Lecture 1 Introduction to Management Accounting

- "Definition": process of identifying, measuring and communicating economic information to permit informed judgments and decisions.
- Provide information to decision makers to make good decisions.

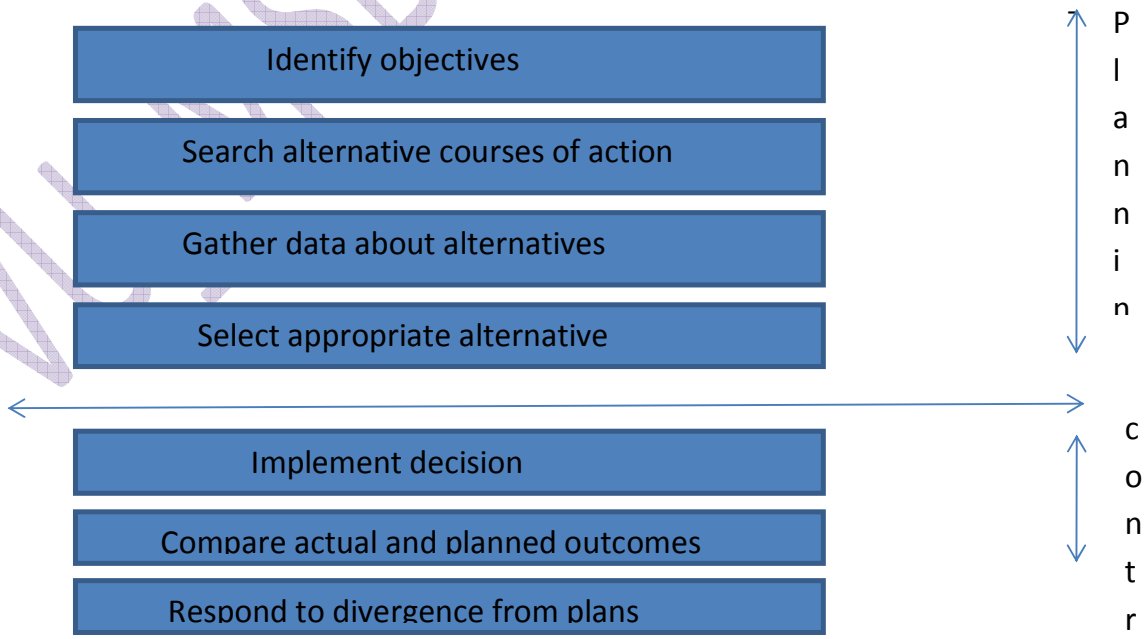
Users of Accounting Information

- Managers – decision making and control
- Shareholders – value and income from investments
- Employees – ability to pay salaries and avoid redundancies
- Creditors – ability to meet financial obligations
- Government – statistical information, taxes
- Others – potential investors/ research

Users …

- Users can be divided into 2 categories:
  - Internal users within the organization
  - External users i.e. shareholders, creditors
- Management accounting is for internal users
- Financial accounting information is for external users

Decision-making process



MGT705 – Advanced Cost and Management Accounting
Lecture 1 – 45 Slides

Identifying objectives

- Economic theory : firms seek to maximize profits (too simplistic)
- Firm is a coalition of various groups: shareholders, employees, customers, suppliers
- Broadly- firms seek to maximize future cash flows

Search for Alternatives

- Possible courses of action to achieve objective
- Essential to identify potential opportunities and treats. i.e.
  - Developing new products in existing markets
  - Developing new products for new markets
  - Developing new markets for existing products
- Search for alternatives involves acquiring information concerning future opportunities

Gather data

- When potential areas of activity are identified, management should assess:
  - Potential growth rate
  - Ability to establish adequate market share
  - Cash flow for each alternative activity
- Uncontrollable factors:
  - Economic boom / recession
  - Inflation
  - Strength of competition

Select appropriate alternative

- In practice decision making involves choosing between competing alternatives and selecting the one that best meets the organizations objectives.
- Assuming objective to be to maximize future net cash flows, alternative selected will be based on comparison of the different cash flows.

Implementation of Decisions

- The budget is the financial plan for implementing management decisions.
- Expressed in terms of cash inflows and outflows, sales revenues and expenses.
- The master budget consists of a budgeted profit and loss account, balance sheet and a cashflow statement.

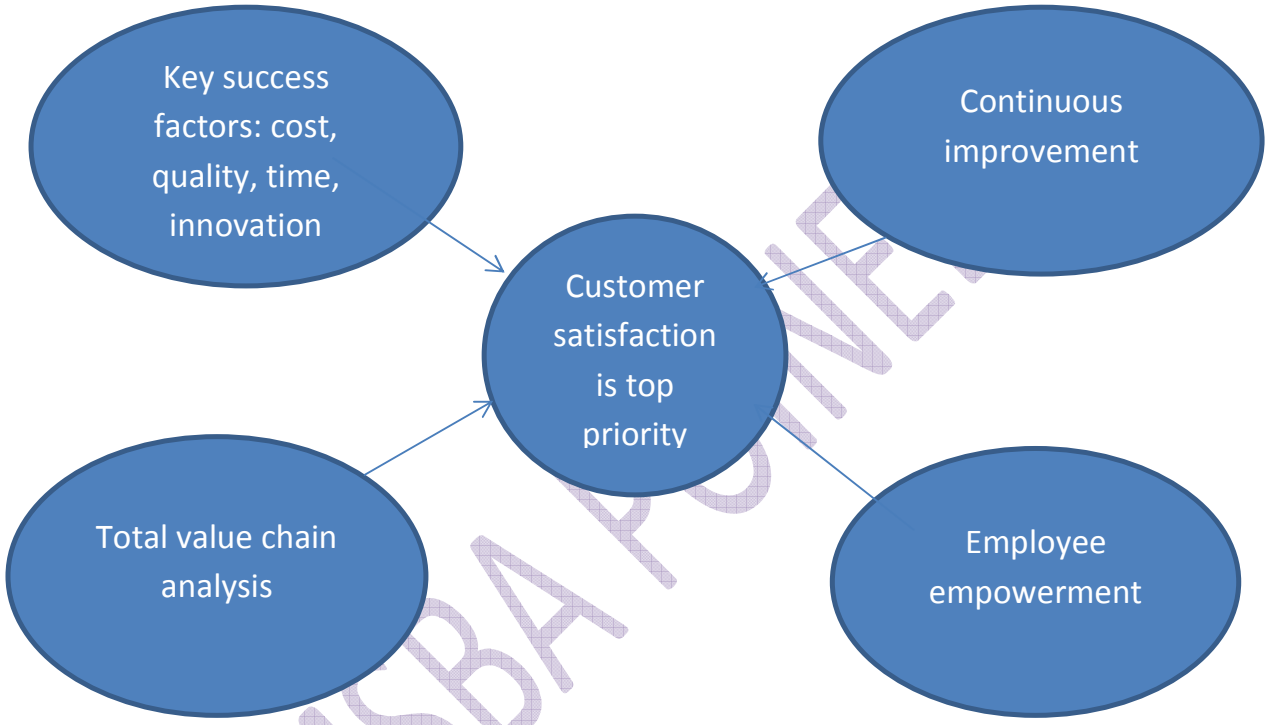
Comparing actual vs plan

- The managerial function of control consists of measurement, reporting and subsequent correction of performance to ensure firms objectives are achieved.
- Performance reports of actual costs and revenues in comparison with budget, should be prepared at regular intervals.
- These reports highlight activities that do not conform to plan

Responding to divergence

- Effective control requires that corrective action is taken for diverging activities.
- This may require modification in plan if the plan (budget) is inappropriate and not attainable

New management approaches



Cost efficiency and quality

- Keeping costs low and being cost efficient provides an organization with a strong competitive advantage. Accuracy and reliability in costing systems has gained importance.
- Companies are focusing on Total Quality Management (TQM) in response to customer demands for high quality.
- The goal of TQM is customer satisfaction.

Continuous improvement

- Continuous improvement is a process that focuses on delivery of products or services of consistently high quality in a timely fashion.
- It is cheaper to produce items correctly the first time rather than to waste resources making sub-standard items that had to be detected, reworked, scrapped or returned by customers.

Cycle time

- Cycle time is a measure that management accounting systems have begun to focus on, it is the length of time from start to completion of a product or service.
- Cycle time is minimized by reducing time spent on transfer of product during production, wait time, inspection time, re-working time and holding period of inventory. These are referred to as non-value added activities, as against processing time which adds value to the product.

Benchmarking

- Benchmarking is a technique that is increasingly being adopted as a mechanism achieving continuous improvement.
- It is a process of measuring a firm's product, service or activity against the other best performing organizations.
- Benchmarking involves a focus on latest developments and best practices that can be incorporated in various business operations.

Employee empowerment

- In their quest for continuous improvement managers have found they have to rely increasingly on the people closest to the operating processes and customers, to develop new approaches to improve performance.
- This has lead to employees being provided with relevant information to enable them to make continuous improvements in processes.

The value chain

- The value chain is the linked set of value creating activities all the way from the basic raw material suppliers to the ultimate end-use product delivered to customers.

The value chain can also be viewed from the customer's perspective, with each link being seen as the customer of the previous link. If each link in the value chain is designed to meet the needs of its customer, then end customer satisfaction should ensue.

Impact of I.T. - ERP

- One advanced IT application that has considerable impact on business information systems is Enterprise Resource Planning (ERP) system .
- ERP comprises a set of integrated software application modules that aim to control all information flows within a company. A major feature of ERP systems is that all data are entered only once, typically where the data originates.

Lecture 2 Introduction to Management Accounting

Cost Terms and Concepts

- **Cost** reflects a monetary measure of resources sacrificed / foregone to achieve a specific objective i.e. acquiring of goods and services.
- Accounting systems measure costs which are used for profit measurement, inventory valuation, decision making, performance measurement and controlling business activities.

Cost Objects

- A cost object is any activity for which a separate measurement of cost is desired. Examples of cost object include: cost of a product, cost of rendering a service and cost of operating a particular department.
- A costing system will typically:
  - Accumulate costs by classifying them into certain categories such as labor, materials and overheads.
  - Then assign these costs to cost objects.

Some cost terms

- Direct and Indirect costs
- Product and Period costs
- Cost behavior in relation to volume of activity
- Relevant and Irrelevant costs
- Avoidable and Unavoidable costs
- Sunk costs
- Opportunity costs
- Incremental and Marginal costs.

Direct and Indirect Costs

In manufacturing organizations one cost object is usually the product. Categories of costs are:

- Direct material x
- Direct labor x
- Prime cost x
- Production overhead x
- Production cost x

Conversion Cost

Direct cost can be specifically and exclusively identified with a particular cost object. Indirect

Product and Period Costs

- Product costs are those that are identified with the goods being produced for resale. These include direct material, direct labor and production overheads.
- Period costs are treated as expense in the period in which they are incurred. They are not included in inventory valuation. Non-manufacturing overheads e.g. admin, sales & distribution, are regarded as period costs.

Example

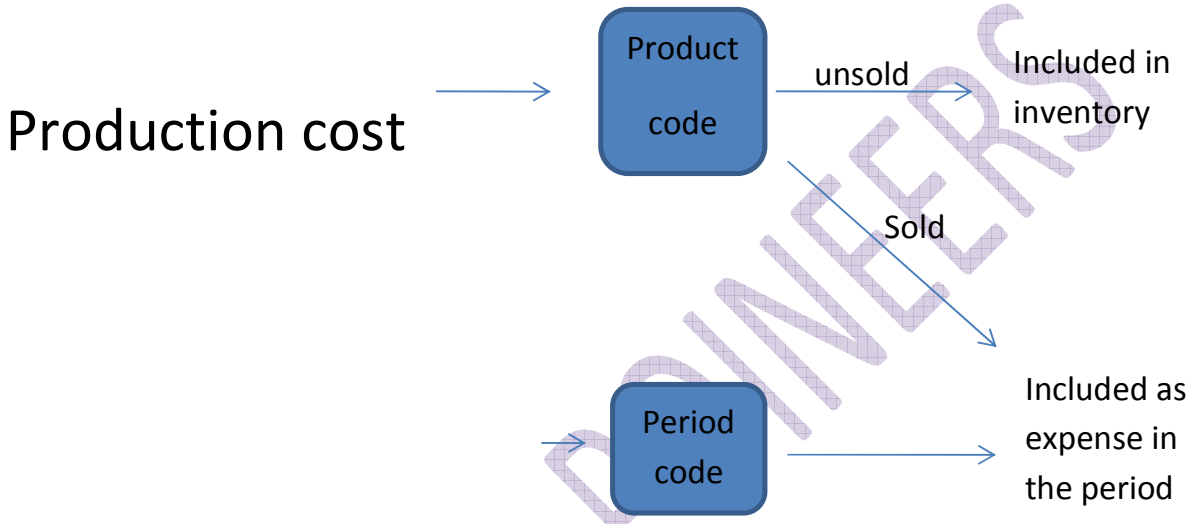
- Fancy Fans Company of Gujranwala produces 100,000 identical units of product during January. Costs for January are :

Manufacturing costs:		
Direct labor	400,000	
Direct material	200,000	
Manufacturing overhead	200,000	
		800,000
Non-manufacturing costs		300,000

In January the company sold 50,000 units for Rs 750,000 and remaining 50,000 were unsold. Profit and loss account will be:

	Rs	Rs
Sales (50,000 units)		750,000
Direct labor	400,000	
Direct materials	200,000	
Production Overheads	200,000	
Production cost (product costs)	800,000	
Less closing stock (50,000 units)	400,000	
Cost of goods sold	400,000	
Gross Profit	350,000	
Less Non production costs (period costs)	300,000	
Net profit	50,000	

Treatment of product and period costs

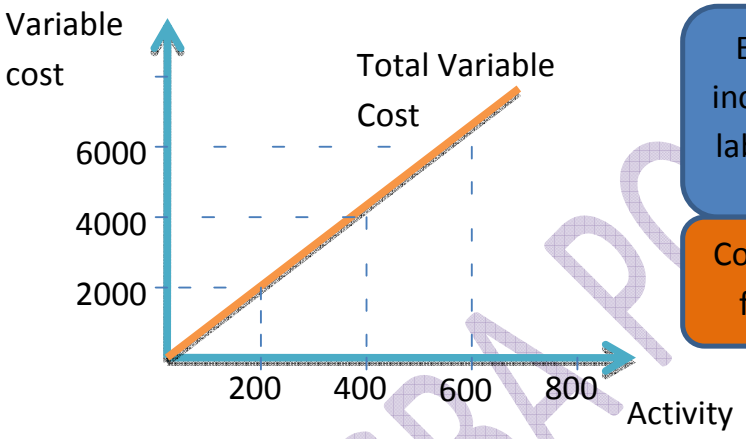


Cost in relation to volume

- Decisions which require information on how cost will vary in relation to volume are:
  - Volume of production for the next year
  - Reduce selling price to sell more units
  - Sales staff should be paid salary, commission, both
  - Change in costs and revenues of hospital, if one more patient is admitted for seven days
  - Change in costs and revenues of hotel, if a room and meals are provided for 2 for a 7 days stay.

Variable, Fixed and Semi-Variable Costs

- Variable costs vary in direct proportion to volume of activity i.e. if volume is doubled, the cost will also double. Total variable cost is linear and variable cost per unit is constant.



Examples of variable costs include direct material, direct labor, energy cost to operate a machine

Cost variation will remain true for a range of activity level

Fixed Costs

- Fixed costs remain constant over a wide range of activity. Examples of fixed costs include depreciation of factory building, supervisor salary, leasing charges.
- While total fixed cost remains constant, fixed cost per unit decrease proportionally.
- Step fixed costs: beyond a certain range of activity fixed costs will change. Senior managers may be added, new machinery may be acquired.

Semi-variable costs

- These costs include a fixed component and a variable component. Examples include payment to sales staff of salary as well as commission, line rent paid on telephone together with charges for calls made.

Relevant and Irrelevant costs

- Costs can be relevant or irrelevant in respect of a particular decision or project.
- All costs which change in response to a decision will be regarded as relevant to the decision. E.g. use of car vs public transport, road tax and insurance paid on car is irrelevant. Petrol cost of car will depend on the alternative chosen.
- In the short-term all costs and revenues are not relevant for decisions being made.

Avoidable and Unavoidable Costs:

- Avoidable costs are those that may be saved when a given alternative is not adopted.
- Unavoidable costs cannot be saved.
- Hence only avoidable costs are relevant in decision-making.
- Decision rule is to accept the alternatives that generate revenue in excess of avoidable costs.

Sunk Costs

- These are costs of resources already acquired and will be unaffected by the choice between various alternatives. Example:
  - Machine purchased 4 yrs ago Rs 100,000
  - Expected life (scrap value is Nil) 5 years
  - WDV under st. line method Rs 20,000

The WDV will have to be written off no matter what future action is chosen. If machine is scrapped and new one purchased, 20,000 will be written off. If machine is used in production, 20,000 will still be written off. This is classified as sunk cost.

Sunk costs are irrelevant for decision making, but they are distinguished from irrelevant costs because not all irrelevant costs are sunk costs. E.g. a comparison of two alternative production methods may result in identical direct material expenditure for both alternatives, so direct material cost would be irrelevant, but the material cost is not sunk since it will be incurred in the future.

Opportunity cost

- Opportunity cost is the cost that measures the alternative sacrificed or lost when one course of action is adopted.
- Opportunity cost applies only to use of scarce resources. When resources are not scarce there is no sacrifice in the use of these resources.
- When no alternative use of resources exists, the opportunity cost is zero.

Example: Sunk and Opportunity Costs

- Mr. Jahangir has taken out a lease on a shop for a down payment of Rs 5000. Additionally the rent under the lease amounts to Rs 5000 per annum. If the lease is cancelled, the initial payment of Rs 5000 is forfeited. Mr. Jahangir plans to use the shop for the sale of clothing, and has estimated operations for the next 12 months as follows:

Sales		100,000
Cost of goods sold	50,000	
Wages & related costs	12,000	
Rent incl. down payment	10,000	
Heat, light, insurance	13,000	
Audit, legal expenses	2,000	
		87,000
Net Profit before tax		13000

Mr. Jahangir can sublet the shop to a friend for Rs 550 per month, if he does not use it himself.

Sunk and Opportunity Cost example…

The down payment of Rs 5000 represents a sunk cost.

The lost profit from subletting of Rs 1600 calculated as :

– Income	(Rs 550x 12)	6600
– Less annual rent		5000
		1600

It is an example of opportunity cost. Note only rental is included in opportunity cost calculation. Rs 5000 sunk cost is excluded.

