Department of Commerce

University of Calcutta

Study Material

Cum

Lecture Notes

Only for the Students of M.Com. (Semester IV)-2020

University of Calcutta

(Internal Circulation)

Dear Students,

Hope you, your parents and other family members are safe and secured. We are going through a world-wide crisis that seriously affects not only the normal life and economy but also the teaching-learning process of our University and our department is not an exception.

As the lock-down is continuing and it is not possible to reach you face to face class room teaching. Keeping in mind the present situation, our esteemed teachers are trying their level best to reach you through providing study material cum lecture notes of different subjects. This material is not an exhaustive one though it is an indicative so that you can understand different topics of different subjects. We believe that it is not the alternative of direct teaching learning.

It is a gentle request you to circulate this material only to your friends those who are studying in Semester IV (2020).

Stay safe and stay home.

Best wishes.

Paper CC 402:

Strategic Cost and Management Accounting (SCM)

CC 402
STRATEGIC COST AND MANAGEMENT ACCOUNTING

MODULE I
Unit 1: Introduction

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

One of the most comprehensive definitions of Management Accounting given by the International Federation of Accountants (IFAC) is 'the process of identification, measurement, accumulation, analysis, preparation, interpretation and communication of information both financial and operating used by management to plan, evaluate and control within the organization and to assure use of and accountability for its resources'.
Therefore, management accounting identifies, measures, accumulates, analyses, prepares, interprets and communicates both financial and non-financial information to the management in performing its functions effectively.

Strategic management accounting helps formulating superior strategies by providing relevant information to the management.

Unit 2: Tools of Strategic Cost Management

a) Activity-based Costing
b) Life Cycle Costing
c) Target Costing
d) Quality Costing

a) Activity-based Costing (ABC)

Accurate cost information is required for different strategic decision making. It has become much relevant in a highly competitive globalised business environment. Activity based costing helps apportioning overhead, which is gradually increasing now-a-days, properly tracing the costs to the products/services.

Traditional Cost Systems vs. ABC

Traditional systems measure accurately volume-related resources like direct labour, materials, energy and machine-related costs. However, many support activities such as material handling, material procurement, set-

ups, production scheduling, etc. are not volume related. Traditional volume based product cost systems, which assume that products consume all resources in proportion to their production volumes, thus report distorted product costs.

On the other hand, under ABC system it is considered that activities cause costs and that products (and customers) create the demands for the activities. ABC system recognizes that businesses must understand the factors that drive each major activity, the cost of activities and how activities relate to products.

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

Unit-related activities are performed each time a unit of the product is produced.

Batch-related activities are performed each time a batch of goods is produced, e.g., setting up a machine.

Product-sustaining activities are performed to support different products in the product line.

One additional expense category that cannot be directly attributed to individual products may be identified as ***Facility-sustaining activities.*** They are performed to sustain a facility's general manufacturing process.

FACTORS INFLUENCING APPLICATION OF ABC

In case of *high volume of overhead expenditure and product diversity or complexity* involving different activities in different proportions, the cost ascertainment under traditional costing system may be misleading. ABC system would help tracing costs more accurately linking costs with the activities that drive such costs.

ACTIVITY BASED MANAGEMENT

ABC analysis may reveal true costs; hence, true profitability of the products, and management may take appropriate actions to increase the profitability. Some of the actions that may be taken to increase the profitability are:

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

The actions mentioned above, if implemented successfully, will reduce the resources required to manufacture products and to provide service to the customers.

Example 1. *Product I* *Product II*

Production (units)	*50*	*100*
Inspection per product line	*25*	*5*
Machine hours per unit	*15*	*20*

Total budgeted inspection costs Rs. 33,000

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

Solution:

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

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

(b) Cost per inspection: Total inspection costs / No. of inspections = 33,000 / 30 = 1,100

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

Example 2: A company produces two products: X and Y. Both the products are produced on the same equipment and use the similar processes. Consider the following data.

	Machine hrs Per unit	*Direct Labour hours per unit*	*Actual output (units)*	*No. of Purchase orders*	*No. of set-ups*
Product X	*2*	*4*	*1000*	*80*	*40*
Product Y	*2*	4	10000	160	60

Cost of the activities:

Soln. Volume-related Rs. 1,10,000; Purchase-related Rs. 1,20,000; Set-up-related Rs. 2,10,000

(a) Traditional System:
Cost center allocated costs : 110000 + 120000 + 210000 = 4,40,000
Machine hour rate: 440000/(1000 x 2 + 10000 x 2) = Rs. 20
Direct labour hour rate: 440000/(1000 x 4 + 10000 x 4) = Rs. 10
Overhead costs per unit of--
X: Rs. 20 X 2 or Rs. 10 x 4 = Rs.40
Y: Rs. 20 X 2 or Rs. 10 x 4 = Rs.40
Total costs allocated – X: 1000 units x 40 = 40,000; Y: 10000 x 40 = 4,00,000

(b) ABC System:

	Activities		
	Volume-related	Purchasing-related	Set-up-related
Costs traced to activities(Rs.)	1,10,000	1,20,000	2,10,000

Consumption of activities 22000 240 100 set-ups
(cost drivers) mach. hrs. purchase orders
Cost per unit of consumption (Rs.) 5 500 2100
Cost traced to products:
X (1000 units) 2000x5=10000 80x500=40000 40x2100=84000
Y (10000 units) 20000x5=100000 160x500=80000 60x2100=126000
Overhead cost per unit: X = (10000 + 40000 + 84000)/1000 = 134
Y = (100000 + 80000 + 126000)/10000 = 30.60

b) Life Cycle Costing

Life Cycle Costing aims at cost ascertainment of a product over its projected life.
It is a system that traces and accumulates the actual costs and revenues attributable to cost object from its introduction to its abandonment. It is also known as cradle-to-grave costing and womb-to-tomb costing which conveys the meaning of fully capturing all costs associated with the product from its initial to final stages, from initial R&D on a product to when customer servicing and support is no longer offered for the product.

Phases in Product Life Cycle:

The four phases in the product Life Cycle are — (a) Introduction (b) Growth (c) Maturity and (d) Decline.

Importance of Life Cycle Costing

- Life cycle costing involves tracing of costs and revenues of each product over their life cycle. Costs and revenues can analysed by time periods. The total
magnitude of costs for each individual product can be reported and compared with product revenues generated in various time periods.
- Life Cycle Costing focuses on recognizing both production and non-production costs. Non-production costs like R&D; design; marketing; distribution; customer service etc. as well as all production costs are considered in Life Cycle Costing.
- Based on a more accurate and realistic assessment ot revenues and costs over the life cycle of a product, better cost control / cost reduction decisions, pricing decisions, etc. can be taken.
- Life Cycle Costing provides scope for analysis of long term picture of product line profitability, feedback on the effectiveness of life cycle planning and cost data to clarify the economic impact of alternatives chosen in the design, engineering phase etc.

Example:

	Year 1 (Rs.)	Year 2 (Rs.)	Year 3 (Rs.)	Year 4 (Rs.)	Total (Rs.)
(a) Pre-production costs: R&D, Design, etc.	1000	--	--	--	1000
(b) Manufacturing Costs	1000	2000	3000	1100	7050
(c) Marketing, Distribution, After-sales service costs	200	500	700	50	1500
(d) End of life costs	--	--	--	50	50
(e) Production and Sales (units)	**200**	**500**	**1000**	**50**	**1750**
(f) Year-wise total costs (Rs.) [a+b+c+d]	2200	2500	3700	1200	**9600**
Year-wise per unit costs [f / e]	11.00	5.00	3.70	24.00	
Life Cycle Costs per unit (Rs.) [Total costs over the life cycle / total production over the life cycle]					9600/ 1750 = **5.486**

C) Target Costing

Target Costing is defined as a structured approach in determining the cost at which a proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated selling price.

Target Costing is a device to continuously control and reduce costs, and manage profit over the life cycle of a product. Target Costing initiates cost management at the earliest stages of product development and applies it throughout the product life cycle by actively involving the entire value chain.

Under traditional costing system,

Expected Selling Price = Estimated Cost + Required Profit

But under Target Costing System,

Target Cost = Target Selling Price – Target or Required Profit.

If it is found that the product cannot be manufactured at the target costs, initiatives will be required to achieve the target costs through applying different cost control and cost reduction techniques. Value engineering and value analysis may be used to identify innovative and cost effective product features in the planning and concept stages. Design may be changed for reduction of costs.

Steps in Target Costing

Target Costing is viewed as a part of an overall Profit Management Process, rather than simply a tool for cost Reduction and Cost Management.

- The customer requirements as to the functionality and quality of the product are to be ascertained.
- The design of the product based on customer's tastes, expectations and requirements is to be specified. However the need to provide improved products, without significant increase in prices, should be recognized as charging a higher price may not be possible in competitive conditions.
- The Target Selling Price is to be determined considering offers of competitors, product utility, prices, target sales volume, etc.
- Since profitability is critical for survival, a Target Profit Margin is to be established.
- The difference between the Target Selling Price and Target Profit Margin indicates the "Allowable Cost" for the product.
  Ideally, the Allowable Cost becomes the "Target Cost for the product". However, the Target Cost may exceed the Allowable Cost, in light of the realities associated with existing capacities and capabilities.
- The "Current Costs" for producing the product is to be estimated.
- The difference between Current Cost and Target Cost indicates the required cost reduction.
  The total target is broken down into its various components, each component is studied and opportunities for cost reductions are identified. These activities are referred to as a) Value Engineering (VE) and b) Value Analysis (VA).

Illustration

A manufacturing company, operating at 50% of its capacity, manufactures its products at Rs. 1500 per unit (60% variable) and sells its product at Rs. 2000 per unit. Due to competition, its competitors are likely to reduce price by 10%. The company wants to respond aggressively by reducing price by 25% and expects that the present volume of 1,00,000 units p.a. will increase to 2,00,000. The company wants to earn a 20% target profit on sales. Determine Target Cost per unit and prepare a Target Product Profitability Statement.

Solution:

Particulars	Existing
Total Production and Sales (units)	100000
Total Costs per unit (Rs.)	1500
Total Sales (Rs.)	20,00,00,000
Total Costs (Rs.)	15,00,00,000
Total Profit (Rs.)	5,00,00,000

Particulars		Target	
Total Production and Sales (units)		200000	
Target Selling Price per unit (Rs.)		1500	
Total Profit per unit (Rs.) [20% of Rs.1500]	300		
Target Cost per unit [Target S.P. – Target Profit]		1200	
Target Product Profitability Statement	Total		Per unit
Total Sales (Rs.)	30,00,00,000		1500
Total Costs (Rs.)	24,00,00,000		1200
Total Profit (Rs.)	6,00,00,000		300

d) Quality Costing

Quality costs are the aggregate of costs of maintaining quality and costs for not maintaining quality.
Total quality costs can be classified initially into two categories: Conformance Costs (costs of maintaining quality) and Non-conformance Costs (costs for not maintaining quality).
Conformance costs may be classified into two: Prevention Costs and Appraisal Costs
Non-conformance costs may be classified into two: Internal Failure Costs and External Failure Costs.
Impact of external failure costs is the highest as it will lead to dissatisfaction of the customers, loss of goodwill and loss of future sales**.**
Total quality costs may be reduced if proper amount of prevention costs are incurred as it will take of other costs. It will help reducing costs as well as improving quality of the product by preventing / reducing defects in the products. Target is zero defect and total quality costs will be minimum when non-conformance costs will be zero, i.e., failure is zero or nil.

Unit 3: PERFORMANCE MEASUREMENT

Organisations traditionally used financial measures for evaluating overall organisaional performance and a few non-financial measures for supplementing financial measures. Non-financial measures like quality, productivity, etc., not only provide an explanation to current performance but also are potential indicators of future performance. Unfortunately, very few orgnisations have undertaken a systematic consideration of how non-financial measures such as quality or productivity rates affect profitability levels.

PERFORMANCE MEASUREMENT TECHNIQUES

I. **Return on Investment (ROI):** ROI, also known as accounting rate of return, expressed as a ratio between accounting measure of income and accounting measure of investment, is the most popular approach of measuring financial performance of a business organisation. However, income (the numerator) and investment (denominator) may be defined in many ways. Income may mean earnings before interest and taxes (EBIT) or earnings after taxes. Similarly, investment may mean total assets employed or net assets employed (total assets employed minus current liabilities). For measuring the performance of the organization as a whole, EBIT and Net Assets may be taken into consideration and for measuring performance of a subunit, total assets employed in that subunit may be considered as investment base in order to obviate the possibility of inflating ROI by

decreasing the investment base (through increasing current liabilities that may be influenced by the manager of the subunit concerned). However, to avoid confusion, two ratios – one based on total assets (ROTA) and the other based on net assets (RONA) may be used.

ROI (based on total assets) = EBIT ÷ Total Assets

ROI (based on net assets) = EBIT ÷ Net Assets

Net Assets = Total Assets – Current Liabilities

ROI may be expressed as a product of *Profitability* (income divided by sales) and *Turnover* (sales divided by investment) with a view to providing more insight into performance recognizing the two basic ingredients in generating and increasing income: (i) increasing income per unit of sales value (Profitability) and (ii) using assets (investments) to generate more revenues (Turnover).

ROI = Profitability x Turnover = (EBIT ÷ Sales) x (Sales ÷ Total Assets or Net Assets)

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

Example:

	Division A Rs.	Division B Rs.
Sales	100000	150000
EBIT	25000	30000
Investments	50000	50000

Return on Investment (ROI) = EBIT ÷ Investment
Division A: 25000 ÷ 50000 = 0.50 or 50%
Division B: 30000 ÷ 50000 = 0.60 or 60%
ROI may be shown as product of Profitability and Turnover i.e., P x T

	Profitability (P) (EBIT ÷ Sales)	Turnover (T) (Sales ÷ Investment)	ROI = PxT
Division A	25000 ÷ 100000 = 0.25	100000 ÷ 50000 = 2	0.25 x 2 = 0.50
Division B	30000 ÷ 150000 = 0.20	150000 ÷ 50000 = 3	0.20 x3 = 0.60

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

However, ROI suffers from certain limitations that must be kept in mind while using the measure for evaluating performance and controlling the activities of the subunits or managers of the subunits. ROI being a ratio, it suffers from all the limitations applicable to the ratio analysis. While evaluating and controlling the performances

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

II. Residual Income (RI) and Economic Value Added (EVA)

RI is the difference between Net Income before Taxes (NIBT) and Capital Charge. Capital Charge is usually taken as the product of Opening Capital Employed and the Risk-adjusted Cost of Capital (also known as Required Rate of Return). Therefore, RI may be expressed as follows:

RI = NIBT (or EBIT) – Required Rate of Return x Opening Capital employed.

