In, First-Out (FIFO) Method

The FIFO Method treats units in beginning WIP separately from those produced in the current period. It assumes that the first units to be completed and transferred out are the ones from the beginning inventory. The costs of the current period are applied only to the work done during that period.

FIFO does not commingle beginning WIP Inventory and current period production activity or costs.

FIFO determines EU (by cost component) by the equivalent units in beginning WIP Inventory that were completed during the current period, physical units started and completed during the period, and equivalent units in ending WIP Inventory.

FIFO determines average unit cost (per cost component) by dividing current period cost by EU.

FIFO determines transferred-out value by adding the cost of beginning WIP Inventory, current period cost needed to complete beginning WIP Inventory, and cost of units started and completed in the current period.

FIFO determines ending WIP Inventory value by multiplying the EU for each cost component by the related cost per EU.

### Summary

The weighted average method computes unit costs by dividing total costs in the Work in Process account by total equivalent units completed to date, and assigns this average cost to units completed and to units in ending work-inprocess inventory.

The first-in, first-out (FIFO) method computes unit costs based on costs incurred during the current period and equivalent units of work done in the current period.

Operating income can differ materially between the two methods when:

- (i) direct material or conversion cost per equivalent unit varies significantly from period to period and
  - (2) physical-inventory levels of work in process are large in relation to the total number of units transferred out of the process.
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## 5. Transferred-In Costs in Process Costing

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In many process-costing systems, production involves multiple departments or stages. As products move through these departments, the costs incurred in earlier stages are carried forward to the next stage. These costs, known as transferred-in costs (or previous-department costs), are recorded through journal entries each month, reflecting the cumulative costs transferred along with the product from one department to the next.

Transferred-in costs are treated similarly to direct materials in that they are considered to be added at the start of the next process. However, unlike direct materials, transferred-in costs are always regarded as being 100% complete when they enter the new department, since they represent work that was fully completed in the previous stage.

For example, in a multi-department manufacturing setup:

- Units that have been processed and completed in Department A move to Department B.
- The costs accumulated in Department A now become part of Department B's costs.
- While these transferred units are incorporated into the production in Department B, they are not treated as direct material costs but as transferred-in costs.

Thus, transferred-in costs represent the cost of work done in prior departments, and while they behave similarly to direct materials in the next department, they are categorized distinctly.

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## 6. Steps of Process Costing

The main purpose of process costing is to accurately allocate costs to products that go through a continuous production process. There are two main methods used in process costing:

- (i) *Weighted Average Method*: Combines the costs of the current and prior periods.
- (ii) *FIFO Method* (First-In, First-Out): Assigns costs to the earliest units produced and completed, keeping the costs of the current period separate from those of the prior period.

Here are the steps of process costing, using both methods:

Step 1: Calculate the physical units to account for and accounted for:

Calculate the physical units to account for:

UNITS TO ACCOUNT FOR  
BEGIN WIP INVENTORY  
+ STARTED (OR TRANSFERRED-IN) DURING THE PERIOD

Calculate the physical units accounted for:

This step involves identifying the groups to which costs are to be assigned (transferred out or remaining in ending WIP Inventory).

UNITS ACCOUNTED FOR  
COMPLETED AND TRANSFERRED OUT  
+ END WIP INVENTORY

Step 2: Calculate the Equivalent Units for various cost components:

Cost components include transferred-in (from previous department), direct material (DM), direct labour (DL), overhead (MOH), conversion (DL+MOH). If multiple materials are used and have different degrees of completion, each material is considered a separate cost component.

COMPUTATION OF EQUIVALENT UNITS (EU)

WEIGHTED AVERAGE METHOD

BEGIN WIP INVENTORY  
+ STARTED AND COMPLETED  
+ END WIP INVENTORY  $\times$  % COMPLETED

TRANSFERRED OUT  
- BEGIN WIP INVENTORY

FIFO METHOD

BEGIN WIP INVENTORY  $\times$  % NOT COMPLETED  
+ STARTED AND COMPLETED  
+ END WIP INVENTORY  $\times$  % COMPLETED

If overhead is applied on a direct labour basis or is incurred at the same rate as direct labour, DL and MOH can be combined as one cost component and referred to as Conversion.

Step 3: Calculate total cost to account for:

TOTAL COST TO ACCOUNT FOR  
BEGIN WIP INVENTORY COST  
+ CURRENT PERIOD COSTS

Step 4: Calculate cost per equivalent unit (EU) for each cost component:

COMPUTE COST PER EU

WEIGHTED AVERAGE METHOD

$$\text{COST PER EU} = \frac{\text{BEGIN WIP INVENTORY COST} + \text{CURRENT PERIOD COST}}{\text{EQUIVALENT UNITS}}$$

FIFO METHOD

$$\text{COST PER EU} = \frac{\text{CURRENT PERIOD COSTS}}{\text{EQUIVALENT UNITS}}$$

Step 5: Assign the costs to inventory accounts:

The total cost assigned to units transferred out plus the units in the ending WIP Inventory must equal the total cost to account for.

ASSIGNMENT OF COSTS

WEIGHTED AVERAGE METHOD

$$\rightarrow \text{TRANSFERRED OUT} = \text{UNITS TRANSFERRED OUT} \times \text{TOTAL COST PER EU}$$

$$\rightarrow \text{END WIP INVENTORY} = \sum (\text{EU FOR EACH COMPONENT} \times \text{COST PER EU})$$

FIFO METHOD

$$\rightarrow \text{TRANSFERRED OUT} = \begin{cases} \text{BEGIN WIP INVENTORY COST} \\ + \\ \text{BEGIN WIP INVENTORY} \times \% \text{ NOT COMPLETED} \\ \times \text{COST PER EU} \end{cases}$$

$$\rightarrow \text{END WIP INVENTORY} = \sum (\text{EU FOR EACH COMPONENT} \times \text{COST PER EU})$$



## 7. Illustration 1 - Weighted Average method

A company manufactures computer webcam in a two-department process: Assembly and Finishing. The following production data and costs were gathered for given month.

### ASSEMBLY DEPARTMENT

Description	Units
Beginning WIP Inventory (100% complete for DM; 40% complete for DL; 30% complete for MOH)	250
Units started	8,800
Ending WIP Inventory (100% complete for DM; 70% complete for DL; 90% complete for MOH)	400

Description	DM	DL	MOH	Total
Beginning WIP Inventory	Rs 3,755	Rs 690	Rs 250	Rs 4,695
Current period	Rs 1,00,320	Rs 63,606	Rs 27,681	Rs 1,91,607
Total costs	Rs 1,04,075	Rs 64,296	Rs 27,931	Rs 1,96,302

You need to compute the following:

- (i) Prepare a cost of production report for the Assembly Department (using weighted average costing method)
- (ii) Prepare T-account to show the flow of costs through the Assembly Department.
- (iii) Prepare the journal entries for the Assembly Department for the month.

SOLUTION:

Computation of Equivalent Units		Equivalent Units		
		Units	DM	DL
Begin WIP Inventory		250		
Started in current Period		8800		
To account for		9050		
Begin WIP Inventory (completed)		250	250	250
Started and Completed		8400	8400	8400
Total Completed in current period		8650		
End WIP (DM-100%, DL-70%, MOH-90%)		400	280	300
Accounted for		9050		
Equivalent Units (EU)			8930	9010

Computation of Costs per EU		DM	DL	MOH	Total
Begin Inventory Cost		3,755	690	250	4,695
Current Period Costs		1,00,320	63,606	27,681	1,91,607
Total Costs		1,04,075	64,296	27,931	1,96,302
Equivalent Units (EU)		9050	8930	9010	
Cost per EU		11.50	7.20	3.10	21.80

### Assignment of Costs

	Cost	Computation
Completed in current period	1,88,570	$8650 \times 21.80$
End WIP Inventory Cost	7,732	$400 \times 11.50 + 280 \times 7.20 + 360 \times 3.10$
Total Cost	<u>1,96,302</u>	

<p>① WIP- ASSEMBLY A/C DR To RAW MATERIAL INVENTORY A/C</p> <p>To transfer in direct material</p> <p>② WIP- ASSEMBLY A/C DR To WAGES PAYABLE A/C</p> <p>To record direct labor costs</p> <p>③ WIP - ASSEMBLY A/C DR To MOH A/C</p> <p>To apply overhead costs to WIP</p> <p>④ WIP - NEXT DEPARTMENT A/C DR To WIP ASSEMBLY A/C</p> <p>To transfer completed goods to next department</p>	<p>1,00,320 1,00,320</p> <p>63,606 63,606</p> <p>27,681 27,681</p> <p>1,88,570 1,88,570</p>
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WIP- ASSEMBLY	
BEGIN WIP	4,695
① 1,00,320	④ 1,88,570
② 63,606	
③ 27,681	
EHD WIP	<u>7,732</u>

## 8. Illustration 2- Weighted Average method

A clothing company makes shirts in a two-department process: Assembly and Finishing. The following production data and costs were gathered for given month, for assembly department.

### ASSEMBLY DEPARTMENT

Description	Units		
Beginning WIP Inventory (100% complete for DM; 60% complete for Conversion)	225		
Units started	275		
Ending WIP Inventory (100% complete for DM; 50% complete for Conversion)	100		
Description	DM	Conversion	Total
Beginning WIP Inventory	Rs 18,000	Rs 8,100	Rs 26,100
Current period	Rs 19,800	Rs 16,380	Rs 36,180

You need to compute the following:

- (i) Prepare a cost of production report for the Assembly Department (using weighted average costing method)
- (ii) Prepare the journal entries for the Assembly Department.
- (iii) Prepare T-account to show WIP for Assembly department.

SOLUTION:

Computation of Equivalent Units		Equivalent Units		
		Units	DM	Conversion
Begin WIP Inventory		225		
Started in current Period		275		
To account for		500		
Begin WIP Inventory (completed)		225	225	225
Started and completed		175	175	175
Total Completed in current period		400		
End WIP Inventory (DM - 100%, CONVERSION - 50%)		100	100	50
Accounted for		500		
Equivalent Units (EU)			500	450

Computation of Costs per EU	DM	Conversion	Total
Begin WIP Inventory Cost	18,000	8,100	26,100
Current Period Costs	19,800	16,380	36,180
Total Costs	37,800	24,480	62,280
Equivalent Units (EU)	500	450	
Cost per EU	75.60	54.40	130.00

### Assignment of Costs

	Cost	Computation
Completed in current period	$(400 \text{ UNITS})$	$52,000$
End WIP Inventory Cost	$(100 \text{ UNITS})$	$10,280$
Total Cost	$\underline{62,280}$	

① WIP ASSEMBLY A/C Dr

19,800

To ACCOUNTS PAYABLE CONTROL A/C

19,800

To record direct materials purchased and used in production during month

② WIP ASSEMBLY A/C Dr

16,380

To VARIOUS ACCOUNTS

16,380

To record conversion costs for the month

③ WIP (TESTING)

52,000

To WIP ASSEMBLY

52,000

To record cost of goods completed and transferred out from assembly to Testing

### WIP- ASSEMBLY

BEGIN WIP	26,100	③ 52,000
①	19,800	
②	16,380	
EHD WIP	<u>10,280</u>	

## 9. Illustration 3- FIFO method

A clothing company makes shirts in a two-department process: Assembly and Finishing. The following production data and costs were gathered for given month, for assembly department.

### ASSEMBLY DEPARTMENT

Description	Units		
Beginning WIP Inventory (100% complete for DM; 60% complete for Conversion)	225		
Units started	275		
Ending WIP Inventory (100% complete for DM; 50% complete for Conversion)	100		
Description	DM	Conversion	Total
Beginning WIP Inventory	Rs 18,000	Rs 8,100	Rs 26,100
Current period	Rs 19,800	Rs 16,380	Rs 36,180

You need to compute the following:

- (i) Prepare a cost of production report for the Assembly Department (using FIFO costing method)

SOLUTION:

Computation of Equivalent Units		Equivalent Units	
	Units	DM	Conversion
Begin WIP Inventory	225		
Started in Current Period	275		
To account for	500		
Begin WIP Inventory (completed) $(DM - 100\%, CONVERSION - 60\%)$	225	0	90
Started and completed	175	175	175
Total completed in current period	400		
End WIP Inventory $(DM - 100\%, CONVERSION - 50\%)$	100	100	50
Accounted for	500		
Equivalent Units (EU)	275	315	

Computation of Costs per EU		DM	Conversion	Total
Begin WIP Inventory Cost		18,000	8,100	26,100
Current Period Costs		19,800	16,380	36,180
Total Costs		37,800	24,480	62,280
Equivalent Units (EU)		275	315	
Cost per EU		72	52	154

**Assignment of Costs**

	Cost	Computation
Begin WIP Costs	<u>26,100</u>	
Cost added to Begin Inventory	<u>4,680</u>	$0 \times 72 + 90 \times 52$
Total Costs from Begin Inventory	<u>30,780</u>	
Started and Completed	<u>21,700</u>	$175 \times 154$
End WIP Costs	<u>9,800</u>	$100 \times 72 + 50 \times 52$
Total Costs	<u>69,280</u>	

## 10. Illustration 4- FIFO method

A company manufactures computer webcam in a two-department process: Assembly and Finishing. The following production data and costs were gathered for given month. The goods are transferred from Assembly department to Finishing department.

### FINISHING DEPARTMENT

Description	Units
Beginning WIP Inventory (100% complete for transferred in; 15% complete for DM; 40% complete for conversion)	100
Units transferred in	8,650
Ending WIP Inventory (100% complete for transferred in; 30% complete for DM; 65% complete for conversion)	200

Description	Transferred In	DM	Conversion Costs	Total
Beginning inventory	Rs 2,176	Rs 30	Rs 95	Rs 2,301
Current period	Rs 1,88,570	Rs 15,471	Rs 21,600	Rs 2,25,641
Total costs	Rs 1,90,746	Rs 15,501	Rs 21,695	Rs 2,27,942

You need to compute the following:

- (i) Prepare a cost of production report for the Finishing Department (using FIFO costing method)
- (ii) Prepare the journal entries for the Finishing Department for the month.
- (iii) Prepare T-account to show the flow of costs through the Finishing Department.

SOLUTION:

Computation of Equivalent Units		Equivalent Units			
		Units	Transferred	DM	Conversion
Begin WIP Inventory		100			
Started in Current Period		8650			
To account for		8750			
Begin WIP Inventory (completed)	(TRANSFERRED - 100%)	100	0	85	60
Started and completed	(DM - 15%) (CONVERSION - 40%)	8450	8450	8450	8450
Total completed in current period	(TRANSFERRED - 100%)	8550			
End WIP Inventory	(TRANSFERRED - 100%) (DM - 30%) (CONVERSION - 65%)	200	200	60	130
Accounted for		8750	8650	8595	8640
Equivalent Units (EU)					

Computation of Costs per EU		Transferred	DM	Conversion	Total
Begin WIP Inventory Cost		2,176	30	95	2,301
Current Period Costs		1,88,570	15,471	21,600	2,25,641
Total Costs		1,88,570	15,471	21,600	2,27,942
Equivalent Units (EU)		8650	8595	8640	
Cost per EU		21.80	1.80	2.50	26.10

**Assignment of Costs**

	Cost	Computation
Begin WIP Costs	2,301	
Cost added to Begin Inventory	2,604	$0 \times 21.80 + 85 \times 1.80 + 60 \times 2.50$
Total Costs from Begin Inventory	<u>4,905</u>	
Started and Completed	2,20,545	$8450 \times 26.10$
End WIP Costs	4,793	$200 \times 21.80 + 60 \times 1.80 + 130 \times 2.50$
Total Costs	<u>9,27,942</u>	

WIP FINISHING A/C Dr

15,471

① To RAW MATERIAL INVENTORY A/C

15,471

To transfer in direct material

② WIP FINISHING A/C Dr

21,600

To CONVERSION COST CONTROL A/C

21,600

To apply direct labor and overhead costs to WIP

③ FG INVENTORY A/C Dr

2,23,149

To WIP INVENTORY A/C

2,23,149

To transfer completed goods to FG

### WIP INVENTORY - FINISHING

BEGIN WIP	2,301	③ 2,23,149
TRANSFERRED	1,88,570	
①	15,471	
②	21,600	
END WIP	<u>4,793</u>	

## 1. Introduction

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The process of formalizing plans and converting qualitative narratives into a structured, measurable format is known as **budgeting**. This process results in a **budget**, which is a document that quantitatively expresses an organization's commitment to its planned activities, as well as how it intends to acquire and use resources.

A budget serves as a tool that lays out specific numerical targets related to the organization's goals, helping to ensure that there is a clear and measurable plan in place.

While budgets are often represented in financial terms—detailing costs, revenues, and expenditures—the budgeting process goes beyond just financial considerations. It must also take into account a wide range of non-financial factors, such as the organization's raw materials, inventory levels, personnel needs, supplies, and facilities. These elements play a crucial role in determining how resources are allocated and managed. By incorporating both financial and non-financial aspects into the budget, the organization can ensure that all necessary resources are planned for, and that their use is aligned with the organization's objectives.

In essence, the budgeting process transforms vague or broad goals into specific, measurable commitments that can be tracked and managed, providing a clear pathway for achieving the organization's strategic and operational plans.

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## 2. Planning Horizon

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Budgets can be approached from two main perspectives: long-term (strategic) planning or short-term (tactical) planning. Each of these perspectives serves different purposes and covers different timeframes.

**Strategic planning** is concerned with long-term objectives, typically spanning a period of 5 to 10 years. It focuses on the overall direction of the organization, setting broad goals such as expansion, new market entry, or significant investments in infrastructure or technology. Strategic planning requires an organization to think ahead, anticipate changes in the external environment, and align its resources with long-term goals. It emphasizes major, high-level decisions that shape the future course of the organization.