Relevant information for shop

- The relevant information for running the shop is:
- Net sales 100,000
- Costs (87000- 5000 sunk cost) 82,000
- 18,000
- Less opportunity cost (sublet) 1,600
- Profit 16,400

Incremental and Marginal costs

- Incremental (differential) costs and revenues represent the difference in cost under each alternative being considered. For example, the incremental cost of increasing output from 1000 to 1100 units per week is the additional cost of producing extra 100 units per week.
- Marginal cost/revenue represents the additional cost / revenue of one extra unit of output.

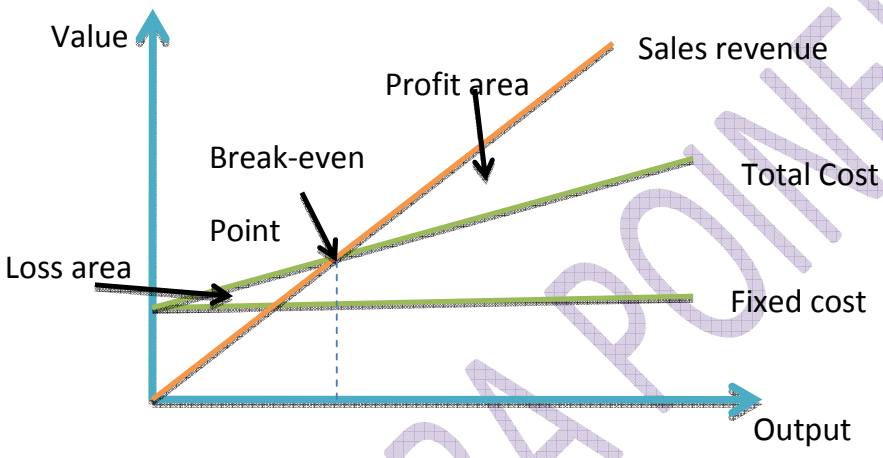
Lecture 3 Cost Volume Profit Analysis

Cost Volume Profit model (CVP)

- This is a systematic method of examining the relationship between changes in activity (output) and changes in sales revenue, expenses and profit.
- It is a useful tool for decision making in setting selling prices and output levels.
- This model also helps to identify the output level at which neither profit nor loss will occur i.e. break-even point.

The Basic Model

- The analysis is based on relationship between volume, sales revenue and costs in the short-run, where certain factors such as plant capacities cannot be expanded.



Example – City Enterprise

- City enterprises operate in the entertainment industry and one of its activities is to promote cricket matches throughout the country. The company is examining the viability of a cricket match in Sialkot:
- Estimated fixed costs Rs 60,000
- (includes amounts paid to cricketers, hire of ground and advertising cost).
- Variable costs (pre-packed lunch box) Rs 10 per ticket sold.
- Proposed selling price Rs 20 per ticket

- Management have requested the following information:
  - The number of tickets that must be sold to break-even
  - How many tickets must be sold to earn a target profit of Rs 30,000
  - What profit would result if 8000 tickets were sold
  - What selling price must be charged to give a profit of Rs 30,000 on sale of 8000 tickets
  - How many additional tickets must be sold to cover extra cost of television advertising of Rs 8000.

Break-even point in units

- Contribution Margin approach:
  Contribution = Sales Revenue -variable expenses.
- As variable cost per unit and selling price per unit are assumed to be constant, the contribution margin per unit is also assumed to be constant.
- Sales price per ticket Rs 20
- Variable cost per ticket Rs 10
- Contribution margin per ticket Rs 10

Break-even…

- The break-even point will occur when fixed costs will be covered by contribution
  i.e. Fixed Cost = Contribution
- Break-even point in units can be calculated as:
  B/E(units)=Fixed cost/contribution per unit
  i.e. 60000/10 = 6000 tickets.

Tickets required for profit of Rs 30000

- Here the contribution margin must equal the fixed costs as well as the desired profit, hence: Tickets required for 30000 profit = fixed cost + 30000 / contribution per ticket
  =60000+30000 / 10
  = 9000 tickets

Profit from sale of 8000 tickets

Contribution margin on 8000 tickets: 8000 x Rs 10 = 80000

Fixed costs	= 60000
Profit	= 20000

Profit Rs 30000 from 8000 tickets

- Contribution required for profit of Rs 30000: fixed cost + profit: 60000+30000 = Rs 90000
- If number of tickets sold is 8000, contribution per ticket should be: 90000/8000=11.25
- Existing contribution = Rs 10
- Additional contribution = Rs 1.25
- New selling price is Rs 20+1.25 = Rs 21.25

Television advertising cost

- Additional tickets that must be sold to meet television advertising costs of Rs 8000:
  - fixed costs will now increase by Rs 8000
  - extra tickets required to cover fixed cost at the contribution margin rate of Rs 10
  = 8000/10 = 800 tickets

Contribution Margin Ratio

- Also known as the profit – volume ratio, it is : Contribution / Sales revenue
- It represents the proportion of sales available to cover fixed costs and provide for profit.
  - In the above example the contribution margin is Rs 10 and selling price is Rs 20, hence the contribution margin ratio is 0.5
  - If sales revenue = 200000,
  - contribution will be 100000 (200000 x .5)
  - deduct fixed costs (60000)
  - profit = 40000

Contribution Margin(CM) Ratio

- Thus a profit of Rs 40000 will be obtained from total sales revenue of Rs 200000 i.e.
- Profit = (sales revenue x CM ratio) – Fixed Cost Profit + Fixed Cost
  = sales revenue x CM ratio

Therefore at Break-even point(where profit=0)

- Sales revenue = Fixed Cost / CM ratio

Relevant Range

- It is vital to remember that the formulae method can only be used for decisions within the relevant range of output.
- Outside this range the unit selling price and variable cost are no longer deemed to be constant.
- In our example of City Enterprises, let us assume caterers charges will be higher if ticket sales are below 4000, but lower if sales exceed 12000. Variable cost of Rs 10 relates only to a sales volume range of 4000 to 12000 tickets.
- Also the hire charges for the ground may be reduced for ticket sales of less than 4000, and increased for ticket sales of more than 12000.
- This implies that the relevant range is sales volume of 4000 to 12000, and outside this range the results of our analysis do not apply.

Margin of Safety

- The margin of safety indicates by how much sales may decrease before a loss occurs.
- Using the above example where unit selling price is Rs 20, variable cost is Rs 10 and fixed costs are Rs 60000, we noted the break-even point was 6000 tickets of Rs 120000 sales revenue.
- If sales are expected to be 8000 tickets or Rs 160000, the margin of safety will be 2000 tickets or Rs 40000.

Margin of safety can be expressed as a percentage:

- % margin of safety = $\frac{\text{expected sales – breakeven sales}}{\text{Expected sales}}$

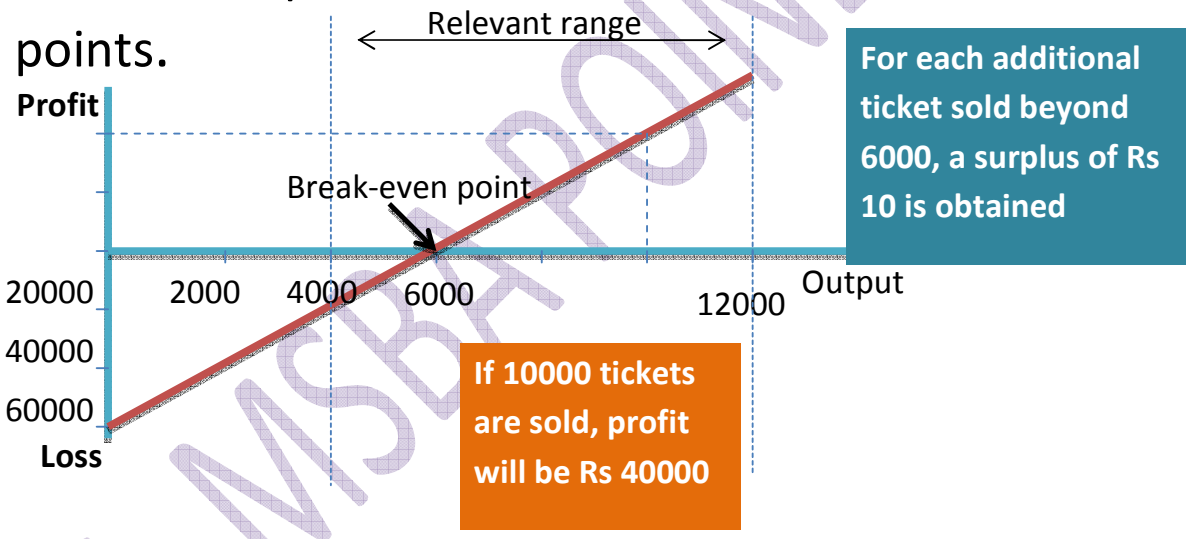
  = $\frac{160000-120000}{160000}$ = 25%

Profit – Volume Graph

- The break-even and contribution charts do not highlight the profit or loss at different volume levels.
- The profit volume graph is a more convenient method of showing the impact of changes in volume on profit.
- The horizontal axis represents the various levels of sales volume, and the profits and losses are recorded on the vertical axis.

Profit – Volume Graph …

- When units are zero, loss = fixed costs 60000
- At break-even (zero profit) sales volume is 6000 tickets. The profit line is drawn between these two points.



Lecture 4 **Cost Volume Profit Analysis (cont…)**

Break-even analysis example – Eastern Company

The summarized profit and loss statement for the Eastern Company for the last year is as follows:

Sales (50,000 units)		1000
Direct materials	350	
Direct Wages	200	
Fixed Production overheads	200	
Variable Production overheads	50	
Administration overheads	180	
Selling and distribution overheads	120	
		1100
Profit / (Loss)		(100)

Eastern Company …

- At a recent Board meeting the directors discussed the results and the Chairman asked for suggestions to improve the situation. You are required to evaluate the following proposals and comment briefly on each.
- A)Pay salesmen a commission of 10% of sales and this will increase sales to break-even point
- B) Reduce selling price by 10% which, it is estimated will increase sales volume by 30%
- C) Increase direct wages from Rs 4 to Rs 5 per hour as a part of productivity/pay deal. It is hoped that this would increase production and sales by 20%, but the advertising cost would increase by Rs 50000.
- D) Increase sales by advertising of Rs 300,000 with an increased selling price of 20%, setting profit margin at 10%.

Eastern Company - solution

- Workings:

Sales	1000
Variable costs	600
Contribution	400
Fixed costs	500
Profit / (Loss)	(100)

- Unit selling price = Rs 20 (Rs 1M/50,000)
- Unit variable cost = Rs 12 (Rs 600000/50,000)
- Unit contribution = Rs 8

Eastern Company –

(A) sales commission 10%, sales increase to B/E

- 10% sales commission = Rs 2 per unit
- Contribution per unit now: Rs 6 per unit
- Break-even point : 500,000/6 = 83,333 units
- This requires an increase of 67% on previous sales of 50,000 units. The directors will need to consider whether this is realistic!

(B) Reduce selling price by 10%, increase sales volume by 30%

- 10% reduction in selling price = Rs 2 per unit.
- Revised contribution per unit = Rs 6
- If sales volume increased by 30% = 50000x130% = 65000
- Contribution (65000 x 6) = 390000

  Less: fixed costs = 500000

  Profit/(Loss) (110000)
- Estimated loss is worse than last year, proposal not recommended.

(C) Increase direct wages, production and sales will go up 20%, Adv Rs 50000

- Wages increase from Rs 4 to Rs 5 per hr – 25%
- Direct wages cost will increase from 200000 to 250000, and output increases by 20%.

Income Statement

Sales (60,000 units)		1.200,000
Direct materials and variable overheads	480,000	
(60,000 units)		
Direct wages	250,000	
		730,000
Contribution		470,000
Less: Fixed costs (advertising Rs 50,000)		(550,000)
Profit / (Loss)		(80,000)

This represents an improvement of Rs 20,000 over last year loss of Rs 100,000 however it does not make the Company profitable.

(D) Increase advertising by 300,000 selling price by 20%, profit margin 10%

- Revised selling price (20 x 120%) = 24
- Let X = revised sales volume,

  sales – (variable cost + fixed cost) = profit

  24X – (12X + 800,000) = .1(24X)

  9.6X = 800000 ; X = 83,333 units
- The proposal results in profit, but would require an increase in sales volume of 67%. Additionally, the risk of increase in fixed cost by Rs 300,000 must be considered.

Separation of semi-variable costs

- Semi variable costs include both a fixed and a variable component.
- E.g. the cost of maintenance is a semi variable cost consisting of planned maintenance which is undertaken whatever the level of activity, and a variable element which is directly related to the level of activity.
- The high-low method to separate fixed and variable costs consists of examining past costs and related activity.

High-low method

- Selecting the highest and the lowest activity levels and comparing the changes in costs which result from the two levels.

Volume	Semi variable costs
5000	22000
Lowest activity	Highest activity
10000	32000

If variable costs per unit are constant, and fixed costs remain unchanged, the increase in costs will be due entirely to an increase in variable costs.

High-low method …

- Variable cost per unit can be calculated as : Difference in cost / Difference in activity = 10000 / 5000 = Rs 2 per unit
- The fixed cost can now be calculated for any level of activity: At 5000,
- Total cost = Rs 22000
- variable cost (5000 x 2) = Rs 10000
- Balance is fixed cost 12000

Example

- Jamal Sons operate a single retail outlet selling direct to the public. Profit statements for August and September are:

	Aug	Sep
Sales	80000	90000
Cost of sales	50000	55000
Gross profit	30000	35000
Less: Selling and Dist.	8000	9000
Admin	15000	15000
Net Profit	7000	11000

Jamal Sons…

a) Use the high-low points technique to identify the behavior of:

i) cost of sales

ii) selling and distribution costs

iii) Administration costs

	Aug	Sep	
Diff Sales	80000	90000	10000
Cost of sales	50000	55000	5000
Selling & Dist	8000	9000	1000
Administration	15000	15000	nil

Increase in sales of 10000 results in increase in cost of sales 5000 and selling and distribution costs of 1000.

Hence variable costs are:

cost of sales – 50% of sales,

selling and dist. - 10% of sales

Fixed cost can be derived using August data:

Total.Var. cost Fix cost (bal) Cost of sales

50,000 40,000 10,000

Selling & dist 8,000 8,000 nil Administration 15,000 nil 15,000

25,000 Total cost = 25,000 (fixed) + 60% Sales (var. cost)

b) Draw a contribution breakeven chart and identify the monthly breakeven sales value and area of contribution.

- The following items are plotted on the graph:

Variable Cost Total Cost Zero sales nil

25000 Fix 80000 sales

48000(60%) 73000 90000 sales

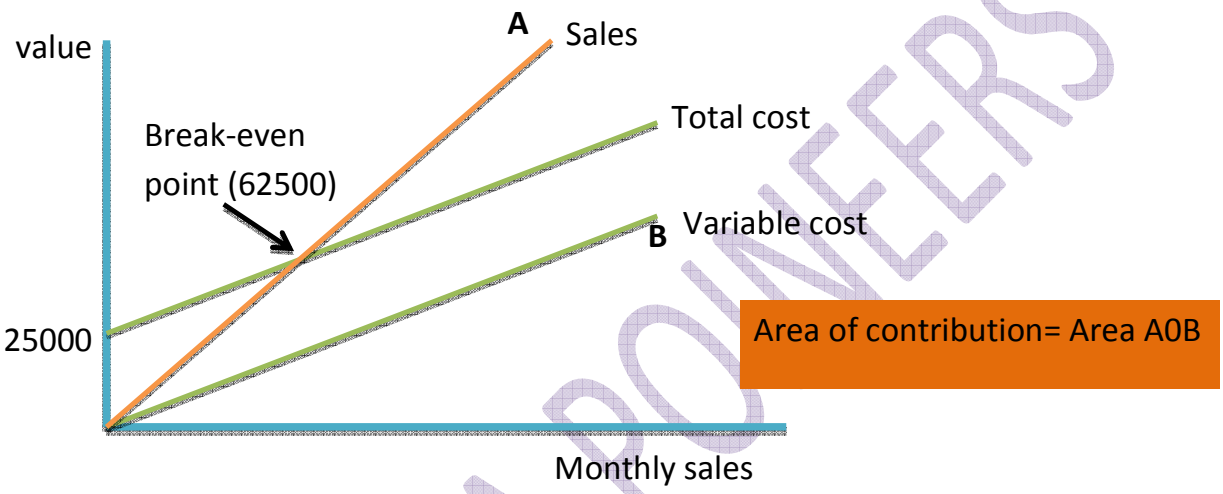
54000(60%) 79000 50000 sales

30000(60%) 55000 100000 sales

60000 85000

Contribution break-even graph

- B/E pt = Fixed costs (25000) = 62500
  contribution to sales ratio (.4)



c) Assuming margin of safety= 30% of break-even value, calculate Jamal Sons annual profit.

Actual sales = 1.3 x break-even sales (62500)
= 81250

Contribution (40% of sales) = 32500

Fixed costs = 25000

Monthly profit = 7500

Annual profit (7500x12) = 90000

Jamal Sons – new outlet

- Jamal sons is now considering opening another retail outlet selling the same products. They plan to use the same profit margins in both outlets and has estimated that the specific fixed costs of the second outlet will be 100000 per annum.
- Jamal sons also expects that 10% of its annual sales from the existing outlet would transfer to this second outlet.

- Calculate the annual value of sales required from the new outlet to achieve the same profit as before.

Contribution from single outlet	= 390,000 (32,500 x 12)
Contribution to cover lost sales (10%)	= 39,000
Specific fixed costs	= 100,000
Total contribution required	529,000
Required sales = 529,000/0.4	= 1,322,500

Lecture 5 Multi-Product Break-even Analysis

- Most firms produce and sell a number of products or services. We shall consider how we can adopt the analysis based on a single product to a multi-product setting.
- Example: The Super Waves Company sells two types of washing machines – a deluxe model and a standard model. The following information is based on the sales forecast for the period:

	Deluxe	**Standard**	**Total**
Sales volume	1200	600	
	Rs 000s	**Rs 000**	**Rs 000s**
Unit selling price	300	200	
Variable cost per unit	150	110	
Unit contribution	150	90	
Total sales revenue	360,000	120,000	480,000
Less: total variable cost	180,000	66,000	246,000
Contribution to direct and Common fixed costs	180,000	54,000	234,000
Less: Direct avoidable fixed costs	90,000	27,000	117,000
Contribution to common fixed costs	90,000	27,000	117,000
Less: Common fixed costs			39,000
Operating profit			78,000

Super Waves Company

- In the above example the Company sells 2 products so there are 2 unit contribution margins. If all fixed costs are directly attributable to products i.e. there are no common fixed costs, we simply apply the analysis as follows:

  Deluxe B/E pt =Direct fixed cost 90,000 =600 units

  Unit contribution 150

  Standard B/E Pt = 27000 = 90

  300 units

- However, as there are common fixed costs also, selling 600 deluxe and 300 standard machines will not cover the common fixed costs and the break-even for the firm as a whole will not be achieved.
- The common fixed costs cannot be specifically identified with the product, and any allocation will be inappropriate and arbitrary.