The move towards the RI measure received even greater publicity when it was renamed into a far more accessible and acceptable term – **Economic Value Added (EVA)** – by the Stern Stewart Consulting organization.

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

EVA = NOPAT (before Interest on Debt) – WACC x Average Capital Employed …… (i)

= Avg.CE $\{$(NOPAT ÷ Avg.CE) – WACC)$\}$

= Avg. CE (Return on Capital – Cost of Capital)

= Avg.CE x Spread …… (ii)

Differences between RI and EVA

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

(i) RI is calculated on the basis of 'Before Tax Income' while EVA is determined on the basis of 'After Tax Income';

(ii) n case of RI, 'Required Rate of Return' used for calculating 'Capital Charge', which may be WACC or may be somewhat different depending on the adjustment for risk factor, but only WACC is considered for EVA.

(iii) For RI, generally total assets is used but for EVA net assets is used.

Example:

EBIT	Rs. 200000
10% Debentures	Rs. 100000
Shareholders' Equity	Rs. 500000
Current Liabilities	Rs. 50000
Risk-free rate of return	6%
Market rate of return	15%
Beta factor (β)	1.2
Tax Rate	40%

Calculate ROI, RI and EVA.

Solution:

ROI

Return on Total Assets = EBIT/ Total Assets = Rs. 200000/ Rs. 600000 = 0.3333 or 33.33%

Return on Net Assets = EBIT / Total Assets = Rs. 200000/ Rs. 550000 = 0.3636 or 36.36%

Residual Income (RI) =

NIBT (or EBIT) – Required Rate of Return x Opening Capital employed

= Rs. 200000 – 15.2% of Rs.600000 = **Rs.108800**

[In absence of information relating to the required rate of return, weighted average cost of capital has been taken as required rate of return.]

EVA = NOPAT (before Interest on Debt) – WACC x Average Capital Employed

Net Operating Profit After Tax (NOPAT) = Rs.200000 – 40% of Rs.100000 = Rs.160000

Cost of Debt Capital = 12% (1 – tax rate) = 12% (1 – 0.40) = 7.2%

Cost of Equity (under CAPM) = Risk-free rate + β(Market rate – Risk-free rate)

= 6% + 1.2(15% -- 6%) = 6% + 10.8% = 16.8%

Weighted average cost of capital = (16.8% x 500000 + 7.2% x 100000) ÷ 600000

= (84000 + 7200) ÷ 600000 = 0.152 or 15.2%

Net Assets = Rs (500000 + 100000 – 50000) = Rs.550000

Therefore, **EVA** = Rs.160000 – 15.2% of Rs.550000 = **Rs.61200**

III. Balance Scorecard (BSC)

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

Balanced Scorecard help measure how the business units create value for current and future customers, how they must develop and increase internal capabilities, and the investment in people, system, and procedures necessary to improve future performance. The Balanced Scorecard incorporates both financial and non-financial perspectives into its fold and captures the critical value creating activities. Hence, a properly constructed *Balanced Scorecard* may be used in measuring total business unit performance.

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

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

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

In the Customer Perspective, the customer and market segment in which the business unit competes, and the business unit's performance in the targeted segments are identified.

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

The fourth perspective, Learning and Growth, identifies the infrastructure that the organization must build to create long-term growth and improvement.

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

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

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Suggested Readings:

- Banerjee, B., Cost Accounting, PHI, New Delhi
- Banerjee, B., Financial Policy and Management Accounting, PHI, New Delhi
- Drury, C., Management and Cost Accounting, Chapman & Hall, London,/ Thomson Learning
- Horngren, Foster and Datar, Cost Accounting – A Managerial Emphasis, PHI, New Delhi
- Hilton, R.W., Managerial Accounting, Tata McGraw-Hill, New Delhi
- Kaplan, R.S., and Atkinson, A.A., Advanced Management Accounting, PHI, New Delhi

Paper CC 402: Strategic Cost and Management Accounting (SCM)

Module –I

Transfer Pricing

(Prof. Ashish Kumar Sana)

A transfer price is the amount charged when one division of an organization sells goods or services to another division.

Transfer pricing is the determination of an exchange price for a product or service when different business units within a firm exchange it. The products can be final products sold to customers or intermediate products. This determination of transfer price is desirable from both a management perspective and tax purposes. Transfer of goods and services between business units is most common in firms with a high degree of vertical integration. Vertically integrated firms engage in a number of different value-creating activities in the value chain (Blocher, Chen, Cokins and Lin, 2006).

Objectives of Transfer Pricing

i) To motivate managers

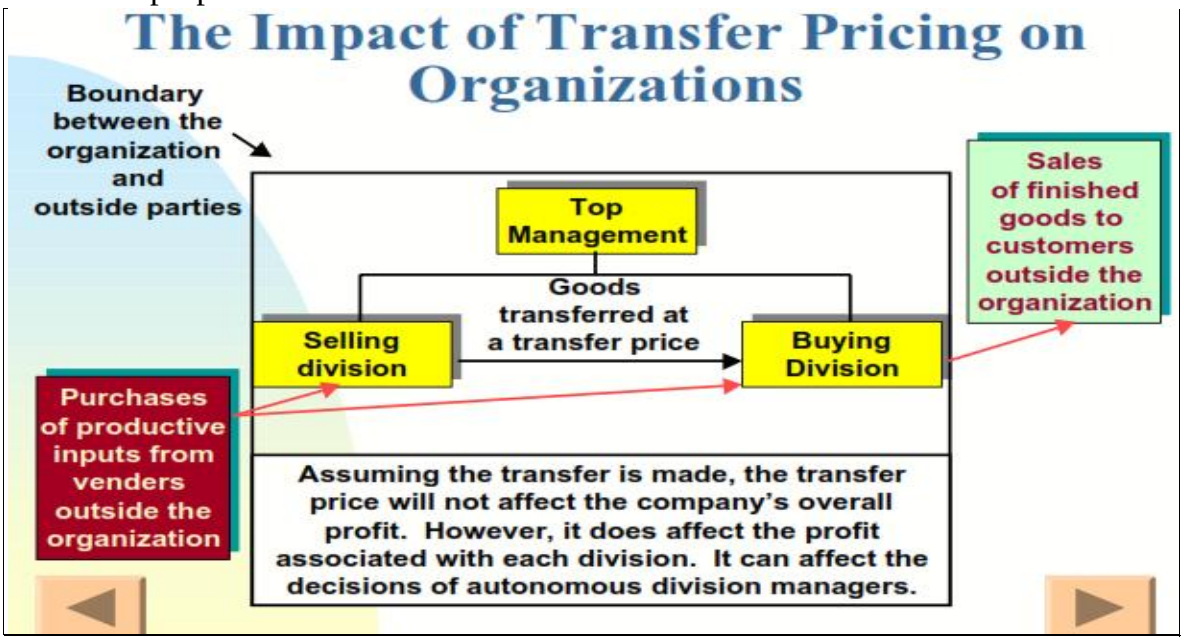
ii) To provide an appropriate incentive for managers to make decisions consistent with the firm's goals

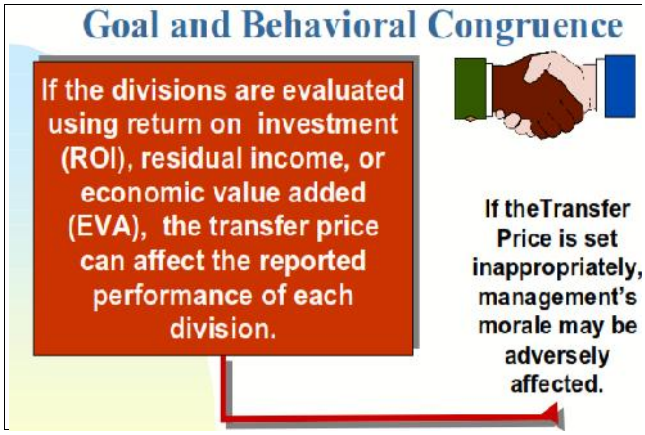
iii) To provide a basis for fairly rewarding the managers

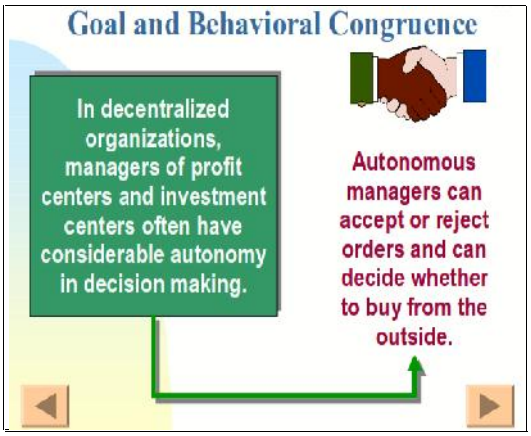
iv) To develop strategic partnerships.

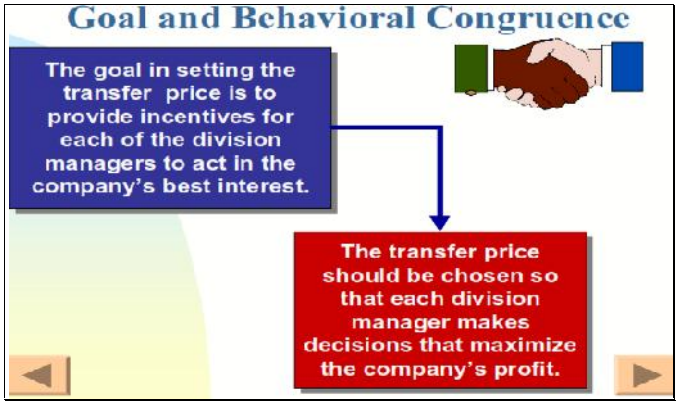
A relatively high transfer price might also be used to encourage internal units to purchase from an external supplier, to encourage an external business relationship the firm wants to develop because of the supplier's quality, or to gain entrance to a market in a new country (Blocher, Chen, Cokins and Lin, 2006).

International Transfer Pricing Objectives

- Minimiation of customs charges
- Currency restrictions
- Risk of Expropriation
- 

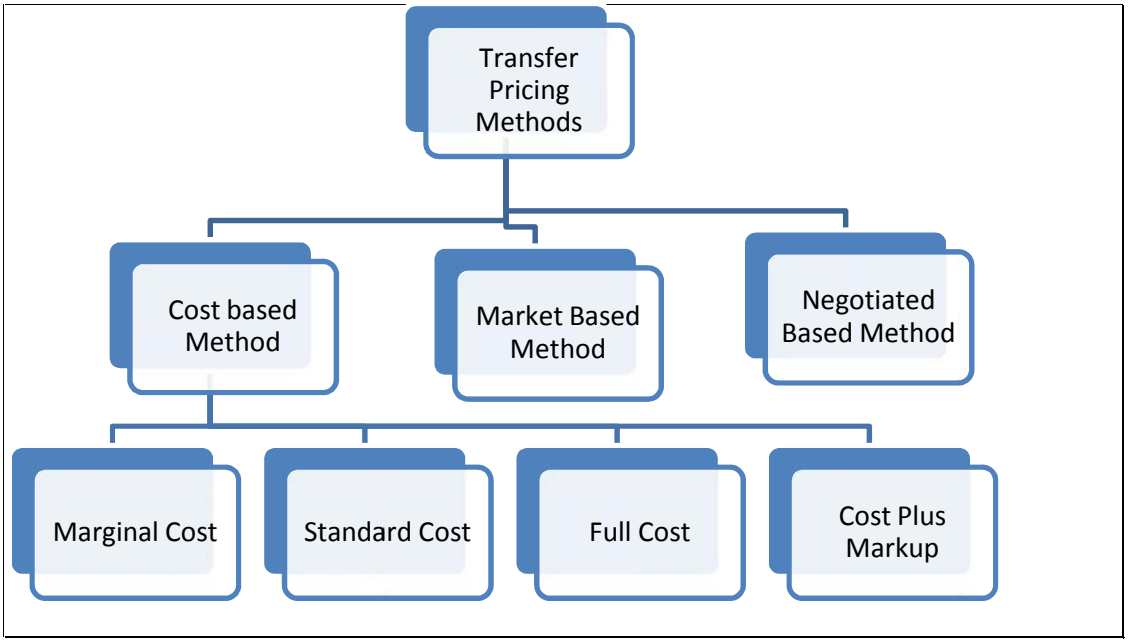






Source: Hilton Ronad W., (2005), *Managerial Accounting*, Tata McGraw Hill, P557

Transfer Pricing Methods



Transfer Pricing Decisions

1. When the supplying division has excess capacity, the range of transfer price would be

   (a) Minimum Transfer Price= Marginal Cost per Unit

   (b) Maximum Transfer Price=Lower of Net Marginal Revenue and the External Buy-in-Price

2. When the supplying division operates at full capacity, the range of transfer price would be

   (a) Minimum Transfer Price= Marginal Cost per Unit + Opportunity Cost per Unit

   (b) Maximum Transfer Price=Lower of Net Marginal Revenue and the External Buy-in-Price

Example:

Division X is a profit centre, which produces four products P, Q, R, S. Each product is sold in the external market also. Following information is available for the period:

Particulars	P	Q	R	S
Market price p.u. (Rs.)	700	690	560	460
Variable Cost p.u. (Rs.)	660	620	360	370
Labour hours required p.u.	3	4	2	3

Product S can be transferred to Division Y but the maximum quantity that might required for transfer is 2000 units of S.