**Tactical planning**, on the other hand, deals with short-term objectives, generally covering a period of 1 to 18 months. Tactical plans are more detailed and operational in nature, focusing on specific tasks, projects, or activities that will be executed in the near term. This type of planning translates the broader strategic goals into actionable steps, addressing issues like staffing, production schedules, inventory management, and marketing campaigns. Tactical plans are crucial for day-to-day management and ensure that the organization remains on track toward its long-term objectives.

Both strategic and tactical planning require a mix of qualitative and quantitative information to be effective. Qualitative information, such as market trends, consumer preferences, and competitive insights, helps inform the overall direction and decisions. Quantitative data, like financial forecasts, sales figures, and resource allocations, provide the measurable basis for evaluating progress and making adjustments.

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### 3. Role of Budgeting

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Budgeting plays a crucial role in the planning process by enabling management to:

**Visualize the future and guide the organization in a focused direction:** Budgeting requires management to think ahead and anticipate future opportunities and challenges. By forecasting revenues, costs, and resource needs, budgeting helps management create a clear path for the organization, ensuring that the business moves in a purposeful and strategic direction.

**Align and communicate organizational goals and objectives:** Through the budgeting process, different levels of management come together to agree on key goals and objectives. This alignment ensures that everyone is working toward the same outcomes, and it promotes a shared understanding of what the organization is trying to achieve. The budget serves as a communication tool, ensuring that all departments understand their roles and responsibilities in meeting the overall objectives.

**Translate strategic goals and objectives into quantifiable, monetary figures:** Strategic plans often start as broad, high-level ideas. Budgeting helps to translate these abstract concepts into specific, measurable financial targets. This makes it easier to track progress, allocate resources, and ensure that strategic goals are supported by the necessary funding and activities. By providing financial details, budgeting turns long-term vision into actionable, trackable outcomes.

**Tie long-term strategies to short-term (tactical) plans:** A budget not only looks at long-term strategies but also breaks them down into short-term, tactical steps. This integration helps ensure that daily operations are aligned with the organization's long-term goals. It creates a link between high-level strategy and the day-to-day activities that will move the organization forward.

**Balance external considerations with internal factors:** Budgeting requires the organization to consider both external market conditions and internal capacities. External factors, such as competition, economic conditions, and regulatory changes, are balanced with internal resources like personnel, technology, and financial constraints. This ensures that the organization's plans are both realistic and adaptable to external influences.

**Determine how to allocate resources to key activities:** A well-constructed budget ensures that resources are committed to the most important activities. Management can prioritize projects, departments, and initiatives based on their strategic importance and financial feasibility. This resource allocation process is critical for ensuring that the organization invests in the right areas to achieve its goals.

**Establish financial performance indicators to measure success:** A budget provides financial benchmarks against which the organization's performance can be measured. These indicators allow management to evaluate whether the company is on track to meet its goals. If there are deviations, the budget helps identify where adjustments are needed to improve performance.

**Engage employees and stakeholders in the planning process:** The budgeting process encourages collaboration and involvement across all levels of the organization. By involving different departments and teams in the planning stages, employees become more invested in the company's goals and are more likely to work together to achieve them.

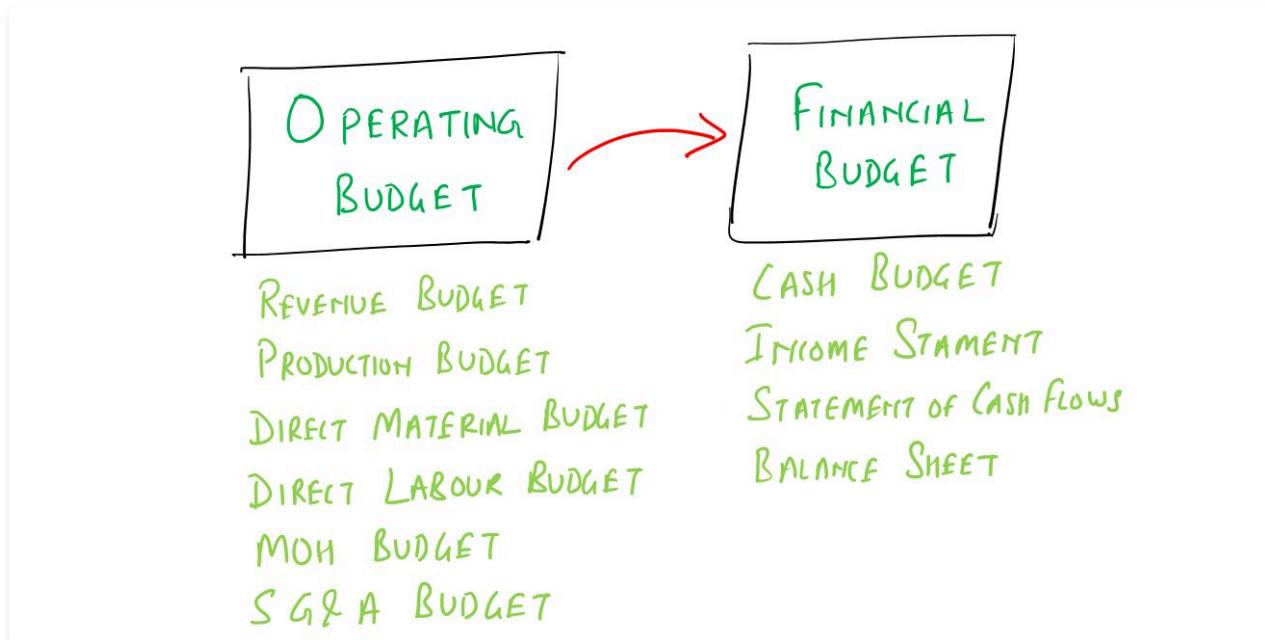
**Foster cooperation and collaboration between departments and divisions:** The budgeting process brings together various parts of the organization, promoting cooperation and alignment. Departments must coordinate their budgets to ensure that the organization as a whole is working toward the same objectives. This cooperation helps prevent silos and encourages a more integrated approach to planning and resource management.

**Monitor and control operations and resource usage:** Finally, a budget serves as a tool for controlling the organization's operations. By setting financial limits and tracking actual spending and resource use, management can ensure that operations stay within budget and that resources are used efficiently. Regular monitoring allows for quick adjustments if necessary, ensuring that the organization remains on course to achieve its financial and operational goals.

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## 4. Master Budget

The budgeting process results in the creation of a **master budget**, which outlines management's operational and financial plans for a specific period, typically a fiscal year. This comprehensive plan includes a set of budgeted financial statements, representing what the company intends to achieve during the budget period.



Different companies may use varied terminology to describe these budgets. For instance, budgeted financial statements are often referred to as pro forma statements. Some organizations may also call the budgeting process a targeting or profit plan.

The master budget consists of two primary components: the operating budget and the financial budget.

### 1. Operating Budget

The operating budget represents the expected revenues and costs, expressed both in units and dollars. For revenues, units refer to the expected sales volume, and dollars represent the anticipated selling prices. For costs, units represent the resources to be consumed or transformed, while dollars reflect the associated costs.

Key components of the operating budget include:

- Sales budget (Revenue budget): Projected sales in both units and dollars.
- Production budget (in units): The number of units expected to be produced.
- Direct Material Usage Budget and Direct Material Purchases Budget: Forecast of raw material usage and purchases.
- Direct Labor Budget: Expected labor hours and costs.
- Manufacturing Overhead Budget: Estimated overhead costs.
- Cost of Goods Sold Budget: Anticipated cost of producing goods sold.
- Selling and Administrative Budget (Nonmanufacturing Costs Budget): Projected selling and administrative expenses.

### 2. Financial Budget

The financial budget compiles monetary information from the operating budget to assess the inflow and outflow of funds during the budget period. These budgets assist in understanding how resources will be allocated and how funds will be managed, serving as a key tool for top management in decision-making.

Key components of the financial budget include:

- Budgeted income statement: Projected profitability for the period.
- Cash budget: Forecast of cash inflows and outflows.
- Capital expenditures budget: Planned investments in long-term assets.
- Balance sheet: Expected financial position at the end of the budget period.
- Statement of cash flows.

The master budget serves as a roadmap for guiding the company's financial and operational decisions over the budget period.

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## 4. Master Budget

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A well-prepared master budget serves multiple key purposes:

- It acts as a guide to help managers align organizational activities and allocate resources in accordance with the company's goals.
  - It serves as a tool to foster employee engagement, encourage cooperation, and enhance coordination across departments.
  - It supports managerial functions such as planning, controlling, problem-solving, and performance evaluation.
  - It provides a foundation for improving management's responsiveness to both internal and external changes.
  - It offers a model that rigorously forecasts future business performance, allowing management to consider alternative strategies in a timely manner.
-

## 5. Operating Budget

The Operating Budget is a key component of the overall Master Budget that outlines an organization's plan for generating revenues and managing operational costs for a specific time period, typically one fiscal year. It is a comprehensive and detailed financial blueprint for day-to-day activities such as production, sales, and administrative operations.

Below are the key steps in preparing an operating budget:

### 1. Revenues Budget (Sales Budget)

The Revenues Budget, also called the **Sales Budget**, is the starting point for the entire operating budget. It estimates the expected sales volume and corresponding revenue in both units and dollars for the upcoming period.

	JAN	FEB	MAR
SALES	2000	3000	2500
SELLING PRICE	10	12	10
REVENUE	20,000	36,000	25,000
<u><b>SALES BUDGET</b></u>			

$$\text{SALES BUDGET} = \text{UNIT OF SALES} \times \text{SELLING PRICE PER UNIT}$$

Sales forecasts serve as the foundation for other parts of the operating budget, as the production levels and inventory requirements depend on anticipated sales. Sales forecasts are influenced by factors such as past sales trends, economic conditions, market research, pricing strategies, competition, and marketing efforts. Tools like Customer Relationship Management (CRM) systems and statistical methods (regression analysis, trend analysis) often support this process.

### 2. Production Budget (in Units)

Once the revenue budget is established, the production budget is prepared. This budget determines how many units need to be produced to meet the sales forecast, while considering any changes in inventory levels.

$$\begin{aligned} & \text{UNIT OF SALES} \\ & + \text{END FG INVENTORY} \\ & - \text{BEGIN FG INVENTORY} \\ \hline & \text{UNITS TO BE PRODUCED} \\ \\ & \text{PRODUCTION BUDGET} \end{aligned}$$

Production planning ensures that enough products are available to meet demand without overproducing.

### 3. Direct Material Usage Budget and Direct Material Purchases Budget

The Direct Material Usage Budget and the Direct Material Purchases Budget are prepared once the production requirements are finalized.

## USAGE OF DM

$$\begin{aligned} &+ \text{END DM INVENTORY} \\ &- \text{BEGIN DM INVENTORY} \\ \hline &\text{REQUIRE PURCHASE OF DM} \end{aligned}$$

## PURCHASE OF DIRECT MATERIAL (DM)

These budgets help to determine how much raw material is needed and how much should be purchased to meet the production targets.

*Direct Material Usage Budget:* This budget calculates the total quantity of raw materials required for production. The Bill of Materials (BOM) is a key document used here, as it details all the raw materials and components needed for each unit of product, including the quantities and the sequence in which materials are used.

*Direct Material Purchases Budget:* After the required material quantities are determined, the purchasing manager prepares the direct materials purchases budget. This budget estimates the amount of raw material that must be purchased by considering the usage, current inventory levels, and desired ending inventory of raw materials.

### 4. Direct Labor Budget

In this step, the direct labor budget is prepared by estimating the labor hours required to produce the forecasted units, based on labor standards (time per unit).

$$\begin{aligned} &\text{STANDARD LABOUR TIME} \left( \begin{array}{l} \text{UNITS TO BE PRODUCED} \\ \times \text{STANDARD TIME PER UNIT} \end{array} \right) \\ &\times \\ &\text{PER HOUR DIRECT LABOUR COST} \\ &= \text{TOTAL DIRECT LABOUR COST} \end{aligned}$$

Direct labor costs are calculated by multiplying the required labor hours by wage rates. Factors like production methods, process improvements, and labor efficiency are also considered.

### 5. Manufacturing Overhead Budget

The Manufacturing Overhead (MOH) Budget estimates all indirect manufacturing costs that are necessary to support production but are not directly tied to a specific product. Overhead costs are categorized into fixed and variable components.

$$\begin{aligned} &\text{TOTAL VARIABLE OVERHEAD COST} \left( \begin{array}{l} \text{ACTIVITY BASE} \\ \times \text{OH RATE PER UNIT} \end{array} \right) \\ &+ \\ &\text{FIXED OVERHEAD COST} \\ &= \text{TOTAL OVERHEAD COST} \end{aligned}$$

To allocate overhead costs accurately, cost drivers are used. For instance, direct labor hours might be the cost driver for the variable portion of manufacturing overhead, while machine setup hours could be used for other overhead costs. Using activity-based cost drivers helps in implementing Activity-Based Costing (ABC), which focuses on budgeting costs based on the activities needed to produce and sell goods.

## 6. Ending Inventories Budget

The Ending Inventories Budget estimates the value of materials, work-in-progress (WIP), and finished goods inventory at the end of the period. Accurate inventory planning is critical to avoid overstocking (which ties up cash) or understocking (which could lead to production delays or lost sales). This budget includes calculations for ending raw materials, WIP, and finished goods inventory.

## 7. Cost of Goods Sold (COGS) Budget

The COGS budget summarizes the total manufacturing costs (direct materials, direct labor, and manufacturing overhead) required to produce the forecasted goods. It incorporates information from the Direct Material Purchases Budget, Direct Labor Costs Budget, and Manufacturing Overhead Budget.

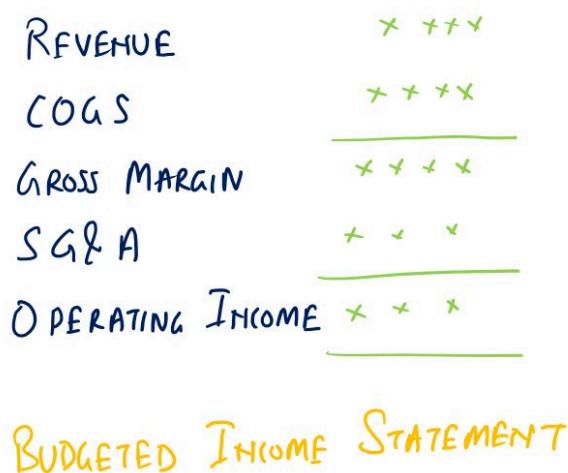
## 8. Non-manufacturing Costs Budget (Selling and Administrative Budget)

The Non-manufacturing Costs Budget, often referred to as the Selling and Administrative Budget, includes all operating expenses that are not directly related to production. These costs cover functions such as:

- Sales and marketing expenses (advertising, commissions)
- Administrative expenses (salaries for office staff, utilities, office supplies)
- Research and development (R&D)
- Product design costs

## 9. Budgeted Income Statement

The final step in the operating budget process is the preparation of the budgeted income statement, which projects the company's expected profitability. It summarizes all the budgets (revenues, cost of goods sold, nonmanufacturing costs) and reflects the company's anticipated financial performance for the budget period.



## 6. Cash Budget

Beginning cash balance	XXX
+ Cash receipts (collections)	XXX
= Cash available for disbursements exclusive of financing	XXX
- Cash needed for disbursements (purchases, direct labor, overhead, S&A, taxes, bonuses, etc.)	(XXX)
= Cash excess or deficiency (a)	XXX
- Minimum desired cash balance	(XXX)
= Cash needed or available for investment or loan repayment	XXX
Financing methods	
± Borrowing (repayments)	XXX
± Issue (reacquire) capital stock	XXX
± Sell (acquire) investments	XXX
± Sell (acquire) plant assets	XXX
± Receive (pay) interest or dividends	XXX
Total impact (+ or -) of planned financing (b)	XXX
= Ending cash balance (c), where [(c) = (a) ± (b)]	XXX

CASH  
BUDGET

After all the preceding budgets—such as the sales budget, production budget, direct materials budget, direct labor budget, manufacturing overhead budget, and others—have been developed, the next critical step in the budgeting process is to create the cash budget.

The cash budget is a detailed plan that forecasts cash inflows and outflows over a specific period, usually broken down by month or quarter. It helps management ensure that the company will have enough cash on hand to meet its obligations, such as payroll, supplier payments, interest, and taxes, while also planning for investment opportunities or periods of cash shortages.

The Cash Budget is typically divided into the following sections:

(i) **Beginning Cash Balance:** This represents the cash on hand at the start of the period, which is carried over from the previous period's ending cash balance. It acts as the foundation for determining cash availability before any cash flows occur.

(ii) **Cash Receipts:** This section includes all expected cash inflows during the period, primarily from sales and collections on accounts receivable. Other sources of cash inflows, such as interest income, asset sales, or dividends received, are also included here. These receipts are vital for determining how much cash the business will generate from operations.

(iii) **Cash Disbursements:** This includes all expected cash outflows for the period. Disbursements cover a wide range of operational and non-operational expenses such as purchases of materials, direct labor, manufacturing overhead, selling and administrative (S&A) expenses, taxes, and bonuses. Accounts payable are also considered here as payments to suppliers for credit purchases are planned.

(iv) **Minimum Desired Cash Balance:** Many companies set a target for the minimum cash they want to have on hand at any point in time to cover unforeseen expenses or emergencies. This section ensures the company maintains sufficient liquidity and avoids cash shortfalls.

(v) **Financing Activities:** If cash disbursements and the minimum cash balance exceed cash receipts, the business may need to arrange for external financing. This section covers borrowing, repayments of loans, issuing or reacquiring capital stock, and transactions involving the purchase or sale of investments or plant assets. It also includes receiving or paying interest and dividends, ensuring cash is managed efficiently.

(vi) **Ending Cash Balance:** The ending cash balance is the projected cash available at the end of the period after considering all cash inflows, outflows, and financing activities. This balance serves as the starting point (beginning cash balance) for the next period.

## 7. Budgeted Financial Statements

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The budgeted financial statements are the final product of the budgeting process.