Multi product B/E …

- The solution to the problem is to convert the sales volume measure of the individual product into standard batches of products based on a planned sales mix.
- In the example, the Super Waves Company plans to sell 1200 deluxe and 600 standard machines giving a sales mix ratio of 2:1.
- We therefore define our standard batch of products as comprising 2 deluxe and 1 standard machine, giving a contribution of 390 per batch.
  - 2 deluxe machines contribution of 150 each =300
  - 1 standard machine contribution = 90

    390

The break-even point in standard batches can be calculated by the same method as before:

B/E number of batches = Total fixed costs

Contribution margin per batch

= 117000+39000

390

= 156000 = 390

400 batches

Thus 800 deluxe machines and 400 standard machines must be sold to break-even.

The following profit statement verifies this:

	Deluxe	**Standard**	**Total**
Units sold	800	400	
	Rs 000s	Rs 000s	Rs 000s
Unit contribution margin	150	90	

Contribution to direct and				
Common fixed costs	120,000	36,000		156,000
Less: Direct fixed costs	90,000	27,000	117,000	
Contribution to common fixed costs	30,000	9,000	39,000	
Less: Common fixed costs				39,000
Profit				nil

Note: Contribution has been defined as sales less variable cost. Where fixed costs are divided into direct and common (indirect) fixed costs, it is possible to identify 2 separate contribution categories. The first is contribution to direct and common fixed costs, being equal to sales less variable cost. The second is after deduction of direct fixed cost and is described as contribution to common or indirect fixed cost.

Multi-product break-even…

- Let us assume that the actual sales volume of 1200 units consisted of 600 units of each type of machine. The sales mix is 1:1 compared to the planned sales mix of 2:1. The contribution to direct and common fixed costs will be:
- Deluxe (150x600) = 90,000
- Standard (90x600) = 54,000
  144000
- Less : Direct and common fixed cost =156000
  (12000) Loss

Multi-product…

- Hence the break-even point will vary depending on the sales mix. The sales mix changed from 2:1 to 1:1, and contribution per batch changed from 390 to 240(1x150)+(1x90)
- The revised break-even point will be : 156000/240 = 650 units based on sales mix of 1:1.

Multi products-example Zeno Ltd

Zeno Ltd produces 2 products and the following budget applies for the year 2012:

	Product X	**Product Y**
	Rs	Rs
Selling price	6	12
Variable Cost	2	4
Contribution Margin	4	8
Fixed Costs	100,000	200,000
Units sold	70,000	30,000

Required: Calculate the break-even points of each of the products, and the Company as a whole, comment on your findings.

Break-even point = Fixed Cost

Contribution per unit

Product X : 100,000/4 = 25,000 **Product Y** : 200,000/8 = 25,000

Company as whole : 300,000/5.20* = 57,692

*Average contribution per unit: [(70,000x4)+(30,000x8)]/100,000 = 5.20

Hence the sum of the break-even points is less than the break-even for the Company as whole. It would be incorrect to simply add the B/E of the products to arrive at the B/E for the Company, because the sales mix will be different from the plan. Summing up would assume 50:50 sales mix whereas the planned sales mix is 70:30

Break-even analysis assumptions

- All other variables remain constant.
- A single product or constant sales mix.
- Total costs and revenues are linear functions of output.
- Profits are calculated on variable costing basis.
- The analysis applies to relevant range of output only.
- Costs can be accurately divided into their fixed and variable elements.
- The analysis applies only to a short term horizon.

Problem: Indus Ltd

- Indus Ltd is a company engaged solely in the manufacture of sweaters, which are bought mainly for sporting activities. Present sales are direct to retailers, but in recent years there has been a steady decline in output because of increased foreign competition. In the last trading year (20X1) the accounting report indicated that the company produced the lowest profit for ten years. The forecast for 20X2 indicates that the present deterioration in profits is likely to continue.
- The company considers that a profit of Rs 80,000 should be achieved to provide an adequate return on capital. The managing director has asked that a review be made of the present pricing and marketing policies. The marketing director has completed this review, and passes the proposals on to you for evaluation and recommendation, together with the profit and loss for the year ending December 31, 20X1.

Indus Ltd – Profit and Loss Account y/e 31 December 20X1

Sales revenue			1,000,000
(100, 000 sweaters @ Rs 10)			
Factory cost of goods sold:			
Direct materials	100,000		
Direct labor	350,000		
Variable factory overheads	60,000		
Fixed factory overheads	220,000	730,000	
Administration overhead		140,000	
Selling and Distribution overhead:			
Sales commission(2% of sales)	20,000		
Delivery cost	50,000		
(variable per unit sold)			
Fixed cost	40,000	110,000	980,000
Profit			20,000

Indus Ltd-Information for MD

- Information to be submitted to MD includes the following three proposals:

i) To proceed on the basis that the demand for sweaters is such that 10% reduction in selling price would increase demand by 40%.

ii) To proceed on the basis that a 10% price reduction, together with a national advertising campaign costing Rs 30,000 may increase sales to the maximum capacity of 160,000 sweaters.

iii)To proceed with an enquiry from a mail order company of purchasing 50,000 units annually if the selling price is right. The mail order company would transport the sweaters from Indus Ltd to its own warehouse and no sales commission would be paid on these sales by Indus Ltd. However, if an acceptable price can be negotiated, Indus Ltd would be expected to contribute Rs 60,000 per annum towards the cost of producing a mail order catalogue. It would also be necessary for Indus Ltd to provide special additional packaging at a cost of Rs .50 per sweater. The marketing director considers that in 20X2 sales from the existing business would remain unchanged at 100,000 units, based on a selling price of Rs 10 if the mail order contract is undertaken.

Required:

a) The calculation of break-even sales value based on 20X1 accounts.

b) A financial evaluation of proposal (i) and a calculation of the number of units Indus Ltd would be required to sell at Rs 9 each to earn a target profit of Rs 80,000.

c) A financial evaluation of proposal (ii).

d) A calculation of the minimum price that would have to be quoted to the mail order company, first, to make sure that Indus Ltd at least break-even on the mail order contract, secondly, to ensure that same overall profit is earned as proposal (i) and thirdly, to ensure that the overall target profit is earned.

Indus Ltd – break even sales value

- B/E sales = Fixed costs / contribution margin
- Contribution = sales – variable cost
- Contribution margin = contribution / sales
- Fixed costs:
  - Fixed factory overheads 220,000
  - Administration overheads 140,000
  - Selling & distribution 40,000 400,000

Indus Ltd – (a) break even sales value...

- Variable cost:
  - Direct material 100,000
  - Direct labor 350,000
  - Variable overheads 60,000
  - Sales commission 20,000
  - Delivery costs 50,000 580,000
- Contribution = 1,000,000 – 580,000 = 420,000
- Contribution margin =420000/1000000 = 0.42
- B/E sales = Fixed costs / contribution margin
- = 400,000 /0 .42
- = 952,380

(b) Financial evaluation of proposal (i)

- Proposal: 10% reduction in selling price will increase demand by 40%.

  Revised selling price 9.00

  Less: variable costs

  Direct materials 1.00

  Direct labor 3.50

Variable overhead	0.60	
Delivery expenses	0.50	
Sales commission (2% of price)	0.18	5.78
Contribution per unit		3.22

Proposal (i)…

Number of units sold (40% increase)	140,000	
Total contribution (3.22x140000)		450,800
Fixed costs		400,000
Profit from proposal (i)		50,800

Part (b) Units required for profit of Rs 80,000 at selling price of Rs 9 per unit:

Desired contribution: 480,000

Contribution per unit: Rs 3.22

Required units: 480,000 / 3.22 = 149,068

(c)Financial evaluation of proposal (ii)

Proposal (ii): Price reduction 10%, advertising Rs 30,000 and sales 160,000 units.

At selling price Rs9, unit contribution	= Rs 3.22
Total contribution of 160000 units	=Rs 515,200
Fixed costs (increase by Rs 30,000)	= Rs430,000
Profit	Rs 85,200

(d) Proposal (iii)

- Proposal: mail order 50,000 units, no transport cost, no sales commission. Fixed costs increase by Rs 60,000 for catalogue and packaging costs increase by Rs0.50
- Variable cost:
  - Direct material 1.00
  - Direct labor 3.50
  - Variable overhead 0.60
  - Delivery expense nil
  - Sales commission nil
  - Additional packaging 0.50 5.60

Break-even contribution per unit:

60,000(fixed cost) / 50,000 units = Rs 1.20

Therefore required selling price is:

Variable cost	Rs 5.60
Contribution	Rs 1.20
Selling price	Rs 6.80

Part ii) earn profit of Rs 50,800:

Contribution required = 60,000 +50,800 =110800 i.e.

Contribution per unit = 110800/50000 = Rs 2.22

Variable cost: 5.60,

Required price: Rs 7.82

Part iii) earn profit of Rs 80,000

Contribution required = 140,000 i.e. Rs 2.80

Required selling price = 2.80+5.60 = Rs 8.40

Lecture 6 Measuring Relevant Costs and Revenues

- Relevant costs and revenues for decision making are only those that will be affected by the decision.
- Costs and revenues independent of the decision, and not affected by it, are obviously not relevant and need not be considered when making that decision.

Qualitative factors

- Many times it is difficult to quantify in monetary terms all the important elements of a decision, these are referred to as qualitative factors.
- A decline in employee morale that results from redundancies is an example of a qualitative factor which can affect future output.
- Out side suppliers may not deliver on time, resulting in loss of customer goodwill and a decline in future sales.
- Hence qualitative factors should also be taken into account in the decision making process.

Example – The Faisalabad-One Company

- The Faisalabad-One Company is a manufacturer of clothing that sells its output directly to clothing retailers.
- One of its departments manufactures sweaters. The department has a capacity of 50,000 sweaters per month. Because of the liquidation of one of its major customers, the Company has excess capacity.
- For the next quarter, monthly production and sales volume is expected to be 35000 sweaters at a selling price of Rs 40 per sweater.

Expected costs and revenues for the next month at 35000 sweaters are as follows:

	Rs.	Per Unit
Direct labor	420,000	12
Direct materials	280,000	8
Variable manufacturing overheads	70,000	2
Manufacturing non-variable Overheads	280,000	8
Marketing & distribution cost	105,000	3
Total costs	1,155,000	33
Sales	1,400,000	40
Profit	245,000	7

- The Faisalabad Company is expecting an increase in demand and considers that the excess capacity is temporary.
- Another company has offered to buy for its staff 3000 sweaters each month for the next three months at a price of Rs 20 per sweater. The company will collect the sweaters from Faisalabad One's factory thus no distribution cost will be incurred.
- No subsequent sales to this customer are anticipated. The company would require its logo inserted on the sweater which will cost Rs 1 per sweater.
- Should the Faisalabad company accept this offer.

	Do not accept	accept	Difference
Direct labor	420,000	420,000	
Direct materials	280,000	304,000	24,000
Variable manufacturing overheads	70,000	76,000	6,000
Manufacturing non-variable overheads	280,000	280,000	
Inserting Company logo	3,000	3,000	
Marketing and distribution cost	105,000	105,000	
Total cost	1,155,000	1,188,000	33,000
Sales	1,400,000	1,460,000	60,000
Profit per month	245,000	272,000	27,000

Important factors

Four important factors must be considered before recommending acceptance of order:

1) It is assumed that future selling price will not be affected by selling some of the product below market price. Otherwise loss of future profits may be greater than short-term profits. **2)** No better opportunities are likely to arise during the period.

3) Company has no alternative use of resources that yield contribution more than Rs 27000 p.m.

4) Fixed costs are unavoidable for the period under consideration

Evaluation in the longer-term

- In the previous example we focused on the short-term, so direct labor and fixed costs were considered irrelevant, as they were unlikely to change in the short-term.
- However in the long-term it may be possible to reduce capacity and spending on fixed costs and direct labor.
- In our example of Faisalabad-One Company, the following factors will apply in the long-term:
    - Direct labor cost could be reduced as this labor could be made redundant with no redundancy costs involved.
    - Capacity could be reduced by cancellation of rental contracts of some machinery.
    - Cost savings could be made in some supervisory and support staff costs.
    - If capacity is reduced, it may be possible to rent out part of the facility.

Therefore in the longer-term decisions, some of the costs that were fixed in the short-term could be changed and no longer remain fixed.

Product mix decisions – when capacity constraint exists

- In the short term, sales demand may be in excess of current productive capacity. Output may be restricted by a shortage of skilled labor, materials, equipment or space.
- The resources responsible for limiting the output should be identified; these are known as limiting factors.
- Where limiting factors apply, profit is maximized when the contribution to profit from the limiting factor is maximum.

Example – Dayan Autos

Dayan autos supplies component parts to firms operating in the automobile industry. Information on three components is as follows:

		X		Y	Z
Contribution per unit (Rs)		12		10	6
Machine hours per unit	6		2	1	
Estimated sales (units)	2000	2000	2000		
Machine hrs for 3 months		12000		4000	2000

- Due to break-down capacity is limited to 12000 hrs for three months. You are asked to advice on product mix for the three month period.
- You may think top priority should be given to product X as it has the highest contribution per unit, but this assumption would be incorrect.
- Component X requires 6 machine hours per unit, whereas Y and Z require 2 and 1 hours respectively.
- The optimum production plan is determined by calculating the contribution per limiting factor for each component.

Example –capacity constraint ….

		X	Y	Z
Contribution per unit		12	10	6
Machine hours required	6 2	1		
Contribution per machine hour	2	5	6	
Ranking		3	2	1

The company can now allocate the 12000 machine hours according to the above rankings.

- Priority would be to produce maximum component Z. Sales are projected at 2000 units so 2000 hours will be used, leaving 10,000 hours unused.
- Second choice would be to produce maximum product Y. Sales of 2000 units will result in use of 4000 hours, leaving a balance of 6000 hours
- This will enable 1000 units of component X to be produced.

The allocation can be summarized as:

Production	hrs used	bal
2000 units of Z	2000	10000
2000 units of Y	4000	6000
1000 units of X	6000	nil

This production program results in the following total contribution:

2000 units of Z at Rs 6 per unit	12,000
2000 units of Y at Rs 10 per unit	20,000
1000 units of Z at Rs 12 per unit	12,000
Total contribution	44,000

- It is necessary to consider qualitative factors before the production program is determined. Customer goodwill nay be lost if company is unable to supply all three products to its major customers. This may cause a reduction in future sales.
- Difficulties arise where more than one resource is scarce. E.g. it could not be applied if labor hours were also limited, and based on contribution per labor hour, a different ranking resulted. In these situations linear programming is used for decision making. This will be covered later in the course.
- In the longer term, additional resources should be acquired if the additional contribution can justify incurring the cost.

Question - Limiting factors and optimal production program

- A farmer is planning his production for the next season, he has asked you to recommend the optimal mix of vegetable production for the coming year. He has given you the following data relating to the current year:

	Potatoes	Turnips	Peas	Carrots
Area occupied (acres)	25	20	30	25
Yield per acre (tons)	10	8	9	12
Selling price per ton (Rs)	100	125	150	135
Variable cost per acre (Rs)				
Fertilizers	30	25	45	40

Seeds	15	20	30	25
Pesticides	25	15	20	25
Direct Wages	400	450	500	570

Fixed overheads per annum Rs 54000

The land that is being used for production of carrots and peas can be used for either crop, but not for potatoes or turnips. The land that is being used for potatoes and turnips can be used for either crop but not for carrots or peas. In order to provide an adequate market service, the gardener must provide each year at least 40 tons each of potatoes and turnips and 36 tons each of carrots and peas.

You are required to present a statement to show :

(i) The profit for the current year
(ii) The profit for the production mix that you would recommend.

Solution - Limiting factors and optimal production program

Preliminary calculations:

Variable costs are quoted per acre, but selling prices are quoted per ton. Therefore it is necessary to calculate the planned sales revenue per acre:

	Potatoes	**Turnips**	**Peas**	**Carrots**
Yield per acre in tons	10	8	9	12
Selling price per ton	100	125	150	135
Sales revenue per acre	1000	1000	1350	1620
Variable cost per acre	470	510	595	660
Contribution per acre	530	490	755	960

Profit statement for the current year:

Acres	25	20	30	25		
Contribution per acre	530	490	755	960		
Total contribution	13250	9800	22650	24000		
Overall contribution						69700
Less: Fixed cost					54000	
Profit						15700

Profit statement for the recommended mix:

	Area A (45 acres)		Area B (55 acres)	
	Potatoes	**Turnips**	**Peas**	**Carrots**
Contribution per acre	530	490	755	960
Ranking	1	2	2	1
Minimum sales requirements (acres)		5	4	
Acres allocated	40			51
Recommended mix	40	5	4	51
Contribution	21,200	2450	3020	48960
Total contribution	75,630			
Less: Fixed costs	54,000			
Profit	21,630			

Notes – The minimum sales requirement for turnips is 40 tons, and this will require allocation of 5 acres. The minimum sales requirement for peas is 36 tons, requiring allocation of 4 acres.

Lecture 7

Replacement of equipment

- We will examine one aspect of asset replacement at this stage, that is the treatment of book values, and apply relevant cost principles (i.e. past or sunk costs are irrelevant for decision making).

Example - Dayan Autos…

- Dayan autos purchased a machine three years ago for Rs 180,000. Depreciation, using the straight line basis, assuming a life of six years with no salvage value, has been recorded each year in the financial accounts. The present written down value of the equipment is Rs 90,000 and it has a remaining life of three years.
- Management is considering replacing this with a new machine that will reduce variable operating costs. The new machine will cost Rs 70,000 and will have an expected life of 3 years with no scrap value.
- The variable operating costs are Rs 3 per unit for the old machine, and Rs 2 per unit for the new machine. It is expected that both machines will be operated at 20,000 units per annum. Sales revenues of both machines will hence be identical.
- Current disposal value of the old machine is Rs 40, 000 and will be zero in three years time.