The maximum sales in the external market are:

P	3000 Units
Q	3500 Units
R	2800 Units
S	1800 Units

Division Y can purchase the same product at a slightly cheaper price of Rs.450 p.u. instead of receiving transfers of product S from Division X.

What should be the transfer price for each unit for 2000 units of S, if the total labour hours available in Division X are: (i) 24,000 hours and (ii) 32,000 hours?

Solution:

Calculation of Ranking of Products when availability of time is the key factor

No	Particulars	P	Q	R	S
1	Market price p.u. (Rs.)	700	690	560	460
2	Less: Variable Cost p.u. (Rs.)	660	620	360	370
3	Contribution p.u. (1-2)	40	70	200	90
4	Labour hours required p.u.	3	4	2	3
5	Contribution per hour (3÷4)	13.33	17.50	100	30
6	Ranking	IV	III	I	II

Situation 1 : When labour hours available in Division X is 24, 000 hours

Statement showing product mix

Product (Ranking)	Maximum Demand (Units)	Hours p.u.	Units Produced	Hours Used	Balance Hours
R	2800	2	2800	5600	(24000-5600)=18400
R	1800	3	1800	5400	(18400-5400)=13000
Q	3500	4	3250	13000	(13000-13000)=0
P	3000	3	0	0	0

Statement showing Transfer Price for each unit for 2000 units of Product S

Transfer Price	2000 units of product S (Rs.)	Per unit of Product S (Rs.)
Variable Cost (Rs.)	7,40,000	370
Opportunity Cost of the Contribution foregone by not producing 1,500 units of Q (1500 units ×Rs.70)	1,05,000	52.50
Transfer price	8,45,000	422.50

Note: Time required to meet the demand of 2,000 units of Product S for Division Y is 6000 hours. This requirement of time viz. 6,000 hours for providing 2,000 units of Product S for Division Y can be met by sacrificing the production of 1,500 units of Product Q (1500 units ×4 hours).

Situation 2 : When labour hours available in Division X is 32, 000 hours

Statement showing product mix

Product (Ranking)	Maximum Demand (Units)	Hours p.u.	Units Produced	Hours Used	Balance Hours
R	2800	2	2800	5600	(32000-5600)=26400
R	1800	3	1800	5400	(26400-5400)=21000
Q	3500	4	3500	13000	(21000-14000)=7000
P	3000	3	2333	0	(7000-7000)=0

Statement showing Transfer Price for each unit for 2000 units of Product S

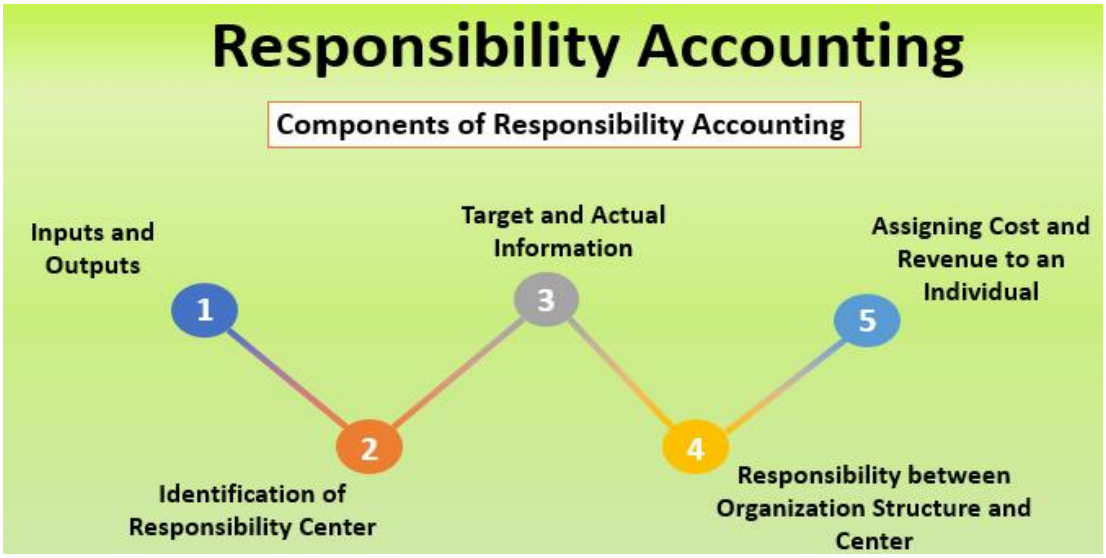
Transfer Price	2000 units of product S (Rs.)	Per unit of Product S (Rs.)
Variable Cost (Rs.)	7,40,000	370
Opportunity Cost of the Contribution foregone by not producing 2,000 units of P (2000 units ×Rs.40)	80,000	40.00
Transfer price	8,20,000	410.00

Note: Time required to meet the demand of 2,000 units of Product S for Division Y is 6000 hours. This requirement of time viz. 6,000 hours for providing 2,000 units of Product S for Division Y can be met by sacrificing the production of 2,000 units of Product P (2000 units ×3 hours).

Unit 7: Responsibility Accounting and Reporting

Responsibility Accounting:

"Responsibility accounting collects and reports planned and actual accounting information about the inputs and outputs of responsibility centres" (Anthony and Welsch, 1977). So, it is a device to measure divisional performance of an organisation.



(Source: https://www.wallstreetmojo.com/responsibility-accounting/)

Features of Responsibility Accounting:

i) **Inputs and Outputs**: Responsibility accounting is based on cost (inputs) and revenues (outputs) data for financial information.

ii) **Planned and Actual**: For financial planning and control of an organisation, it is not only contains historical information about costs and revenues, but also estimated future cost and revenue data.

iii) **Responsibility Centres**: Responsibility accounting focuses on responsibility centres. Responsibility Centre is a unit or sub-unit of an organization. There is a manager for each centre who is responsible for each centre.

Types of Responsibility Centre:

Responsibility centres of an organisation are generally categorized into (a) Cost Centres; (b) Profit Centres; (c) Investment Centres

Cost Centres

A Cost/ Expense centre is a responsibility centre in which inputs, but not outputs, are measured in monetary terms" (Anthony and Welsch, 1977). In a cost centre of responsibility, the accounting system records only the cost incurred by the centre but the revenues earned are excluded. The implication of cost centre is that the performance of the divisional manager will be judged on the basis of the cost incurred in his department or division. The analysis of performance is restricted to the consumption of resources in the division. In other way, the performance measure in a cost centre is the efficiency of operation in that centre in terms of quantity of inputs used in producing some given output *(Source: Khan & Jain, Management Accounting).*

The cost centre can be employed in three situations:

Situation 1: In several cases, the output (revenue) of a responsibility centre cannot be reliably measured in financial terms such as legal advice, good public relations, reliable accounting reports and better qualified personnel. Their outputs cannot obviously be expressed in monetary terms. The only measurable performance is their efficiency in the use of inputs. These can be evaluated only as expense centres it staff units or divisions.

Situation 2: If a production centre is producing one single product, its performance can be measured as cost centre in terms of efficiency and effectiveness. Although, the output cannot be expressed in monetary terms, the number units produced can reasonably represent output. So, a comparison of the actual number of units produced of a single product with the units produced I some previous period would measure divisional effectiveness. *(Source: Khan & Jain, Management Accounting).*

Situation 3: A cost centre can also be suitably employed to measure performance if the responsibility of the departmental manager is to produce a stated quantity of outputs at the lowest feasible costs (J.M. Fremgen, Accounting for Managerial Analysis, 1976, p328)

Cost Centre Evaluation Technique **(Applicable to Manufacturing,**	1. Variance analysis 2. Job Order System

product-line, marketing, function or other segments)	3. Processing Costing System

Profit Centres:

A profit centre is a responsibility centre in which inputs are measured in terms of expenses and outputs are measured in terms of revenues " (Anthony and Welsch, 1977, Management Accounting). Both costs and revenues of the centre are accounted for in this centre. Profit analysis can be used as a basis for evaluating the performance of a divisional manager. Management can determine whether the division was effective in attaining its objectives or not. This objective is presumably to earn a "satisfactory profit". The performance of the managers is measured by profit. In other words, managers can be expected to behave as if they were running their own business. For this reason, the profit centre is good training for general management responsibility.

As a measurement of performance, profit centre can be used (i) for evaluation and ranking of profit centres (ii) as a basis for decisions to modify operations of profit centres.

Investment Centres:

A investment centre is a responsibility centre in which inputs are measured in terms of costs/expenses and outputs are measured in terms of revenues in which assets employed are also measured " (Anthony and Welsch, 1977, Management Accounting).

Investment centres consider not only cost and revenues but also the assets used in the division. As a responsibility centre, the performance of a unit would be measured in relation to the revenues/profits and the assets employed in a division. The measure of performance in an investment centre is based on the relationship between the segment profit contribution and segment assets. There are two ways to relate segment profit contribution to segment resources: (i) Segment Rate of Return on Investment (SROI)

(ii) Segment Residual Income

Segment Rate of Return on Investment (SROI)

(1) Segment Rate of Return on Investment (SROI) =

$$\frac{Segment\ Profit\ Contribution\ (SPC)}{Segment\ Resources/Assets(SR/SA)} \times 100$$

(2) Segment Rate of Return on Investment (SROI) =

$$\frac{SPC}{Segment\ Sales\ Revenue} \times \frac{Segment\ Sales\ Revenue}{Segment\ Assets}$$

(3) SROI (Operating) =

$$\frac{SPC\ before\ interest}{Segment\ net\ assets} \times 100$$

(4) SROI (Net) =

$$\frac{SPC\ after\ interest}{Segment\ net\ assets} \times 100$$

Segment Residual Income (SRI) = SPC-(SROI×SR)

Suggested Readings:

- Khan and Jain, *Management Accounting*, The McGraw-Hill
- Blocher, Chen, Cokins and Lin, *Cost Management-A Strategic Emphasis*, The Tata McGraw-Hill
- Hilton, *Managerial Accounting,* The Tata McGraw-Hill
- *Study Materials of The Institute of Chartered Accountants of India*
- *Study Materials of The Institute of Cost Accountants of India*

Department of Commerce

University of Calcutta

Study Material

Cum

Lecture Notes

Only for the Students of M.Com. (Semester IV)-2020

University of Calcutta

(Internal Circulation)

Dear Students,

Hope you, your parents and other family members are safe and secured. We are going through a world-wide crisis that seriously affects not only the normal life and economy but also the teaching-learning process of our University and our department is not an exception.

As the lock-down is continuing and it is not possible to reach you physically. Keeping in mind the present situation, our esteemed teachers are trying their level best to reach you through providing study material cum lecture notes of different subjects. This material is not an exhaustive one though it is an indicative so that you can understand different topics of different subjects. We believe that it is not the alternative of direct teaching learning.

It is a gentle request you to circulate this material only to your friends those who are studying in Semester IV (2020).

Stay safe and stay home.

Best wishes.

Department of Commerce
University of Calcutta

M.Com/ 4th Semester

Subject: Strategic Cost and Management Accounting
Paper CC 402/ Module II

Contents

Unit	Topics Allotted	Day Shift		Evening Shift	
		Faculty	Status of Completion	Faculty	Status of Completion
8	Cost Analysis for Decision Making	Professor (Dr.) S.S.Saha	Completed and materials already provided	Professor (Dr.) S.S.Saha	Completed and material already provided
9	Marginal Costing and Strategic Management Decision	Professor (Dr.) S.S.Saha	Not completed. Study materials are being provided.	Professor (Dr.) S.S.Saha	Not completed. Study materials are being provided.
10 (i)	Budgetary Control System	Dr. Mitrendu Narayan Roy	Completed and material already provided	Dr. Biswanath Sinha	Not completed. Study materials are being provided.
10 (ii)	Standard Costing and Variance Analysis	Dr. Mitrendu Narayan Roy	Not completed. Study materials are being provided.	Dr. Biswanath Sinha	Partly completed and study materials are being provided for the incomplete portion
10 (iii)	Cost Management Technique	Professor (Dr.) S.S.Saha	Not completed. Study materials are being provided.	Professor (Dr.) S.S.Saha	Not completed. Study materials are being provided.

Name of the Faculty: Professor (Dr.) S.S.Saha

[DAY AND EVENING SHIFT]

TOPICS

- **Unit 8: Cost Analysis for Decision Making**
- **Unit 9: Marginal Costing and Strategic Management Decision**
- **Unit 10(iii): Cost Management Technique**

Unit 8: Cost Analysis for Decision Making

Matters related to this topic were already discussed in details in the classes and appropriate materials were provided to the students.

Unit 9: Marginal Costing and Strategic Management Decision

Contents: Marginal cost and strategic management decisions —consideration of limiting factor in decision making— make or buy, adding or dropping a product line, shutdown or continue, special order/ export order, product-mix, pricing decisions

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Marginal cost and Strategic Management Decision

Marginal costing is based on the principle of dividing all costs into fixed cost and variable cost. Fixed costs are unrelated to the levels of production. These costs remain the same irrespective of the production quantities. Variable costs change in relation to production levels. They are directly proportionate. The variable cost per unit, however, remains the same. In marginal costing, these variable costs are only considered while calculating the production costs. Of all the available techniques of costing, marginal costing is most suitable for making decisions like how much material to buy, the correct product mix, fixing the selling price, etc.

Decision making is a very important factor in every firm. Decision making means choosing or selecting a course of action from a given set of alternatives. Application of marginal costing plays a very significant role in this regard particularly for managerial decisions. These are as follows:

- Make or buy decision;
- Adding or dropping a product line;
- Shut-Down or Continue decision;
- Accepting additional orders and exploring foreign market;
- Selection of most profitable mix; and
- Fixation of selling price;

Consideration of Limiting Factor/ Key Factor

Limiting Factor which limits production and/ or sales comprises shortage of materials, labour, plant capacity, sales demand, etc. In case of decision making with regard to selection of profitable product –mix, optimum sales-mix, make or buy, appropriate criteria in relation to limiting factor should be taken into consideration.