These statements provide an overview of the company's expected financial position and performance for a specific period, assuming that all projections, estimates, and assumptions used in the budgeting process come to fruition. These statements allow management to assess whether the projected results are acceptable. If the outcomes are unsatisfactory, such as low projected net income, management has the chance to make adjustments to sales strategies, cost control, or operational decisions before the budget period begins.

The three key budgeted financial statements are:

### 1. Budgeted Income Statement

The Budgeted Income Statement reflects the expected profitability for the budgeted period. It shows the forecasted revenue, cost of goods sold (COGS), gross profit, operating expenses, and net income. It summarizes all the operational budgets—such as sales, production, and operating expenses—and allows management to evaluate whether projected profits are in line with business goals.

The income statement gives insight into expected financial performance. If net income is too low, management can adjust pricing, marketing efforts, or costs to ensure that the company achieves acceptable profitability.

### 2. Budgeted Balance Sheet

The Budgeted Balance Sheet forecasts the financial position of the company at the end of the budget period. It includes estimates for assets, liabilities, and shareholders' equity based on the projections from other budgets (such as capital expenditures, inventory, and accounts receivable/payable).

The balance sheet helps in assessing the company's liquidity, solvency, and overall financial stability. By analyzing the budgeted balance sheet, management can ensure that the company will have sufficient resources to meet obligations and avoid cash shortages or excessive debt levels.

### 3. Budgeted Statement of Cash Flows

The Budgeted Statement of Cash Flows forecasts the cash inflows and outflows during the budgeted period. It shows how cash will be generated from operating, investing, and financing activities. The cash flow statement is crucial for ensuring that the company will have enough liquidity to meet its short-term obligations and invest in growth opportunities.

If the projected financial results are not acceptable (e.g., net income is too low), management has the flexibility to explore options such as:

- *Increasing sales prices:* This could increase net income but may also reduce sales volume due to higher prices, which could affect demand.
  - *Reducing costs:* Management could look for cost-saving measures, but some actions, like using lower-quality materials, could lead to higher spoilage rates or lower product demand due to quality issues.
  - Any such changes would require revisiting the previous budgets to ensure that the revised assumptions and projections are feasible and aligned with company goals.
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## 8. Rolling Budget

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A rolling budget (or continuous budget) is a budgeting approach that keeps a constantly updated 12-month budget in place. Instead of preparing a budget for a fixed period, such as a fiscal year, a rolling budget continuously extends the time horizon by adding a new month as each current month ends. This ensures that at any point, the organization is working with a full 12-month budget that reflects the latest business conditions.

For example, at the end of January, a new budget for the following January is added, maintaining a full-year view of the budget. This process allows management to focus on both short-term and long-term planning without having to overhaul the entire budget at a specific time each year.

Benefits of a Rolling Budget:

**Eliminates Fiscal Year Mindset:** Unlike traditional budgeting, which often revolves around a fiscal year, a rolling budget recognizes that business is an ongoing process. This continuous approach helps management make decisions with a broader, long-term perspective, rather than focusing solely on the fiscal year-end.

**Improves Flexibility and Responsiveness:** Rolling budgets allow management to make adjustments as business conditions change, ensuring that forecasts are current and aligned with the latest market dynamics. This helps management take corrective actions more proactively.

**Reduces Budget Gaps:** Traditional budgets can sometimes become outdated by the time they are fully implemented. Rolling budgets, on the other hand, minimize the gap between planning and execution by keeping the budget current and relevant throughout the year.

**Encourages Continuous Planning:** With a rolling budget, managers remain continuously involved in the planning process. Instead of an intense budgeting period at the end of the fiscal year, they engage in regular updates and revisions, which leads to more consistent, thoughtful planning.

**Streamlines Year-End Budget Process:** By having a constantly updated budget, the need for a significant overhaul at the end of the fiscal year is reduced or even eliminated. This saves time and resources, as managers do not need to allocate a separate period to develop an entirely new budget.

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## 9. Budget Manual

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A budget manual is a comprehensive document that provides detailed information and guidelines for the budget preparation process within an organization. It serves as a guide for employees involved in budgeting, outlining the procedures, responsibilities, and timelines to ensure that the budgeting process is efficient, consistent, and aligned with organizational goals. The manual helps streamline the budgeting process by providing clarity on what needs to be done, who is responsible, and how the budget should be structured.

In many organizations, the budget manual is maintained on an intranet or other digital platform so it can be easily accessed and updated as needed. It typically includes the following components:

### Key Components of a Budget Manual:

**Statements of Budgetary Purpose:** These statements explain the overarching goals of the budget. They begin with general objectives, such as the role of the budget in planning, controlling, and forecasting, and move towards specific goals, such as ensuring the organization maintains minimum cash balances. For example, a general statement might outline that "the cash budget is essential for planning and controlling cash flows," while a specific statement might highlight targets for maintaining a certain cash reserve or planning for upcoming periods of high cash needs.

**Listing of Budgetary Activities:** The manual should detail the specific activities involved in the budgeting process, such as collecting data, reviewing draft budgets, and approving final versions. These tasks should be listed by position rather than by individual, ensuring that whoever holds a particular role is responsible for carrying out the associated duties. This clarity of roles is important, especially in larger organizations where multiple individuals and departments are involved in budget preparation. The manual should also specify who holds final authority for revising and approving the budget, such as a budget committee or top management.

**Budget Calendar:** A budget calendar is crucial for coordinating the entire budgeting process. It lays out a timeline for key activities, such as when data should be collected, when draft budgets should be submitted, and when final approval is expected. The calendar also indicates critical control points, such as dates for comparing actual performance with the budget and providing feedback to managers. A well-structured budget calendar ensures that the budgeting process runs smoothly and allows adequate time for data gathering, review, and revisions.

**Sample Budget Forms and Templates:** Consistency is key in budgeting, and the use of standardized forms and templates helps ensure that all departments or individuals present budget information in a uniform way. These templates may include pre-programmed spreadsheets or worksheets that can be updated with current data, making it easier for managers to input figures accurately. For example, a company might provide a standard form for estimating employee fringe benefits as a fixed percentage of base salary or for budgeting travel expenses using a set per diem allowance for meals. Such templates help simplify the process, allowing for quicker and more efficient summarization and comparison of data.

**Final Budgets and Revisions:** The budget manual typically includes examples of past budgets, including both the proposed and final approved versions. This section is important for understanding how the budgeting process unfolded, including any changes or revisions made along the way. This historical data is valuable for future budgeting cycles, as it provides insight into common issues, potential areas for improvement, and the rationale behind previous budget decisions. The final approved *master budget* is often included in the manual as a key control document, serving as the baseline for monitoring actual performance throughout the fiscal period.

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## 10. Illustration

The July 31, 2024, balance sheet for a company includes the following information:

Cash: ₹ 40,000 (debit)

Accounts Receivable: ₹ 2,70,000 (debit)

Merchandise Inventory: ₹ 18,000 (debit)

The management has designated ₹35,000 as the company's monthly minimum cash balance. The following additional information is available for the company:

- Expected revenues for August, September, and October are ₹6,50,000, ₹7,20,000, and ₹8,25,000, respectively. All sales are made on credit.
- The collection pattern for accounts receivable is as follows: 55% of sales are collected in the month of sale, 44% in the following month, and 1% becomes uncollectible.
- Cost of Goods Sold (COGS) is estimated at 60% of sales.
- Management plans to end each month with inventory equivalent to 5% of the following month's COGS.
- All accounts payable related to inventory are settled in the month of purchase.
- Other monthly expenses total ₹78,000, including ₹12,000 for depreciation, excluding uncollectible accounts.
- Excess cash is invested in ₹5,000 increments.

You are required to compute the followings:

- (i) Forecast the cash collections for August.
- (ii) Forecast the cost of purchases for August and September.
- (iii) Prepare the cash budget for August, considering the impact of borrowing or investing.

**SOLUTION:**

- (i) Forecast the cash collections for August.

$$\begin{aligned} \text{ACCOUNT RECEIVABLE} &= 45\% \text{ of JULY SALES} \\ 2,70,000 &= 45\% \text{ of JULY SALES} \\ \Rightarrow \text{JULY SALES} &= 6,00,000 \end{aligned}$$

$$\text{COLLECTION FROM JULY SALES} = 6,00,000 \times 0.44 = 2,64,000$$

$$\text{COLLECTION FROM AUG SALES} = 6,50,000 \times 0.55 = 3,57,500$$

$$\begin{aligned} \text{TOTAL AUGUST CASH COLLECTION} &= 2,64,000 + 3,57,500 \\ &= \text{Rs } 6,21,500 \end{aligned}$$

- (ii) Forecast the cost of purchases for August and September.

	AUGUST	SEPTEMBER
SALE	<u>6,50,000</u>	<u>7,20,000</u>
COGS (60% of SALE)	3,90,000	4,32,000
DESIRED END BALANCE (5% of next COGS)	<u>21,600</u>	<u>24,750</u>
TOTAL NEEDED	4,11,600	4,56,750
LESS BEGIN BALANCE	<u>18,000</u>	<u>21,600</u>
COST OF PURCHASE	<u>3,93,600</u>	<u>4,35,150</u>

(iii) Prepare the cash budget for August, considering the impact of borrowing or investing.

### AUGUST CASH BUDGET

BEGIN CASH BALANCE	40,000	3,93,600
AUGUST COLLECTIONS	<u>+ 6,03,000</u>	<u>+ 78,000</u>
TOTAL CASH AVAILABLE	<u>6,43,000</u>	<u>- 12,000</u>
DISBURSEMENTS	<u>- 4,59,600</u>	4,59,600
MINIMUM CASH BALANCE	<u>- 35,000</u>	
CASH AVAILABLE	<u>1,48,400</u>	
FINANCING	<u>- 1,45,000</u>	
END CASH BALANCE	<u>38,400</u>	

## 11. Budgetary Control

Budget Ratios are financial metrics that help organizations assess their performance against budgeted expectations. They provide insights into how well actual performance aligns with planned performance, enabling management to identify variances that may be favorable or unfavorable. This analysis is crucial for effective financial planning, control, and decision-making.

If the budget ratio is 100% or more, it indicates that actual performance meets or exceeds the budgeted targets. This suggests that the organization is operating efficiently and effectively.

If the budget ratio is less than 100%, it indicates a shortfall in performance, which could signal inefficiencies or operational challenges that need to be addressed.

$$\text{CAPACITY RATIO} = \frac{\text{ACTUAL HOURS}}{\text{BUDGETED HOURS}}$$

$$\text{EFFICIENCY RATIO} = \frac{\text{STANDARD HOURS}}{\text{ACTUAL HOURS}}$$

$$\begin{aligned}\text{ACTIVITY RATIO} &= \text{CAPACITY RATIO} \times \text{EFFICIENCY RATIO} \\ &= \frac{\text{STANDARD HOURS}}{\text{ACTUAL HOURS}}\end{aligned}$$

### Activity Ratio

Measures the number of standard hours equivalent to work produced as a percentage of the budgeted standard hours. A higher activity ratio indicates that the company is achieving a larger proportion of its budgeted output.

### Efficiency Ratio

Measures the standard hours equivalent of work produced as a percentage of the actual hours spent in producing that work. A higher efficiency ratio indicates that the company is producing output in less time than the standard allows, reflecting effective resource utilization.

### Capacity Ratio

Indicates the relationship between actual working hours and budgeted hours.

A ratio of 100% or more suggests that the company is utilizing its capacity effectively. A lower ratio indicates underutilization.

These three ratios are interrelated, and you can derive one from the others.

Efficiency Ratio = Capacity Ratio/Activity Ratio

$$\text{CALENDAR RATIO} = \frac{\text{ACTUAL WORKING DAYS}}{\text{BUDGETED WORKING DAYS}}$$

### Calendar Ratio

It indicates the proportion of actual working days compared to the planned or budgeted working days for a given period.

## STANDARD CAPACITY USAGE RATIO

$$= \frac{\text{BUDGETED HOURS}}{\text{MAXIMUM HOURS IN BUDGETED PERIOD}}$$

## ACTUAL CAPACITY USAGE RATIO

$$= \frac{\text{ACTUAL HOUR}}{\text{MAXIMUM HOURS IN BUDGETED PERIOD}}$$

### Standard Capacity Usage Ratio

Measures how much of the budgeted capacity is being utilized during a specific period. It compares budgeted hours to the maximum possible hours that could have been worked in that period.

### Actual Capacity Usage Ratio

Measures the actual hours worked in relation to the maximum possible working hours during a specified period. This ratio assesses how effectively the organization is utilizing its available capacity based on real performance.

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## 12. Illustration

Consider the following data:

Standard Working Hours: 8 hours per day, 5 days per week

Maximum Capacity: 50 employees

Actual Working Capacity: 40 employees

Actual Hours Expected to be Worked in Four Weeks: 6,400 hours

Standard Hours Expected to be Earned in Four Weeks: 8,000 hours

Actual Hours Worked in the Four-Week Period: 6,000 hours

Standard Hours Earned in the Four-Week Period: 7,000 hours

Special Holiday: One day due to a national event within the four-week period

Required Calculations:

- (i) Efficiency Ratio
- (ii) Activity Ratio
- (iii) Calendar Ratio
- (iv) Standard Capacity Usage Ratio
- (v) Actual Capacity Usage Ratio
- (vi) Actual Usage of Budgeted Capacity Ratio (Capacity Ratio)

**SOLUTION:**

Standard Working Hours: 8 hours/day  $\times$  5 days/week = 40 hours/week

Maximum Capacity: 50 employees

Actual Working Capacity: 40 employees

Actual Hours Expected to be Worked (4 weeks): 6,400 hours

Standard Hours Expected to be Earned (4 weeks): 8,000 hours

Actual Hours Worked in the 4-Week Period: 6,000 hours

Standard Hours Earned in the 4-Week Period: 7,000 hours

Budgeted Number of Days: 20 days (4 weeks  $\times$  5 days)

Actual Number of Days: 19 days (20 days - 1 holiday)

### 1. Efficiency Ratio

- **Formula:**

$$\text{Efficiency Ratio} = \left( \frac{\text{Standard Hours}}{\text{Actual Hours}} \right) \times 100$$

- **Calculation:**

$$\text{Efficiency Ratio} = \left( \frac{7,000 \text{ hours}}{6,000 \text{ hours}} \right) \times 100 = 116.67\%$$

### 2. Activity Ratio

- **Formula:**

$$\text{Activity Ratio} = \left( \frac{\text{Standard Hours}}{\text{Budgeted Hours}} \right) \times 100$$

- **Calculation:**

$$\text{Activity Ratio} = \left( \frac{7,000 \text{ hours}}{6,400 \text{ hours}} \right) \times 100 = 109.375\%$$

### 3. Calendar Ratio

- Formula:

$$\text{Calendar Ratio} = \left( \frac{\text{Available Working Days}}{\text{Budgeted Working Days}} \right) \times 100$$

- Calculation:

$$\text{Calendar Ratio} = \left( \frac{19 \text{ days}}{20 \text{ days}} \right) \times 100 = 95\%$$

### 4. Standard Capacity Usage Ratio

- Formula:

$$\text{Standard Capacity Usage Ratio} = \left( \frac{\text{Budgeted Hours}}{\text{Maximum Possible Hours in the Budgeted Period}} \right) \times 100$$

- Calculation:

$$\text{Standard Capacity Usage Ratio} = \left( \frac{6,400 \text{ hours}}{8,000 \text{ hours}} \right) \times 100 = 80\%$$

### 5. Actual Capacity Usage Ratio

- Formula:

$$\text{Actual Capacity Usage Ratio} = \left( \frac{\text{Actual Hours Worked}}{\text{Maximum Possible Working Hours in a Period}} \right) \times 100$$

- Calculation:

$$\text{Actual Capacity Usage Ratio} = \left( \frac{6,000 \text{ hours}}{8,000 \text{ hours}} \right) \times 100 = 75\%$$

### 6. Actual Usage of Budgeted Capacity Ratio

- Formula:

$$\text{Actual Usage of Budgeted Capacity Ratio} = \left( \frac{\text{Actual Working Hours}}{\text{Budgeted Hours}} \right) \times 100$$

- Calculation:

$$\text{Actual Usage of Budgeted Capacity Ratio} = \left( \frac{6,000 \text{ hours}}{6,400 \text{ hours}} \right) \times 100 = 93.75\%$$

## 13. Performance Budgeting

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Performance Budgeting is a budgeting approach that allocates financial resources based on measurable outcomes, objectives, or performance indicators. Unlike traditional budgeting, which primarily focuses on input costs and historical expenditure patterns, performance budgeting emphasizes results and accountability, ensuring that resources are directed toward activities that achieve specific goals.

This method evaluates the success of programs or departments by linking the budget to their performance, making it an essential tool for improving efficiency and effectiveness in resource allocation.