Total costs over a period of 3 years for each alternative are as follows:

		Retain	Replace	difference
Present mach	**machine**	**(relevant cost)**		
Variable operating cost				
20,000 units @ Rs 3 for 3 yrs		180,000		
20,000 units @ Rs 2 for 3 yrs			120,000	(60,000)
Old machine book value:				
3 yr depreciation charge				
Lump sum write-off		90,000	90,000	nil
Old machine disposal value			(40,000)	(40,000)
Purchase of new machine			70.000	70,000
270,000	240,000	30,000		

- It can be seen that the 90,000 book value of the old machine is irrelevant to the decision as it will be written off in both cases. The disposal value of the old machine together with cost and benefit of the new machine need to be considered.
- These are all items with a cashflow impact. The decision therefore considers all items that have a cashflow impact.
- The above analysis shows there is a cashflow advantage of Rs 30,000 over 3 years, in replacing the old machine with the new one. This advantage arises due to reduction in variable operating cost.

Managers can sometimes take incorrect decisions as they may view the old asset in isolation as follow:

Book value	90,000
Sale proceeds	40,000
Loss on sale	50,000

However the decision should be viewed together with the advantage obtained from the purchase of the new machine and the cost and benefit of replacement examined over three years. Depreciation and profit or loss on sale of replaced assets is irrelevant for replacement decisions

Special pricing – example: A company which produces a range of products and absorbs production overheads using a rate of 200% on direct wages, is faced with a decision-making problem. The absorption rate was calculated from the following budgeted figures:

- Variable production costs 64,000
- Fixed production costs 96,000
- Direct labor costs 80,000

Problem 1

- The normal selling price of product x is Rs 22 and production cost of one unit is:
  - Raw material 8
  - Direct labor 4
  - Production overhead 8
    20

There is a possibility of supplying a special order for 2000 units of product X at a price of Rs 16 each. Normal budgeted sales will not be affected, and Company has spare capacity for the additional units.

Solution 1

- Production overhead absorption rate = 64,000(Variable) + 96,000 (fixed) 80,000(direct labor) = 200% of direct labor
- Variable overhead rate = 64,000 variable / 80,000 direct labor = 80% of direct labor

	Per unit		2000 units
Additional revenue	16.00		32,000
Additional costs:			
Raw material	8.00		
Direct labor	4.00		
variable overhead			
(80% of direct labor)	3.20	15.20	30,400
Contribution	0.80		1,600

The order should be accepted because it provides a positive contribution to fixed costs. It is assumed that direct labor is a variable cost.

Outsourcing

- Outsourcing is the process of obtaining goods and services from outside suppliers instead of producing the same goods or providing the same services within the organization. Many organizations outsource some of their activities such as maintenance of certain machinery, cleaning, photocopying and packaging.

Example - Make or buy decision

- A company which produces a range of products and absorbs production overheads using a rate of 200% on direct wages, is faced with a decision-making problem. The absorption rate was calculated from the following budgeted figures:
  - Variable production costs 64,000
  - Fixed production costs 96,000
  - Direct labor costs 80,000

Problem 2

- The cost of making component Q, which forms part of product Y, is stated below:
  - **Rs**
  - Raw materials 4
  - Direct labor 8
  - Production overhead 16
    28
  - Component Q could be bought from an outside supplier for Rs 20. Should the company continue making component Q?

Solution 2

- Relevant manufacturing costs of the component are:
  - Rs
  - Raw material 4.00
  - Direct labor 8.00
  - Variable overhead (80%x8) 6.40
    18.40
  - The additional costs of manufacturing are lower than the cost of purchase, hence company should continue to manufacture component.

Case A

- One of the divisions of Dayan Autos is currently negotiating with another supplier regarding outsourcing component A which it manufactures. The division currently manufactures 10,000 units per annum of the component. The cost currently assigned to the component are as follows:

	Total	unit cost
Direct materials	120,000	12
Direct labor	100,000	10
Variable manufacturing overheads	10,000	1
Fixed manufacturing overheads	80,000	8
Share of non-manufacturing overheads	50,000	5
Total costs	360,000	36

The above costs are expected to remain unchanged in the foreseeable future

If Dayan Autos continues to manufacture the component.

- The supplier has offered to supply 10,000 components per annum at a price of Rs 30 per unit guaranteed for a minimum of three years.
- If component A is outsourced, the current direct labor will be made redundant at no additional cost.
- Direct materials and variable overhead are avoidable if component A is outsourced.
- Fixed manufacturing overheads would be reduced by Rs 10,000 per annum, but non-manufacturing costs would remain unchanged.
- Should the division of Dayan Autos make or buy the component?

- At first it appears that the component should be outsourced since the purchase price of Rs 30 is less than the unit cost of manufacturing of Rs 36. However, the unit cost includes some costs that would remain unchanged whether or not the components are outsourced. These costs are therefore not relevant to the decision.
-

(Rs per annum)	Make 10000	Buy 10000	Difference
Direct materials	120,000	-	120,000
Direct labor	100,000	-	100,000
Variable manufacturing overhead	10,000	-	10,000
Fixed manufacturing overhead	80,000	70,000	10,000
Non-manufacturing overhead	50,000	50,000	-
Outside purchase cost	_____	300,000	(300,000)
Total cost per annum	360,000	420,000	(60,000)

This is easier to interpret if restated as follows:

(Rs per annum)	Relevant cost of making	Relevant cost of outsourcing
Direct materials	120,000	
Direct labor	100,000	
Variable overheads		10,000
Fixed overheads	10,000	
Outsourcing cost	_____	300,000
	240,000	300,000

Case B

- Now assume that the extra capacity that will be made available from outsourcing component A, can be used to manufacture and sell 10,000 units of part B at a price of Rs 34 per unit.
- All the labor force required to manufacture component A will be used to make part B.

- The variable overheads, fixed overheads and non-manufacturing overheads will be the same as for A.
- Material required for part B would cost Rs 13 per unit.
- Should Dayan autos outsource component A?
- The management of Dayan Autos now have three alternatives:
  - 1. Make component A , do not make part B
  - 2. Outsource component A, do not make part B
  - 3. Outsource component A, make and sell part B. It is assumed there is insufficient capacity to make both A and B.

		(1)Make A Not B	(2) Buy A No B	(3)Buy A Make B
Direct materials		120,000		130,000
Direct labor	100,000		100,000	
Variable overheads	10,000		10,000	
Fixed overheads		80,000	70,000	80,000
Non-manufacturing overheads		50,000	50,000	50,000
Outsourcing cost			300,000	300,000
Revenue from sale of part B				(340,000)
		360,000	420,000	330,000

Note except for non-manufacturing costs, all other costs vary between the alternatives, and are therefore relevant to the decision. Non-manufacturing costs are irrelevant to the

decision and may be ignored.

Comparison of the three alternatives indicates that buying component A and using the extra capacity to make part B is the preferable alternative.

- The incremental costs of outsourcing are Rs 60,000 more than making component B, but the extra capacity released enables Dayan Autos to obtain a profit contribution of Rs 90,000. (sales Rs 340,000 less incremental costs of Rs 250,000). Overall outcome is a benefit of Rs 30,000.
- Incremental (relevant) cost of making part B are as follows: Rs
  - Direct materials 130,000
  - Direct labor 100,000
  - Variable overheads 10,000
  - Fixed overheads 10,000

250,000

Lecture 8

Discontinuation Decisions

- Periodic profitability analysis provides attention-directing information that highlights those unprofitable activities which requires a more detailed appraisal to ascertain whether or not they should be discontinued.
- We will see how the principle of relevant costs can be applied to discontinuation decisions.

Example – The Dollar Company

- The dollar company is a wholesaler which sells its products throughout Asia. The company headquarters are in Singapore and has a regional structure with each region consisting of 3-5 territories.
- Each region has its own regional office and a warehouse which distributes the goods directly to the customers.
- Each territory has an office where marketing staff are located.
- The West Asia region consists of three sales territories with offices located in Karachi, Colombo and Dacca. The budgeted results for the next quarter are as follows:

(Rs 000s)	Karachi	Colombo	Dacca	Total
Cost of goods sold	800	850	1000	2650
Salespersons salaries	160	200	240	600
Sales office rent	60	90	120	270
Depn of sales office equipment	20	30	40	90
Apportionment of warehouse rent	24	24	24	72
Depn of warehouse equipment	20	16	22	58
Region and Headquarter costs				
Cause and effect allocations	120	152	186	458
Arbitrary apportionments	360	400	340	1100
Total costs assigned to each location	1564	1762	1972	5298
Reported profit / (loss)	236	238	(272)	202
Sales	1800	2000	1700	5500

Assuming the above results are typical of future performance, should Dacca territory be discontinued?

Example – The Dollar Company

- It is apparent that the West Asia region is profitable, but the analysis suggests that the Dacca sales territory is unprofitable. A more detailed study is required to ascertain whether it should be discontinued.
- This study indicates:
  - Discontinuing Dacca territory will eliminate cost of goods sold, salespersons salaries, sales office rent and Regional Headquarter expenses arising from the cause and effect allocation.
  - it will have no effect on depreciation of sales office equipment, warehouse rent, depreciation of warehouse equipment, and arbitrary cost allocation of HQ expenses.

Relevant cost computation

Total costs and revenues Rs 000s

			Keep Dacca		Discontinue	Difference
Cost of goods sold		2650		1650		1000
Salespersons salaries		600		360		240
Sales office rent	270		150		120	
Depn sales office equipment		90		90		
Apportionment of warehouse rent		72		72		
Depn of warehouse equipment	58		58			
Regional and Headquarter costs						
Cause and effect allocations	458		272		186	
Arbitrary apportionment		1100		1100		____
Total costs to be assigned		5298		3752		1546
Reported profit	202		48		154	
Sales		5500		3800		1700

Determining the relevant cost of direct materials

- The company will continue to incur some costs even if the Dacca territory is closed, these costs are therefore irrelevant to the decision. This shows that profits will decline by Rs 154,000 if the Dacca territory is closed.
- We have assumed when considering various decisions that any materials required would not be taken from existing stock but would be purchased at a later date, so the estimated purchase price would be the relevant material cost.
- Where materials are taken from existing stock, the original purchase price represents a past or sunk cost and is therefore irrelevant for decision-making.
- Consider the situation where the materials have no further use apart from the particular activity. If the materials have some realizable value, their use will result in loss of this sales revenue. This will

represent an opportunity cost and must be assigned to the activity. If the materials have no realizable value, the relevant cost of materials will be zero.

- If the materials are to be replaced, then using them for a particular activity will necessitate their replacement. Therefore the future replacement cost represents the relevant cost of the materials.

Determining relevant cost of direct labor

- Where the company has temporary spare capacity and labor force is to be maintained for the short-term, the direct labor cost incurred will remain the same for all alternative decisions. The direct labor cost will therefore be irrelevant for short-term decision making purposes.
- Where casual labor is used and where workers can be hired on a daily basis, a company may adjust the employment of labor to exactly the amount required. Labor cost will increase if company accepts additional work, and will decrease if production is reduced.
- In this situation labor cost will be a relevant cost for decision-making purposes.
- In a situation of full capacity, the only way that labor resources could be obtained for a specific order would be to reduce existing production. This would result in lost contribution, and must be taken into account in the relevant cost for the specific order. The relevant labor cost is therefore the hourly rate plus an opportunity cost consisting of the contribution lost by accepting the order.
- Example –
- A division of Dayan Autos has received an enquiry from one of its major customers for a special order for a component that will require 1000 skilled labor hours and that will incur other variable costs of Rs 8000. Skilled labor is currently in short supply, and if the company accepts the order it will be necessary to reduce production of component P. Details of cost per unit and selling price of component P are as follow:

Example – direct labor

	Rs	Rs
Selling price		88
Less: direct labor	40	
4 hrs @ Rs 10 / hr		
Other variable costs	12	52
Contribution		36

What is the minimum selling price the company should accept for the special order?

In this example the relevant labor cost is Rs 19 per hour, consisting of hourly wage rate of Rs 10 plus the lost contribution of Rs 9 per hour from component P. (the contribution of component P is Rs 36 and requires 4 direct labor hours.

Hence relevant cost for special order are:

- Variable cost (excl direct labor) 8000
- Direct labor (1000 hrs@ Rs 19) 19000

27000

- The acceptance of the special order means that production of component P must be reduced by 250 units (1000/4). We can now compare the special order with component P:

	P	Component order	Special
Sales (250 units @88)		22000	27000
Direct labor (250@40p.u)		10000	10000
Variable cost (250@12p.u)		3000	8000
Contribution		9000	9000

The contribution to profits will be unchanged if the selling price of the special order is equivalent to the relevant cost of the order.

Misconceptions about relevant costs

- All fixed costs are irrelevant – only correct within a short-term time horizon. E.g salaries were relevant for discontinuation decision.
- Variable costs are always relevant – two alternative production methods that require identical direct materials, and then direct materials cost is irrelevant.
- Relevant costs are incremental or differential costs. You should focus on the impact decisions will have on future costs and revenues for the company as a whole, not parts within the Co.

Dawood Ltd – alternative use of obsolete material

- Dawood Ltd is a company that has in stock some materials of type XT that cost Rs 75000 but are now obsolete and have a scrap value of only Rs 21000. Other than selling for scrap, an alternative use is: converting the obsolete materials into a specialized product, which would require the following additional work and materials:

  Material A 600 units

  Material B 1000 units

  Direct labor: 5000 hrs skilled, 5000 hrs semi-skilled and 5000 hrs highly skilled, total 15000 hours.

  Extra selling and delivery expenses Rs 27000

  Extra advertising Rs 18000

  900 units would be produced and sold for Rs 400 per unit.

Dawood Ltd – alternative use of obsolete material

- Material A is already in stock and is widely used within the firm. However any material used in this alternative will have to be replaced immediately.
- Material B is also in stock, but it is unlikely that any additional supplies can be obtained for some time.

- Material B is normally used in production of product Z, which sells at Rs 390 per unit and incurs total variable cost (excl material B) of Rs 210 per unit. Each unit of Z uses 4 units of B. Details of materials A and B are:

Dawood Ltd – alternative use of obsolete material

	A	B
Acquisition cost per unit	100	10
Net realizable value per unit	85	18
Replacement cost per unit	90	-

Wage rates and overhead recovery rates of Dawood Ltd are:

Variable overhead	Rs 1 per direct labor hr
Fixed overhead	Rs 3 per direct labor hr
Unskilled labor	Rs 6 per direct labor hr
Semi-skilled labor	Rs 8 per direct labor hr
Highly skilled labor	Rs 10 per direct labor hr

- The unskilled labor is employed on a casual basis and sufficient labor can be acquired to exactly meet production requirements
- Semi-skilled labor is part of permanent force and company has temporary excess supply at present
- Highly skilled labor is in short supply, this is presently engaged in meeting demand for product L, which requires 4 hours per unit. The contribution from sale of one unit of product L is Rs 24.
- Required: advise whether stock of material XT should be sold or converted into specialized product.

Solution:

Conversion versus immediate sale:	Rs	Rs	
Sales revenue (900 units at Rs 400 per unit)		360,000	
Less: relevant costs:			
Material XT opportunity cost	21,000		
Material A (600 units at Rs 90)	54,000		
Material B (1000 units at Rs 45)		45,000	
Direct labor – unskilled (5000 hrs @ Rs 6)	30,000		semi-skilled
	nil		
highly skilled (5000 hrs @ Rs 16)	80,000		
Variable overheads (15000 hrs @ Rs 1)		15,000	

Advertising	18,000	
Fixed overheads	nil	
	_____	290,000
Excess of relevant revenues		70,000

Notes:

- Material A replacement cost Rs 90;
- Product Z relevant revenue less relevant cost is Rs 180 (selling price 390 less variable cost (210) per unit, Z uses 4 units of material B i.e Material B opportunity cost is 45 per unit ;
- Lost contribution of product L is Rs 24 or Rs 6 per hr, so relevant cost of highly skilled workers will be Rs 16 per hour.

Lecture 9

Example – acceptance of special order

- The production manager of your organization has approached you for some costing advice on project Xen, a one-off project from overseas that he intends to tender for.

The costs associated with the project are as follows:

Material A	4000
Material B	8000
Direct labor	6000
Supervision	2000
Overheads	12000
	32000

- You ascertain the following information :

  i) Material A is in stock and the above was the cost. There is now no other use for Material A, other than the above project, within the factory it would cost Rs 1750 to dispose of. Material B would have to be ordered at the cost shown above.

  ii) Direct labor costs of Rs 6000 relate to workers that will be transferred to this project from another project. Extra labor will need to be recruited to the other project at a cost of Rs 7000.

  iii)Supervision costs have been charged to the project on the basis of 33.33% of labor costs and will be carried out by existing staff within their normal duties.

  iv) overheads have been charged to the project at the rate of 200% on direct labor.

  v) The company is currently operating at a point above break-even.

vi) The project will need utilization of machinery that will have no other use to the company after the project has finished. The machinery will have to be purchased at a cost of Rs 10,000 and then disposed of for Rs 5250 at the end of the project.

- The production manager tells you that the overseas customer is prepared to pay up to a maximum of Rs 30,000 for the project and a competitor is prepared to accept the order at that price.
- He also informs you that the minimum he can charge is Rs 40,000 as the above costs show Rs 32,000 and this does not take into consideration the cost of the machine and the profit to be taken on the project.
- **Required:**
  - a) Cost of the project for the production manager, clearly stating how you have arrived at your figures.
  - b) Advise the production manager stating whether the organization should go ahead with the tender for the project, and the price bearing in mind that the competitor is prepared to undertake the project for Rs 30,000.
  - c) state four non-monetary factors that should be taken into account before tendering for this project.

Solution – acceptance of special order

(a)

Relevant costs of the project:	Rs
Material A	(1750)
Material B	8000
Direct labor	7000
Net cost of machinery	4750
Relevant cost	18000
Contract price	30000
Contribution	12000

- **Notes:**
  - Disposal costs of Rs 1750 are saved if material A is used in the project.
  - Actual cost of material B represents the incremental cost.
  - Labor costs are represented by the additional cash-flows of this contract.
  - The net cost of purchasing the machinery represents the additional cash-flows associated with this contract.
  - Supervision and overheads will continue even if the contract is not accepted, hence these are irrelevant.

(b)

- The costs given do not represent incremental cash-flows arising from undertaking the contract.