MAKE OR BUY DECISION

A manufacturing concern may sometimes have to take the decision whether to buy a component or services required for final production or whether to make it in-house. However, make or buy decision under different situations can be made as follows:

CASE-I: When Company having spare/ unused capacity in making components parts instead of buying them from market.

(i) When Manufacture involves only variable costs assuming that fixed costs were already incurred and fixed costs are not relevant, whether one should make or buy :

- If Variable Cost / Marginal Cost < Purchase Price, it is advisable to make/manufacture the components parts in the factory.

Illustration-1

X Manufacturing Company having unused capacity requires component-A 20000 units @ Rs. 60 per unit to manufacture a final product. Total manufacturing costs of Rs. 64 per unit comprise Rs. 32 as raw material, Rs. 12 as direct labour, Rs. 6 as variable overhead,

Rs. 6 as avoidable fixed overhead, and Rs. 8 as other fixed overhead allocated on the basis of capacity utilized.

Required

(i) Should the company make or buy the component-A?

(ii) Determine the range of production at which one is more profitable than the other.

Solution

(i) Should the company make or buy the component-A?

- Purchase price of component-A = Rs. 60
- Manufacturing costs per unit of component-A (Relevant Cost= Variable Cost / Marginal Costs + Avoidable fixed costs)= (Rs. 32 as raw material + Rs. 12 as direct labour +Rs. 6 as variable overhead) + Rs. 6 as avoidable fixed overhead = Rs.56
- Decision: The company should make the component-A as Manufacturing costs< Purchase price

(ii) Determine the range of production at which one is more profitable than the other

- Minimum Volume of Production (at which both the alternatives making and buying are equally profitable) which will justify 'Making' as compared to 'Buying'
- Minimum Volume of Production = Increase in fixed costs ÷ Contribution Per Unit = Rs. 120000÷ Rs.10= 12000 units
- Increase in fixed costs = Rs. 6 as avoidable fixed overhead × 20000 units = Rs. 120000
- Contribution Per Unit = Purchase Price – Variable/ Marginal Cost (excluding Avoidable FCs)

  = Rs. 60 – Rs. 50 = Rs.10

- Decision: (a) From 1 to 11999 units, buying will be more profitable and (b) from 12001 units to 20000 units, making will be more profitable

CASE-II: When Company does not have spare/ unused capacity in making the components parts.

(i) When Manufacture involves increase in fixed costs (Avoidable fixed costs) and fixed costs are relevant here as relevant cost/ product cost, whether one should make or buy:

- If Relevant Cost (Variable/ Marginal Cost + Avoidable fixed costs) < Purchase Price, it is advisable to make/manufacture the components parts in the factory.
- One can determine the Minimum Volume of Production (at which both the alternatives making and buying are equally profitable) which will justify 'Making' as compared to 'Buying'.
- Minimum Volume of Production = [Increase in fixed costs ÷ Contribution Per Unit]
- Contribution Per Unit = [purchase price **–** Variable/ Marginal Cost (excluding Avoidable fixed costs)]

(ii) When Manufacture involves withdrawal or suspending the production of existing products thereby causing loss of contribution or opportunity cost.

- If Relevant Cost (Variable/ Marginal Cost + Avoidable fixed costs + loss of contribution) < Purchase Price, it is advisable to make/manufacture the components parts in the factory.
- Loss of contribution will be calculated with reference to the limiting factor.

Illustration-2

X Manufacturing Company produces a variety of products each having a number of components parts. Product-A require 20 hours to process on a machine working to full capacity. Selling price of Product-A is Rs. 160 and its marginal cost is Rs. 80. B-2, a component part used for product –B could be made on the same machine in 4 hours for a marginal cost of Rs. 20. The supplier's price is Rs. 30.

Required: Should one make or buy B-2 assuming that machine hour is the limiting factor?

Solution

Contribution per unit of Product-A	Rs. 160– Rs. 80 = Rs. 80
Contribution per Machine Hour	Rs. 80÷ 20 hours = Rs. 4
	Per unit of B-2 (Rs.)
Purchase Price	30
Cost of Manufacturing:	
Marginal Cost	20
Opportunity Cost (contribution foregone) (Rs. 4 × 4 hours)	16
Total Relevant Cost in making	36
Decision (as Relevant Cost> Purchase Price)	Buying is more profitable than making

CASE-II: When there is a limiting factor: The manufacturing resources of the organization are limited and it becomes necessary to buy out some products if the market demands are to be met. The products to be manufactured must be selected on the basis of opportunity costs.

(i) If there is only one resource in limited supply, contribution per product per unit of limiting factor of output should be the selection criteria. Contribution per product per unit is difference between purchase price of product and marginal costs excluding fixed costs as fixed costs do not change.

- When product having contribution per unit of limiting factor of output is negative, it should be bought out.
- Those product having highest rates of contribution per unit of limiting factor of output should be manufactured
- Hence, product having lowest rates of contribution per unit of limiting factor of output should be bought out.

Illustration-3

Four types of components are currently being produced using a company's own facilities though the company is working at full capacity and is considering buying one or more type of component from an outside supplier. The total fixed costs will remain

unaffected for the company as a whole with the making in or buying out of the component. *From the following information, which component or components would you recommend to be bought out when (a) labour time is the limiting factor; (b) machine time is the limiting factor?*

Components	**A**	**B**	**C**	**D**
Time per unit:				
♦ Labour Hours	0.40	0.50	0.50	0.30
♦ Machine Hours	0.10	0.20	0.40	0.50
Cost per unit:	**(Rs.)**	**(Rs.)**	**(Rs.)**	**(Rs.)**
Marginal costs (Rs.)	10	12	15	15
Fixed costs (allocated)	2	4	5	15
Total costs	12	16	20	30
Purchase price	9	17	22	24

Solution

	A(Rs.)	**B(Rs.)**	**C(Rs.)**	**D(Rs.)**
Purchase price	9	17	22	24
Less: Marginal costs (Rs.)	10	12	15	15
Contribution per unit	(–) 1	5	7	9
Contribution per Labour Hour	(–) 2.5	10	14	30
Contribution per Machine Hour	(–) 10	25	17.5	18
	Should be bought out			

Decision:

- When Labour Hour is limiting factor, order of selection for buying based on lowest rates of contribution per unit of limiting factor would be : B,C,D
- When Machine Hour is limiting factor, order of selection for buying based on lowest rates of contribution per unit of limiting factor would be : C,D ,B

Illustration-4

A Ltd. manufactures and sells 25000 units of product annually. One of the components required for production is procured from outside supplier at Rs. 190/ unit. Annually it is purchasing 25000 units for its usage. If the component is produced in the own plant, annual production can be increased by 5000 units. Costs of the components are as follows:

	Rs./ unit
Direct material	80
Direct labor	75
Factory overhead (70% variable)	40
Total cost	195

If the component is made in-house, in order to market the additional units, overall price should be reduced by 5% and additionally Rs. 100000 p.m. should be incurred for advertising. Present selling price and contribution of the product are Rs. 2500/ unit and Rs. 600 respectively. Analyze the make or buy decision on unit basis and total basis and recommend the profitable alternative.

Solution:

- Variable cost of producing the component:

	Rs./ unit
Direct material	80
Direct labor	75
Factory overhead (70% variable)	28
Total variable cost	183

- If A Ltd. decides to manufacture the component in-house, the capacity would increase from 25000 to 30000.
- Since 25000 components are purchased to produce 25000 units, component usage is 1 component/ unit.
- Variable cost of the product will be [(2500 – 600) – 190] = Rs. 1710/ unit.
- Fixed overhead of Rs. 12/ unit will be incurred irrespective of the fact that the component is manufactured or not.
- Increase in advertising expenses would be Rs. 1200000 (Rs. 100000 × 12)
- Overall selling price would reduce from Rs. 2500 to Rs. 2375 (Rs. 2500 x 95%)
- Current contribution considering the procurement price of Rs. 190 for the component is Rs. 600. Since, variable cost of procurement is Rs. 183, in case of in-house manufacture; contribution would increase by Rs. 7 (Rs. 190 – Rs. 183). On the other hand, selling price is getting reduced by Rs. 125 (Rs. 2500 x 5%). Hence, contribution in case of make decision is (Rs. 600 + Rs. 7 – Rs. 125) = Rs. 482.
- It can be summarized as follows:

Particulars	Procurement of 25000 components		Produce 30000 components	
	Per unit (Rs.)	Total (Rs.)	Per unit (Rs.)	Total (Rs.)
Selling price	2500	62500000	2375	71250000
Contribution	600	15000000	482	14460000

- Incremental loss in contribution is Rs. 540000 (Rs. 15000000 – Rs. 14460000). Overall incremental loss is Rs. 1740000 (Rs. 540000 + Rs. 1200000 for advertising) which is Rs. 68/ unit.
- In this particular situation, A Ltd. should go for buy decision.

SHUT-DOWN OR CONTINUE DECISION/ ADDING OR DROPPING A PRODUCT LINE

Decisions are taken for closure of a particular segment (division, product line, services, departments, stores, or outlets) based on incremental revenue lost and incremental cost savings generated out of such decision.

- Incremental revenue lost = Original revenue – Revenue after dropping the segment. Revenue generated due to increase in demand for other segments that should be considered in incremental revenue.

- Incremental cost savings involve variable costs and specific avoidable fixed costs associated with the segment.
- If the segment can be used for any other purpose (lease/ rent) the incremental opportunity costs should also be considered.
- If incremental cost savings > incremental revenue lost, the segment should be discontinued and vice versa. However, if they are equal, then decisions are taken based on qualitative factors, such as impact on employees of that segment, impact on suppliers and customers, etc.

Illustration-5

R Ltd. is contemplating shutting down its Division C. The following information is given:

Particulars	A & B	C	Total
Maximum achievable sales (Rs.)	4140000	517500	4657500
Less: variable cost (Rs.)	2070000	276000	2346000
Contribution (Rs.)	2070000	241500	2311500
Less: Specific avoidable fixed cost (Rs.)	1449000	414000	1863000
Divisional income (Rs.)	621000	(172500)	448500

The rates of variable cost are 90% of the normal rates due to current volume of operation. However, if the current volume goes down, the rate will go back to normal. Comment on shutting down division C.

Solution:

Incremental loss/ savings due to discontinuance of division C

Particulars	Nature	Rs.
Specific avoidable fixed cost	Savings due to discontinuation	414000
Contribution	Loss due to discontinuation	(241500)
Variable cost (2070000 x 10/90)	Increase in variable cost due to discontinuation	(230000)
Savings/ (loss) due to discontinuation		(57500)

Since there is a loss due to discontinuation, C should not be discontinued.

ACCEPTING ADDITIONAL ORDERS AND EXPLORING FOREIGN MARKET (SPECIAL ORDER/ EXPORT ORDER) DECISION

If the manufacturing concern is working below its productive capacity, special orders or export orders may be attractive to them. In such orders, the concern is asked to deliver certain quantities of the product at a special price which would result in incremental revenue for the concern. However, accepting such offer would also require the concern to incur certain incremental variable costs (special packing, commission, shipping, etc.) and incremental fixed cost (inspection).

- If the incremental revenue > incremental cost, the special order should be accepted and vice versa.

- If the concern is working at its full capacity, in order to accept the order, it may have to forego the orders from its existing customers. Management has to qualitatively evaluate whether that would be a prudent decision.

Illustration-6

B Ltd. is engaged in the manufacture of product X by joint process of 5 machines. Machines are capable of producing 40 units of X/ hour. The variable cost/ unit is Re. 0.32 and selling price/ unit is Re. 0.80. B Ltd. received an order from another company to manufacture 40000 units of Y, a separate product the price of which is Rs. 30/ unit and variable cost is Rs. 24/ unit. The additional cost to be incurred to take up this order is Rs. 100000. The existing machines can produce 16 units of Y/ hour. The company has a total capacity of 10000 hours during the period in which the toy is required to be manufactured. The fixed cost excluding the aforementioned additional cost is Rs. 1000000. The company has an existing order for supply of 400000 X during the period. *Do you advise the company to take up this special order?*

Solution:

Statement showing contribution/ machine hour

Particulars	X	Y
Demand (units)	300000	40000
Sales (Rs./ unit)	0.80	30
Less: Variable cost (Rs./ unit)	0.32	24
Less: Specific fixed cost (Rs./ unit)		2.50
Contribution	0.48	3.50
Machine hour required/ unit	0.025	0.0625
Contribution/ machine hour	19.20	56.00

Since, contribution/ machine hour for product Y is higher, B Ltd. may provide priority to the special order. Total machine hour required for Y is 2500 hours. Hence, remaining 7500 hours can be utilized for producing X. However, with the remaining machine hours only 300000 units can be produced. B Ltd. may have to take decision whether it should go for the special order for better contribution or stick to the existing order of 400000 units of X to build better customer relationship.

MOST PROFITABLE MIX DECISION

Decisions are often taken whether to produce one product in place of another or what should be optimum combination of the products. This is decided based on contribution/ unit of the products concerned. If the concern has limited resource for a key factor (e.g. machine hour), per unit contribution for one unit of the limiting factor is to be calculated. The product with higher contribution should be produced.

Illustration-7

P Ltd. produces two products – X and Y. The cost information of these two products is presented as follows:

Particulars	X	Y

Direct material (Rs./ unit)	10	9
Direct wages (Rs./ unit)	3	2
Selling price (Rs./ unit)	20	15

The fixed cost is Rs. 800. Variable cost is allotted to products as 100% of direct wages.
Sales mixtures:

- 100 units of product A and 200 units of product Y
- 150 units of product X and Y
- 200 units of product X and 100 units of product Y

You are suggested to recommend which sales-mixture to be adopted.