Key features of performance budgeting are:

- **Outcome-Oriented:** Focuses on achieving specific objectives rather than merely controlling expenses.
  - **Performance Metrics:** Relies on measurable indicators, such as efficiency, output, or impact, to evaluate success.
  - **Linking Budgets to Results:** Aligns financial inputs with expected outcomes, making resource allocation more strategic.
  - **Accountability:** Holds departments or units accountable for achieving results tied to their budgets.
  - **Evaluation and Feedback:** Continuously monitors performance and uses feedback for adjustments.
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## 14. Zero Based Budgeting (ZBB)

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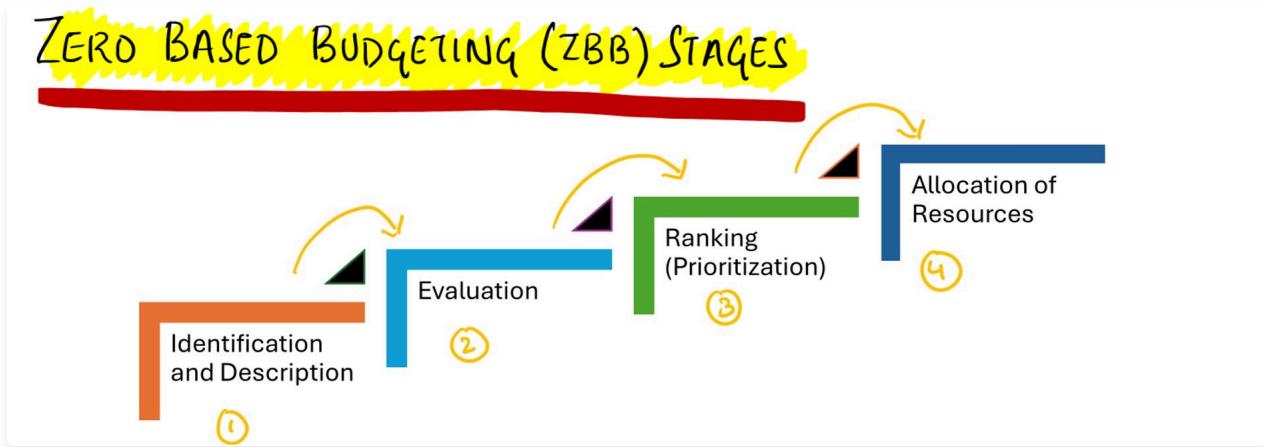
Zero-Based Budgeting (ZBB) is a budgeting approach where every expense must be justified from scratch for each new budgeting cycle, regardless of the previous year's budget. Unlike traditional budgeting, which adjusts past budgets to account for inflation or new priorities, ZBB starts from a "zero base," requiring all departments or activities to re-evaluate their needs and justify expenditures in detail.

Aspect	Zero-Based Budgeting	Traditional Budgeting
Starting Point	Starts from zero	Based on previous year's budget
Justification	Requires full justification of all expenses	Justifies changes or new expenses only
Focus	Efficiency and necessity	Incremental adjustments
Priority Setting	Ranks activities based on importance	Often maintains status quo

Key Features of Zero-Based Budgeting are:

- **Start from Zero:** Budgets are not based on historical figures; every expense must be re-justified and approved as if it were being proposed for the first time.
  - **Justification of Expenditures:** Every activity or cost is analyzed to determine its necessity and alignment with organizational goals.
  - **Prioritization:** Activities are ranked based on their importance and contribution to the organization, and resources are allocated accordingly.
  - **Cost Control:** Emphasis on efficiency and cost-effectiveness ensures that unnecessary or low-priority expenditures are eliminated.
  - **Periodic Review:** ZBB is often conducted annually or during significant organizational changes, providing a thorough review of all expenses.
-

## 14. Zero Based Budgeting (ZBB)



ZBB involves the following stages:

### 1. Identification and description of Decision packages

Decision packages are the programmes or activities for which decision is required to be taken. The programmes or activities are described for technical specifications, financial impact in the form of cost benefit analysis and other issues like environmental, regulatory, social etc.

### 2. Evaluation of Decision packages

Once Decision packages are identified and described, it is evaluated against factors like synchronisation with organisational objectives, availability of funds, regulatory requirement etc.

### 3. Ranking (Prioritisation) of the Decision packages

After evaluation of the decision packages, it is ranked on the basis of priority of the activities. Because of this prioritization feature, ZBB is also known as *Priority-based Budgeting*.

### 4. Allocation of resources

After ranking of the decision packages, resources are allocated for decision packages. Budgets are prepared like it is done first time without taking reference to previous budgets.

## 14. Zero Based Budgeting (ZBB)

Benefits of Zero-Based Budgeting are listed below:

- Cost Efficiency: Eliminates unnecessary expenditures, focusing only on essential activities.
- Resource Optimization: Ensures resources are allocated to high-priority areas, maximizing their impact.
- Accountability: Requires managers to justify every expense, promoting transparency and responsibility.
- Flexibility: Adapts to changing organizational goals and market conditions.
- Encourages Innovation: Forces departments to think creatively and find cost-effective ways to achieve objectives.

Challenges of Zero-Based Budgeting are listed below:

- Time-Consuming: The process of justifying every expense can be lengthy and resource-intensive.
- Complexity: Requires detailed data collection and analysis, which may be challenging in large organizations.
- Resistance to Change: Employees and managers may resist the rigorous scrutiny of their activities and expenditures.
- Risk of Short-Term Focus: May prioritize immediate cost savings over long-term investments or strategic goals.

# 1. Flexible Budget

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A **Flexible Budget** is a budgeting tool that adjusts based on different levels of activity or sales volume, making it more adaptable and insightful than a traditional static budget.

Unlike a static budget, which remains fixed at a single level of planned activity throughout the period, a flexible budget allows adjustments to reflect changes in actual business conditions. This makes it a powerful tool for evaluating financial performance when the level of activity fluctuates, offering a more accurate and relevant comparison between actual results and budgeted expectations.

*Static Budget (Master Budget)* is created at the beginning of the budgeting period and is based on one level of expected output or sales. For example, a company may create a budget for producing 10,000 units of a product. This budget remains unchanged, regardless of actual production levels, and deviations from this budget (variances) are used to evaluate performance.

In contrast, a *flexible budget* adjusts to different levels of production or sales volume. It recalculates costs and revenues based on actual or varying activity levels, offering a more relevant financial analysis as business conditions change. For instance, a flexible budget can show how costs would vary at 8,000, 10,000, or 12,000 units of production.

Flexible budgets separate variable costs from fixed costs; it is the variable costs that put the "flex" in the flexible budget.

Fixed costs (such as rent, insurance, or salaries) do not change with the level of activity or output. These costs remain constant regardless of how many units are produced. Variable costs (such as raw materials, labor, and utilities) change in direct proportion to production volume. For example, if the cost to produce one unit of a product is Rs 5, and production increases by 1,000 units, the total variable cost increases by Rs 5,000.

Let's assume that a company has the following cost behavior at different production levels:

Fixed costs: Rs 50,000

Variable costs per unit: Rs 20

Selling price per unit: Rs 40

We will create a flexible budget for three activity levels: 5,000 units, 7,000 units, and 9,000 units.

Particulars	Activity Level 1 (5,000 units)	Activity Level 2 (7,000 units)	Activity Level 3 (9,000 units)
Sales Revenue (₹40/unit)	₹2,00,000	₹2,80,000	₹3,60,000
Variable Costs (₹20/unit)	₹1,00,000	₹1,40,000	₹1,80,000
Fixed Costs	₹50,000	₹50,000	₹50,000
Total Costs (Variable + Fixed)	₹1,50,000	₹1,90,000	₹2,30,000
Operating Income (Revenue - Total Costs)	₹50,000	₹90,000	₹1,30,000

## 2. Making Flexible Budget

Let us understand, with an illustration, why do we need flexible budget.

Consider a clothing company that manufactures and sells jackets. For simplicity, we assume that only costs are in the manufacturing function; company incurs no costs in other value-chain functions, such as marketing and distribution. We also assume that all units manufactured in April 2024 are sold in April 2024. Therefore, all direct materials are purchased and used in the same budget period, and there is no direct materials inventory at either the beginning or the end of the period. No work-in-process or finished goods inventories exist at either the beginning or the end of the period.

The budgeted variable cost per jacket for each category is as follows:

Direct Material Costs: Rs 60 per jacket

Direct Labor Costs: Rs 16 per jacket

Variable Manufacturing Overhead Costs: Rs 12 per jacket

The number of units manufactured is the cost driver for all variable costs. The relevant range for the cost driver is from 0 to 12,000 jackets.

Budgeted and actual data for April 2024 follow:

Budgeted fixed costs for production between 0 and 12,000 jackets = Rs 2,76,000

Budgeted selling price = Rs 120 per jacket

Budgeted production and sales = 12,000 jackets

Actual production and sales = 10,000 jackets

	<b>Static Budget</b>	<b>Actual Results</b>	<b>Variance</b>
Units Sold	12,000	10,000	2,000 (U)
Revenue	14,40,000	12,50,000	1,90,000 (U)
Direct Material	7,20,000	6,21,600	84,400 (F)
Direct Labour	1,92,000	1,98,000	6,000 (U)
Variable MOH	1,44,000	1,30,500	13,500 (F)
Total Variable Costs	10,56,000	9,50,100	1,05,900 (F)
Contribution Margin	3,84,000	2,99,900	84,100 (U)
Fixed Costs	2,76,000	2,85,000	9,000 (U)
Operating Income	1,08,000	14,900	93,100 (U)

$$\begin{aligned} \text{STATIC BUDGET VARIANCE} &= 14,900 - 108,000 \\ &= 93,100 (\text{U}) \end{aligned}$$

The static budget, or master budget, is based on the level of output planned at the start of the budget period (12,000 in our example). The master budget is called a static budget because the budget for the period is developed around a single (static) planned output level.

Comparing this static budget with actual results, we find variance. The static-budget variance is the difference between the actual result and the corresponding budgeted amount in the static budget.

A favorable variance (denoted F) has the effect, when considered in isolation, of increasing operating income relative to the budgeted amount. For revenue items, F means actual revenues exceed budgeted revenues. For cost items, F means actual costs are less than budgeted costs. An unfavorable variance (denoted U) has the effect, when viewed in isolation, of decreasing operating income relative to the budgeted amount. Unfavorable variances are also called adverse variances.

The unfavorable static-budget variance for operating income comes out to be Rs 93,100. It should be noted that the company produced and sold only 10,000 jackets, although managers anticipated an output of 12,000 jackets in the static budget.

Managers want to know how much of the static-budget variance (Rs 93,100) is because of inaccurate forecasting of output units sold and how much is due to performance in manufacturing and selling

10,000 jackets. This is the reason, why we need a flexible budget, which enables a more realistic understanding of deviations from the static budget.

A flexible budget calculates budgeted revenues and budgeted costs based on the actual output in the budget period (10,000 in our example). The flexible budget is prepared at the end of the period

(April 2024), after the actual output of 10,000 jackets is known. The flexible budget is the hypothetical budget that company would have prepared at the start of the budget period if it had correctly forecast the actual output of 10,000 jackets.

In preparing the flexible budget, it should be noted that:

- (i) The budgeted selling price is the same Rs 120 per jacket used in preparing the static budget.
- (ii) The budgeted unit variable cost is the same Rs 88 per jacket used in the static budget.
- (iii) The budgeted total fixed costs are the same static-budget amount of Rs 2,76,000, because the 10,000 jackets produced falls within the relevant range of 0 to 12,000 jackets.

	<b>Static Budget</b>	<b>Actual Results</b>	<b>Variance</b>	<b>Flexible Budget</b>
Units Sold	12,000	10,000	2,000 (U)	10,000
Revenue	14,40,000	12,50,000	1,90,000 (U)	12,00,000
Direct Material	7,20,000	6,21,600	84,400 (F)	6,00,000
Direct Labour	1,92,000	1,98,000	6,000 (U)	1,60,000
Variable MOH	1,44,000	1,30,500	13,500 (F)	1,20,000
Total Variable Costs	10,56,000	9,50,100	1,05,900 (F)	8,80,000
Contribution Margin	3,84,000	2,99,900	84,100 (U)	3,20,000
Fixed Costs	2,76,000	2,85,000	9,000 (U)	2,76,000
Operating Income	1,08,000	14,900	93,100 (U)	44,000

The only difference between the static budget and the flexible budget is that the static budget is prepared for the planned output of 12,000 jackets, whereas the flexible budget is based on the actual output of 10,000 jackets. The static budget is being "flexed," or adjusted, from 12,000 jackets to 10,000 jackets.<sup>2</sup> The flexible budget for 10,000 jackets assumes that all costs are either completely variable or completely fixed with respect to the number of jackets produced.

### 3. Analyzing Flexible Budget

The Flexible Budget divides total Static Budget variance (Rs 93,100 in our example) for operating income into two parts:

- (i) Flexible Budget variance and
- (ii) Sales Volume variance

	(1)	(2)	(2-1)	(3)	(2-3)	(3-1)
	Static Budget	Actual Results	Static Budget Variance	Flexible Budget	Flexible Budget Variance	Sales Volume variance
Units Sold	12,000	10,000	2,000 (U)	10,000	0	2,000 (U)
Revenue	14,40,000	12,50,000	1,90,000 (U)	12,00,000	50,000 (F)	2,40,000 (U)
Direct Material	7,20,000	6,21,600	84,400 (F)	6,00,000	21,600 (U)	1,20,000 (F)
Direct Labour	1,92,000	1,98,000	6,000 (U)	1,60,000	38,000 (U)	32,000 (F)
Variable MOH	1,44,000	1,30,500	13,500 (F)	1,20,000	10,500 (U)	24,000 (F)
Total Variable Costs	10,56,000	9,50,100	1,05,900 (F)	8,80,000	70,100 (U)	1,76,000 (F)
Contribution Margin	3,84,000	2,99,900	84,100 (U)	3,20,000	20,100 (U)	64,000 (U)
Fixed Costs	2,76,000	2,85,000	9,000 (U)	2,76,000	9,000 (U)	0
Operating Income	1,08,000	14,900	93,100 (U)	44,000	29,100 (U)	64,000 (U)
			(A)		(B)	
					A = B + C	
						(C)

The Sales Volume variance is the difference between a Flexible Budget amount and the corresponding Static Budget amount. It is Rs 64,000 in our example.

$$\begin{aligned}
 & \text{STATIC BUDGET VARIANCE} \quad (\text{ACTUAL RESULT} - \text{STATIC BUDGET}) \\
 & = \text{FLEXIBLE BUDGET VARIANCE} + \text{SALES VOLUME VARIANCE} \\
 & \quad (\text{ACTUAL RESULT} - \text{FLEXIBLE BUDGET}) \quad (\text{FLEXIBLE BUDGET} - \text{STATIC BUDGET})
 \end{aligned}$$

The Flexible Budget variance is the difference between an Actual result and the corresponding Flexible Budget amount. It is Rs 29,100 in our example.

#### Sales Volume Variance

The difference between the Static Budget and the Flexible Budget amounts is called the Sales Volume variance because it arises solely from the difference between the actual quantity (or volume) sold and the quantity of units expected to be sold in the Static Budget.

## Sales Volume Variance

$$= \left( \frac{\text{ACTUAL SALE}}{\text{STATIC BUDGET}} - \frac{\text{STATIC BUDGET}}{\text{SALE}} \right) \times \frac{\text{BUDGETED CONTRIBUTION MARGIN PER UNIT}}{\text{BUDGETED SELLING PRICE} - \text{BUDGETED VARIABLE COST PER UNIT}}$$

$$= \left( \frac{\text{ACTUAL SALE}}{\text{STATIC BUDGET}} - \frac{\text{STATIC BUDGET}}{\text{SALE}} \right) \times \left( \frac{\text{BUDGETED SELLING PRICE}}{\text{PRICE}} - \frac{\text{BUDGETED VARIABLE COST PER UNIT}}{\text{Cost per unit}} \right)$$

If Sales Volume variance in operating income is unfavourable, it could be because of one or more of the following reasons:

1. The overall demand is not growing at the rate that was anticipated.
2. Competitors are taking away market share.
3. Company did not adapt quickly to changes in customer preferences and tastes.
4. Budgeted sales targets were set without careful analysis of market conditions.

## Flexible Budget Variance

The Flexible Budget Variance is the difference between an Actual Result and the corresponding Flexible Budget amount. The Flexible Budget variance for revenues is called the Selling Price variance because it arises solely from the difference between the actual selling price and the budgeted selling price.

## Flexible Budget Variance

$$= \left( \frac{\text{ACTUAL SELLING PRICE}}{\text{BUDGETED SELLING PRICE}} - \frac{\text{BUDGETED SELLING PRICE}}{\text{PRICE}} \right) \times \frac{\text{ACTUAL SALE}}{\text{SALE}}$$

If Flexible Budget Variance is unfavorable, it could be because of one or more of the following reasons:

1. Company used greater quantities of inputs (such as direct manufacturing labor-hours) compared to the budgeted quantities of inputs.
2. Company incurred higher prices per unit for the inputs (such as the wage rate per direct manufacturing labor-hour) compared to the budgeted prices per unit of the inputs.

## 4. Advantages

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Advantages of a Flexible Budget are listed below.

**More Accurate Performance Evaluation:** A flexible budget provides a more accurate basis for performance comparison because it adjusts to actual production levels. Managers can compare actual results with relevant budget figures, avoiding misleading conclusions that might arise from using a fixed budget.

**Better Cost Control:** Since a flexible budget adjusts to different activity levels, it helps managers track and control variable costs more effectively. If variable costs exceed expectations for a certain level of output, it becomes clear that cost control efforts need to be improved.

**Improved Decision-Making:** Flexible budgets allow businesses to plan for multiple scenarios and adjust their strategies accordingly. Management can better decide how to allocate resources, set pricing, or adjust production plans based on real-time financial insights.

**Adaptability to Changing Conditions:** Flexible budgets are particularly useful in industries with fluctuating demand or production levels, as they allow for ongoing adjustments. This flexibility helps businesses remain agile in dynamic environments.

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## 1. Introduction

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**Responsibility Accounting** is a management control system that focuses on dividing an organization into smaller units, called responsibility centers, and assigning specific managers accountability for the performance of their respective units. The goal of responsibility accounting is to measure and evaluate the financial performance of individual segments within an organization and hold managers accountable for activities under their control. This system is integral to effective management as it promotes decentralization, accountability, and better decision-making throughout the organization.

By implementing responsibility accounting, an organization can track financial outcomes, such as revenues, costs, or profits, on a departmental or divisional level. This system enables organizations to monitor and manage their financial performance more effectively, ensuring that each segment operates efficiently while contributing to overall corporate goals.

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## 2. Responsibility Centers

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A key feature of responsibility accounting is the concept of responsibility centers, which are specific units or segments within the organization, such as departments, divisions, or product lines. Each responsibility center has a manager responsible for its financial performance.