- As the company is operating at an activity level in excess of break-even point, and sales revenue in excess of Rs 18,000 (incremental cost) will provide additional contribution and increase profits.
- Assuming that the company has spare capacity, and that a competitor is prepared to accept the order at Rs 30,000 a tender price slightly below Rs 30000 would be appropriate.

- **(c)** non-monetary factors:
  - i) is there sufficient spare capacity to undertake the project.
  - ii) is the overseas customer credit-worthy.
  - iii) Does the workforce have the necessary skills to undertake the project.
  - iv) is the contract likely to result in repeat business with the customer.

Example – deletion of a product

- Blue Turban Ltd makes three products and is reviewing the profitability of its product line. You are given the following budgeted data about the firm for the coming year

(all 000s)	**A**	**B**	**C**
Sales (units)	100	120	80
Revenue		1500	1440	880
Costs: material		500	480	240
labor		400	320	160
Overhead		650	600	360
		1550	1400	760
Profit / loss		(50)	40	120

- The company is concerned about the loss on product A. It is considering ceasing the production of it, and switching the spare capacity of 100, 000 units to product C.

You are told:

- (i) all production is sold
- (ii) 25% of labor cost for each product is fixed.
- (iii) Fixed administration overheads of Rs 900,000 have been apportioned to each product on the basis of units sold and are included in the overhead cost above. All other overheads are variable in nature.
- (iv) Ceasing production of product A would eliminate the fixed labor charge associated with it and one-sixth of the fixed administration overhead apportioned to product A.
- (v) Increasing the production of product C would mean that the fixed labor cost associated with product C would double, the variable labor cost would rise by 20% and its selling price would have to be decreased by Rs 1.50 in order to achieve the increased sales.
- **Required:**
  - (a) prepare marginal cost statement for a unit of each product on the basis of
    - (i) the original budget
    - (ii) if product A is deleted
  - (b)Prepare a statement showing the total contribution and profit for each product group on the basis of

- (i) the original budget
- If product A is deleted

– (c)Advise whether product A should be deleted.

Solution – deletion of a product

(a) (i)	A	B	C
Selling price	15	12	11
Less variable cost:			
Materials	5	4	3
Labor	3	2	1.5
Variable overheads	3.5	2	1.5
Contribution	3.5	4	5

Fixed overheads are apportioned to the products on the basis of sales volume and the remaining overheads are variable with output.

• **(ii)**	B	C
– Selling price	12	9.5
• Less variable costs:		
– Materials	4	3
– Labor	2	1.8
– Variable overheads	2	1.5
– Contribution	4	3.2

– The price of C has been reduced by Rs 1.50 and variable labor cost has increased by 20%.

b) (i)

(all 000s)	A	B	C	Total
• Total contribution	350	480	400	1230
• Less fixed costs:				
• Labor	100	80	40	220
• Administration 300	360	240	900	
• Profit	(50)	40	120	110

(b) (ii)

(000s)	B	C	Total
– Total contribution	480	576	1056
– Less fixed costs:			
– Labour	80	80	160
– Fixed administration			850
– Profit			46

– Fixed overhead cost apportioned to product A of 300 will decline by one-sixth, hence fixed admin overheads decline from 900 to 850.

- **c)**
  - If product A is eliminated the majority of the fixed cost allocated to it will continue and be borne by the remaining products.
  - Product A generates a contribution of Rs 350,000 towards fixed costs, but the capacity released will provide additional contribution from product C of Rs 176,000 (576 – 400).

  - This will result in net loss in contribution of Rs 174,000. (350 – 176)
- However, fixed cost saving of Rs 110,000 can be obtained if product A is abandoned as follows:
- Administration apportioned to A 50,000
- Fixed labor cost for A 100,000
- Less: additional fixed cost for C (40,000) 110,000
- Therefore there will be a net loss in contribution of Rs 64,000 (174 – 110) and profits will decline from Rs 110,000 to Rs 46,000.
  - **Product A should not be eliminated even though a loss is reported**.

Lecture 10

Activity based costing - ABC

- The measurement of indirect relevant cost for decision making using Activity Based Costing techniques will be examined.
- An ABC system assigns overheads to each major activity (rather than departments).
- With ABC systems, many activity based cost-centers (called activity cost pools) are established, whereas with traditional systems overheads are pooled by departments and described as cost centers.

- Activities can be many different tasks and may include: scheduling production, setting-up machines, moving materials, purchasing materials, inspecting items, and processing supplier records.
- Production process activities include machining of products and assembling products.
- Usually production process activity cost centers are identical to cost centers used by traditional systems.
- Overall ABC systems will have a greater number of cost centers.

- The second stage of the allocation process allocates costs from cost centers (pools) to products or other cost objects.
- Instead of using the term 'overhead allocation rates, or bases', the term cost drivers is used in ABC systems.
- Direct labor hours and machine hours are used as allocation bases in traditional systems.
- Cost drivers include number of production runs for production scheduling and number of purchase orders for purchasing activity.

- Traditional systems allocate service department costs to production centers, and thus included in the production center overhead rates.
- In contrast ABC systems establish separate cost driver rates for service departments, and assign the service activities directly to cost objects, without any reallocation to production centers.

- By using greater number of cost centers and different types of cost drivers, and assigning activity costs to cost objects on the basis of cost driver usage, ABC systems can more accurately measure the resources consumed by cost objects.

Example: General Enterprises - Traditional system

- The annual overhead costs for General Enterprises which has three production centers (two machine centers and one assembly center) and two service centers (materials procurement and general factory support) are as follows:

Indirect wages and supervision		Rs	
	Machine center X	1,000,000	
	Y	1,000,000	
	Assembly	1,500,000	
	Materials procurement	1,100,000	
	General factory support	1,480,000	6,080,000
Indirect materials			
	Machine center X	500,000	
	Y	805,000	
	Assembly	105,000	
	Materials procurement	0	
	General factory support	10,000	1,420,000
Lighting and heating		500,000	
Property taxes		1,000,000	
Insurance of machinery		150,000	
Depreciation of machinery		1,500,000	
Insurance of buildings		250,000	
Salaries of works management		800,000	4,200,000
			11,700,000

Example: General Enterprises - Traditional system

Expense (All Rs 000s)	Total	Mach X	Mach Y	Assmbly	Mat proc	Gen sup
Indirect wages	6080	1000	1000	1500	1100	1480
Indirect materials	1420	500	805	105	-	10
Lighting and heating	500	100	50	150	150	50
Property taxes	1000	200	100	300	300	100
Insurance of machinery	150	80	50	10	5	5
Depreciation of machinery	1500	800	500	100	50	50
Insurance of building	250	50	25	75	75	25
Salaries of works mangt	800	240	160	240	80	80
	11700	2970	2690	2480	1760	1800

Total	Mach X	Mach Y	Assmbly	Mat proc	Gen sup
11700	2970	2690	2480	1760	1800
Reallocation of service center costs:					
Mat proc (value of mat issued)	880	660	220	(1760)	
Gen factory sup (direct labor hrs)		450	450	900	(1800)
	11700	4300	3800	3600	
Machine and dir labor hrs		2000	1000	2000	
Overhead rate		2.15	3.80	1.80	

- We shall compute the manufacturing cost of two products.
- Product A is a low sale volume product with direct costs of Rs 100. It is manufactured in batches of 100 units and each unit requires 5 hours in Machine center A, 10 hours in machine center B and 10 hours in the assembly center.
- Product B is a high sales volume product and is manufactured in batches of 200 units. Each unit requires 10 hours in Machine center A, 20 hours in Machine center B and 20 hours in the assembly center.
- Direct costs of Rs 200 have been assigned to Product B.
- Calculations of the manufacturing costs assigned to the products are as follows:

Product A		**Rs**
Direct costs (100 units x Rs 100)	10,000	
Overhead allocation:		
Machine center A (100 units x 5 mach hrs x Rs 2.15)	1,075	
Machine center B (100 units x 10 mach hrs x Rs 3.80)	3,800	
Assembly (100 units x 10 dir lab hrs x 1.80)		1,800
Total cost		16,675

Cost per unit (16675 / 100) = Rs 166.75

Product B		
Direct costs (200 units x Rs 200)	40,000	
Overhead allocation		
Machine center A (200 units x 10 mach hrs x 2.15)	4,300	
Machine center B (200 units x 20 mach hrs x 3.80)	15,200	
Assembly (200 units x 20 dir lab hrs x 1.80)	7,200	
Total cost		66,700

Cost per unit (66,700 / 200) = Rs 333.50

Illustration of cost assignment with an ABC system

Activity	**Activity cost**	**cost driver**	**Quantity**	**cost driver rate**
Production activities:				
machining: activity center A	2,970,000	machine hrs	2,000,000	1.485
machining: activity center B	2,690,000	machine hrs	1,000,000	2.69
assembling	2,480,000	dir labor hrs	2,000,000	1.24

Material procurement :				
purchasing components	960,000	purchase orders	10,000	96
receiving components	600,000	material receipts	5,000	120
disburse materials	200,000	production runs	2,000	100
General support activities:				
production scheduling	1,000,000	production runs	2,000	500
set-up machines	600,000	set-up hours	12,000	50
quality inspection	200,000	item inspections	1,000	200
Total cost of manufacturing Activities	11,700,000			

Activity	**Cost driver Rate**	**Quantity or 100 of A**	**Quantity for 200 of B**	**Cost to A**	**Cost to B**
Machining A	1.485	500 hrs	2000 hrs	743	2,970
Machining B	2.69	1000 hrs	4000 hrs	2,690	10,760
Assembly	1.24	1000 hrs	4000 hrs	1,240	4,960
Purchasing components	96	1	1	96	96
Receiving components	120	1	1	120	120
Disburse materials	100	5	1	500	100
Production scheduling	500	5	1	2,500	500
Set-up machines	50	50 hrs	10 hrs	2,500	500
Quality inspection	200	1	1	200	200
Total overhead cost				10,589	20,206
Units produced				100	200
Overhead cost per unit				106	101
Direct costs per unit				100	200
Total cost per unit				206	301

(Rs)	Traditional	ABC
Product A	167	206
Product B	334	301

Compared with ABC the traditional system under-costs product A and over-costs product B.

Allocating cost on the basis of machine hours or direct labor hours, the traditional system incorrectly assumes these are the cause of costs of the support activities.

Product B consumes twice as many machine hrs and direct labor hrs as product A, therefore the traditional system allocates twice the amount of support costs to B.

Lecture 11

Cost assignment with an ABC system

- ABC systems create separate cost centers for each major support activity and allocates costs to products using cost drivers that are the significant determinants of the cost of the activity.
- The ABC system recognizes that where a batch of two products consume the same quantity of purchasing, receiving and inspection activities, it allocates the same cost to both products.

Volume based and non-volume based cost drivers

- These cost drivers are appropriate for measuring consumption of expenses such as machine energy costs, depreciation related to machine usage and indirect labor employed in production centers.
- Volume based cost drivers are appropriate in the above circumstances, as activities are performed each time a unit of product is produced.
- Now consider two activities: setting up a machine and re-engineering products. Set up resources are consumed each time a machine is changed from one product to another. It costs the same to set up a machine for 10 or 5000 units.

- ABC systems rely on a greater number and variety of second stage cost drivers. They use both volume based and non-volume based cost drivers.
- Traditional systems use only volume based cost drivers. Volume based cost drivers assume that a product's consumption of overhead resources is directly related to units produced.
- Typical volume based cost drivers used by traditional systems are: units of output, direct labor hours and machine hours.

- The number of set-ups rather than units produced is a more appropriate measure of consumption of set-up activity.
- Similarly product re-engineering costs may depend upon the number of different engineering works orders and not the number of units produced.
- For both these activities, non volume based cost drivers such as number of set ups and engineering orders are needed for the accurate assignment of costs of these activities.

- Using only volume based cost drivers to assign non-volume related overhead costs can result in reporting of distorted product costs.
- The extent of distortion depends on what proportion of total overhead costs the non-volume based overheads represent and the level of product diversity.
- If non-volume related overhead costs are only a small proportion of the total overhead costs, the distortion of product cost will not be significant. In these circumstances traditional systems are likely to be acceptable.

Product diversity

- Product diversity applies when products consume different overhead activities in dissimilar proportions. Differences in product size, product complexity, size of batches and set-up times cause product diversity.
- If all products consume overhead resources in similar proportions, product diversity will be low and products will consume non-volume related activities in the same proportion as volume related activities, product cost distortion will not occur with traditional product costing systems.
- Two conditions therefore will lead to product cost distortion in traditional costing systems: non-volume related overheads are a large proportion of total overheads, and product diversity applies.

Example – Boric Company

- The Boric Company has only one overhead cost center. It currently operates a traditional costing system using direct labor hours to allocate overhead to products.

- The company produces several products, two which are the HV and the LV.
- HV is made in high volumes whereas LV is made in low volumes.
- HV is produced in large production batches, and consumes 30% of direct labor hours.
- LV has irregular and low demand, is produced in small batches and consumes only 5% of direct labor hours.

- Detailed investigation indicates that the number of batches processed causes the demand for overhead resources.
- The traditional system is therefore replaced with an ABC system using the number of batches processed as the cost driver.
- You ascertain that each product accounts for 15% of batches processed during the period and overheads assigned to the cost center amount to Rs 1 million.
- The direct costs and sales revenues assigned to the products are as follows:

	HV	LV
• Direct costs	310,000	40,000
• Sales revenue	600,000	150,000

- Show the product profitability analysis for products HV and LV using the traditional and ABC systems.

The reported product costs and profits for the two products are as follows:

	Traditional system		ABC system	
(all 000s)	HV	LV	HV	LV

Direct costs	310	40	310	40
Overheads allocated *	300 (30%)	50(5%)	150 (15%)	150(15%)
Reported profits/losses	(10)	60	140	(40)
Sales revenue	600	150	600	150

*Allocation of Rs 1 million overheads using direct labor hours as allocation base for traditional system and number of batched processed as cost driver for ABC system.

- HV is high volume product that consumes 30% of direct labor hours, whereas LV the low volume product consumes only 5%.
- The traditional system that uses direct labor hours as the allocation base allocated six times more overhead to product HV.
- However, ABC recognizes that overheads are caused by other factors. In this example they are caused by number of batches processed, and ABC uses this as the cost driver.
- Both products require 15% of total number of batches so they are allocated an equal number of overheads.

- It is apparent that the traditional system based on direct labor hours will over-cost high volume products. Six times more overheads were assigned to HV as the consumption ratio for HV is .3 and LV is .05
- When number of batches processed is used as the cost driver, the consumption ratio is .15 for both and an equal amount of overhead is assigned.
- Distorted product costs are reported with the traditional system that uses volume based cost driver, because two conditions specified above apply:
  - Non-volume overheads are a large proportion of total overheads. (100% in our example)
  - Product diversity exists as consumption ratios for the two identified cost drivers are significantly different.

Designing ABC systems

Four steps are involved:

- identifying major activities that take place in an organization
- assigning costs to cost pools/cost centers for each activity
- Determining the cost driver for each major activity
- Assigning the cost of activities to products, based on the product's demand for activities

Identifying activities

- Activities are composed of units of work or tasks. E.g. purchase of materials, this activity consists of many different tasks such as receiving a purchase request, identifying suppliers, preparing purchase orders, mailing purchase orders and performing follow-ups.

- Activities are identified by carrying out an activity analysis. Starting point is to examine the physical plan of the workplace, and the payroll listing (to ensure all relevant personnel have been taken into account).
- This has to be supplemented by series of interviews, or having staff complete a time sheet for a specific period, explaining how their time is spent.
- Many detailed tasks are likely to be identified, but after further interviews, the main activities will emerge.
  E.g. Purchasing:

- If decomposed into its constituent tasks may involve collection of vast amount of data and be too costly.
- Alternatively it may be merged with receiving, storage and issuing activities. This is too high a level of aggregation because a single cost driver is unlikely to provide a satisfactory determinant of cost.
- Number of purchase orders may give a good explanation of purchase costs, but inappropriate for costs relating to receiving and issuing.
- Hence it is preferable to break it into three activities, and establish separate cost driver for each.

- The final choice of activities must be a matter of judgment but it is likely to be influenced by factors such as total cost of activity center (must be significant to justify separate treatment), and the ability of a single cost driver to provide a satisfactory determinant of cost of activity.
- Where this is not possible, further decomposition of the activity will be necessary.
- Thus all activities that have the same cost driver can be merged to form a single activity.
- However, if there are significant differences in consumption ratios, activities should not be aggregated

Step 2 – Assigning costs to activity cost centers

- After the activities have been identified the cost of resources consumed over a specified period must be assigned to each activity.
- Many of the resources will be directly attributable to specific activity centers others (e.g. lighting, heating) may be indirect and jointly shared by several activities. These should be assigned on the basis of cause-and-effect cost drivers to provide a reasonable estimate.
- Arbitrary allocations should not be used.
- The greater the amount of costs apportioned to activity centers, the more arbitrary and less reliable will be the product cost information generated by the ABC system.

Step 3 – Selecting cost drivers for assigning activity costs to cost objects.

- In order to assign activity center costs to a product a cost driver must be selected for each activity.
- There are three types of activity cost drivers: transaction drivers, duration drivers and intensity drivers.
- **Transaction drivers** such as number of purchase orders, number of customer orders, number of inspections and number of set-ups, all count the number of times an activity is performed.

- Transaction drivers are the least accurate because they assume the same amount of resources are consumed each time the activity is performed.
- **Duration drivers** represent the amount of time required to perform the activity. Examples of duration drivers include set-up hours and inspection hours.
- If one product requires a long set-up time and another requires a short set-up time, then using set-up hours as a cost driver will more accurately measure resource consumption than the transaction

driver (number of set-ups), which assumes equal amount of resources are consumed by both products.

- Using number of set-ups would result in cost of the product requiring long set-up hours being under-stated.
- **Intensity drivers** involve direct charging based on the actual activity resources committed to the product.
- For example if activities require unskilled and skilled personnel, a duration driver would establish an average hourly rate to be assigned to the products.
- Whereas an intensity driver would record the actual or estimated time for each type of personnel, and assign the specific resources directly to the products.
- Sometimes a weighted average approach can be used. E.g. where purchasing is an activity cost center, overseas orders may be weighted 1.5 times relative to a home order.

Step 4 – Assigning cost of activities to products

- The final stage involves applying the cost driver rates to products.
- The cost driver must be measurable in a way that enables it to be identified with the individual product.
- Thus if set-up hours are selected as the cost driver, there must be a mechanism for measuring the set-up hours consumed by each product.
- The ease and cost of obtaining data on cost driver consumption by products is therefore a factor that must be considered during the third stage. This is when an appropriate cost driver is being selected.