Solution:
Calculation of contribution

(Rs./ unit)

Particulars	X	Y
Selling price	20	15
Less: Direct Materials	10	9
Less: Direct wages	3	2
Less: Variable overhead	3	2
Contribution	4	2
PV ratio	20%	13.5%

Identification of optimum product mix

Products	Contribution/ unit	Plan A		Plan B		Plan C	
		Units	Value	Units	Value	Units	Value
X	4	100	400	150	600	200	800
Y	2	200	400	150	300	100	200
Total		300	800	300	900	300	1000

Since, total contribution is highest under Plan C, it should be adopted.

Illustration-8
An agro-products procedure company is planning its production for the next year. The following information is relating to the current year:

Products /Crops	**X_1**	**X_2**	**Y_1**	**Y_2**
Area Occupied (acres)	250	200	300	250
Yield per acre (ton)	50	40	45	60
Selling price per ton (Rs.)	200	250	300	270
Variable cost per acre(Rs.):				
• Seeds	300	250	450	400
• Pesticides	150	200	300	250
• Fertilizers	125	75	100	125
• Cultivations	125	75	100	125
• Direct Wages	4000	4500	5000	5700

Fixed overhead per annum is Rs. 53, 76,000. The land that is being used for the production of Y_1 and Y_2 can be used for either crop, but not for X_1 and X_2 . The land that is being used for the production of X_1 and X_2 can be used for either crop, but not for Y_1 and Y_2 · In order to provide an adequate market service, the company must produce each year at least 2000 tons each of X_1 and X_2 and 1800 tons each of Y_1 and Y_2. You are suggested to

(i) prepare a statement of the profit for the current year;
(ii) prepare a statement of the profit for the production mix by fulfilling market commitment.

Solution:

(i) Statement showing the profit for the current year

	Products /Crops	**X_1**	**X_2**	**Y_1**	**Y_2**	**Total**
A	Yield per acre (ton)	50	40	45	60	
B	Selling price per tones (Rs.)	200	250	300	270	
C	Sales revenue per acre(Rs.) [A× B]	10000	1000	13500	16200	
D	Variable cost per acre(Rs.)	4700	5100	5950	6600	
E	Contribution per acre(Rs.) [C— D]	5300	4900	7550	9600	
F	Area (acres)	250	200	300	250	
G	Total Contribution (Rs.) [E× F]	13,25,000	9,80,000	22,65,000	24,00,000	69,70,000
	Less: Fixed Cost(Rs.)	---	---	---	---	53, 76,000
	Profit (Rs.)					15,94,000

(ii) Statement showing profit for the Recommended Mix

Products /Crops	**X_1**	**X_2**	**Y_1**	**Y_2**	**Total**
Contribution per acre(Rs.)	5300	4900	7550	9600	
Rank	1	2	2	1	
Minimum Tones	2000	2000	1800	1800	
Acres required	40 [2000÷50]	50 [2000÷40]	40[1800÷45]	30 [1800÷60]	
Balance acres	360	---	---	480	
Recommended Mix in acre	400	50	40	510	
Total Contribution (Rs.)	21,20,000	2,45,000	3,02,000	48,96,000	75, 63,000
Less: Fixed Cost(Rs.)	---	---	---	---	53, 76,000

Profit (Rs.)	21,87,000

FIXATION OF SELLING PRICE DECISION

The lowest price at which a concern may sell its product is determined based on relevant cost of manufacturing (incremental cost + opportunity cost if any). Pricing decision is important in case of intense competition, surplus production capacity, clearance of old inventories, getting special orders and improving market share.

Illustration-9
L Ltd. wants increase their volume of sales by 100% while maintaining present level of profit. Any change in fixed or variable costs are not anticipated. The following information is obtained from their books:

Sales of 70000 units	Rs. 840000
Variable cost	Rs. 5/ unit
Fixed cost	Rs. 50000

At what price they should be ready to sell their product?

Solution:
Statement showing current profit

Sales	Rs. 840000
Variable costs (70000 × Rs. 5)	Rs. 350000
Contribution	Rs. 490000
Fixed cost	Rs. 50000
Profit	Rs. 440000

Current PV ratio: Rs. 490000÷ Rs. 840000 = 58.33%.
Present selling price/ unit = Rs. 840000÷70000 = Rs. 12
Present contribution/ unit = Rs. 490000÷ 70000 = Rs. 7

Since the company wants to increase their volume of sales by 100%, new sales quantity = 70000 × 2 = 140000 units.

(Fixed cost + desired profit)/ Future PV ratio = Future sales

Or, (Rs. 50000 + Rs. 440000) = Future sales × Future PV ratio
Or, Future contribution = Rs. 490000
Or, (Future selling price/ unit — Rs. 5) × 140000 = Rs. 490000
Or, Future selling price/ unit = Rs. 8.5

So, in order to increase volume of sales by 100%, L Ltd. should set the selling price at Rs. 8.5/unit.

Unit 10(iii): Cost Management Technique

Contents: Cost control and cost reduction, benchmarking, value chain analysis and value engineering/value analysis

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Cost Control and Cost Reduction

Cost Control is a process in which a focus is made on controlling the total cost through competitive analysis. It is a practice which works to align the actual cost in agreement with the established norms. It ensures that the cost incurred on production should not go beyond the pre-determined cost. Cost Control involves a chain of various activities, which starts with the preparation of the budget in relation to production. However, It involves: determination of standards; ascertaining actual results comparing the standards; an analysis of the variances; and establishing the action that may be taken.

Cost Reduction is a process, which aims to lower the unit cost of a product manufactured or service rendered without affecting its quality. It can be done by using new and improved methods and techniques. It ascertains substitute ways to reduce the production cost of a unit. Thus, cost reduction ensures savings in per unit cost and maximization of profits of the enterprise. Cost Reduction aims at cutting off the unnecessary expenses which occur during the production Process, storage, selling and distribution of the product. To identify cost reduction, the following are the major elements:

- Savings in per unit production cost;
- The quality of the product should not be affected;
- Savings should be non-volatile in nature.

Benchmarking

The Concept

Benchmarking is simply the process of measuring the performance of one's company against the best in the same or another industry. Benchmarking is basically learning from others. It is using the knowledge and the experience of others to improve the organization. It is analyzing the performance and noting the strengths and weaknesses of the organization and assessing what must be done to improve. There are three reasons that benchmarking is becoming more commonly used in industry. They are:

- Benchmarking is a more efficient way to make improvements. Managers can eliminate trial and error process improvements. Practicing benchmarking focuses on tailoring existing processes to fit within the organization.
- Benchmarking speeds up organization's ability to make improvements.
- Benchmarking has the ability to bring corporate performance up as a whole significantly. If every organization has excellent production and total quality management skills then every company will have world class standards.

When using benchmarking techniques, an organization must look at how processes in the value chain are performed:

- Identifying a critical process that needs improvement;
- Identify an organization that excels in the process, preferably the best;

- Contacting the organization which is benchmarking; visiting them, and studying the process or activity;
- Analyzing the data and improving the critical process at own organization.

Types of Benchmarking

There are four different types of benchmarking which consist of: internal benchmarking, competitive benchmarking, functional or industry benchmarking, and process or generic benchmarking.

(a) *Internal Benchmarking*: This is benchmarking against operations. It is one of the simplest forms since most companies have similar functions inside their business units. Determining the internal performance standard of an organization is main objective of internal benchmarking.

(b) *Competitive Benchmarking:* Competitive benchmarking is a type used with direct competitors. It is done externally and its goal is to compare companies in the same markets which have competing products, services, or work processes. An example would be McDonald's versus Burger King.

(c) *Functional or Industry Benchmarking:* Functional or industry benchmarking is performed externally against industry leaders or the best functional operations of certain companies. The benchmarking partners are usually those who share some common technological and market characteristics.

(d) *Process or Generic Benchmarking:* Process benchmarking focuses on the best work processes. Instead of directing the benchmarking to the business practices of a company, the similar procedures and functions are emphasized. This type can be used across dissimilar organizations.

The Benchmarking Process

Benchmarking is a very structured process that consists of several steps to be taken. There are five stages included in the benchmarking process which is discussed below:

(i) *Planning the Exercise:* This step involves identifying the strategic intent of the business or process to be benchmarked. Many times this information can be obtained by looking at the company's mission statement which summarizes its main purposes. Then selection of the actual processes to be benchmarked must be chosen.

(ii) *Forming the Benchmarking Team:* The next step is to select overall team members. These members should be chosen from various areas of the organization. All members should cooperate and communicate with one another in order to get the best results out of the benchmarking process. There are three main teams comprising the overall group. The lead team is responsible for maintaining commitment to the process throughout the organization. The preparation team is responsible for carrying out detailed analysis, and the visit team must carry out the benchmarking visit.

(iii) *Collecting the Data:* This step involves gathering information on best practice companies and their performances. Before a company identifies best practice companies, they should first identify their own processes, products, and services. This step will allow a company to fully realize the extent of improvements available. Site visits are also an important factor in collecting data because they allow for a more in-depth understanding of the processes.

(iv) *Analyzing Data for Gaps:* This step involves determining how a company relates to the benchmarked company. It allows identification of performance gaps and their possible causes.

(v) *Taking Action:* This step involves determining what needs to be done in order to match the best practice for the process.

Value Chain Analysis

Value Chain is the series of internal processes or activity a company performs 'to produce its product, to design its product, to deliver its product, to support its Product'. It is the linked set of value creating activities all the way from basic raw material sources for components suppliers through to the ultimate end-use product or service delivered to the customer.

Coordinating the individual parts of the value chain together creates the conditions to improve customer satisfaction, particularly in terms of cost efficiency quality and delivery. A firm, which performs the value chain activities more efficiently, and at a lower cost, than its competitors will gain a competitive advantage. Therefore it is necessary to understand how value chain activities are performed and how they interact with one another. The activities are not just a collection of independent activities but a system of interdependent activities in which the performance of one activity affects the performance and cost of other activities.

Value Engineering/Value Analysis

Value engineering is one of the most effective, promising rewarding modern technique available to identify and eliminate unnecessary costs in design, testing, manufacturing, construction, operations, maintenance, procedure, specification, and practices and so on. Value engineering is the systematic applications of the recognized techniques which identify the function of a product or a service establish a monetary value for that function and provide the necessary function reliably at the lowest overall cost. Value engineering is an approach to productivity improvement that attempts to increase the value obtained by customer of a product by offering the same level of functionality at lower cost. So, value engineering is the review of new and existing products during the design phase to reduce cost. So, let's compare value analysis or value engineering with conventional cost reduction. The conventional cost reduction is item oriented, while value engineering is function oriented.

Suggested Readings:

1. B. Banerjee, Cost Accounting, PHI, New Delhi
2. Ashish Bhattacharya, Cost Accounting, PHI, New Delhi
3. Charles T. Horngreen, et al. Introduction to Management Accounting, Prentice Hall of India
4. Colin Drury, Management and Cost Accounting, Thomson Learning

Name of the Faculty: Dr. Mitrendu Narayan Roy

[DAY SHIFT]

TOPICS

- **Unit 10(i): Budgetary Control System**
- **Unit 10(ii): Standard Costing and Variance Analysis**

Unit 10(i): Budgetary Control System

Matters related to this topic were already discussed in details in the classes and appropriate materials were provided to the students.

Unit 10(ii): Standard Costing and Variance Analysis

Concept of standard costing
According to CIMA, standard costing is the control technique that reports variances by comparing actual costs with pre-set standards and thereby facilitating action through management by exceptions.

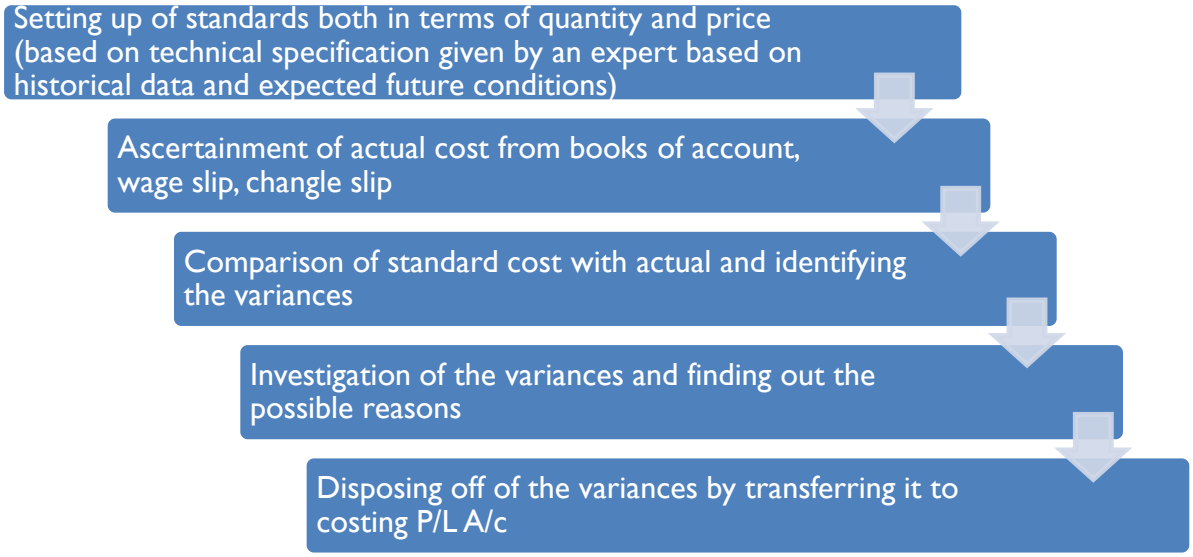
Concept of standard cost
According to CIMA, standard cost is the planned quantity or unit cost of the product produced by the organization. It may be determined based on number of bases (in case of quantity: production budget, material specification and proportion, in terms of quantity and

quality, degree of automation, skill set and availability of workers, working condition external laws and Government policy; in case of price: mean price expected to prevail in the next period or normal price expected to prevail in the cycle of seasons). It is computed for performance evaluation, control, and determination of selling price.