Responsibility centers are classified into 4 main types based on the scope of responsibility:

1. **Cost Centers:** Cost centers focus on managing and controlling costs. Managers in cost centers are expected to operate within their budgets and improve operational efficiency without generating revenue. Typical cost centers include support functions such as human resources, IT, and maintenance departments. Performance is evaluated based on the variance between actual and budgeted costs. Cost centers often focus on cutting unnecessary expenses while maintaining service quality. Metrics such as cost per unit or cost per employee might be used to evaluate efficiency in cost centers.
  2. **Revenue Centers:** Revenue centers are responsible for generating income through sales or services but do not directly manage costs. The performance of revenue centers is evaluated based on achieving sales targets, customer acquisition goals, or market share growth. A sales department is a common example of a revenue center, where the sales manager is held accountable for meeting revenue projections. Performance measures include total sales, sales growth, and customer retention.
  3. **Profit Centers:** A profit center manager is responsible for both generating revenue and controlling costs, with the overall objective of maximizing profit. Profit centers often operate like mini-businesses within the larger organization, with managers overseeing both sales and production functions. For example, a product division might be treated as a profit center where the division head is accountable for both marketing and production costs. Profit center performance is assessed using financial metrics such as gross profit, operating profit, and net income.
  4. **Investment Centers:** Investment centers have the highest level of responsibility, where managers oversee not only costs and revenues but also the efficient use of capital assets. Managers of investment centers must make decisions about capital investments, such as purchasing new equipment, expanding facilities, or entering new markets. Performance in investment centers is often measured by return on investment (ROI) or residual income (RI), which reflects the ability of the center to generate returns relative to the capital employed. Large business units or divisions with significant autonomy and decision-making power are typically organized as investment centers.
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### **3. Controllability**

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Controllability refers to the extent to which a manager can influence or control certain costs, revenues, or financial outcomes within their area of responsibility. A controllable cost is one that can be significantly affected by the actions or decisions of a manager within a specific responsibility center during a given time period. For example, a production manager may have control over costs like labor, materials, and machine maintenance but may not influence costs like rent or property taxes.

In a responsibility accounting system, uncontrollable costs can either be excluded from a manager's performance report or clearly separated from controllable costs. This helps ensure that managers are evaluated fairly based on what they can actually influence. For instance, a machining supervisor's performance report might focus only on costs such as direct materials, labor, power, and machine maintenance, excluding uncontrollable costs like rent or property taxes paid on the entire plant.

For example, if the cost of raw materials rises due to market conditions, a department manager who has no control over those prices should not be held responsible for the resulting increase in expenses. By following the controllability principle, the manager's performance evaluation will focus on the factors they can actually influence, leading to a more accurate and fair assessment of their contribution to the organization's performance.

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### **4. Decentralization**

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Responsibility accounting encourages decentralization, which is the delegation of decision-making authority to lower-level managers who have control over their specific responsibility centers. This enables managers to make more timely and informed decisions because they are closer to the day-to-day operations of their units. Decentralization empowers managers to take ownership of their areas and encourages innovation and flexibility in responding to operational challenges. In large organizations, decentralization also reduces the burden on top management by allowing decision-making to be distributed across various levels.

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## 5. Advantages

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The advantages of Responsibility Accounting are discussed below.

**Improved Accountability:** Responsibility accounting enhances accountability by clearly defining the scope of responsibility for each manager. When managers know what they are responsible for, they are more likely to make decisions that align with organizational goals and improve efficiency. It also ensures that financial outcomes can be traced back to the appropriate individuals or departments.

**Better Decision-Making:** By decentralizing decision-making authority, responsibility accounting allows managers who are closer to the day-to-day operations to make informed and timely decisions. This leads to better resource allocation, improved customer service, and quicker responses to operational challenges.

**Performance Measurement:** Responsibility accounting provides a structured way to measure performance at all levels of the organization. By comparing actual results to budgeted or expected performance, managers can identify areas where they need to improve and make adjustments. It also allows upper management to monitor the overall health of different segments and make strategic decisions.

**Motivation:** When managers are given responsibility and are held accountable for their performance, they are often more motivated to achieve their targets. Responsibility accounting encourages a sense of ownership among managers, as they are responsible for the success of their departments or divisions.

**Alignment with Organizational Goals:** Responsibility accounting aligns the performance of individual managers with the broader goals of the organization. By holding managers accountable for the financial performance of their areas, the system ensures that every part of the organization contributes to achieving overall corporate objectives.

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## 6. Challenges and Limitations

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Challenges and limitations of Responsibility Accounting are listed below.

**Difficulty in Measuring Non-Financial Performance:** Responsibility accounting focuses primarily on financial metrics, which may not capture all aspects of performance, particularly in non-revenue-generating areas such as research and development, human resources, or customer service. Some important contributions, such as improving employee morale or increasing customer satisfaction, are difficult to quantify in financial terms.

**Potential for Short-Term Focus:** Responsibility accounting may lead managers to focus on short-term financial results at the expense of long-term strategic objectives. For example, a manager might cut costs in ways that boost short-term profitability but harm long-term growth, such as reducing research and development spending or delaying maintenance.

**Interdependency of Departments:** In many organizations, departments and divisions are interdependent, meaning that the performance of one unit can affect another. Responsibility accounting may not fully account for these interdependencies, which could lead to unfair performance evaluations or suboptimal decision-making.

**External Factors:** Managers are sometimes evaluated based on outcomes that can be influenced by external factors beyond their control. For instance, changes in economic conditions, regulatory environments, or market trends can affect performance, making it difficult to fairly assess the manager's contribution to the results.

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## **1. Introduction**

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A cost sheet is a detailed document that summarizes the various costs associated with producing a product or delivering a service within a specific period. It serves as an essential tool for management and accounting professionals, providing insights into the cost structure and helping to assess profitability, budget planning, and financial decision-making.

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## 2. Components of Cost Sheet

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A cost sheet provides a comprehensive overview of all costs associated with the production process, enabling businesses to analyze profitability, control expenses, and make informed financial decisions. Each component contributes to understanding the total cost structure and helps in identifying areas for potential improvement.

Here's a detailed discussion of the components as presented in the cost sheet:

### 1. Direct Material Costs

This represents the cost of raw materials consumed during the production process.

Calculation:

Opening Stock of Raw Material: The value of raw materials available at the beginning of the period.

Add: Purchases: The total cost of raw materials purchased during the period.

Less: Closing Stock of Raw Materials: The value of raw materials remaining at the end of the period.

Example:

Opening Stock: Rs 12,000

Purchases: Rs 130,000

Closing Stock: Rs 8,000

Direct Material Consumed:  $Rs\ 12,000 + Rs\ 130,000 - Rs\ 8,000 = Rs\ 134,000$

### 2. Direct Labor Costs

The total wages paid to workers directly involved in manufacturing the product.

Example:

Direct wages in the cost sheet amounted to Rs 50,000.

### 3. Direct Expenses

These are expenses directly associated with the production process but not classified as direct materials or labor.

Example:

Direct expenses in the cost sheet were noted as Rs 10,000.

### 4. Prime Cost

This is the total of all direct costs associated with production.

Calculation:

Prime Cost = Direct Materials + Direct Labor + Direct Expenses.

Example:

Prime Cost =  $Rs\ 134,000\ (\text{Direct Material}) + Rs\ 50,000\ (\text{Direct Labor}) + Rs\ 10,000\ (\text{Direct Expenses}) = Rs\ 194,000$ .

Particulars	Amount (Rs)
Direct Material	
Opening Stock of Raw Material	12,000
Add: Purchases	130,000
Less: Closing Stock of Raw Materials	(8,000)
Material Consumed	134,000
Direct Wages	50,000
Direct Expenses	10,000
<b>Prime Cost</b>	<b>194,000</b>
Factory Overhead (100% of Direct Wages)	50,000
<b>Works Cost</b>	<b>244,000</b>
Office and Administrative Overhead (20% of Works Cost)	48,800
<b>Total Cost of Production</b>	<b>292,800</b>
Add: Opening Stock of Finished Goods	10,000
<b>Cost of Goods Available for Sale</b>	<b>302,800</b>

Less: Closing Stock of Finished Goods	(15,000)
<b>Cost of Goods Sold</b>	287,800
Selling and Distribution Overhead	25,000
<b>Cost of Sales</b>	312,800
Profit on Cost (20%)	62,560
<b>Sales Revenue</b>	375,360

## 5. Factory Overhead

Definition: Indirect costs incurred in the production process, which cannot be traced directly to specific units of output.

Calculation:

It is often expressed as a percentage of direct labor or production costs.

Example:

In the cost sheet, factory overhead was calculated as 100% of direct wages, which amounted to Rs 50,000.

## 6. Works Cost

The total cost incurred to manufacture the product, including prime costs and factory overheads.

Calculation:

Works Cost = Prime Cost + Factory Overhead.

Example:

Works Cost = Rs 194,000 (Prime Cost) + Rs 50,000 (Factory Overhead) = Rs 244,000.

## 7. Office and Administrative Overhead

Costs related to general management and administration, which cannot be directly traced to production.

Calculation:

Typically expressed as a percentage of works cost.

Example:

In this case, it was 20% of works cost:

Office and Administrative Overhead = 20% of Rs 244,000 = Rs 48,800.

## 8. Total Cost of Production

The aggregate cost of producing goods, incorporating all manufacturing costs.

Calculation:

Total Cost of Production = Works Cost + Office and Administrative Overhead.

Example:

Total Cost of Production = Rs 244,000 + Rs 48,800 = Rs 292,800.

## 9. Cost of Goods Available for Sale

The total cost available to be sold during a period.

Calculation:

Cost of Goods Available for Sale = Total Cost of Production + Opening Stock of Finished Goods.

Example:

Cost of Goods Available for Sale = Rs 292,800 + Rs 10,000 = Rs 302,800.

## 10. Closing Stock of Finished Goods

The value of unsold finished goods at the end of the accounting period.

Example:

In the cost sheet, this was recorded as Rs 15,000.

## 11. Cost of Goods Sold (COGS)

The direct costs attributable to the production of the goods sold during the period.

Calculation:

Cost of Goods Sold = Cost of Goods Available for Sale - Closing Stock of Finished Goods.

Example:

COGS = Rs 302,800 - Rs 15,000 = Rs 287,800.

## **12. Selling and Distribution Overhead**

Costs incurred to sell products and deliver them to customers, which are not included in production costs.

Example:

This was noted as Rs 25,000.

## **13. Cost of Sales**

The total expense incurred to generate sales during the period.

Calculation:

Cost of Sales = Cost of Goods Sold + Selling and Distribution Overhead.

Example:

Cost of Sales = Rs 287,800 + Rs 25,000 = Rs 312,800.

## **14. Profit on Cost**

The amount remaining after deducting costs from sales revenue, representing profit.

Example:

A profit margin of 20% was calculated on the cost of sales:

Profit = 20% of Rs 312,800 = Rs 62,560.

## **15. Sales Revenue**

The total income generated from sales during the period.

Example:

The sales revenue in this instance was recorded as Rs 375,360.

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## **3. Uses of Cost Sheet**

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A cost sheet serves multiple purposes in an organization, particularly in cost control, financial planning, and decision-making. Here are some key uses of a cost sheet:

**Cost Control:** It helps in monitoring and controlling costs by comparing actual costs against standard costs. This enables management to identify variances and take corrective actions when necessary.

**Cost Analysis:** The cost sheet provides detailed information about various cost components, allowing for in-depth analysis of production costs. This analysis can help identify areas for cost reduction and efficiency improvement.

**Pricing Decisions:** By detailing all costs associated with production, a cost sheet aids in determining the selling price of products. Understanding total costs helps businesses set competitive prices while ensuring profitability.

**Profitability Assessment:** The cost sheet facilitates the evaluation of profitability for different products or services. By analyzing the cost of goods sold (COGS) and comparing it with sales revenue, organizations can assess which products are more profitable.

**Budgeting:** Cost sheets can be used as a basis for preparing budgets. Historical cost data can help in forecasting future costs and establishing budgets for various departments.

**Financial Reporting:** Cost sheets play a vital role in financial reporting by providing detailed cost information necessary for preparing profit and loss statements, balance sheets, and other financial documents.

**Decision Making:** The insights gained from cost sheets can aid management in making informed decisions regarding production, outsourcing, discontinuing products, or entering new markets.

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## 4. Treatment of Various Items

<b>ITEMS IN THE COST SHEET</b>	Abnormal costs	Subsidy/Grant/Incentives
	Penalty, fine, damages and demurrage	Interest and other finance costs

The items included in a cost sheet can be categorized as follows:

### (i) Abnormal Costs

Abnormal costs that are material and quantifiable should not be included in the cost of production, acquisition, or provision of services. Examples of such costs include:

- Costs arising from extraordinary circumstances, such as a pandemic (e.g., COVID-19).
- Expenses related to employee management during unexpected events like a sudden lockdown.

### (ii) Subsidies, Grants, and Incentives

Payments received or receivable in the form of subsidies, grants, or incentives should be deducted from the costs associated with the relevant cost objects.

### (iii) Penalties, Fines, Damages, and Demurrage

Expenses related to penalties, fines, damages, and demurrage do not form part of the cost and should be excluded from the cost sheet.

### (iv) Interest and Other Finance Costs

Interest payments, including any charges akin to interest for utilizing non-equity funds, as well as the incidental costs incurred in arranging such funds, are not included in the cost of production. Instead, interest and finance charges should be presented separately in the cost statement under cost of sales.

## 5. Items excluded from Cost Sheet

ITEMS EXCLUDED FROM COST SHEET	Cash discount	Interest paid	Preliminary expenses written off
	Goodwill written off	Provision for taxation	Provision for bad debts
	Transfer of reserves	donations	Income tax paid
	Dividend paid	Profit/loss on sale of assets	Damages payable at law etc.

The following items are of financial nature and thus not included while preparing a cost sheet.

1. Cash discount
2. Interest paid
3. Preliminary expenses written off
4. Goodwill written off
5. Provision for taxation
6. Provision for bad debts
7. Transfer to reserves
8. Donations
9. Income tax paid
10. Dividend paid
11. Profit/loss on sale of assets
12. Damages payable at law etc.

## 6. Illustration

The following data relates to the manufacture of a standard product during the month of April, 2020:

<b>Particulars</b>	<b>(Amount in Rs.)</b>
Raw materials	1,80,000
Direct wages	90,000
Machine hours worked (hours)	10,000
Machine hour rate (per hour)	8
Administration overheads (general)	35,000
Selling overheads (per unit)	5
Units produced	4,000
Units sold	3,600
Selling price per unit	125

You are required to prepare a cost sheet in respect of the above showing:

- (i) Cost per unit and (ii) Profit for the month

**Solution:**

**(i) Cost Sheet**

Output: 4,000 units

<b>Particulars</b>	<b>Total Cost (Rs.)</b>	<b>Cost per unit (Rs.)</b>
Raw materials	1,80,000	45.00
Direct wages	90,000	22.50
Prime cost	2,70,000	67.50
Add: Factory overheads (10,000 hrs × Rs. 8 per hour)	80,000	20.00
<b>Cost of Production</b>	<b>3,50,000</b>	<b>87.50</b>
Less: Closing Stock of finished goods (4,000 – 3,600 units) × Rs. 87.50	(35,000)	--
<b>Cost of Goods Sold</b>	<b>3,15,000</b>	<b>87.50</b>
Add: Administration overheads (general)	35,000	9.72
Add: Selling Overheads (3,600 units × Rs. 5 unit)	18,000	5.00
<b>Cost of sales (total Cost)</b>	<b>3,68,000</b>	<b>102.22</b>

**(ii) Statement of Profit**

<b>Particulars</b>	<b>Total Cost (Rs. )</b>
Sales revenue (3,600 units @ Rs. 125)	4,50,000
Less: Cost of sales	3,68,000
<b>Profit</b>	<b>82,000</b>



## 7. Illustration

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ABC Manufacturing Company produces a single product, Widget A. The following cost data is provided for the financial year ending December 31, 2025:

Direct Materials:

Opening Stock: Rs. 50,000

Purchases: Rs. 120,000

Closing Stock: Rs. 30,000

Direct Labour:

Total Direct Labour Cost: Rs. 80,000

Direct Expenses:

Total Direct Expenses: Rs. 10,000

Factory Overhead:

Variable Overhead (based on machine hours): Rs. 30,000

Fixed Overhead: Rs. 40,000

Sales Data:

Selling Price per Unit: Rs. 150

Total Units Sold: 1,000

Prepare a cost sheet for ABC Manufacturing Company and calculate the total cost of production, cost of goods sold, and profit for the year.

**SOLUTION:**

Step 1: Calculate the Direct Material Cost

Calculate the Cost of Raw Materials Consumed:

Cost of Raw Materials=Opening Stock+Purchases–Closing Stock

$$= 50,000 + 120,000 - 30,000 = \text{Rs.} 140,000$$

Step 2: Prepare the Cost Sheet

<b>Direct Material:</b>	
Material Consumed	140,000
<b>Direct Labour:</b>	
Total Direct Labour Cost	80,000
<b>Direct Expenses:</b>	
Total Direct Expenses	10,000
<b>Prime Cost:</b>	
(Direct Material + Direct Labour + Direct Expenses)	230,000
<b>Factory Overhead:</b>	
Variable Overhead	30,000
Fixed Overhead	40,000
<b>Total Factory Overhead:</b>	70,000
<b>Works Cost:</b>	
(Prime Cost + Total Factory Overhead)	300,000
<b>Sales:</b>	
Total Units Sold	1,000
Selling Price per Unit	150
<b>Total Sales Revenue:</b>	150,000
<b>Cost of Goods Sold:</b>	
(Works Cost)	300,000
<b>Profit:</b>	
(Total Sales Revenue - Cost of Goods Sold)	(150,000 - 300,000) = -150,000

The cost sheet shows that the total cost of production for ABC Manufacturing Company is Rs. 300,000. The company sold 1,000 units at a price of Rs. 150 per unit, generating a total sales revenue of Rs. 150,000. This results in a loss of Rs. 150,000 for the year. The company needs to evaluate its cost structure and consider strategies to reduce costs or increase sales prices to achieve profitability.

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## 1. Introduction

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Apart from what we discussed, there are other types of costing systems like Life Cycle Costing, Target Costing, Kaizen Costing and Just-in-time. These costing systems are discussed in the chapter further.