Lecture 12

Activity hierarchies

- Manufacturing activities can be classified along a cost hierarchy dimension consisting of:
  - 1. unit-level activities;
  - 2. batch-level activities;
  - 3. product-sustaining activities;
  - 4. facility-sustaining activities.
- Unit-level activities (also known as volume-related activities) are performed each time a unit of product or service is produced. Expenses in this category include direct labor, direct materials, energy costs and expenses that are consumed in proportion to machine processing time (such as maintenance). Unit-level activities consume resources in proportion to the number of units produced.

Batch-related activities

- Batch-related activities such as setting up a machine, or processing a purchase order are performed each time a batch of goods is produced.
- The cost of batch related activities varies with the number of batches made, but is fixed (same) for all units in the batch.
- For example, set-up resources are consumed when a machine is changed from one product to another. As more batches are produced, more set-up resources are consumed. It would cost the same to set-up a machine for 10 or 5000 items.

- Thus demand for set-up resources is independent of the number of units produced after set-up.

- Similarly purchase resources are consumed each time a purchase order is processed, but the resource consumed is independent of the number of items on the purchase order.
- Other examples of batch-related costs include the resources devoted to production scheduling, sample inspection and materials movement.
- Traditional costing systems treat batch-related expenses as fixed costs.
- ABC systems assume that batch-related expenses vary with the number of batches processed.

Product-sustaining activities

- These are performed to enable continued production and sale of an individual product.
- Examples include maintaining and updating product specifications and technical support provided to individual products.
- Other examples are the resources to prepare and implement changes to design and test routines and to perform product enhancements.
- The costs of product sustaining activities are incurred irrespective of the number of units produced, or batches processed. Their expenses will tend to increase as the number of products produced is increased.

Facility-sustaining activities

- These are performed to support the facility's general manufacturing process and include general administrative staff, plant management and property costs.
- They are incurred to support the organization as a whole and are common and joint to all the products manufactured in the plant.
- There would have to be an expansion or contraction in the size of the plant, for facility-sustaining costs to change.
- ABC advocates that these costs should not be assigned to products since they are unavoidable and irrelevant for most decisions. Instead they are regarded as common costs to all products and deducted as lump sum from total of operating margin.

Comparison of traditional product costing with ABC - example

Details of four products and relevant information for a company, are given below for one period.

Product	**A**	**B**	**C**	**D**	
Output in units	120	100	80	120	
Cost per unit:		Rs	Rs	Rs	Rs
Direct material	40	50	30	60	
Direct labor		28	21	14	21
Machine hrs p.u.		4	3	2	3

The four products are similar and usually produced in production runs of 20 units and sold in batches of 10 units.

- The production overheads are currently absorbed using a machine hour rate, and the total of the production overheads for the period has been analysed as follows:

Machine dept. costs (rent, depreciation, supervision)	10430
Set-up costs	5250
Stores receiving	3600
Inspection / quality control	2100
Materials handling and despatch	4620

- You have ascertained that the cost drivers to be used are shown below for the overheads listed:

Cost	Cost Driver
Set up costs	number of production runs
Stores receiving	requisitions raised
Inspection / QC	number of production run
Materials handling and despatch	orders executed

The number of requisitions raised on the stores is 20 for each product, and the number of orders executed is 42, each order being for a batch of 10 units of a product

You are required:

- (a) to calculate the total costs for each product if all overhead costs are absorbed on a machine hour basis.
- (b) to calculate the total cost for each product using activity-based costing
- (c) to calculate and list the unit product costs from your figures in (a) and (b) above, to show the differences and to comment briefly on any conclusions which may be drawn which could have pricing and profit implications.

Solution

(a) Overheads absorbed on machine hr basis

- Total machine hours = (120x4)+(100x3)+(80x2)+(120x3)=1300 hours
- Machine hr overhead rate = $\frac{10430+5250+3600+2100+4620}{1300 \text{ hrs}}$

= Rs 20 per machine hr

Product	A	B	C	D
Direct material	40	50	30	60
Direct labor	28	21	14	21
Overheads @20per m/c hr	80	60	40	60
	148	131	84	141
Unit of output	120	100	80	120
Total cost	17760	13100	6720	16920

(b) Using activity-based costing:

Cost	Rs	Cost driver	vol	Cost p.u
Machine dept	10430	m/c hrs	1300	8.02
Set up costs	5250	prod run	21	250
Stores receiving	3600	requisition	80	45
Inspection / QC	2100	prod run	21	100
Mat handling	4620	orders exe	42	110

Note: 20 reqn for each prod (20x4) = 80 requisitions

Production runs = total units (420) / 20 units per run = 21 prod runs

- Cost for each product is computed by multiplying the cost driver rate per unit by the quantity of the cost driver consumed by each product.

	A	B	C	D
Prime costs	8160	7100	3520	9720
Set ups (250 ea)	1500	1250	1000	1500
Stores (45 ea)	900	900	900	900
Inspect (100 ea)	600	500	400	600
Handling (110)	1320	1100	880	1320
Machine*(8.02/hr)	3851	2407	1284	2888
Total costs	16331	13257	7984	16928

(c) Cost per unit	A	B	C	D
• Costs from (a)	148	131	84	141
• Costs from (b)	136	133	100	141
• Difference	12	(2)	(16)	-

- Product A cost is over-stated with the traditional system. Products B and C are under-stated and similar costs are reported for product D.
- It is claimed that ABC more accurately measures the resources consumed by the products.
- Where cost-plus pricing is used, the transfer to an ABC system will result in different product prices.
- If activity based costs are used in stock valuations, then stock valuations as well as reported profits will differ.

Lecture 13

Activity-based costing profitability analysis

- The approach of activity based profitability analysis is to categorize costs according to their hierarchical levels.
- Hierarchies identify the lowest level to which cost can meaningfully be assigned without relying on arbitrary allocations.
- The lowest hierarchical level may be the product or customer, and ignoring the business unit level, the highest levels are product lines and distribution channels.
- Let us focus on the product as the cost object.
- A unit level contribution margin is calculated for each individual product. This is derived by deducting the cost of unit level activities from sale revenue.

- From this unit level contribution, expenses related to batch level activities are deducted.
- Next the cost of product sustaining activities are deducted .Thus the three different contribution levels are reported at the individual product level.
- Differentiating contributions at these levels provides a better understanding of the implications of product mix and discontinuation decisions in terms of cost and profit behavior.
- There are two further levels within the product hierarchy, these are the product brand level and product line level.

- Where products are marketed by brands, all expenditure relating to a brand, such as management and brand marketing, is for the benefit of all products within the brand and not for any specific individual product. It should thus be attributed to the brand and not the individual product.
- Similarly marketing, research and development and distribution expenses might be incurred for the benefit of the whole product line and not for any specific brand.
- Therefore these product line sustaining expenses should be attributed to the product line.
- Finally the profit for the organizational unit as a whole can be determined by deducting facility sustaining expenses from the sum of the product line contributions.

- The aim of ABC hierarchical profitability analysis is to assign all organizational expenses to a particular hierarchical or organizational level where cause-and-effect cost assignments can be established so that arbitrary allocations are non-existent.

- The hierarchical approach helps to identify the impact on resource consumption by adding or dropping items at each level of the hierarchy.
- For example if a product within a particular brand is dropped, then all unit, batch and product-sustaining activities uniquely associated with that product will be affected but the higher level brand and product level activities will be unaffected.

Resource consumption models

- Possibly the most important theoretical advance in ABC systems was one which emphasized that ABC systems are models of resource consumption.
- ABC systems measure the cost of using resources and not the cost of supplying resources. This highlighted the critical role played by unused capacity.
- To have a good conceptual grasp of ABC it is essential that you understand the contents of this section.

Use the following equation to formalize the relationship between activity resources supplied and activity resources used for each activity:

Cost of resources = Cost of resources + Cost of unused supplied used capacity

- The left hand side of the above equation indicates the amount of expenditure on an activity depends on the cost of resources supplied rather than the cost of resources used.

Example:

- The following information relates to the purchasing activity of Cessna Company for the next year:
- 1. Resources supplied:10 full time staff for Rs 30,000 per year
  (Including employment costs) = Rs 300,000 annual activity cost.
  Cost driver = number of purchase orders processed.

Quantity of cost driver supplied per year: (each member of staff can process 1500 orders per year.)

= 15000 purchase orders.

Estimated cost driver rate: Rs 20 per P.O. (300000 / 15000)

(2) Resources used

Estimated number of purchase orders to be processed during the year = 13000
Estimated cost of resources used assigned to parts and materials = Rs 260,000 (13000x20)

(3) Cost of unused capacity

Resources supplied (15000) – Resources used (13000) at Rs 20 per order = Rs 40,000 (2000x20)

- Periodic financial accounting profit statements measure the expense incurred to make the resources available (i.e the cost of resources supplied). Whereas ABC systems measure the cost of resources used by the individual products.
- Essna Company expects to process 13000 purchase orders, the ABC system will therefore assign Rs 260,000 (13000 0rders at Rs 20 per order) to the parts and material ordered during the year. This represents the cost of resources used.
- The predicted cost of unused capacity will be Rs 40,000 (2000 orders at Rs 20 per order).

Resource consumption models

- Unused capacity arises because the supply of some resources has to be acquired in discrete amount in advance of its usage. Supply cannot be continually adjusted in the short-run to match exactly the usage of resources.
- Typical expenses in this category include the acquisition of equipment and the employment of non-piecework employees. They are categorized as fixed costs.
- Some resources e.g material, casual labor, energy can be continually adjusted to meet exactly their usage. These are categorized as variable costs.
- The problem of adjusting the supply of resources to match their usage applies only to fixed costs.
- Activity based systems will measure the cost of using these resources, even though the cost of supplying them will not vary with the short run usage.
- Managers make decisions (e.g on changes in output volume, mix and process changes) and such decisions result in changes in activity resource usage.
- Where such decisions result in a decline in demand for activity resources, then the first term on the right hand side on the equation above (cost of resources used) will decline.
- However, the cost of unused capacity (the second term on the right hand side of the equation) will increase to offset exactly the lower resource usage cost.
- To translate the benefits of reduced activity demand into cash flow savings, management action is required.
- They must permanently remove the unused capacity by reducing spending on the supply of resources.
- Demands for activity resources can also increase because of decisions to introduce new products or expand output.
- Such decisions can lead to situations where activity resource usage exceeds the supply of resources.
- In the short term the excess demand might be absorbed by people working longer hours or faster. Eventually however, additional spending will be required to increase the supply of activity resources.

Selecting the cost driver denominator level

- In the above example of Cessna Company, there are two potential denominator levels that can be used to establish the cost driver rates.
- These are the capacity supplied and the budgeted activity level.
- If practical capacity is used the cost driver rate will be 300,000 / 15000 = Rs 20 per purchase order. Whereas if the budgeted activity level is used, the cost driver rate will be 300,000 / 13000 = Rs 23.08
- Support activity costs are caused by the level of capacity made available, rather than the budgeted activity level. Therefore the correct denominator is practical capacity.

- Using budgeted activity would mean that the cost of unused capacity is hidden in the cost driver rate and charged to products.

- Budgeted capacity usage can lead to higher cost driver rates, and will result in an increase in reported product costs.
- There is a danger that bid prices will be increased when demand is depressed, at a time when a firm should be considering lowering prices.
- Practical capacity ought to be used for measuring human resources. For physical resources it is recommended that a modified practical capacity i.e normal capacity (3 year outlook) should be used.

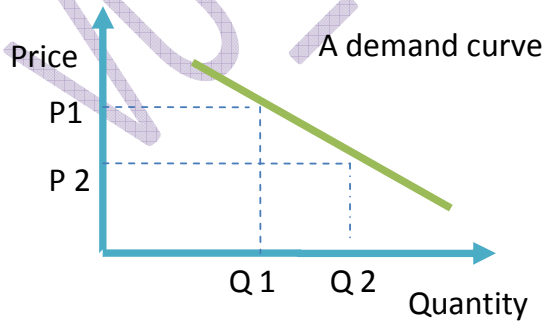
Lecture 14

Pricing decisions and profitability analysis

- Accounting information is often an important input to pricing decisions.
- Market leaders or organizations that sell highly customized products, have some discretion in setting selling prices.
- Pricing decisions will be influenced by the cost of the product.
- In other organizations prices are set by market and supply forces, nevertheless cost information is required for determining profitability of different products, and the target product mix.

Establishing optimum selling price

- The economic model shows that firms will set selling prices where profits are maximized.
- Precise quantification in practice is very difficult; management produces estimates of sales demand at various selling prices.

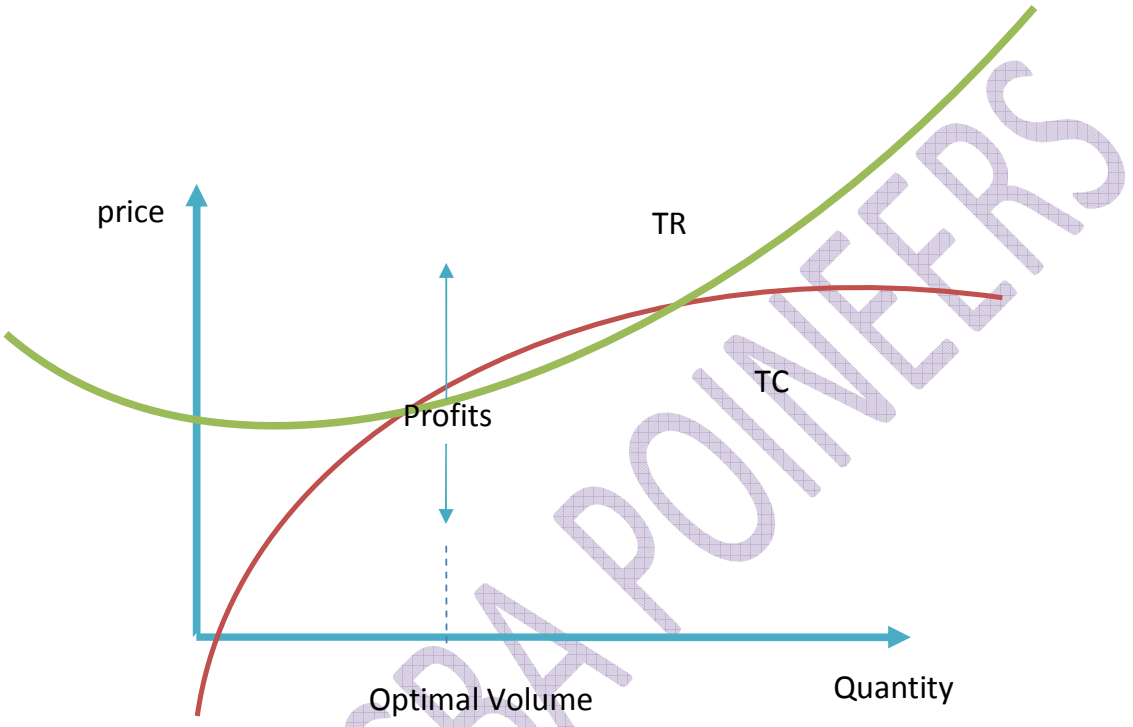


Establishing optimum selling price

- Estimate of profits at different output levels:

Price	Units sold	Total Revenue	Total Cost	Profit
40	10	400	360	40
38	11	418	364	54
36	12	432	370	62
34	13	442	378	**64**
32	14	448	388	60
30	15	450	400	50
28	16	448	414	34

- To determine optimum selling price, it is necessary to estimate the total cost for each price level.
- Profits are maximized at a selling price of 34.



The role of cost information in pricing decisions

- Small firms operating in an industry where prices are set by dominant market leaders, will have little influence over the price of their products. They are described as price-takers.
- The market leaders and highly customized producers are described as price-setters.
- Cost information is vital to price-takers as well as price-setters.

Price setting firm in short-run

- Only incremental costs of undertaking a special order should be taken into account.
- In service companies e.g. hotels, the incremental cost of accepting one-off special business are likely to be minimal. They may consist of meals, laundering and bathroom facilities.
- In most cases incremental costs are likely to be confined to unit level activities.
- Bids should be made at prices that exceed incremental costs. Cost data is likely to be the dominant factor.

Special order in the short-run

- Bids for one-time orders based on covering incremental costs should meet the following conditions:
  - Sufficient capacity is available for all resources required. If some resources are fully utilized, opportunity cost of the scarce resources must be covered by the bid price.
  - Bid price will not affect future selling price.
  - Order will utilize unused capacity in short period only, and released for more profitable opportunity

Price setting firm in the long-run

- In the long-run firms can adjust the supply of virtually all their activity resources.
- Three approaches are relevant:
  - Pricing customized products
  - Pricing non-customized products
  - Target costing for non-customized products.

- **Customized products**: product should be priced to cover all resources being used. This will require a costing system that accurately measures resources consumed by each product. For price-setters there are stronger grounds for ABC.

Product pricing using ABC – Cholistan Company

- The Cholistan company has received a request for a price quotation from one of its regular customers for an order of 500 units as follows:

Direct labor per unit produced	2 hours
Direct material per unit produced	Rs 22
Machine hour per unit produced	1 hour
Number of component and material purchases	6
Number of production runs prior to assembly	4
Average set up time per production run	3 hours
Number of deliveries	1
Number of customer visits	2
Engineering design and support	50 hours
Customer support	50

Product pricing using ABC – Cholistan Company…

- Details of activities required for the order:

Activity	Cost driver rate
Direct labor processing and assembly	Rs 10 per labor hr
Machine processing	Rs 30 per machine hr
Purchasing and receiving materials	Rs 100 per purchase order
Scheduling production	Rs 250 per production run
Setting-up machines	Rs 120 per hr
Packaging and delivering orders	Rs 400 per delivery
Invoicing and accounts administration	Rs 120 per customer order
Marketing and order negotiation	Rs 300 per customer visit
Customer support – incl. after sales	Rs 50 per customer service hr
Engineering design and support	Rs 80 per engineering hr

- Estimate of cost of resources required to fulfill the order.