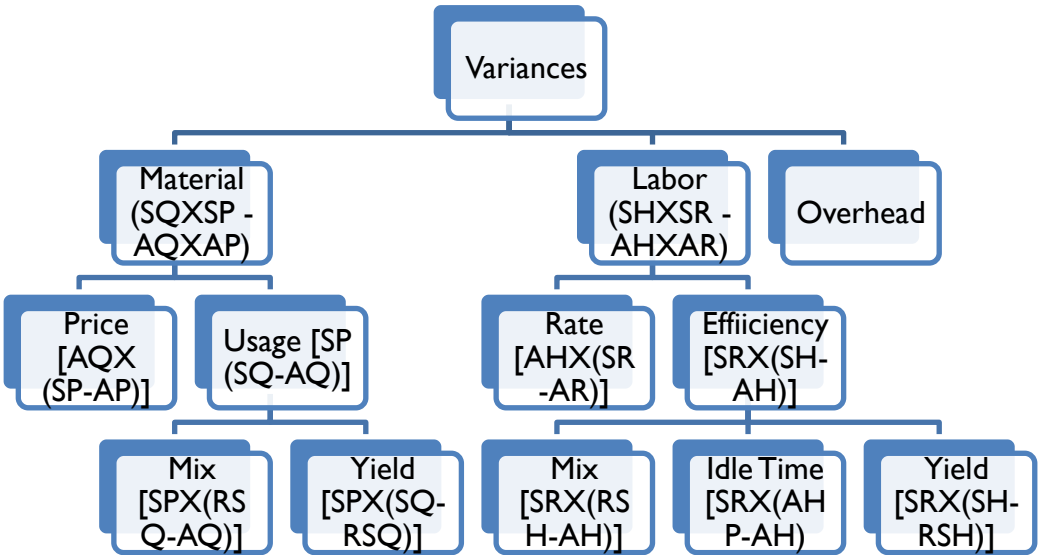
Need for standard costing

Standard costing is a measure of performance evaluation and cost control for different responsibility centers within the organization. Standard costs are set after taking into consideration the present condition and future possibilities for the purpose of estimating profitability from the proposed project. Standard costs should not be crossed by the responsibility centers and any variances from standard to actual should be reported upon and action must be taken against variances by the respective responsibility center. This method helps the managers of a responsibility centre to set the budget without compromising on the quality of budgeted quantity. Standard profit of the company may be evaluated by deducting standard cost from revenue for an interim period. This helps the responsibility centers to take managerial actions within interim period so that expected result is achieved at the end of the period.

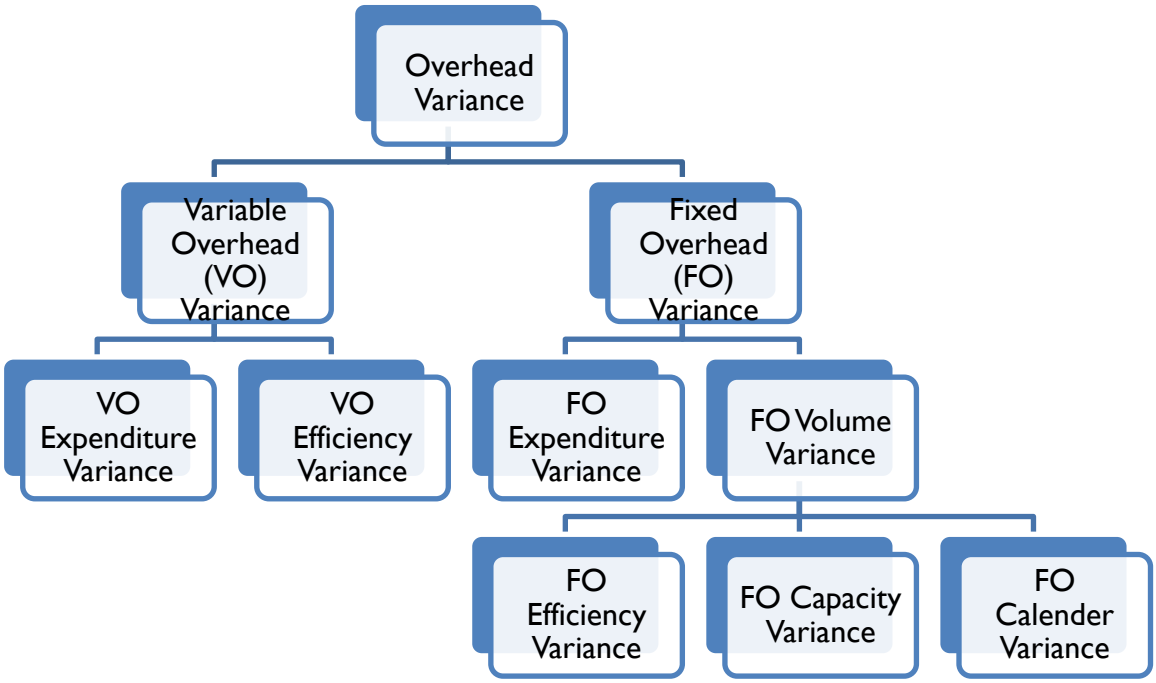
Process of Standard Costing



Types of variances

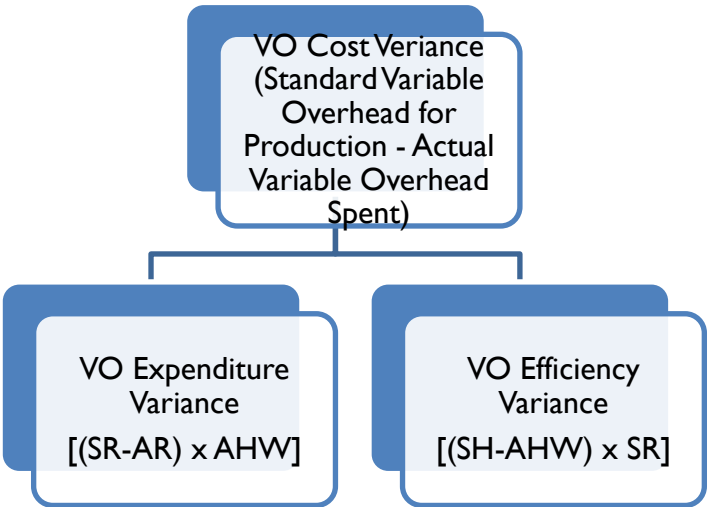


Types of Overhead Variance



Variable Overhead Variances

Variables overhead consists of expenses other than direct material and direct labor that varies with level of production. Usually variable overhead depends on number of hours worked. Hence, it may vary with machine hour or labor hour. However, if the variable overhead consists of indirect material, then it may vary with direct material used.



- SR: standard rate
- AR: actual rate
- AHW: actual hour worked
- SH: standard hour for producing actual output

Problem 1: From the following information, calculate (i) variable overhead cost variance; (ii) variable overhead expenditure variance; (iii) variable overhead efficiency variance.

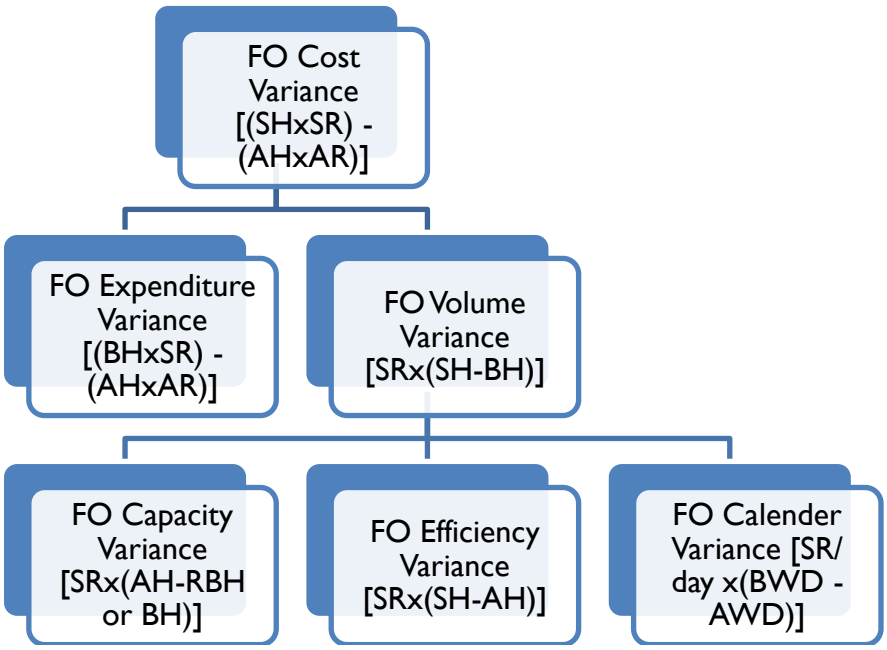
Budgeted production	6000 units
Budgeted variable overhead	Rs. 120000
Standard time for one unit of output	2 hours
Actual production	5900 units
Actual overhead incurred	122000
Actual hours worked	11600 hours

Solution:

- Standard cost/ unit: Rs. 120000/ 6000 = Rs. 20/ unit
- Standard cost/ hour (SH): Rs. 20/ unit/ 2 = Re. 10/ hour
- Variable overhead cost variance: Rs. 20x5900 units (Standard overhead for actual production) – Rs. 122000 (actual overhead incurred) = Rs. 4000 [Adverse (A)]
- Variable overhead expenditure variance: AHW x (SR – AR) = 11600 x (10 – 122000/11600) = Rs. 6000 (A)
- Variable overhead efficiency variance: SR x (SH – AHW) = 10 x (2 x 5900 – 11600) = Rs. 2000 [Favorable (F)]

Fixed Overhead Variances

Overhead consists of indirect material, indirect labor and indirect expenses. The portion of the total overhead that does not change with level of production is called fixed overhead. Hence, amount incurred on fixed overhead depends upon the capacity utilization. With increase in the level of production, fixed overhead/ unit falls. Hence, it is imperative to determine the budgeted fixed overhead rate based on budgeted fixed overhead and budgeted hours worked. If the budgeted hour worked is more than the actual hour worked, then there will be under-absorption and vice versa. On the other hand, there can be divergence in the budgeted fixed overhead and actual fixed overhead.



- BH: Budgeted hours
- AWD: actual working day
- BWD: budgeted working days
- RBH: revised budgeted hour (computed only when calendar variance is computed)

Verification of formulae

- Fixed overhead cost variance = fixed overhead expenditure variance + fixed overhead volume variance
- Fixed overhead volume variance = efficiency variance + capacity variance + calendar variance

Basic calculations:

- SR: standard overhead rate (Budgeted overhead/ budgeted hour or Budgeted overhead/ budgeted unit)
- Standard hour per actual output (SHAO) (when SR/ hour is used): Budgeted hour/ Budgeted output x Actual output
- Standard output for actual hours (SOAH) (when SR/ unit is used): Budgeted output/ Budgeted hours x Actual hours
- Absorbed overhead (when SR/ hour is used): SHAO x SR/hour
- Absorbed overhead (when SR/ unit is used): Actual output x SR/unit
- Standard overhead (when SR/ hour is used): AH x SR/hour
- Standard overhead (when SR/ unit is used): SOAH x SR/unit
- Budgeted overhead (when SR/ hour is used): BH x SR/hour
- Budgeted overhead (when SR/ unit is used): Budgeted output x SR/unit
- Actual overhead (when SR/ hour is used): AH x AR/hour
- Actual overhead (when SR/ unit is used): Actual output x AR/unit

Fixed overhead variances (when SR/ unit is used)

- Cost variance: Absorbed overhead – actual overhead
- Expenditure variance = budgeted overheads – actual overheads
- Volume variance: absorbed overheads – budgeted overheads
- Efficiency variance: absorbed overhead – standard overhead
- Capacity variance: standard overhead – budgeted overhead
- Calendar variance: difference in number of actual working days and standard working days

Problem 2:

	Standard	Actual
Production	4000 units	3800 units
Working days	20	21
Machine hours	8000 hours	7800 hours
Fixed overhead	Rs. 400000	Rs. 390000

Calculate fixed overhead variances.

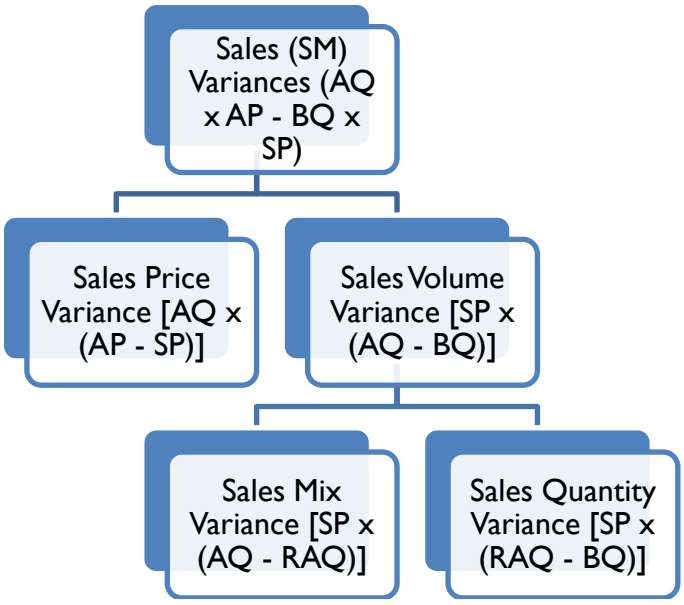
Solution:

- SR/ hour: Rs. 400000/ 8000 hour = Rs. 50/ hour
- BH: 8000 hour
- AH: 7800 hour
- AR/ hour: Rs. 390000/ 7800 hours = Rs. 50 hour
- SH: 8000 hours/ 4000 units x 3800 units = 7600 hours
- SR/ day : Rs. 400000/ 20 days = Rs. 20000
- Fixed overhead cost variance: (SR x SH) – (AR x AH) = (Rs. 50 x 7600 hours) – (Rs. 50 x 7800 hours) = Rs. 10000 (A)
- Fixed overhead expenditure variance: (BH x SR) – (AH x AR) = (8000 hours x Rs. 50) – (Rs. 50 x 7800 hours) = 10000 (F)
- Fixed overhead volume variance: SR x (SH – BH) = Rs. 50 x (7600 hours – Rs. 8000 hours) = Rs. 20000 (A).
- Fixed overhead efficiency variance: SR x (SH – AH) = Rs. 50 x (7600 hours – 7800 hours) = Rs. 10000 (A)
- Fixed overhead capacity variance: SR x (AH – RBH) = Rs. 50 x (7800 hours – 8000 hours/ 20 days x 21 days) = Rs. 30000 (A)
- Fixed overhead calendar variance: SR/ day x (BWD – AWD) = Rs. 20000 x (20 – 21) = Rs. 20000 (F)

Sales Variances

Sales variance can be measured in terms of (a) sales value variance and (a) sales margin variance. It helps to identify the performance of the responsibility centre entrusted with responsibility of sales quantity and unit price.