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## 2. Life Cycle Costing

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The traditional cost accounting system generally reports profitability based on fixed calendar intervals, such as monthly, quarterly, or annually. This approach segments financial information in line with accounting periods, rather than the product's entire life cycle.

However, **Life Cycle Costing** (LCC) takes a broader approach by tracking costs and revenues for each product over its entire life, from development through to disposal. Instead of focusing on short-term periods, LCC focuses on the complete financial journey of a product, allowing a company to evaluate its long-term profitability.

The *Chartered Institute of Management Accountants* (CIMA) defines life cycle costing as a practice to maximize the value derived from an asset over its useful life, while minimizing the total cost to the entity. This emphasizes the need for strategic planning around the long-term costs and benefits of products or assets.

Life cycle costing is designed to capture the total costs and revenues associated with a product from inception to disposal. The aim is to ascertain the overall cost of the product (or project) over its projected life. This involves accumulating costs related to R&D, production, marketing, and disposal.

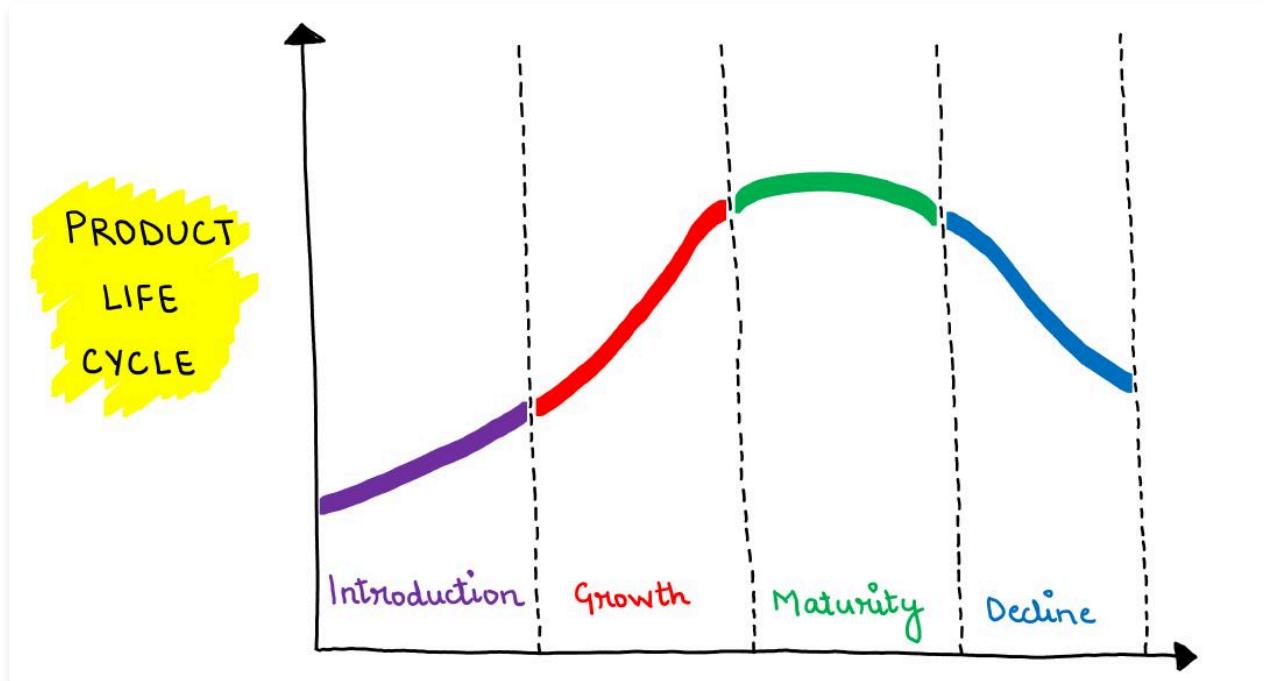
Life cycle costing accumulates actual costs and revenues for a cost object—often a product—through every stage of its life. This provides a comprehensive view of profitability, accounting for costs that traditional accounting periods may overlook. By focusing on the entire life cycle, it ensures that management can assess true profitability, factoring in costs from "cradle to grave" or "womb to tomb."

Imagine a company developing a new electric vehicle (EV). Life cycle costing would consider the total costs from development (design and testing), introduction (launch and marketing), growth (scaling up production), maturity (maintenance and customer support), and decline/disposal (recycling the battery and materials). Tracking all related costs and revenues over the vehicle's projected life ensures the company understands the full profitability of the EV, beyond annual production and sales figures.

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## 2. Life Cycle Costing

Life Cycle Costing is implemented across the four phases of the Product Life Cycle—Introduction, Growth, Maturity, and Decline—by analyzing and managing costs, revenues, and strategic priorities at each phase.



Here's how Life Cycle Costing is applied across these phases:

### 1. Introduction Phase

- **Sales Volumes:** Sales are initially low as the product is new and unfamiliar to customers.
- **Prices:** High pricing is often set to cover initial production, R&D costs, and promotional expenses.
- **Promotion to Sales Ratio:** The ratio is highest in this phase because heavy investment in marketing is needed to create awareness, inform potential customers, and launch the product in the market.
- **Competition:** Minimal, as few competitors have entered the market with similar products.
- **Profits:** Profits are usually minimal or negative due to high initial costs, including R&D, production, and marketing expenses.

During the introduction phase, Life Cycle Costing focuses on managing these initial high costs to avoid overspending. The aim is to carefully track all costs associated with launching the product, ensuring that future profits can recover these expenses.

Particulars	Introduction	Growth	Maturity	Decline
Phase	I	II	III	IV
Sales Volumes	Initial stages, hence low	Rise in sales levels at increasing rates	Rise in sales levels at decreasing rates	Sales level off and then start decreasing
Prices of products	High levels to cover initial costs and promotional expenses	Retention of high level prices except in certain cases	Prices fall closer to cost, due to effect of competition	Gap between price and cost is further reduced
Ratio of promotion expenses to sales	Highest, due to effort needed to inform potential customers, launch products, distribute to customers etc.	Total expenses remain the same, while ratio of S&D OH to sales is reduced due to increase in sales	Ratio reaches a normal A of sales. Such normal A becomes the industry standard	Reduced sales promotional efforts as the product is no longer in demand
Competition	Negligible and insignificant	Entry of a large number of competitors	Fierce Competition	Starts disappearing due to withdrawal of products

Profits	Nil, due to heavy initial costs	Increase at a rapid pace	Normal rate of profits since costs and prices are normalized	Decline profits due to price competition new products etc.
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## 2. Growth Phase

- *Sales Volumes:* Sales begin to increase significantly as the product gains popularity and customer acceptance.
- *Prices:* Prices remain high or are retained at an initial level to maximize revenue, but in some cases, slight reductions may occur to attract more customers.
- *Promotion to Sales Ratio:* While promotional costs remain, the ratio decreases as sales volume increases, spreading promotional costs across a larger sales base.
- *Competition:* Competitors start to enter the market, increasing the competitive landscape.
- *Profits:* Profits start increasing rapidly due to higher sales volumes and stable prices.

In the growth phase, Life Cycle Costing helps to maximize profitability by optimizing costs. Companies focus on scaling production and reducing unit costs, often benefiting from economies of scale. Cost tracking at this stage ensures that growth is profitable and sustainable.

## 3. Maturity Phase

- *Sales Volumes:* Sales continue to rise but at a decreasing rate, eventually leveling off as the market becomes saturated.
- *Prices:* Due to increased competition, prices may fall closer to the cost of production, narrowing profit margins.
- *Promotion to Sales Ratio:* This ratio reaches a normal level as companies standardize promotional expenses. Promotional efforts may focus on retaining market share rather than attracting new customers.
- *Competition:* Competition is fierce, with many firms offering similar products, making it challenging to maintain market share.
- *Profits:* Profits stabilize as both costs and prices reach a balanced level.

In the maturity phase, Life Cycle Costing is used to carefully monitor costs as margins narrow. Companies may look for cost-cutting opportunities to maintain profitability. Efforts are also made to extend the product life through product enhancements, process improvements, or packaging changes to differentiate from competitors.

## 4. Decline Phase

- *Sales Volumes:* Sales begin to fall as demand decreases, often due to technological advancements, changing customer preferences, or the introduction of new products.
- *Prices:* Prices drop significantly, often below cost, as companies try to sell off remaining inventory.
- *Promotion to Sales Ratio:* Sales promotional efforts are reduced or eliminated since the product is no longer in high demand.
- *Competition:* Competitors start withdrawing from the market, and some may shift their focus to newer products.
- *Profits:* Profits decline as prices drop and sales decrease, often leading to losses if the product remains in the market too long.

In the decline phase, Life Cycle Costing focuses on managing the end-of-life costs, such as disposal, recycling, or phasing out production. The goal is to minimize losses by carefully controlling expenses and reducing inventory levels to avoid overproduction. Companies may decide to discontinue the product if costs become unsustainable.

## 2. Life Cycle Costing

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Product Life Cycle Costing (PLCC) is a crucial approach that provides a comprehensive view of a product's profitability over its entire life, from inception to disposal. By focusing on long-term costs and revenues, PLCC helps managers make strategic decisions about design, production, and marketing while controlling overall manufacturing costs. This approach considers the evolving cost structure and profitability of a product throughout its various stages, allowing for proactive cost management and better decision-making.

Here are some key reasons why Product Life Cycle Costing is important:

### 1. Long-Term Profitability and Cost Tracking

- PLCC provides a holistic view of costs and revenues for each product over its entire life span, rather than focusing only on short-term, calendar-based financial performance (monthly, quarterly, or annually).
- Costs and revenues are tracked and analyzed by period, but the main focus is on accumulating them across the entire life cycle of the product. This enables companies to see the total cost incurred and revenue earned from the product from introduction to disposal.

### 2. Detailed Cost Allocation for Development and Design

- PLCC tracks and allocates research, design, and development costs to individual products over their entire life cycles. This gives a clear picture of the total investment in each product and allows these costs to be compared with the revenues generated in later stages.
- By accurately tracing these early-stage costs, companies gain insight into the financial impact of their R&D investments and can assess if these costs are justified by future revenues.

### 3. Early Revenue Generation and Cost Control

- PLCC encourages proactive measures to increase revenue or reduce costs at each stage of the product's life cycle, enabling the firm to maximize profitability. For instance, during the growth stage, companies might increase promotional efforts to capitalize on the product's popularity, while in the maturity stage, cost control measures might be prioritized to maintain profitability.
- By understanding the cost dynamics at each stage, managers can implement strategies earlier than they might in traditional accounting, leading to better overall profitability.

### 4. Enhanced Decision-Making

- PLCC allows for more accurate, realistic assessment of costs and revenues within each life cycle stage, providing better data for decision-making. This helps companies make informed choices about product pricing, design modifications, or discontinuation based on long-term profitability rather than short-term financial metrics.
  - For example, if a product is nearing the decline stage, the company may decide to reduce inventory and phase out production to avoid excess costs, rather than continue investing in a product with diminishing returns.
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## 3. Target Costing

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**Target costing** is a strategic pricing approach used primarily in competitive markets. It begins with identifying a product's target price—an estimated price that customers are willing to pay, based on their perceived value and competitor pricing. This customer-focused method becomes critical as companies face rising competition, shortening product life cycles, and increasingly informed customers who expect higher quality at lower prices.

In the target costing process, once the target price is established, a company subtracts its desired profit margin to determine the allowable cost, known as the target cost. This target cost becomes the maximum cost the company can incur to achieve its profit objectives. If the current cost exceeds the target cost, the company employs cost-cutting measures across all parts of the value chain to meet this target.

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### 3. Target Costing

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The target costing process involves setting a product's cost based on the desired price in the market and the required profit margin.

Here are the five key steps in target costing:

#### **1. Develop a Product Based on Customer Needs**

Start by designing a product that meets the specific needs of potential customers. This often involves market research and competitor analysis to identify the essential product features that customers value, and avoid features that add unnecessary costs.

#### **2. Choose a Target Price**

Determine the target price, which is the estimated price that customers are willing to pay. This price is based on customer expectations and competitive pricing in the market.

#### **3. Calculate Target Cost per Unit**

Derive the target cost by subtracting the desired profit margin from the target price. This target cost represents the maximum amount the company can spend on producing the product while still achieving the target profit.

#### **4. Conduct Cost Analysis**

Analyze the production costs associated with different components and processes. This step may involve breaking down the costs of each component and identifying areas where costs can be reduced.

#### **5. Apply Value Engineering**

Use value engineering to refine the product design, materials, and production methods, ensuring they align with the target cost. Value engineering seeks to maintain or improve product quality and functionality while systematically reducing costs across the value chain.

Through these steps, target costing helps firms control costs and maximize profitability while delivering products at prices that meet customer expectations. This approach is especially valuable in competitive markets where pricing is a key factor in maintaining market share

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### 3. Target Costing

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TechNow Ltd. is launching a new smartphone model. The company operates in a highly competitive market, so it decides to use target costing to ensure it meets customer expectations while achieving its profit goals.

Let us use steps of Target Costing with this example.

#### Step 1: Develop a Product Based on Customer Needs

- *Customer Needs:* Through market research, TechNow Ltd. learns that customers want a high-resolution camera, long battery life, and a sleek design at an affordable price.
- *Initial Design:* Based on this input, the design team proposes a smartphone model that includes these features without adding unnecessary, costly elements.

#### Step 2: Choose a Target Price

- *Setting the Price:* TechNow Ltd. determines that the target market price for this model should be Rs. 20,000 to stay competitive and meet customer expectations.
- *Market Analysis:* This price point is chosen based on competitor pricing and what customers are willing to pay for a similar product.

#### Step 3: Calculate Target Cost per Unit

TechNow Ltd. requires a profit margin of 25% on this product.

*Calculating Target Cost:*

$$\text{Target Cost} = \text{Target Price} - \text{Desired Profit Margin}$$

$$\text{Target Cost} = 20,000 - (20,000 \times 0.25)$$

$$= 20,000 - 5,000 = 15,000$$

TechNow Ltd. needs to keep the total cost of producing each smartphone within Rs. 15,000 to meet its profit goal.

#### Step 4: Conduct Cost Analysis

The cost breakdown for the initial design is as follows:

Camera Module: Rs. 4,500

Battery: Rs. 3,000

Processor: Rs. 5,000

Display: Rs. 3,000

Other Components: Rs. 2,000

*Total Initial Cost: Rs. 17,500*

The initial cost (Rs. 17,500) exceeds the target cost (Rs. 15,000) by Rs. 2,500.

#### Step 5: Apply Value Engineering

To bring the cost down to Rs. 15,000, the team looks for ways to reduce costs without compromising quality.

Camera Module: Negotiate with suppliers to reduce the cost to Rs. 4,000.

Battery: Consider a different, but reliable, supplier offering the battery at Rs. 2,500.

Processor: Choose a processor with slightly lower specs but adequate for customer needs, reducing the cost to Rs. 4,500.

Revised Cost Breakdown:

Camera Module: Rs. 4,000

Battery: Rs. 2,500

Processor: Rs. 4,500

Display: Rs. 3,000

Other Components: Rs. 1,000

*Total Revised Cost: Rs. 15,000*

By using value engineering, the team successfully reduces the production cost to Rs. 15,000, aligning it with the target cost.



### 3. Target Costing

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*Value engineering* (VE) is a systematic approach to enhancing the value of a product by analyzing its design, materials, and production processes to reduce costs without compromising quality or functionality. The aim of value engineering is to optimize both the value-added features that customers desire and minimize or eliminate non-value-added costs that do not contribute to the customer's perception of the product's value.

#### Key Components of Value Engineering

In value engineering, costs are broadly categorized as:

- *Value-Added Costs*: These are expenses that directly contribute to the features or attributes that customers find desirable. For instance, in a smartphone, high-quality camera lenses or durable materials for the casing are considered value-added costs because they enhance the functionality and appeal of the product.
- *Non-Value-Added Costs*: These are costs that do not add any perceived value to the product from the customer's perspective. Examples include unnecessary components, overly complex designs, excessive inventory, and costs related to inefficiencies like rework or material waste. In a furniture manufacturing company, for instance, reworking a product due to production defects would be a non-value-added cost.

#### Process of Value Engineering

Value engineering is often applied in the early design stages of product development, where cost reduction is easier to achieve without disrupting production.

Here's how the process typically unfolds:

- *Cross-Functional Collaboration*: Value engineering involves collaboration between different departments—marketing, design, production, engineering, and finance—to understand what customers value most and identify areas for cost reduction.
- *Identify Value-Added and Non-Value-Added Components*: Each component, material, or process is analyzed to determine if it contributes to customer-perceived value. Unnecessary features or redundant steps in the production process are identified for elimination or simplification.
- *Redesigning for Efficiency*: Once non-value-added components are identified, teams work to redesign the product or process to achieve the same functionality with reduced costs. This can include simplifying the design, consolidating parts, or using more cost-effective materials.

#### *Example 1: Value Engineering in Automobile Manufacturing*

An automobile company is launching a new sedan model. Initial designs feature premium upholstery, a high-end sound system, and advanced safety features, all of which add value from the customer's perspective. However, during the value engineering review, the team identifies several non-value-added components, such as:

- Excessive Wiring: The initial design includes complex wiring that could be streamlined. By simplifying wiring systems, the company reduces production time and material costs.
- Redundant Safety Alerts: The vehicle has both visual and audio indicators for certain functions that are not necessary. Eliminating one of these alerts reduces the cost without affecting the car's quality or safety.

The team decides to retain the premium upholstery and high-end sound system as these features contribute directly to customer satisfaction. By eliminating the unnecessary wiring and redundant safety alerts, the company reduces manufacturing costs, enabling a competitive price point without compromising quality.