Unit–level expenses		
Direct materials (500x22)		11000
Direct labor (500x2x10)	10000	
Machining (500x1hr x Rs 30)		15000 36000
Batch-level expenses		
Purchasing and receiving material (6x100)		600
Scheduling production (4 runs x 250)		1000
Setting-up machines (4 runs x 3 hrs x 120)		1440
Packaging and delivery (1 x 400)	400	3440
Product sustaining expenses		
Engineering design and support (50 hrs x 80)		4000
Customer sustaining expenses		

Marketing and order negotiation (2visits x 300)		600
Customer support (50 hrs x 50)	2500	3100
Total cost of resources		46540

- The full cost (excluding facility sustaining cost) of the order is Rs 46,540. Facility sustaining costs are incurred to support the organization as a whole and not for individual products.
- To determine a proposed selling price an appropriate percentage mark-up is added to the estimated cost.
- Mark-up should be sufficient to cover facility sustaining cost and a profit contribution.
- Assume Cholistan Co. adds 20%, it would give a price of Rs 55848. (Add 9308). This is cost-plus pricing.

Product pricing using ABC

- Consider a purchase order of 3000 units instead of 500 units, where the batch level expenses remain unchanged.
- Cost of resources used will be:
  - Unit level expenses (6 x 36000) 216000
  - Batch level expenses 3440
  - Product sustaining expenses 4000
  - Customer sustaining expenses 3100

  Total cost of resources 226540

  Cost per unit for 500 unit order (46540/500) = Rs 93.08

  Cost per unit for 3000 unit order(226540/3000) = Rs 75.51

Lecture 15

Pricing non-customized products

- A market leader must make pricing decisions for large and unknown volumes, of a product that is sold to thousands of customers.
- An estimate of sales volume is required to determine the unit cost. Hence two unknowns, sale price and sales volume.
- It is recommended that cost-plus selling prices are estimated for a range of potential sales volumes.

Non-customized products – Case A

- The Alipur Company is launching a new product; sales volume will be dependent on selling price.
- The best estimate is that demand is likely to range between 100,000 and 200,000 units provided the selling price is below Rs 100.
- The company has produced the following cost estimates and selling prices required to generate a target profit contribution of Rs 2million from the product.
- The Alipur Company has produced estimates of total cost for a range of output levels.
- The information indicates sales volume and accompanying selling prices that are required to generate the target profit.
- The unit cost calculation indicates the breakeven selling price.
- Management must asses the price with highest probability of generating the specified sales volume.

Sales volume (000s)	100	120	140	160	180	200
Total cost (000s)	10000	10800	11200	11600	12600	13000
Required profit (000s)	2000	2000	2000	2000	2000	2000
Required sales (000s)	12000	12800	13200	13600	14600	15000
Required selling price	120	107	94	85	81	75
Unit cost	100	90	80	73	70	65

Non-customized products – Case B

- Same cost schedule applies, but the 2 million minimum contribution does not apply.
- Estimate of sales demand at different selling prices have been made, based on market research.

Potential selling price	100	90	80	70	60
Estimated sales volume at					
Potential prices	120	140	180	190	200
Estimated sales revenue	12000	12600	14400	13300	12000
Estimated total cost	10800	11200	12600	12800	13000
Estimated profit	1200	1400	1800	500	(1000)

- Profits are maximized at selling price of Rs 80.
- Another pricing policy could be to sell at the lower price of Rs 70 to ensure a larger market share is obtained in future.

Target Costing

- In target costing the starting point is the determination of the target selling price.
- Next a standard or desired profit is deducted to get to a target cost for the product.
- The aim is to ensure that future cost will not be higher than the target cost.

The stages involved in target costing can be summarized as follows:

Stage 1: determine the target price which customers will be prepared to pay for the product.

Stage 2: deduct a target profit margin from the target price to determine the target cost.

Stage 3: estimate actual cost of the product.

Stage 4: if estimated cost exceeds the target cost, investigate ways of driving down the actual cost to the target cost.

- The major attraction of target costing is that marketing factors and customer research provide the basis for determining selling price.
- Whereas costs tend to be the dominant factor in cost-plus pricing.
- Further attraction is that the approach requires the collaboration of product designers, production engineers, marketing and finance staff.
- Target costing is most suited for setting prices for non-customized and high sales volume products.

Short-term product mix decisions

- Price taking firms will be faced with opportunities of taking on short-term business at a market determined selling price.
- In such situations accept short-term business where incremental sales revenue exceeds short run incremental costs.

However, as mentioned earlier in the course, such business is acceptable under certain conditions. These are:

- Sufficient capacity is available for all resources required. If some resources are fully utilized, opportunity cost of the scarce resource must be covered in the selling price.
- The company will not commit itself to repeat long-term business that is priced to cover only short-term incremental costs.
- Order will utilize unused capacity only for a short period, and capacity will be released for use on more profitable opportunities.
- Note, in the longer term capacity constraints can be removed.

Long-run product mix decisions

- In the longer-term a firm can adjust the supply of resources committed to a product.
- Therefore sales revenue from the product should exceed the cost of all resources committed to it.
- Hence there is a need to undertake periodic profitability analysis to distinguish between profitable and non-profitable products.
- Activity based profitability analysis should be used to evaluate each product's long-run profitability.
- Under this, products are the cost objects in four different hierarchical levels. Unit, brand, product line and whole business.

- Most decisions are likely to be made at the individual product level. Before discontinuing, other alternatives and considerations are taken into account.
- Sometimes it is important to maintain a full product line for marketing reasons.
- Other options considered before discontinuing products include re-engineering or re-designing the products to reduce their resource consumption.
- Where products are discontinued, overall profitability will improve only if managers eliminate spending on supply of activity resources no longer required.

Cost-plus pricing

- Companies use different cost bases and mark-ups to determine their selling price.

Cost	Rs	m-up %	Price
Direct variable cost	200	250	500
Direct non-variable cost	100		
Total direct costs	300	70	510
Indirect costs	80		
Total cost (excl. higher level)	380	40	532
Higher level sustaining cost	60		
Total cost	440	20	528

Establishing target mark-up %

- Mark-ups are related to demand. Firms are able to command a higher mark-up for a product that has high demand.
- Mark-ups are likely to decrease when competition is intense.
- Luxury goods with low sales turnover may attract high profit margins, whereas non-luxury goods with high sales turnover may not.
- Another approach to choose a mark-up is to earn a target rate of return on capital investment.

- For example if the cost per unit of a product is Rs 100 and annual volume is 10,000 units. Product requires investment of Rs 1 million and the target rate of return is 15%, the target mark-up will be:
- 15% x 1,000,000 = Rs 15 per unit 10,000 units
- Target price will be 100 + 15 = 115
- The major problem with this approach is that it is difficult to determine the capital invested to support a product. Assets are normally used for many different products.
- Management should use this information together with their knowledge of the market and intended pricing strategies, before the final price is set.

Limitations of cost plus pricing

- The main criticism against cost-plus pricing is that it ignores demand for the product. It is assumed that prices should solely depend on costs.
- For example a cost-plus formula may suggest Rs 20 for a product where the demand is 100,000 units. Whereas at a price of Rs 25 the demand may be 80,000 units. Assuming that variable cost for each unit sold is Rs 15, the total contribution will be Rs 500,000 at price of Rs 20, and Rs 800,000 at the price of Rs 25.
- Thus the cost-plus pricing formula might lead to incorrect decisions.
- Cost-plus can give rise to a loss if the volume is insufficient and contribution does not cover fixed costs.

Lecture 16

Pricing policies

- Cost information is one of the many variables that must be considered in the pricing decision.
- Final price will depend upon the pricing policy of the company.
- A price skimming or a price penetration policy might be selected.
- **Price skimming policy** is an attempt to exploit those sections of the market that are relatively insensitive to price changes.
- For example high initial prices may be charged to take advantage of the novelty appeal of a new product when demand is initially inelastic.
- A skimming policy offers a safeguard against unexpected future increases in costs, or large fall in demand after the novelty appeal has declined.
- Once the market becomes saturated, the price can be reduced to attract that part of the market that has not yet been exploited.
- A skimming pricing policy should not be adopted when a number of close substitutes are already being marketed.

- A **penetration pricing policy** is based on the concept of charging low prices initially with the intention of gaining rapid acceptance of the product.
- Such a policy is appropriate when close substitutes are available or when markets are easy to enter.

Product life-cycle

- Many products have a product life cycle consisting of four stages:
  - Introductory – product is launched, minimal awareness and acceptance.
  - Growth – sales begin to expand because of introductory promotions
  - Maturity – sales taper off as new customers are exhausted.
  - Decline – sales diminish as the product is replaced with new and better versions.

- In the introductory stage it may be appropriate to keep a slightly higher or lower price compared to the price found by normal analysis to create a more favorable demand in future years.
- Limited production capacity may rule out low prices. A higher initial price may be set and reduced progressively.
- If there is no production constraint, a lower price may be preferred. This may result in higher sales volume and a slow competitive reaction.
- At the maturity stage a firm should adopt a selling price that will maximize short-term profits.

Hamdard Ltd

- Hamdard has recently spent some time on researching and developing a new product for which they are trying to establish a suitable price. Previously they have used cost plus 20% to set the selling price.

The standard cost per unit has been established as follows:

Direct materials	
Material 1	10 (4 kg at Rs 2.50 / kg)
Material 2	7 (1 kg at Rs 7)
Direct labor	13 (2 hrs at Rs 6.50 per hr)
Fixed overhead	7 (2 hrs at Rs 3.50 per hr)
	37

Required:

(a) Using standard costs, calculate two different cost plus prices using two different bases and explain an advantage and disadvantage of each method.

(b) Give two other possible pricing strategies that could be adopted and describe the impact of each one on the price of the product.

- **Solution:**
- (a) Variable cost plus 20% = 30 x 1.20 = Rs 36
  Total cost plus 20% = 37 x 1.20 = Rs 44.40
- Advantages of variable cost include that it avoids arbitrary allocations, identifies short-term relevant costs, simplicity.
- The disadvantages are that it represents only a partial cost is short-term oriented and ignores price demand relationships.
- Advantages of total cost include that it attempts to include all costs, reduces the possibility that fixed costs will not be covered.
- Disadvantages are that some arbitrary apportionments are likely and price/demand relationship is ignored.

(b) Pricing strategies

- Price skimming is likely to lead to higher initial price.
- Price penetration policy is likely to lead to lower initial prices.

Customer profitability analysis

- In the past management accounting reports have tended to focus on analyzing profits by products. Increasing attention is now being given to analyzing profits by customers.
- Customer profitability analysis provides important information that can be used to determine which classes of customers needs to be emphasized or de-emphasized.

Case

- A company found that customer related selling costs represent 34% of the total costs. These costs were allocated on the basis of sales value.
- An activity based costing system was introduced that sought to explain the resources consumed by different customers.
- A detailed study identified two cost drivers:

  - Number of orders placed: each order had a large fixed cost that did not vary with the number of items purchased.
  - Non-standard production items: these items were more costly to produce than standard items.
- The company estimated the cost per order, and the cost of handling standard and non-standard items.
- A customer profitability analysis was performed based on the sales for the previous year.
- This analysis revealed that only 40% of its customers were profitable and a further 10% lost 120% of total profits. i.e 10% incurred losses equal to 120% of the profits.
- Two of the most unprofitable customers turned out to be among the top three in total sales volume. These two companies made small orders of non-standard items.

Example – The Daisy Company

- The Daisy Company has recently adopted customer profitability analysis by a review of the past 12 months. Details of activities and the cost driver rates for customer related expenses are as follows:

Activity	**Cost driver rate**
Sales order processing	Rs 300 per sales
Sales visits	Rs 200 per sales visit
Normal delivery cost	Rs 1 per delivery km
Special deliveries	Rs 500 per special deliver
Credit collection costs	10% p.a. on avg. pay-time

Details relating to four of the customers:

Customer		A	B	C	D
Number of sales orders	200	100	50	30	
Number of sales visits		20	10	5	5
Km per delivery	300	200	100	50	
Number of deliveries		100	50	25	25
Total delivery Km		30000	10000	2500	1250
Special deliveries		20	5	0	0
Average collection period (days)	90	30	10	10	
Annual sales		1m	1m	.5m	2m
Annual operating profit contribution		90000	120000	70000	200000

The profitability analysis in respect of the four customers is as follows:

Customer attributable costs	A	B	Y	Z
Sales order processing	60000	30000	15000	9000
Sales visits	4000	2000	1000	1000
Normal deliveries	30000	10000	2500	1250
Special (urgent) deliveries	10000	2500	0	0
Credit collection	24658	8220	1370	5480
	128658	52720	19870	16730
Operating profit contribution	90000	120000	70000	200000
Contribution to sustaining expenses	(38658)	67280	50130	183270

- It can be seen that A and B are high cost to serve and Y and Z are low cost to serve customers.
- Customer A provides positive operating profit contribution, but is unprofitable when customer attributable costs are taken into account.
- This is because customer A requires more sales orders, sales visits and normal and urgent deliveries than the other customers.
- In addition the customer is slow to pay and has higher delivery costs.
- Customer A can be made profitable if it can be persuaded to place smaller number of large quantity orders, avoid special deliveries and reduce credit period.
- Otherwise selling price should be increased or discounts reduced, to cover the extra resources consumed.

Example – with limiting factor

- A manufacturer has three products A, B and C. Currently sales, cost and selling price details and processing time requirements are as follows:

	A	B	C
– Annual sales	6000	6000	750
– Selling price	20	31	39
– Unit cost	18	24	30
– Processing time p.u. (hrs)	1	1	2

  – The firm is working at full capacity (13500 hrs per year). Fixed manufacturing overheads are absorbed into unit costs by a charge of 200% of variable cost.

Assuming that

(i) processing time can be switched from one product line to another,

(ii) demand at current price is:

A	B	C
11000	8000	2000 and selling prices are not to be altered.

Required: Calculate the best production programme for the next operating period and to indicate the increase in the net profit that this should yield. Identify the opportunity cost of a processing hour.

Solution

- Fixed manufacturing overhead costs are absorbed into the unit costs by a charge of 200% of variable cost. Therefore unit variable cost is one third of total unit cost.

Contribution per processing hour	A	B	C
Selling price	20	31	39
Variable cost	6	8	10
Contribution	14	23	29
Contribution per processing hr	14	23	14.5
Ranking	3	1	2

Optimal programme:

	Output	Hours	Contribution
Product B	8000	8000	184000
Product C	2000	4000	58000
Product A	1500	1500	21000
		13500	263000

Existing programme:

	Output	Hours	Contribution
Product A	6000	6000	84000
Product B	6000	6000	138000
Product C	750	1500	21750
			243750

- Contribution and profits will increase by Rs 19250 if the optimal production programme is implemented.
- An additional hour of processing would be used to increase product A by one unit, thus increasing contribution by Rs 14. Therefore the opportunity cost of one processing hour is Rs 14.

Lecture 17

Information for Planning and Control – The Budget Process

- The various activities within a company should be coordinated by the preparation of plans of actions for future periods. These detailed plans are usually referred to as budgets.
- Our objective is to focus on the planning process within a business organization and to consider the role of budgeting.
- Planning is the design of a desired future and of effective ways of bringing it about.
- A distinction is normally made between short-term planning and long-term planning known as corporate planning or strategic planning.

Stages in the Planning Process

Stage 1 – Establishing Objectives:

- Comprises the mission of the organization, corporate objectives and unit objectives.
- The mission describes in very general terms the broad purpose and reason for the organization, the nature of business and the customers it seeks to serve.
- Corporate objectives relate to the organization as a whole. They are normally measurable and are expressed in financial terms such as desired profits or sales levels, return on capital employed, rates of growth or market share.

Establishing objectives

Corporate objectives are formulated by the Board of Directors and handed down to senior managers.

Overall objectives are broken down into subsidiary objectives relating to areas such as project range, market segmentation, customer service etc.

Unit objectives relate to specific objectives of individual units within a company.

Stage 2 – Identify Potential Strategies

- The next stage is to identify a range of possible course of action that might enable the company's objectives to be achieved.
- The identification of strategies should take into account the following:
  - Generic strategy to be pursued
    - Lowest cost producer or a unique product, service; focus on particular segment
  - Alternative directions to develop.
    - Market penetration or new market development; product development or diversification

Stage 3 – Evaluation of strategic options

- Suitability – exploits company strengths and environmental opportunities, avoid weakness
- Feasibility – can the strategy be funded? And necessary market position achieved? Can the company cope with competitive reactions,
- Acceptability - will it be sufficiently profitable, is the level of risk acceptable.

Stage 4 – Select course of action

- After selection of the strategic options, long-term plans should be created to implement the strategies.
- A long-term plan is a statement of preliminary targets and activities required by an organization to achieve its strategic plan, together with a broad estimate of the resources required in each year.
- As it concerns the future, plans tend to be general in nature, imprecise and subject to change.

Stage 5 – Implementation of long-term plans

- Long-term plans represent the broad direction that top management intend to follow.
- The budget is developed in the context of ongoing business and is ruled by previous decisions already taken.
- Initial estimates are reviewed in the light of more recent information.
- This review process may result in decisions being taken on possible activity adjustments within the current budget period.
- Budgeting must be considered as an integrated part of the long –term planning process.

Stages 6 & 7 – Monitor actual outcomes & respond to divergences

- The final stages are to compare the actual and planned outcomes, and to respond to any divergences from plan.

Lecture 18

The multiple functions of budgets

- Planning annual operations – managers must produce detailed plans for the implementation of the long-range plans. Encourages managers to anticipate problems before they arise.
- Coordinating the activities of various parts of the organization – the budget serves as the vehicle through which the actions of the different parts of the organization can be brought together and reconciled into a common plan.
- Communicating plans to the various responsibility center managers – everyone in the organization should have a clear understanding of the part they are expected to play in achieving the annual budget.
- Motivating managers to strive to achieve the organizational goals – budget is a useful device to influence managerial behavior. A budget is a standard that managers may be motivated to achieve. Like a challenge.
- Controlling activities – a budget assists managers in managing and controlling the activities for which they are responsible. By comparing with actual results, managers can ascertain which costs do not conform to plan and require attention. This process enables management by exception.
- Evaluating the performance of managers – success is measured in meeting the budget, bonuses may be awarded on achieving of targets.

Conflicting roles of budgets

- As a single budget is used to serve several purposes, there is a danger that they may conflict with each other.
- Demanding budgets that may not be achieved may be appropriate to motivate maximum performance, but they are unsuitable for planning purpose.
- There is also a conflict between planning and performance evaluation roles. Budgets are set in advance on anticipated circumstances. Performance should be based on an adjusted budget to reflect actual operating circumstances.