Sales Value Variance

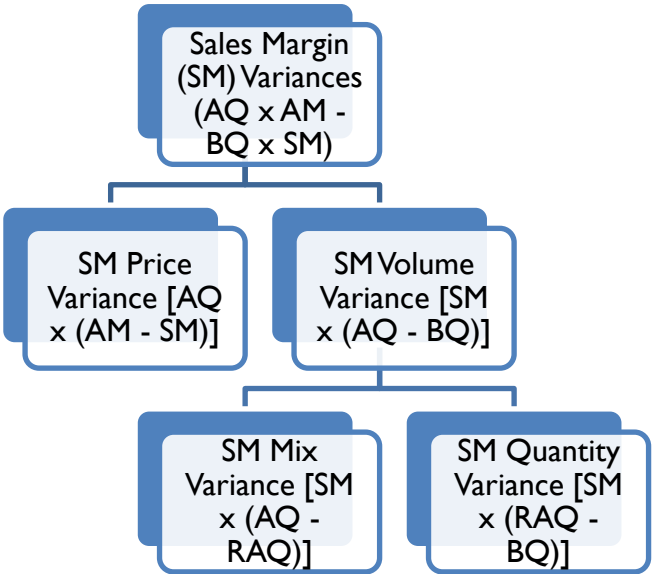


- AP: Actual price/ unit
- BP: Budgeted price/ unit
- SP: Standard price/ unit
- AQ: Actual quantity
- BQ: Budgeted quantity
- RAQ: Revised actual sales quantity (actual quantity sold in budgeted proportion)

Sales Margin Variances

Sales margin can be calculated as selling price – unit manufacturing cost in case of absorption costing system. Hence, while calculating margin; standard cost of sales not the actual cost of sales is deducted from the actual sales.

Sales Margin Variances



- AM: Actual margin (Actual price/ unit – Standard cost/ unit)
- BM: Budgeted margin

- SM: Standard margin (Standard price/ unit – Standard cost/ unit)

Reporting of Variances

After computation of variances, it becomes utmost necessary to report them on a prompt and periodic basis to the concerned executives, so that the causes behind the variances can be identified and appropriate corrective measures can be taken to avoid similar adverse variances in future with a view to fulfill the objective of cost control. Hence, these reports should give due emphasis to standard cost performance and proximity of actual cost performance from the standard; the magnitude of variances; and reasons for such variance. Reporting must be made based on the principle of management by exception (MBE).

Reconciliation of profit

Variances are prepared based on standard/ budgeted and actual data. Sometimes, we are provided with variances and actual data and we may have to compute the budgeted profit and reconcile the budgeted profit with the actual one. The process of reconciliation is shown below:

Reconciliation Statement (Absorption Costing Method)

Particulars	Rs.	Rs.		Rs.
Budgeted Profit (Budgeted quantity x standard margin)				XXX
Material cost variances				
(a) Material price variance		XXX		
(b) Material usage variance				
(i) Material mix variance	XXX			
(ii) Material yield variance	XXX	XXX	XXX	
Labor cost variance				
(a) Labor rate variance		XXX		
(b) Labor idle time variance		XXX		
(c) Labor efficiency variance				
(i) Labor mix variance	XXX			
(ii) Labor sub-mix efficiency variance	XXX	XXX	XXX	
Variable overhead cost variance				
(a) Variable overhead expenditure variance		XXX		
(b) Variable overhead efficiency variance		XXX	XXX	
Fixed overhead cost variance				
(a) Fixed overhead expenditure variance		XXX		
(b) Fixed overhead volume variance				
(i) Fixed overhead capacity variance	XXX			
(ii) Fixed overhead efficiency variance	XXX	XXX	XXX	
Sales margin variance (in terms of profit)				
(a) Sales margin price variance		XXX		
(b) Sales margin volume variance				
(i) Sales margin mix variance	XXX			
(ii) Sales margin quantity variance	XXX	XXX	XXX	
Actual profit				XXX

Note:

1. If reconciliation statement is to be prepared from standard profit (actual quantity x standard margin), standard margin volume variances will not be applicable. So, only sales margin price variance is to be adjusted.

Problem 3:

Particulars	Budget	Actual	Variances
Sales/ production (units)	200000	165000	(35000)
Sales (Rs.)	2100000	1692900	(407100)
Less: Variable cost (Rs.)	1266000	1074150	191850
Less: Fixed cost (Rs.)	315000	330000	(15000)
Profit	519000	288750	(230250)

Prepare a reconciliation of budgeted profit to actual profit using absorption costing approach.

Solution:

Workings:

- Standard margin: Rs. 519000
- Average standard margin/ unit = Rs. 519000/ 200000 units = Rs. 2.595
- Actual sales price/ unit: Rs. 1692900/ 165000 units = Rs. 10.26
- Standard variable cost/ unit: Rs. 1266000/ 200000 units = Rs. 6.33
- Standard cost/ unit: (Rs. 1266000 + Rs. 315000)/ 200000 units = Rs. 7.905
- Actual cost/ unit: (Rs. 1074150 + Rs. 330000)/ 165000 units = Rs. 8.51
- Actual margin/ unit = Rs. 10.26 - Rs. 7.905 = Rs. 2.355
- Actual variable cost/ unit: Rs. 1074150/ 165000 units = Rs. 6.51
- Standard fixed cost/ unit: Rs. 315000/ 200000 units = Rs. 1.575

Calculation of variances

1. Sales margin variances
   (a) Sales margin price variance = (AM/unit - SM/unit) x AQ = [(Rs. 2.597 – Rs. 2.357)] x 165000 units = Rs. 39600 (A)
   (b) Sales margin volume variance = SM x (AQ – BQ) = Rs. 2.597 x (165000 – 200000) = Rs. 90825
2. Variable overhead variances
   (a) Variable cost variance: standard variable cost/ unit x AQ – actual variable overhead = Rs. 6.33 x 165000 – Rs. 1074150 = Rs. 29700 (A)
3. Fixed overhead variances
   (a) Fixed overhead expenditure variances: budgeted overhead – actual overhead = Rs. 315000 – Rs. 330000 = Rs. 15000 (A)
   (b) Fixed overhead volume variance: absorbed overhead – budgeted overhead = Rs. 1.575 x 165000 – Rs. 315000 = Rs. 55125 (A)

Reconciliation Statement (under absorption costing)

Particulars	Rs.		Rs.
Budgeted Profit (Budgeted quantity x standard margin)			**519000**
Variable overhead cost variance (A)		(29700)	
Fixed overhead expenditure variance (A) Fixed overhead volume variance (A)	(15000) (55125)		
Fixed overhead cost variance (A)		(70125)	

Sales margin volume variance (A)	(90825)		
Sales margin price variance (A)	(39600)		
Sales margin variance (A)		(130495)	
Actual profit (reconciled)			**288750**

Investigation of variances

Investigation of variances is a conclusive step after calculation of variances that decisively point out the exact cause behind a favorable or adverse variance and provide implications for behavioral, motivational and inter-departmental changes that may be implemented to control the variance. However, a variance does not always mean an 'out-of-control' situation. Hence, before undergoing investigation, the management accountant must make the management aware about the associated cost and benefit of the process.

Factors governing investigation

Variance is a difference of estimates from the actual. Investigation depends upon certain factors within the organization:

(a) *Size:* If the average estimate is slightly different from the actual, the company may not undertake investigation. In fact, the company should set a limit of the variance amount. If the variance of a particular parameter goes beyond that limit, then only the investigation should be undertaken.
(b) *Type:* adverse variance is given more priority for investigation as compared to the favorable variances.
(c) *Cost:* cost associated with the investigation process should be lower than the benefit associated with it.
(d) *Pattern:* if the variance of a particular parameter is worsening for last few years, investigation of the same should be undergone.
(e) *Budgetary process:* if the budgetary process is uncontrollable or unrealistic, then investigation of the entire budgetary process should be undertaken instead of investigation of a particular parameter.

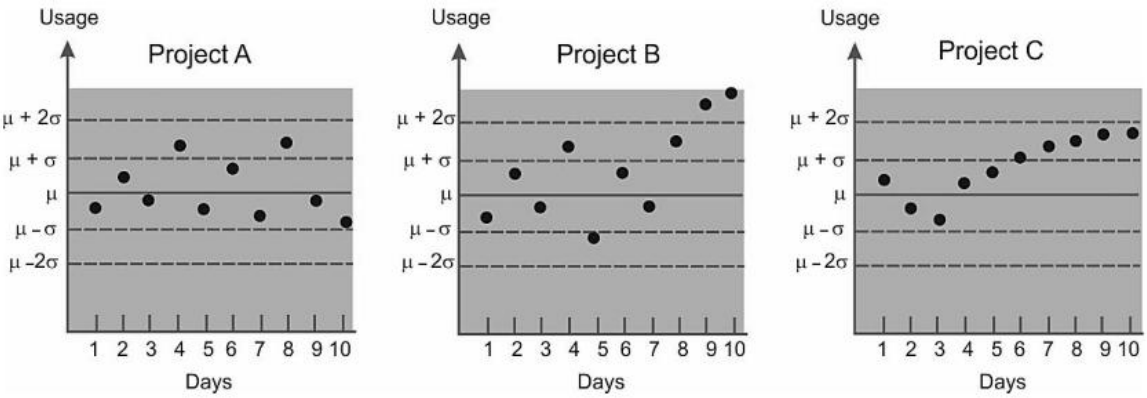
Process of investigation

Rule of Thumb Method:

In order to investigate a variance, the first step is to set a limit for the variance investigation. This limit may be an arbitrary limit based on amount of variance or may be as a percentage of cost (say 10%) based on managerial judgments. If the standard usage for a particular component is 10 kg/ unit and actual output is 1000 units, then the variance would not be investigated if the actual usage is between $\pm$10% of the standard usage (9000 to 11000 kg).

Statistical Control Chart

Statistical control charts are mainly used to maintain statistical quality control of products and services. However, they may also be used to identify out-of-control observations in variance investigations. Each observation (say labor usage in an hour) is plotted on a chart which is prepared based on past series of information assumed to follow normal distribution. Hence, based on past series of information, population mean (μ) and SD (σ) of a parameter is determined. Based on normal distribution table, 68.27% of the observation would fall between the ranges of $\mu + \sigma$; 95.45% of the observations would fall within the range of $\mu + 2\sigma$; and 99.8% of the observations would fall within the range of $\mu + 3\sigma$. For example, in an organization, there are three projects – A, B, and C. The control range considered is $\mu + 2\sigma$. Now, observations under these three projects are plotted on the statistical control chart as follows:



****Source: ICAI Study Mat***

It is observed that observations under Project A fall within the range of $\mu + 2\sigma$, while in case of Project B, two observations are out of control. Hence, investigation of variances is required for those two observations. While all observations are within the control range under Project C, the observations seem to slowly cross the range. Hence, the project may be considered for investigation based on the trend of observations.

Cost-benefit Analysis

Cost benefit analysis involves comparing the expected cost to the company if they undergo investigation of variance and expected cost to the company if they don't.

Now, two mutually exclusive states are possible in variance investigation – 'in-control' (where variance occurred due to random fluctuations from the expected result) and 'out-of-control' (where corrective actions are required to be taken). If the underlying variance follows normal distribution, probability of the variance being an 'in-control' (P_1) can be determined based on normal distribution theory. The probability of variance being 'out-of-control' (P_2) is equal to ($1-P_1$).

Example: Average time required for producing an output is 2.5 hours is normally distributed with a standard deviation (SD) of 15 minutes (derived from average of a series from past experience under close supervision). Actual time taken for production of 1000 units is 3000 hours. Hence, time taken to produce 1 unit is 3 hours. Since, the distribution is normal, the test statistics (Z) is calculated as follows: $Z = x - \mu / \sigma = (3-2.5)/0.25 = 2$. P (Z=2) = 0.9772. Hence, probability of completing the project in more than 3 hours is (1-0.9772) = 0.0228 or 2.28%. Hence, the probability of time taken for completing a unit in more than 3 hours (being out-of-control) is 2.28%. If the probability goes beyond 2.28%, the variance is to be investigated.

There are four types of cost associated with an investigation process:

(a) Cost of investigation (C)
(b) Cost of correction (M)
(c) Cost of process per period being out-of-control (P)
(d) Cost of process allowed to remain out-of-control (L)

Expected cost of undergoing investigation and not undergoing investigation can be evaluated as follows:

Action	**In-control probability (P_1)**	**Out-of-control probability (P_2)**
Investigate	**C**	**C + M + P**
Do not investigate	-	**L**

Expected cost of undergoing investigation: $P_1 \times C + P_2 \times (C+M+P)$
Expected cost of not undergoing investigation: $P_2 \times L$

Decision about investigation is taken as follows:

- If expected cost of undergoing investigation > expected cost of not undergoing investigation => Do not undergo investigation
- If expected cost of undergoing investigation < expected cost of not undergoing investigation => Undergo investigation
- If expected cost of undergoing investigation = expected cost of not undergoing investigation => Take decision about investigation about managerial judgment

The break-even probability is the level where,
Expected cost of undergoing investigation = Expected cost of not undergoing investigation
Or, $P_1 \times C + P_2 \times (C+M+P) = P_2 \times L$
Or, $(1-P_2) \times C + P_2 \times (C+M+P) = P_2 \times L$
Or, $C + P_2 \times (M+P) = P_2 \times L$
Or, $P_2 = C/ [L – (M+P)]$

P_2 is the probability of variance being out-of-control
C is the cost of investigation
L – (M+P) is the benefit obtained from investigation
Hence, investigation is to be carried out if probability of being out of control > cost of investigation/ benefit of investigation

Problem 4:
A company using a detailed system of standard costing finds that the cost of investigation of variances is Rs. 20,000. If after investigation, an out of control situation is discovered, the cost of correction is Rs. 30,000. Cost of process per period out of control is Rs. 24000. If no investigation made, the present value of extra cost involved is Rs. 150000. The probability of the process being in control is 0.82 and the probability of the process being out of control is 0.18. You are required to advise whether investigation of the variances should be undertaken or not. Calculate the probability at which it is desirable to institute investigation into variances.