#### *Example 2: Value Engineering in Consumer Electronics*

A company designing a new washing machine model wants to incorporate high-efficiency washing cycles and durable components that appeal to environmentally conscious customers. During the value engineering process, the team identifies:

- *Expensive Metal Housing*: The initial design uses a costly metal exterior. Switching to a high-quality composite material achieves the same durability at a lower cost.
- *Simplified Control Panel*: The initial design includes multiple buttons for individual functions. The team reduces this to a single touchscreen panel with customizable settings, enhancing user experience and reducing the cost of manufacturing and assembly.

These changes streamline the washing machine's design, reduce manufacturing costs, and still provide a high-quality product that meets customer demands for durability and efficiency.

## 4. Kaizen Costing

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Kaizen Costing refers to the ongoing continuous improvement program that focuses on the reduction of waste in the production process, thereby, further lowering costs below the initial targets specified during the design phase. It is a Japanese term for a number of cost reduction steps that can be used subsequent to issuing a new product design to the factory floor.

**Kaizen, or Continuous Improvement** is a policy of constantly introducing small incremental changes in a business in order to improve quality and/or efficiency (Kaizen means *Change for Better*). This approach assumes that employees are the best people to identify room for improvement, since they see the processes in action all the time. A firm that uses this approach, therefore, has to have a culture that encourages and rewards employees for their contribution to the process. Kaizen can operate at the level of an Individual, or through **Kaizen Groups** or **Quality Circles** which are groups specifically brought together to identify potential improvements. This approach would also be compatible with **Team working** or **Cell Production**, as improvements could form an important part of the team's aims.

Aspect	Target Costing	Kaizen Costing
What?	A procedural approach to determining a maximum allowable cost for a proposed product, assuming a target profit margin.	A mandate to reduce costs, increase product quality, and/or improve production processes through continuous improvement efforts.
Used For?	New products	Existing products
When?	Development stage (includes design)	Primary production stages (introduction and growth); possibly, but not typically, maturity.
How?	Aims at a specific cost reduction objective; used to set original production standards.	Aims at a specified cost reduction objective; reductions are integrated into original production standards to sustain improvements and provide new challenges.
Why?	Large potential for cost reduction because 80–90% of a product's lifelong costs are embedded in design and development stages.	Limited potential for reducing cost of existing products, but useful information for future target costing efforts.
Focus?	All product inputs (material, labor, and overhead) as well as production processes and supplier components.	Focuses on the most effective areas for cost reduction, generally starting with the most costly component and, in more mature companies, including overhead components.

Activities in Kaizen Costing include elimination of waste in production, assembly, and distribution processes, as well as the elimination of unnecessary work steps in any of these areas. Thus, kaizen costing is intended to repeat many of the value engineering steps, continuously and constantly refining the process, thereby, eliminating out extra costs at each stage.

Kaizen was introduced by **Toyota Production System** (book *Toyota Way*), post World War II. In this respect, Dr. W. Edwards Deming gave PDCA (Plan-Do-Check-Act) concept for implementation of Kaizen.

The principles of Kaizen Costing are listed below:

1. The system seeks gradual improvements in the existing situation, at an acceptable cost.
  2. It encourages collective decision making and application of knowledge.
  3. There are no limits to the level of improvements that can be implemented.
  4. Kaizen involves setting standards and then continually improving these standards to achieve long-term sustainable improvements.
  5. The focus is on eliminating waste, improving systems, and improving productivity.
  6. It involves all employees and all areas of the business.
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## 5. Just in Time (JIT) Costing

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Just in time (JIT) production, also known as *lean production*, is a "demand-pull" manufacturing approach that produces each component in a production line precisely when needed by the next step.

In a JIT system, activity at each workstation is triggered by the requirement for its output at the subsequent workstation. This approach starts with customer demand for the finished product, driving demand through each stage back to the sourcing of direct materials at the beginning of production. By aligning production with demand, JIT enables seamless coordination across workstations, facilitating a smooth flow of goods with minimal inventory levels.

The objectives of JIT production are to:

- (1) meet customer demand promptly,
  - (2) ensure high product quality, and
  - (3) minimize total production costs.
- 

## 5. Just in Time (JIT) Costing

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A JIT production system is characterized by several key features:

- *Manufacturing Cells*: Production is organized into manufacturing cells, which consist of all the necessary equipment to produce a specific product. Materials move efficiently from one machine to the next, allowing for various operations to occur in sequence and minimizing materials-handling costs.
  - *Multiskilled Workforce*: Workers in JIT systems are hired and trained to be versatile, capable of handling multiple tasks, including minor repairs and routine equipment maintenance. This flexibility supports the smooth flow of operations and minimizes downtime.
  - *Aggressive Defect Elimination*: With tight links between workstations and minimal inventory at each station, any defects quickly impact the entire production line. This creates an urgency to address and resolve issues immediately, tracing them back to the source and eliminating root causes to prevent recurrence.
  - *Reduced Setup and Cycle Times*: JIT emphasizes reducing setup time (the time needed to prepare equipment and materials for production) and manufacturing cycle time (the time from receiving an order to completing it). Lower setup times make smaller production batches economical, which in turn reduces inventory levels. Reducing cycle times also enables quicker responses to changes in customer demand.
  - *Timely Quality Supplier Deliveries*: Suppliers are chosen based on their ability to provide high-quality materials reliably and on time. JIT production often goes hand-in-hand with JIT purchasing, where suppliers deliver materials directly to the production floor, ensuring seamless integration into the production process.
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## 5. Just in Time (JIT) Costing

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Early proponents of JIT production emphasized its ability to reduce inventory carrying costs. However, lower inventory levels offer additional benefits, such as an increased focus on quality improvement by addressing the root causes of rework, scrap, and waste, as well as reduced manufacturing cycle times. When calculating the relevant benefits and costs of lowering inventories in JIT systems, a cost analyst should consider all associated benefits and costs.

Sunrise Components Ltd., a supplier of mechanical parts, is considering a JIT production system to enhance efficiency and reduce inventory costs. Implementing JIT requires annual tooling costs of Rs. 80,000 to minimize setup times. Sunrise expects that JIT will help reduce average inventory by Rs. 4,00,000, and savings in insurance, storage, materials handling, and setup will add up to Rs. 20,000 per year. The required rate of return on inventory investments is 12% annually. Additionally, JIT improvements are expected to reduce rework costs by Rs. 20,000 and improve quality, allowing for a Rs. 1 price increase on each of 15,000 units sold.

Analysis of Relevant Benefits and Costs

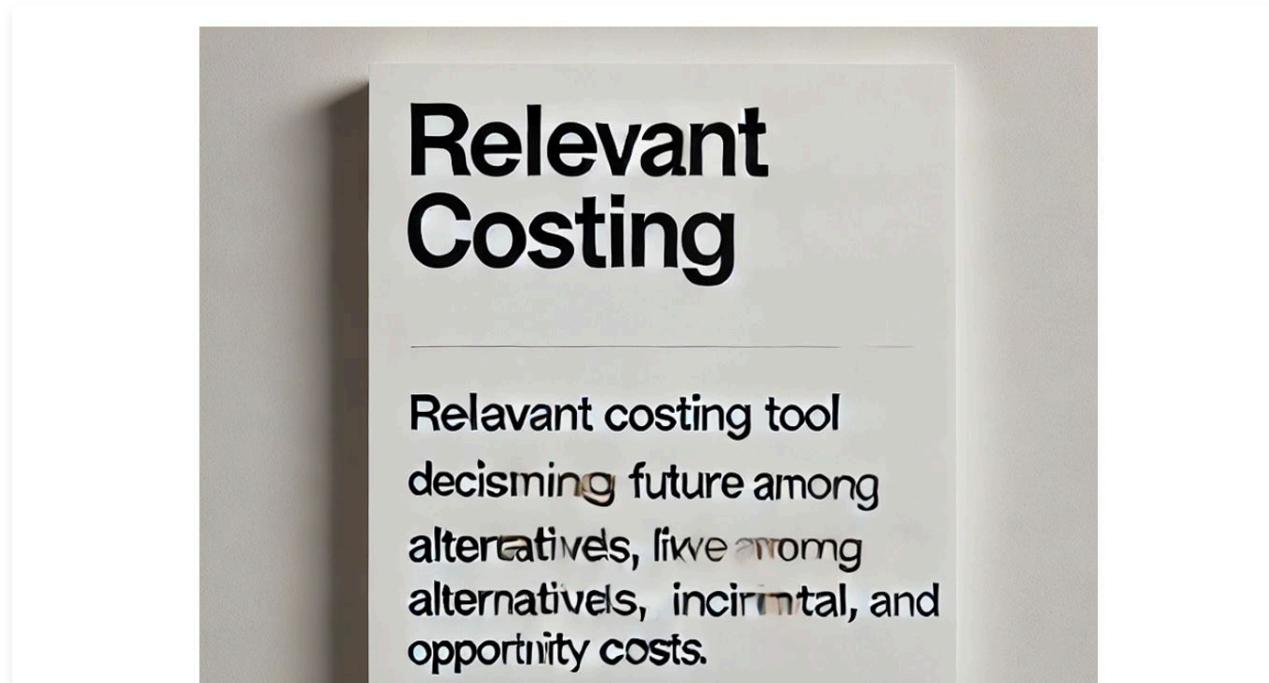
Description	Calculation	Amount (Rs.)
Annual Savings in Insurance, Storage, etc.		20,000
Reduction in Inventory Carrying Costs	12% of Rs. 4,00,000	48,000
Savings from Reduced Rework	500 units x Rs. 40/unit	20,000
Additional Revenue from Improved Quality	15,000 units x Rs. 1/unit	15,000
Total Relevant Annual Savings	Sum of above	1,03,000
Incremental Tooling Cost for JIT Implementation	Annual tooling cost	(80,000)
Net Incremental Benefit	Total Savings - Tooling Cost	23,000

Based on the calculation, Sunrise Components Ltd. should implement the JIT system as it yields a net incremental benefit of Rs. 23,000 annually, considering both direct savings and additional revenue. This approach illustrates how JIT can reduce inventory and operational costs while also enhancing product quality and pricing potential.

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## 1. Relevant Costing

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Relevant Costing helps businesses make effective decisions by focusing only on costs and revenues that will be directly affected by a specific decision. The main principle of relevant costing is to ignore any costs that do not change based on the decision being evaluated. By concentrating on these "relevant" costs, companies can avoid the distraction of irrelevant information and focus on the economic impact of the decision.

Relevant costs are expected future costs, and relevant revenues are expected future revenues that differ among the alternative courses of action being considered. Revenues and costs that are not relevant are said to be irrelevant.

Some of the decision making scenarios involving relevant costs are:

- *Make or Buy Decisions:* In a "make or buy" decision, a company must decide whether to produce a component in-house or purchase it from an external supplier. The relevant costs in this case would include direct materials, direct labor, and any other costs that would change if production were outsourced, such as shipping and quality control costs.
- *Special Order Decisions:* A company might receive a special order from a customer at a reduced price. The relevant costs in this decision would include the direct costs of fulfilling the order (such as raw materials and labor) but would exclude fixed overheads, which are irrelevant as they will be incurred regardless of whether the order is accepted.
- *Add or Discontinue a Product Line:* When deciding whether to add or discontinue a product line, relevant costs include all the expenses that will be avoided or incurred depending on the decision. For example, if a company is considering discontinuing a product, direct costs such as raw materials and labor used in producing that product are relevant, while fixed costs like rent that will continue regardless of the decision are irrelevant.
- *Sell or Process Further Decisions:* In some cases, a company must decide whether to sell a product at its current stage of production or process it further and sell it at a higher price. The relevant costs include the additional processing costs and the potential additional revenue from selling the finished product. The sunk costs incurred up to the current point of production are irrelevant.
- *Equipment Replacement Decisions:* When considering whether to replace old equipment with newer, more efficient equipment, the relevant costs would include the cost of the new equipment, any changes in operating costs, and potential savings from improved efficiency. The original cost of the old equipment, being a sunk cost, would be irrelevant to this decision.

# 1. Relevant Costing

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Key Characteristics of Relevant Costs are listed below:

- *Future-Oriented*: Relevant costs are those that will be incurred in the future as a result of a particular decision. Historical costs or past expenditures, known as sunk costs, are not considered because they cannot be altered by any current or future decision.
  - *Differential Costs*: Relevant costs are often differential costs—those that differ between two or more alternatives. Only the costs that will change depending on the decision being made are considered. If the costs remain the same regardless of the decision, they are irrelevant.
  - *Avoidable Costs*: Relevant costs are avoidable costs, meaning they can be eliminated if a particular course of action is taken. For example, if a company decides to outsource production, the labor and material costs of in-house production would be considered avoidable and relevant to that decision.
  - *Incremental Costs and Revenues*: Relevant costs often include incremental costs, which are additional costs incurred when choosing one option over another. Incremental revenues, the additional income generated by a decision, are also considered relevant.
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# 2. Decision Making Process

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The five-step decision-making process is a structured approach that managers can use to make informed and effective decisions.

Here's a breakdown of each step:

- (i) **Identify the Problem and Uncertainties**: The first step involves clearly defining the problem or opportunity that requires a decision. It's important to identify the root issue and understand any uncertainties or unknowns that could affect the decision. This step ensures that the focus is on solving the right problem.
- (ii) **Obtain Information**: Once the problem is identified, managers gather relevant information and data to help them understand the situation better. This information may include internal data, market trends, customer feedback, financial records, and more. The goal is to collect all necessary inputs to make an informed decision.
- (iii) **Make Predictions About the Future**: After gathering information, managers predict possible outcomes for different scenarios. This involves estimating the potential impact of each option, taking into account both the benefits and the risks. Predicting future consequences helps in assessing how each alternative will affect the business.
- (iv) **Make Decisions by Choosing Among Alternatives**: Based on the predictions, managers evaluate the various options available and select the best course of action. This step requires considering factors such as costs, benefits, risks, and alignment with company goals. The decision-making criteria may vary depending on the situation.
- (v) **Implement the Decision, Evaluate Performance, and Learn**: After making the decision, managers implement the chosen solution. They then monitor the outcomes, measure the performance of the decision, and assess whether the objectives were met. This step also involves learning from the process—what worked well, what didn't, and how to improve future decision-making.

By following this process, managers can make more rational and data-driven decisions, minimize risks, and continuously improve through learning from past experiences.

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### 3. Relevant Factors

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In decision-making, managers must consider all relevant costs and revenues linked to each decision alternative. The relationship between time and relevance plays a key role in this process. As the decision-making time horizon shortens, fewer costs and revenues remain relevant because most cannot be altered by short-term management actions. Over a longer time frame, management can influence nearly all costs.

Costs or revenues are relevant when they are logically connected to a decision and differ between alternatives, either as incremental or differential amounts. **Incremental revenue** (or differential revenue) is the revenue that varies across decision options, while **incremental cost** (or differential cost) is the cost that changes depending on the choice made.

Relevant costing involves comparing the incremental revenues and incremental costs of various alternatives. While incremental costs can be either variable or fixed, the general rule is that most variable costs are relevant, while most fixed costs are not. This is because, within the relevant range, changes in an activity measure (such as sales or production volume) affect total variable costs, but total fixed costs remain constant. However, this rule has exceptions, especially when the decision time horizon is long.

The difference between incremental revenue and incremental cost for a given alternative is the **incremental profit** (or incremental loss) of that course of action. Management can compare these incremental effects to determine the most profitable or least costly alternative.

Some relevant factors, like sales commissions or direct production costs, are easy to identify and quantify as they are tracked in the accounting system. However, other relevant factors, although quantifiable, may not be recorded in the accounting system. These factors should not be ignored just because they are difficult to measure or involve estimates. For example, opportunity costs, which represent the benefits lost when one option is chosen over another, are critical to decision-making but are not reflected in accounting records.

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## 4. Sunk costs

Sunk costs are expenditures that have already been incurred and cannot be recovered, no matter what decision is made in the future. These costs are a result of past actions and should not influence future decisions.

Let's explore this concept using an example involving a company called "EcoCraft Manufacturing."

Two years ago, EcoCraft Manufacturing purchased a production machine for ₹12,00,000 to streamline its operations. Recently, a newer and more efficient machine has become available in the market for ₹10,80,000. This upgraded machine could save the company ₹3,55,000 (over the life of machine) due to lower energy consumption and reduced maintenance costs. EcoCraft is considering replacing its current machine, but if it sells the old machine now, it would only recover ₹8,90,000 through resale.

In this case, the ₹12,00,000 spent on the old machine is a sunk cost. Whether EcoCraft keeps the old machine or replaces it, this amount has already been paid and cannot be altered by any future action. Therefore, the initial purchase price should not play a role in the decision-making process. What matters are the costs and benefits that will arise from this point forward.

The relevant information for EcoCraft's decision includes:

- (i) The resale value of the old machine, which is ₹8,90,000.
- (ii) The cost of the new machine, which is ₹10,80,000.
- (iii) The savings that the new machine would generate, which is ₹3,55,000.

$$\begin{aligned} \text{COST OF NEW MACHINE} &= 10,80,000 \\ \text{RESALE OF OLD MACHINE} &= 8,90,000 \\ \text{NET OUTLAY WITH NEW MACHINE} &= \underline{1,90,000} \\ \text{SAVING FROM NEW MACHINE} &= 3,55,000 \\ \text{INCREMENTAL ADVANTAGE FROM} \\ \text{NEW MACHINE} &= 3,55,000 - 1,90,000 \\ &= \text{Rs } 1,60,000 \end{aligned}$$

If EcoCraft focuses too heavily on the sunk cost of ₹12,00,000, it might resist purchasing the new machine, even if doing so would be financially beneficial. This would be an example of the sunk cost fallacy, where decisions are influenced by past investments that cannot be recovered, rather than focusing on future costs and benefits.

To make a rational decision, EcoCraft should disregard the ₹12,00,000 already spent and instead weigh the future financial benefits of the new machine. By selling the old machine for ₹8,90,000, the company could cover part of the cost of the new machine, and the savings of ₹3,55,000 would improve its operating income in the long run.