Solution:

Pay-off matrix

Action	**In-control (0.82)**	**Out-of-control (0.18)**
Investigate	Rs. 20000	Rs. 20000 + Rs. 30000 + Rs. 24000 = Rs. 74000
Do not investigate	-	Rs. 150000

If investigation is done, the expected cost is: Rs. 20000 x 0.82 + Rs. 74000 x 0.18 = Rs. 29720

If investigation is not done, the expected cost is: Rs. 150000 x 0.18 = Rs. 27000
Hence, it is advisable not to investigate.

The probability at which it is desirable to institute investigation is the point where the expected costs of each action are same.
Cost of investigation (C): Rs. 20000

Cost of correction (M): Rs. 30000
Cost of process per period out of control (P): Rs. 24000
Extra cost if no investigation (L): Rs. 150000
Probability of being in control = $P_1 = (1 – P_2)$
Probability of being out-of-control = P_2
Expected cost of investigation: $P_1 \times C + P_2 \times (C+M+P) = (1-P_2) \times$ Rs. 20000 + $P_2 \times$ 74000 = 54000 P_2 + 20000.
Expected cost if investigation is not made: $P_2 \times L$ = Rs. 150000 P_2
Expected cost from the actions equal
Hence, 54000 P_2 + 20000 = 150000 P_2
P_2 = [20000/ (150000 – 54000)] = 0.21
Hence, investigation is desirable when probability of being out-of-control is more than 0.21. In the current situation, that probability is 0.18. Hence, the decision not to investigate is apt.

Suggested Readings:

5. B. Banerjee, Cost Accounting, PHI, New Delhi
6. Ashish Bhattacharya, Cost Accounting, PHI, New Delhi
7. Charles T. Horngreen, et al. Introduction to Management Accounting, Prentice Hall of India
8. Colin Drury, Management and Cost Accounting, Thomson Learning

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[EVENING SHIFT]

TOPICS

- **Unit 10(i): Budgetary Control System**
- **Unit 10(ii): Standard Costing and Variance Analysis**

Strategic Cost and Management Accounting

Module (ii) (Evening section)

Standard costing and Variance analysis:

1. **Already taught in class:**

a) Introduction: Concept, steps involved, types of standard, material and labour cost variances.
b) Fixed and variables overhead variance: Problem solved
c) Sales Variance: (i) The value method (Problem solved)
(ii) The profit method (Problem solved)

2. **Investigation of variances:**

Not all variances are investigated by management. Investigation decisions have a cost. Hence, they have to decide which areas have to be investigated. An investigation should only be undertaken if the benefits expected from the investigation exceeds the cost of searching for and correcting the source of variance. This method is also known as **cost-benefit analysis**.

Example:

Cost of investigation of variance (I) = INR 12,800

Cost of correction of out of control process (C) = INR 32,000

Cost of allowing the process to remain out of control (O) = INR 1, 60,000

Probability of being in control = 0.95

Probability of being out of control = 0.05

(Q1) Should investigation of variance be undertaken or not?

(Q2) Find out the break-even probability

Solution (Q1):

The expected value of each action will be:

a) Investigate E(a1) = PI + (1-P)*(I+C)
b) Do not investigate E(a2) = (1-P)*O

Therefore, Expected value of investigation E (a1) = (0.95*12,800) + (1-0.95)*(12,800+32,000)

= INR 14,400

Expected value of not investigation E (a2) = 0.05*1, 60,000

= INR 8,000

Since the cost to investigate (14,400) is more than the cost of not investigating (8000); hence the advice to management will be not to investigate.

Solution to Q2:

Let P1 be the break-even probability (i.e., cost of investigation = cost of not investigation)

E (a1) = E (a2)

Or, (P1*12800) + (1-P1)*(12800+32000) = (1-P1)*(1, 60,000)

After solving the equation we get;

P1 = 0.9 or 90%

Therefore, the break-even probability is 90%.

Budgetary Control System:

A) Introduction:

Budgetary control is a system of planning and controlling cost. For this purpose the following steps are involved:

- Establishment of budget
- Measurement of actual performance
- Comparison of actual performance with budgeted performance to ascertain variances
- Analysis of the causes of variation and reporting to the right people to take right action at the right moment

The objectives of budgetary control are normally to plan and control the income and expenditure of manufacturing and trading operations; capital expenditure; expenditure on research and development and financing of a business to ensure adequate working capital. In small companies the preparation of budget is the responsibility of the cost and management accountant. But in large companies preparation of budget is done by a budget committee which consists of sales manager, production manager, purchase manager, accountant etc. following the guidelines given in the budget manual. The budget manual should provide the detailed procedure for preparation, development and control of each functional budget like sales budget, production budget etc.

In the preparation of budget, principle budget factor (i.e., a factor is of such importance that it influences all other budgets) is the starting point and all other budgets must be centered around. For example: A factory can produce (Maximum capacity) 40,000 units per year of a particular product. But the demand for the product in the market is only 30,000 units per year. Hence, demand for sales is the limiting factor. Therefore, sales budget must be prepared first and other budgets such as production budget, material purchase budget etc. should follow the sales budget.

The traditional budgeting gives more emphasis on the financial aspect than the physical aspect or performance. In this context the concept of **Performance Budgeting** has been introduced. **Performance Budgeting** is a technique of presenting the budget for cost and revenue in terms of function, programs and activities and correlating the physical and financial aspect of the individual items comprising the budget. Thus, performance budgeting aims at establishing a relationship between the inputs and the outputs. Hence, under this technique the emphasis is more on the functions of the organization, the program to discharge these functions and the activities which will be involved in undertaking these programs ,i.e., the main focus is; the purpose for which the expenditure is being incurred and not the items of expenditure.

Moreover, for better resource allocation and control, another new technique **Zero Based Budgeting** has also been introduced. This technique starts with the premise that the budget for the next period is zero so long the demand for a function, process, project or activity is not justified for each rupee. Thus, each functional manager is required to carry out cost benefit analysis of each of the activities for which he is responsible. For this purpose the following steps are normally undertaken:

- To develop decision package
- To evaluate all decision packages and rank them in order of importance through cost benefit analysis and allocated resource accordingly

B) Functional Budgets:

Functional budgets include:

- Sales budget
- Production budget
- Purchase budget
- Wages budget
- Manpower budget

Example to prepare a functional budget is given below:

. A company manufactures three products A_1, A_2 and A_3, the current pattern of sales of A_1, A_2 and A_3 is in the ratio of 3:4:1 respectively. Company's estimation for the next budget period are as under :

	A_1	A_2	A_3
Budgeted Selling price per unit (₹)	200	152	124
Budgeted material consumption per unit	5 kg	5 kg	5 kg
Standard hours allowed per unit	5	4	3
Budgeted Material cost ₹ 12 per kg	—	—	—
Budgeted Wages rate ₹ 8 per kg	—	—	—
Budgeted Variable overhead ₹ 20 per unit	—	—	—

Overtime premium is 50% and is payable if a worker works for more than 40 hours in a week. Number of direct worker is 90. There are eight weeks consisting of 5 days per week available in the budget period. The fixed overhead for the budget period is expected to be ₹ 3,00,000 and the company desires a profit of ₹ 2,04,000 for the same period. It is assumed that the production and sales will occur evenly throughout the budget period.

Anticipated stock for the budget period :

	A_1	A_2	A_3	Raw material
Opening :	1020 units	2000 units	500 units	8000 kg
Closing :	10 day's sale	10 day's sale	10 day's sale	10 day's consumption

Prepare :

(i) Sales budget in quantities and value,

(ii) Production budget,

(iii) Raw meterial purchase budget in quantities and value,

(iv) Wages budget.

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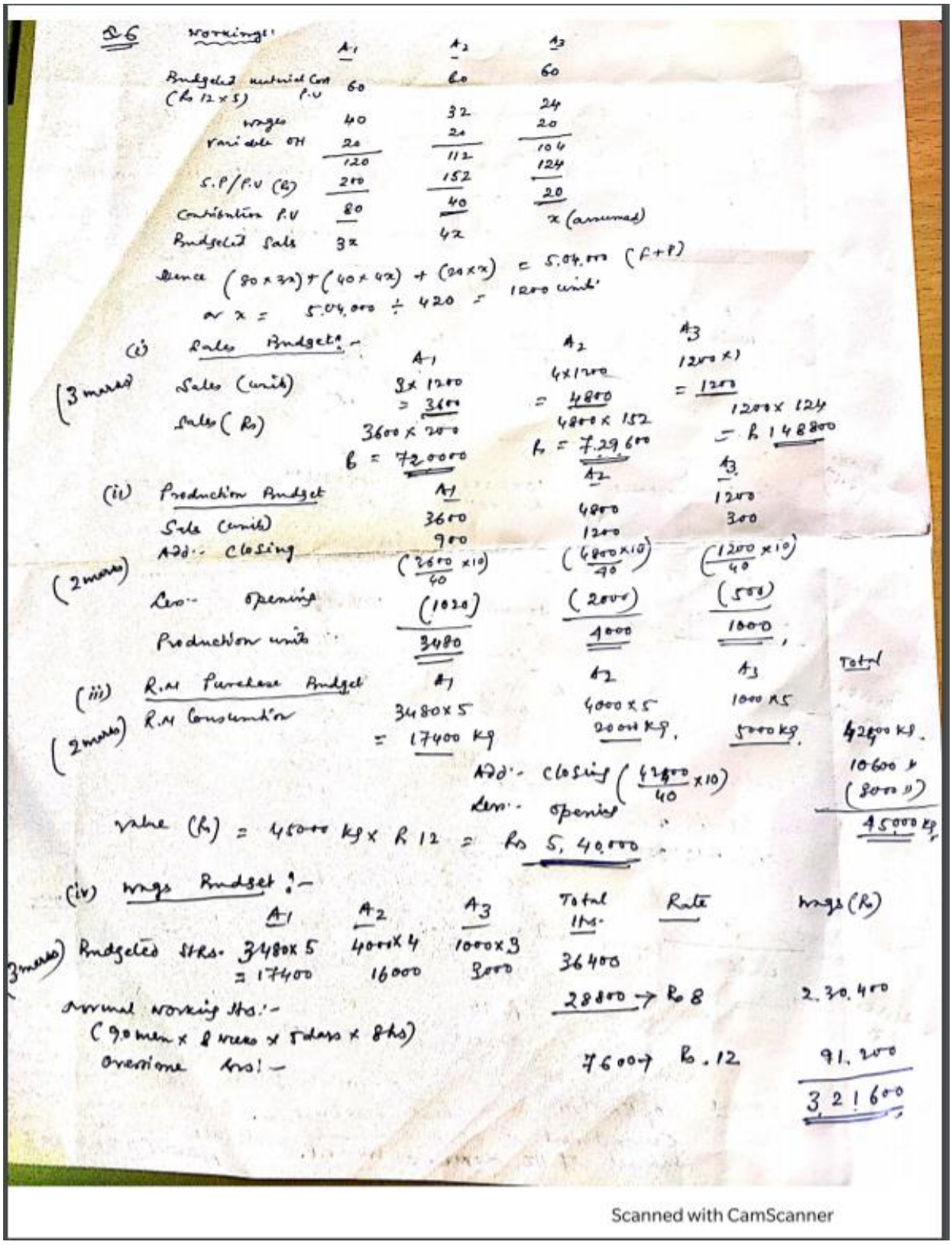
Solution:


Q6 Workings:
A1 A2 A3
Budgeted material Cost P.V (Rs 12×5) 60 60 60
Wages 40 32 24
Variable OH 20 20 20
120 112 104
S.P/P.V (B) 200 152 124
Contribution P.V 80 40 20
Budgeted Sale 3x 4x x (assumed)
Hence (80×3x)+(40×4x)+(20×x) = 5,04,000 (F+P)
or x = 5,04,000 ÷ 420 = 1200 units
(i) Sales Budget:- (3 marks)
Sales (unit) A1 3×1200 = 3600 A2 4×1200 = 4800 A3 1200×1 = 1200
Sales (Rs) 3600×200 Rs = 72,0000 4800×152 Rs = 7,29,600 1200×124 = Rs 1,48,800
(ii) Production Budget (2 marks)
Sale (units) A1 3600 A2 4800 A3 1200
Add:- Closing 900 (3600×10/40) 1200 (4800×10/40) 300 (1200×10/40)
Less:- Opening (1020) (2000) (500)
Production units 3480 4000 1000
(iii) R.M Purchase Budget (2 marks)
R.M Consumption A1 3480×5 = 17400 kg A2 4000×5 = 20000 kg. A3 1000×5 = 5000 kg. Total 42900 kg.
Add:- closing (42900/40 ×10) 10600 "
Less:- opening (8000 ")
45000 kg.
value (Rs) = 45000 kg × R 12 = Rs 5,40,000
(iv) Wages Budget:- (3 marks)
A1 A2 A3 Total Hrs. Rate Wages (Rs)
Budgeted Hrs. 3480×5 = 17400 4000×4 = 16000 1000×3 = 3000 36400
28800 → Rs 8 2,30,400
Normal working Hrs.:- (90 men × 8 hrs × 5 days × 8 hrs) 76000 Rs. 12 91,200
Overtime hrs:- 3,21,600
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