This example demonstrates the crucial distinction between relevant and irrelevant costs in decision-making. The sunk cost of ₹12,00,000 is irrelevant because it cannot be changed. The decision should instead be based on the relevant costs, which include the resale value of the old machine and the potential savings from the new machine. By focusing on these future outcomes, EcoCraft can make a more informed and rational decision.

## 5. Make or Buy Decision

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Deciding how to source essential inputs is a critical decision for every business. Traditionally, many companies preferred to manage all operations internally, ensuring that they had full control over the quality and availability of parts and services. However, there has been a growing shift toward outsourcing, where businesses purchase required materials, components, and services from external suppliers rather than producing them in-house.

**Outsourcing** refers to hiring an external, non-affiliated supplier to perform work for a company, often off-site. This process allows businesses to buy products or services from outside vendors rather than manufacture them internally. The decision to outsource, also known as a **make-or-buy decision**, is made only after a careful comparison of internal production costs (including opportunity costs) and external purchase costs, as well as assessing the most efficient use of available resources.

When considering whether to make a product in-house or buy it from an external supplier, the company must ensure that it has the capacity to produce internally or consider the costs associated with acquiring the necessary resources for internal production.

Both quantitative and qualitative factors play a crucial role in this decision-making process.

### Relevant Quantitative Factors

- *Incremental production costs:* The variable costs incurred when producing each additional unit.
- *Cost of purchasing from an external supplier:* This includes the supplier's price per unit, any applicable discounts, shipping fees, and other related expenses.
- *Number of available suppliers:* The availability of alternative suppliers and how competitive the market is for the required goods or services.
- *Production capacity:* The ability of the company to produce the necessary components internally, considering labor, equipment, and time.
- *Opportunity costs:* The potential benefits forgone when facilities are used for internal production instead of other profitable activities, such as producing higher-margin products.
  - Space availability for storing materials or finished goods.
  - Costs associated with inventory management.
  - Potential throughput improvements if components are bought instead of made.

### Relevant Qualitative Factors:

- *Control over quality:* The company's ability to ensure the quality of purchased materials or components meets its standards.
- *Importance of the outsourced work:* How critical the part or service being outsourced is to the overall product or service.
- *Customer impact:* How outsourcing might affect customer satisfaction, brand perception, or market position.
- *Future supplier relationships:* The impact outsourcing might have on future bargaining power with suppliers, particularly in negotiations for price or quality improvements.
- *Perceptions of price fluctuations:* Concerns about potential future price changes, including the risk of rising costs or price instability.
- *Product pricing and dumping concerns:* Whether current supplier prices are fair, and in cases involving international suppliers, whether there are concerns about product dumping—the practice of exporting goods at prices lower than the domestic market price to gain a competitive advantage.

The make-or-buy decision requires careful consideration of both the financial and strategic implications. By weighing these quantitative and qualitative factors, businesses can determine whether producing internally or purchasing from an external supplier is the most cost-effective and beneficial option.

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## 5. Make or Buy Decision

Let's consider an example for BrightHome Furniture, a company that manufactures door handles for custom cabinetry. The company is currently producing its own handle sets but is considering whether it should continue producing the handle sets in-house or purchase them from an external supplier.

The total cost to manufacture one handle set internally is ₹7.90, while the company can purchase each set externally for ₹7.00 from a supplier. BrightHome's cost accountant is conducting an analysis to decide which option is more cost-effective.

Here's the breakdown of the internal cost to produce one handle set:

- Direct Material, Direct labor, and Variable manufacturing overhead: ₹6.20
- Fixed overhead directly related to handle production: ₹0.50
- General fixed overhead (unrelated to the handle production): ₹1.20

Direct Material, Direct labor, and Variable manufacturing overhead (₹6.20) are variable costs incurred for each handle set produced. Direct fixed overhead (₹0.50) is a specific cost that is avoidable if the company decides to stop producing the handles. Therefore, this cost is relevant to the decision.

The remaining fixed overhead (₹1.20) is a common cost not associated with handle production, meaning it will continue to be incurred even if BrightHome stops manufacturing the handles. As such, this cost is irrelevant to the make-or-buy decision.

Let's summarize the relevant costs in a table:

Cost Component	In-House Production (₹)	Purchase from Supplier (₹)
Variable Production Costs	₹6.20	–
Avoidable Fixed Overhead	₹0.50	–
Purchase Price (from supplier)	–	₹7.00
<b>Total Relevant Cost</b>	<b>₹6.70</b>	<b>₹7.00</b>

The relevant cost to produce a handle set in-house is ₹6.70 (₹6.20 for variable production costs plus ₹0.50 for avoidable fixed overhead). The cost to buy the handle set from the external supplier is ₹7.00.

Since producing the handle sets internally costs ₹6.70, and purchasing from the supplier costs ₹7.00, the company will save ₹0.30 for each handle set produced in-house. Thus, BrightHome Furniture should continue to manufacture the handle sets internally rather than outsourcing them, as this will result in a savings of ₹0.30 per set.

The key takeaway here is that in a make-or-buy decision, only the relevant costs—those that can be avoided or incurred based on the decision—should be considered. In this case, the fixed overhead that cannot be avoided (₹1.20) is irrelevant to the decision. Since the total relevant cost of making the handle sets is lower than the cost of purchasing them, it's more cost-effective to continue producing them in-house.

### Opportunity Costs

The opportunity cost of the facilities currently being used for production is also relevant in this decision. If BrightHome Furniture decides to outsource the handle sets, the company would free up its facilities for other, potentially more profitable purposes. In such cases, management should consider whether the available capacity could be better utilized for a more profitable alternative.

Additionally, another opportunity cost associated with continuing in-house production is the consumption of production capacity. By using the facility to produce handle sets, BrightHome may be missing out on the chance to manufacture other, higher-margin products. Therefore, when evaluating the make-or-buy decision, the potential opportunity costs, such as the alternative uses of production capacity, must be factored in along with the direct relevant costs.

## 5. Make or Buy Decision

TechPro Audio manufactures various home audio and theater systems. One critical component in all their products is a speaker module that requires two specific speakers, custom-configured based on the combination of these speakers.

The company incurs the following costs for manufacturing each speaker module:

Cost Component	Amount (₹)
Direct material	₹24
Direct labor	₹16
Variable overhead	₹10
Fixed overhead	₹20

Of the ₹20 per-unit fixed overhead, TechPro can avoid ₹8 if the speaker modules are outsourced to a supplier offering them for ₹56 each. The company currently produces 20,000 speaker modules annually.

Compute the followings:

- Should TechPro Audio outsource the production of the module? Provide calculations.
- TechPro's vice president, estimates that the company can rent out the facilities used for the modules for ₹1,20,000 annually. What should the company do? Provide calculations.
- What qualitative factors should TechPro Audio consider before deciding to outsource the speaker module production?

SOLUTION:

- Should TechPro Audio outsource the production of the module? Provide calculations.

Cost Component	Amount (₹)
Direct material	₹24
Direct labor	₹16
Variable overhead	₹10
Avoidable fixed overhead	₹8
<b>Total Relevant Cost</b>	<b>₹58</b>

In this case, the cost to outsource is ₹56, which is lower than the ₹58 relevant cost to manufacture. Therefore, TechPro Audio should outsource the production of the speaker modules to reduce costs.

- TechPro's vice president, estimates that the company can rent out the facilities used for the modules for ₹1,20,000 annually. What should the company do? Provide calculations.

TechPro Audio's vice president estimates that renting the manufacturing facility could generate ₹1,20,000 annually. This introduces an opportunity cost of ₹6 per module ( $\text{₹1,20,000} \div 20,000 \text{ units}$ ).

Cost Component	Amount (₹)
Relevant manufacturing cost	₹58
Opportunity cost	₹6
<b>Total Relevant Cost</b>	<b>₹64</b>

With the opportunity cost included, the relevant cost of continuing production rises to ₹64 per unit. Since the cost to outsource is only ₹56, the company would be better off outsourcing the production to save ₹8 per unit.

**c. What qualitative factors should TechPro Audio consider before deciding to outsource the speaker module production?**

TechPro Audio should also consider several qualitative factors when making its outsourcing decision, including:

- Quality Control: Will the supplier maintain the same quality standards for the speaker modules?
  - Supply Reliability: How dependable is the supplier in terms of delivery times and order fulfillment?
  - Long-term relationship: Is the supplier financially stable, and can they support long-term business needs?
  - Impact on Employees: What will be the effect on the current workforce? Would layoffs be necessary?
  - Customer Perception: Will customers react negatively if they learn that TechPro is outsourcing an essential part of the production process?
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## 5. Make or Buy Decision

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The following data is given for a firm:

Expected sales 50,000 units

Variable costs Rs. 2.50 per unit

Fixed costs Rs. 1.50 per unit

Selling price Rs. 5.00 per unit

The firm expects to get a special export order for 10,000 units at a price of Rs. 3.75 per unit. Advise whether the export order should be accepted or not.

**SOLUTION:**

Given Data:

Expected Sales: 50,000 units

Variable Cost: Rs. 2.50 per unit

Fixed Cost: Rs. 1.50 per unit (irrelevant for the export order decision)

Selling Price: Rs. 5.00 per unit

Special Export Order: 10,000 units at Rs. 3.75 per unit

Relevant Cost Calculation

For the export order, only the variable costs are relevant, as fixed costs will remain the same regardless of the additional units.

Variable Cost per Unit: Rs. 2.50

Export Order Selling Price per Unit: Rs. 3.75

Contribution per Unit for Export Order: Export Price – Variable Cost = Rs. 3.75 - Rs. 2.50 = Rs. 1.25

Total Contribution from Export Order

Total Contribution = Contribution per Unit × Quantity of Export Order

= Rs. 1.25 × 10,000 = Rs. 12,500

Since the total contribution from the export order (Rs. 12,500) is positive, the firm should accept the export order as it will increase overall profit without affecting fixed costs.

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## 5. Make or Buy Decision

Innerchef is delivering south Indian food in Delhi. The increased demand has caused the firm to think about contracting out some of the activities that, in the past, are done in house. In particular, the firm is considering contracting out the food preparation services to external suppliers.

Currently, the cost of sourcing and purchasing food is about Rs. 1,80,000 per year. The total cost of running the kitchen is Rs. 15,000 per month. The firm rents its store location and all the equipment in the store for Rs. 9,000 per month.

If the firm contracts out the food preparation costs, the firm would operate instead from a small office, which has current rent of Rs. 2,500 per month. It is expected that the rent will increase by 12% after two months. The firm pays a driver Rs. 60,000 per year to drive the van used to pick up food from supplies and deliver the meals to customers. Depreciation on the van amounts to Rs. 3,500 per year and the annual operating costs for fuel and maintenance are Rs. 7,500 per year. The van has a residual value of Rs. 1,000. The van cannot be sold because of current pollution norms.

The prospective external suppliers have quoted a cost of Rs. 5,00,000 per year for preparing and delivering the meals to Innerchef's customers' sites. Based on preliminary discussions with potential customers, the firm believes that by freeing up the time to concentrate more on sales, it can increase its sales by Rs. 1,50,000 per year. The firm has estimated that with the prospective suppliers the contribution margin ratio of any new business would be about 20%. Fixed costs would increase by a negligible amount as sales increase.

Should Innerchef Contract with the External Suppliers?

### SOLUTION:

Note that neither the depreciation on the van nor its salvage value is relevant. Depreciation is based on historical cost, which is a sunk cost, and the firm will not realize the residual value of the van since it can not be sold again. So the residual value of the van is not relevant to this decision.

Note, also, that the cost of the van was a sunk cost for this decision; it would not change as a result of whatever action the firm takes.

An important relevant item is the contribution margin of new business that the firm expects to earn from freeing up its time.

*Current In-House Relevant Costs (Only costs that will be eliminated if contracted out)*

Cost Component	Annual Amount (Rs.)	Relevant (Yes/No)	Reason
Sourcing and purchasing food	1,80,000	Yes	Directly saved if outsourced
Kitchen running costs (Rs. 15,000 × 12 months)	1,80,000	Yes	Directly saved if outsourced
Store rent and equipment (Rs. 9,000 × 12 months)	1,08,000	Yes	Directly saved if outsourced
Driver's salary	60,000	Yes	Saved as delivery is outsourced
Fuel and maintenance	7,500	Yes	Saved as van is no longer needed

Total Relevant In-House Costs (Costs that can be eliminated if outsourced)

$$= 1,80,000 + 1,80,000 + 1,08,000 + 60,000 + 7,500 = \text{Rs.} 5,35,500$$

*Relevant Costs of Contracting Out*

Cost Component	Annual Amount (Rs.)
External suppliers' quoted cost	5,00,000
New office rent after increase	33,000

Total Contracting Out Costs

$$= 5,00,000 + 33,000 = \text{Rs.} 5,33,000$$

*Additional Contribution from Increased Sales*

Expected Increase in Sales (Rs.)	Contribution Margin	Additional Contribution (Rs.)
1,50,000	20%	30,000

*Net Impact Analysis Using Relevant Costs*

Description	Amount (Rs.)
Savings from In-House Relevant Costs	5,35,500
Total Contracting Out Relevant Costs	5,33,000
Additional Contribution from Increased Sales	30,000
<b>Net Benefit of Contracting Out</b>	<b>32,500 (Savings)</b>

Since contracting out results in a net savings of Rs. 32,500 per year, Innerchef should accept the contract with the external suppliers. This decision will reduce costs and generate additional revenue, making it beneficial for the firm.

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## 6. Scarce Resources Decision

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A **scarce resource** is any resource that is critical to production but is available only in limited quantities.

Managers often face the short-term challenge of optimizing the use of scarce resources that are vital to production or service provision but have limited availability.

Common examples of scarce resources include:

- Machine hours,
- Skilled labor hours,
- Raw materials,
- Production capacity,
- Other critical inputs.

In the long term, a company can acquire more of a scarce resource by expanding its operations, such as purchasing additional machinery to increase available machine hours. However, in the short term, management must maximize the efficiency of the currently available scarce resources.

To make the best use of limited resources, managers should base their decisions on the **contribution margin per unit of the scarce resource** for different products or services. This means focusing on the product or service that generates the highest contribution margin for every unit of the scarce resource used.

By allocating scarce resources to the production and sale of the product or service with the highest contribution margin per unit of resource, the organization can maximize overall profitability in the short run.

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## 6. Scarce Resources Decision

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TechPro Electronics manufactures two high-demand products: laptops and tablets. Due to limited availability of "labor hours", the company must decide how to allocate its resources between these two products to maximize its overall profitability.

The following financial and operational data is available for both products:

Product	Selling Price per Unit (₹)	Variable Cost per Unit (₹)	Contribution Margin per Unit (₹)	Labor Hours per Unit
Laptops	₹60,000	₹42,000	₹18,000	8 hours
Tablets	₹30,000	₹20,000	₹10,000	4 hours

TechPro has 4,800 labor hours available for production in the upcoming month. The goal is to determine how to allocate these limited labor hours between the production of laptops and tablets to maximize profitability.

To make the most efficient decision, TechPro must calculate the contribution margin per labor hour for each product. This allows the company to assess which product generates more profit for each labor hour invested.

Contribution Margin per Labor Hour for Laptops = ₹18,000 ÷ 8 = ₹2,250 per hour

Contribution Margin per Labor Hour for Tablets = ₹10,000 ÷ 4 = ₹2,500 per hour

The tablets provide a higher contribution margin per labor hour (₹2,500) compared to laptops (₹2,250). Therefore, TechPro should prioritize producing tablets over laptops, as it earns more profit per hour of labor invested.

This example illustrates how to use contribution margin per scarce resource (in this case, labor hours) to allocate resources effectively and maximize profitability. When multiple constraints are present, companies may need to perform further analysis (using Linear Programming) to optimize production across multiple products.

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## 7. Sales Mix Decisions - Change in Selling Price

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Sales mix refers to the proportion of various products that together constitute a company's total sales.

Several factors influence a company's sales mix, including:

- Product selling prices
- Sales force compensation
- Advertising expenditures

A company must regularly evaluate and adjust the selling prices of its products. The key factors that can drive price changes include:

- Demand fluctuations
- Changes in production or distribution costs
- Economic conditions
- Competitive pressure

In a multiproduct firm, any adjustment in the selling price of one product generally results in a shift in the sales mix due to the economic principle of demand elasticity, where demand responds to changes in price.

While many assume that maximizing unit sales of the product with the highest selling price will lead to the highest profit, this is not necessarily the case. The product with the highest selling price per unit does not always generate the highest contribution margin per unit or per dollar of sales.

### Profit Maximization Strategy

To achieve profit maximization, managers need to consider not only the unit selling price but also each product's sales volume and contribution margin per unit. The ultimate goal is to maximize the company's **total contribution margin**, which is the sum of the contribution margins generated by all the products in the firm's portfolio.

For example, if a company manufactures two products, "Product A" and "Product B," simply focusing on selling more of Product A (which has a higher selling price) might not always be the most profitable option if Product B contributes more to overall profitability. Thus, total contribution margin (not per-unit contribution) is the key metric when making decisions that impact the sales mix.

When a company considers raising or lowering prices, there are several **quantitative factors** that must be analyzed to ensure the pricing decision aligns with profit goals:

- New contribution margin per unit after the price change.
- Short-term and long-term changes in demand for the product and overall production volume resulting from the price adjustment.
- Best use of the company's scarce resources, such as production capacity or labor, when shifting the sales mix.

For instance, lowering the price of a product might increase demand and sales volume, but it's essential to determine whether the new price maintains a strong enough contribution margin to make the increase in sales worthwhile.

In addition to the numbers, **qualitative factors** also play an important role in pricing decisions. These factors may not have a direct financial impact but can significantly affect the company's long-term market position and customer relationships:

- Customer goodwill: How price changes might affect the way customers perceive the company. A drastic price increase, for example, could hurt the brand's reputation.
- Customer loyalty: Will the new pricing structure damage or strengthen customer loyalty to the company's products?
- Competitor responses: How competitors might react to the price change. For instance, a price cut might trigger price wars, which can erode profitability across the industry.