The Budget Period

- The conventional approach is that once a year the manager of each budget center prepares a detailed budget for one year.The preparation of budgets on an annual basis has been strongly criticized on that grounds that it ties the company to a twelve month commitment. This can be risky as the budget is based on uncertain forecast.
- An alternative approach is for the budget to be broken down by months for the first three months, and by quarters for the remaining nine months. The quarterly budgets are developed into monthly budgets as the year proceeds. In 2nd qtr monthly budgets for the 3rd qtr is prepared, and so on.
- A new budget for a fifth quarter will also be prepared. This process is known as continuous or rolling budget.This ensures that a twelve month budget is always available by adding a quarter as the quarter just ended is dropped. Rolling budgets ensure that planning is not something that takes place once a year.
- Planning is a continuous process and managers are encouraged to constantly look ahead and review future plans.

A detailed illustration – The Enterprise Company

- The enterprise company manufactures two products, known as the alpha and beta. Alpha is produced in dept 1 and beta in dept 2. The following information is available for 20X0
- Standard material and labor costs:
  - Material X 7.20 per unit
  - Material Y 16.00 per unit
  - Direct labor 12.00 per unit

Overhead is recovered on a direct labor hour basis.

- The standard material and labor usage for each product is as follows:
- Model Alpha Model Beta
  - Material X 10 units8 units
  - Material Y 5 units 9 units
  - Direct labor hour 10 hours 15 hours
  -

The balance sheet for the previous year end 20X0 was as follows:

		Rs	Rs
Fixed Assets			
Land		170000	
Buildings and equipment		1292000	
Less depreciation		255000	1037000
Current Assets			
Stocks, finished goods	99076		
raw materials	189200		
Debtors	289000		
Cash	34000		
	611276		
Less: Current liabilities			
Creditors		(248800)	362476
Net Assets		1569476	
Represented by		========	
1200000 ordinary shares		1200000	
Reserves		369476	1569476
			========

Other relevant data is as follows for the year 20X0

	Finished products	
	Alpha	**Beta**
Forecast sales (units)	8500	1600
Selling price per unit	Rs400	Rs560
Ending inventory required (units)	1870	90
Beginning inventory (units)	170	85

	Direct material	
	Material X	Material Y
Beginning inventory (units)	8500	8000
Ending inventory required (units)	10200	1700
	Dept 1	Dept 2
Budgeted variable overheads rates		
(per direct labor hr)	Rs	Rs
Indirect materials	1.20	0.80
Indirect labor	1.20	1.20
Power (variable portion)	0.60	0.40
Maintenance (variable portion)	0.20	0.40

	dept 1	dept 2
	Rs	Rs
Budgeted Fixed overheads		
Depreciation	100000	80000
Supervision	100000	40000
Power (fixed portion)	40000	2000
Maintenance (fixed portion)	45600	3196

Estimated non-manufacturing overheads:

Stationery etc. (admin)	4000
Salaries	
sales	74000
office	28000
Commissions	60000
Car expenses (sales)	22000

Advertising	80000
Miscellaneous (office)	8000
	276000

Budgeted cash flows are as follows:

(All Rs 000s)	Q1	Q2	Q3	Q4
Receipts from customers	1000	1200	1120	985
Payments:				
Materials	400	480	440	548
Payments for wages	400	440	480	646
Other costs and expenses	120	100	72	14

You are **required** to prepare a master budget for the year 20X0 and the following budgets:

1. Sales budget
2. Production budget
3. Direct materials usage budget
4. Direct materials purchase budget
5. Direct labor budget
6. Factory overhead budget
7. Selling and administration budget
8. Cash budget

Lecture 19

Sales budget

- The sales budget shows the quantities of each product that the company plans to sell and the intended selling price.
- It provides the prediction of total revenue from which cash receipts from customers will be estimated.
- It also provides the basic data for constructing budgets for production costs, selling and distribution and administrative expenses.

- The sales budget is therefore the foundation for all other budgets. If sales budget is not accurate, other budgets will be unreliable.

Assume market analysis show this result:

Product	Units sold	Price	Revenue
Alpha	8500	400	3400,000
Beta	1600	560	896,000
			4296000

- This will be supported by detailed budgets showing territories, monthly details by product.

Detailed monthly budget for 4 territories

Month	North		South		East		West		Total	
	units	value	units	value	units	value	units	value	units	value
January Alpha										
Beta										
Total										
Feb										
Mar										
Apr										
May										
Jun										
Jul										
Aug										
Sep										
Oct										
Nov										
Dec										
Total Alpha	3000	1200	2500	1000	1000	400	2000	800	8500	3400
Beta	500	280	600	336	200	112	300	168	1600	896

Annual Production budget

		Dept 1	Dept 2
		Alpha	Beta
Units to be sold	8500	1600	
Planned closing stock		1870	90
Total units required		10370	1690
Less planned opening stock		170	85
Units to be produced		10200	1605

The total production for each dept should also be analyzed on a monthly basis.

Direct materials usage budget

- The supervisors of depts 1 and 2 will prepare estimates of the materials required to meet the production budget.

	Department 1			Department 2		
	Units	price	total	units	price	total
Material X	102000	7.20	734400	12840	7.20	92448
Material Y	51000	16	816000	14445	16	231120
			1550400			323568

Working

Material X - 10200 units at 10 units per unit of alpha = 102000

- 1605 units at 8 units per unit of beta = 12840

Material Y - 10200 units at 5 units per unit of alpha = 51000

- 1605 units at 9 units per unit of beta = 14445.

Direct materials purchase budget

- The objective is to purchase materials at the right time and at the planned purchase price.
- It is necessary to take into account the planned raw material stock levels.

	Material X	Material Y
Quantity necessary for production	114840	65445
Planned closing stock	10200	1700

	125 040	67145
Less: planned opening stock	8500	8000
Total units to be purchased	116540	59145
Planned unit purchase price	7.20	16
Total purchases	839088	946320

For detailed planning and control it will be necessary to analyze the annual budget on a monthly basis.

Factory overhead budget

- Anticipated activity
  - 102000 direct labor hrs (dept 1 – 10200 X 10hrs)
  - 24 075 direct labor hrs (dept 2 – 1605 X 15 hrs)

	Variable overhead rate		Overheads	
Controllable overheads:	Dept **1**	Dept **2**	Dept **1**	Dept **2**
Indirect material	1.20	.80	122400	19260
Indirect labor	1.20	1.20	122400	28890
Power (variable portion)	0.60	0.40	61200	9630
Maintenance (var portion)	0.20	0.40	20400	9630
Non-controllable overheads:				
Depreciation			100000	80000
Supervision			100000	40000
Power (fixed portion)			40000	2000
Maintenance (fixed portion)			45600	3196
Total overhead			612000	192606
Departmental overhead rate			6.00	8.00

Selling and Administration budget

- In practice separate budgets would be prepared for selling and for administration

Selling:			
Salaries	74000		
Commission		60000	
Car expenses		22000	
Advertising		80000	236000
Administration:			
Stationery		4000	
Salaries	28000		
Miscellaneous		8000	40000
			276000

Master budget

- When all the budgets have been prepared, the budgeted profit and loss account and balance sheet provide the overall picture of the planned performance for the budget period.

Budgeted profit and loss account for the year ending 20X0

Sales (schedule 1)		4296000
Opening stock of raw material	189200	
Purchases (schedule 4)	1785408	
Less closing stock of raw material	(100640)	
Cost of raw material consumed	1873968	
Direct labor	1512900	
Factory overhead (schedule 6)	804606	
Total manufacturing cost	4191474	
Add opening stock of finished goods	99076	
Less closing stock of finished goods	(665984)	

Cost of sales	3624566	
Gross profit	671434	
Selling and administration expenses		276000
Budgeted operating profit for the year		395434

Inventory valuation

	Alpha		Beta	
	units	Rs	Units	Rs
Direct materials				
X	10	72.00	8	57.80
Y	5	80.00	9	144.00
Direct labor	10	120.00	15	180.00
Factory Overheads:				
Dept 1	10	60.00		
Dept 2		15	120.00	
		332.00		501.60

Closing stock:

Alpha 1870 units @ 332 = 620840

Beta 90 units @ 501.60 = 45144

665984

Lecture 20

Budgeted Balance Sheet

Fixed assets:		
Land		170000
Buildings and Equipment	1292000	
Less depreciation	435000	857000
		1027000

Current assets:			
Raw material stock		100640	
Finished goods stock		665984	
Debtors	280000		
Cash		199170	
	1245794		
Current Liabilities:			
Creditors		307884	937910
			1964910
Represented by			=======
120000 ord shares Rs 10 each	1200000		
Reserves		369476	
Profit and Loss account	395434	1964910	
		========	

Workings

- depn: 255000+180000 (sch 6) = 435000
- Debtors: 289000 (o/bal)+4296000(sales) – 4305000 (cash recd) = 280000
- Cash – closing bal per budget
- Creditors: 248800(o/bal) + 1785408 (purchases) + 141660 indirect materials – 1876984 (cash paid) = 307 884

Cash Budgets

- Cash budgets help a firm to identify cash balances that are surplus to its requirements, these can be invested in the short term.
- They also identify cash deficiencies which need to arranged to meet the requirements.
- The overall aim should be to attain maximum cash availability and earn maximum return on idle funds.

	Q1	Q2	Q3	Q4	Total
Opening balance	34000	114000	294000	421984	34000
Receipts from debtors	1000000	1200000	1120000	985000	4305000
	1034000	1314000	1414000	1406984	4339000
Payments:					

Purchase of material	400000	480000	440000	547984	1867984
Payment of wages	400000	440000	480000	646188	1966188
Other costs and expenses	120000	100000	72016	13642	305658
	920000	1020000	992016	1207814	4139830
Closing balance	114000	294000	421984	199170	199170

Final Review

- The budgeted profit and loss account, balance sheet and cash flow will be submitted to the budget committee for review.
- Financial ratios such as return on capital employed, working capital, liquidity and gearing ratios will be reviewed.
- In the example ROCE is 20% but the working capital ratio is 4:1, so management should consider ways of reducing investment in working capital, before finally approving the budget.

Activity based budgeting

- For those indirect costs and support activities where consumption of resources does not vary with output of products, conventional budgets merely serve as authorization for certain levels of spending for each item of expense.
- Performance reporting normally implies little more than checking whether the budget has been exceeded.
- With conventional budgeting indirect costs and support activities are prepared on an incremental basis. This means current budgeted allowance for existing activities is taken as the starting point.
- The base is then adjusted for changes which are expected to occur. This is called incremental budgeting.

Incremental approach to budgeting

- In incremental budgeting the expense may be based on the previous budgeted allowance plus an increase to cover higher prices.
- The major disadvantage of the incremental approach is that the majority of expenditure associated with the base activity remains unchanged.
- Past inefficiencies and waste is perpetuated.
- To manage costs more effectively, organizations that have implemented Activity Based Costing have also adopted activity based budgeting (ABB)

Activity based budgeting

- The aim of ABB is to authorize supply of only those resources that are needed to perform required activities to meet the production volume.
- In ABB cost objects are the starting point. Their budgeted output determines the necessary activities, which are then used to estimate the resources required.

Stages in ABB

- ABB involves the following stages:
  - Estimate the production and sales volume by individual products and customers.
  - Estimate the demand for organizational activities
  - Determine the resources required to perform the organizational activities.
  - Estimate for each resource, the quantity required to meet demand.
  - Take action to adjust the capacity of resources to match projected supply.
- The first stage is identical to conventional budgeting.
- Next ABB extends conventional budgeting to support activities such as ordering, receiving, scheduling production and processing customer orders.
- Estimates of quantities of activity cost drivers must be derived for each activity. E.g. number of Pos, number of receipts, number of set-ups and number of customer orders processed
- Third stage is to estimate the resources required for performing quantity of activity drivers demanded. E.g if orders processing is estimated at 5000 and each order takes 30 minutes processing time, then 2500 labor hours of customer order processing must be supplied.
- The final stage is to compare the quantity of resource required with the resources currently committed.
- Where necessary, additional spending must be authorized in the budget to acquire additional resources.
- Alternatively, if the demand for resources is less, the budget process should result in action to reduce resources no longer needed.

Budgeting in non-profit organizations

- Budgeting in non-profit organizations normally begins with managers of various activities calculating the costs of maintaining ongoing activities.
- Then costs of further development of services are added.
- The available resources should be sufficient to cover total costs of such services.
- One difficulty encountered is that precise objectives are not defined in a quantifiable way.
- Actual accomplishments are difficult to measure.

- In most situations output cannot be measured in monetary terms.
- In profit oriented organizations output can be measured in sales revenue terms.
- The effect is that budgets in non-profit organizations tend to be concerned mainly with input of resources.
- There is not the same emphasis on what is intended to be achieved for a given input of resources.

Line item budgets

- A line item budget is where the expenditures are expressed in considerable detail, but the activities being undertaken are given little attention.
- Line item budget shows the nature of the spending but not the purpose.
- Compliance with these budgets provides no assurance that resources are used wisely, effectively or efficiently in financing various activities.

Lecture 21

Example – preparation of cash budget

- The management of Kader Bux Ltd has been informed that the union of direct workers intends to call a strike. The accountant has been asked to advise management on the effect the strike will have on cash flow.

  The following budget data was made available:

	Week 1	week 2	Week 3
Sales	400 units	500 units	400 units
Production	600 units	400 units	nil

The strike will commence beginning of week three, and will continue for at least 4 weeks.

Sales at 400 units per week will continue during the strike period until stocks of finished goods are exhausted.

Kader Bux Ltd…

- Production will stop at the end of week 2. The current stock of finished goods is 600 units
- Selling price of the product is Rs 60 and manufacturing cost is made up as follows:
  - Direct material 15
  - Direct wages 7
  - Variable overheads 8
  - Fixed overheads 18
  - Total 48

Direct wages are regarded as variable cost.

- The company operates full-absorption costing and the fixed overhead absorption rate is based on budgeted fixed overheads of Rs 9000 per week.
- Included in the fixed overheads is Rs 700 for depreciation of equipment.
- During the period of the strike direct wages and variable overheads would not be incurred and the cash expended on fixed overheads would be reduced by Rs 1500 per week.

- The current stock of raw material are worth Rs 7500, it is intended that these stocks should increase to Rs 11000 by the end of week 1 and then remain at this level during the period of the strike. All direct materials are paid for 1 week after they have been received.
- Direct wages are paid one week in arrear.
- All relevant overheads are paid immediately as the expense is incurred.
- All sales are on credit, 70% of sales value is received in cash at the end of the first week, and balance at the end of the second week.

- The current amount outstanding to suppliers is Rs 8000 and direct wage accruals amount to Rs 3200. Both of these will be paid in week 1.
- The current balance owing from debtors is Rs 31200 of which Rs 24000 will be received during week 1, and the remaining during week 2.
- The current balance of cash in hand and at bank is Rs 1000.

Required : (a)

- (i) prepare a cash budget for weeks 1 to 6 showing the balance of cash at the end of each week together with a suitable analysis of receipts and payments during each week.
- (ii) comment upon any matters arising from the cash budget which you consider should be brought to the management's attention.

- **(b)** explain why reported profit figure for a period does not normally represent he amount of cash generated in that period.

Solution - Kader Bux Ltd

Cash Budget for week 1 – 6

		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Receipts from debtors		24000	24000	28200	25800	19800	5400
Payments :							
To material suppliers		8000	12500	6000	-	-	-
To direct workers		3200	4200	2800	-	-	-
For variable overheads	4800	3200	-	-	-	-	
For fixed overheads		8300	8300	6800	6800	6800	6800
Total payments	24300	28200	15600	6800	6800	6800	
Net movement	-300	-4200	12600	19000	13000	-	1400
Opening bal (wk 1 given)	1000	700	-3500	9100	28100	41100	
Closing balance	700	-3500	9100	28100	41100	39700	

Workings :

Debtors	week 1	week2	week 3	week 4	week 5	week 6
Units sold		400	500	400	300	-	-
Sales		24000	30000	24000	18000	-	-
Cash received (70%)		16800	21000	16800	12600	-	
(30%)				7200	9000	7200	5400
given		24000	7200				

Total receipts	24000	24000	28200	25800	19800	5400

Sales in week = opening stock (600 units) + production in weeks 1 and 2 (1000 units) less sales in weeks 1 to 3 (1300 units) = 300 units

Creditors	Week 1	week 2		week 3	week4	week 5	week 6	
Materials consumed								
@ Rs 15	9000	6000	-	-	-	-		
Increase in stocks	3500							
Materials purchased	12500	6000						
Payment to suppliers	8000	12500	6000					(given)
Wages								
Wages consumes								
@ Rs 7	4200	2800	-	-	-	-		
Wages paid	3200	4200	2800	-	-	-		(given)

Variable overhead payments = budgeted production X budgeted cost per unit.

Fixed overhead payments for weeks 1-2 = fixed overheads (9000) less depn (700)

Fixed overheads for weeks 3-6 = 8300 (normal) less 1500 per week.

(ii) Comments for Management

- Finance will be required to meet the cash deficit in week 2, but lowering of budgeted material stocks at end of week 1 would reduce the borrowing at end of week 2.
- Surplus cash after week 2 should be invested on short-term basis.
- After week 6 there will be no cash receipts, only outflows of Rs 6800 per week. The closing balance of Rs 39700 at the end of week 6 will be sufficient for a further 5 to 6weeks (39700/6800)

(b) Profits and cash-flows

- According to the matching concept, revenues and expenses may not be attributed to the same period as the related cash flows.
- Some items of expense do not affect cash flow e.g. depreciation.

Lecture 22

Zero-based budgeting

- Zero-based budgeting (also known as priority based budgeting) emerged to overcome the limitations of incremental budgets.
- This approach requires that all activities are justified and prioritized before a decision is taken to allocate resources.
- Zero-based budgeting also focuses on programs and activities instead of line items of traditional budgeting.
- ZBB works on the premise that each year's budget should be compiled as if the programs were being launched for the first time.

- All funds are allocated on the basis of cost-benefit or similar analysis.
- It questions long standing assumptions and serves as a tool for systematically examining any unproductive projects.
- It is best suited for discretionary costs such as advertising, research and development and training.

ZBB involves the following three stages:

- A description of each organizational activity
- Evaluation and ranking of decisions in order of priority
- Allocation of resources based on order of priority upto the spending cut-off level.

Benefits of ZBB

- Benefits of ZBB over traditional methods are being claimed as follows:
  - ZBB avoids the deficiencies of incremental budgeting and represents a move towards the allocation of resources on need basis. The level of funding is not taken for granted.
  - ZBB takes a questioning attitude rather than one that assumes current practices represent value for money.
  - ZBB focuses attention on output in relation to value for money.

ZBB – lack of success

- The main reason for its lack of success would appear to be that its too costly and time-consuming.
- The process of identifying decisions and determining their purpose, cost and benefits is extremely time-consuming.
- Frequently there is insufficient information available to evaluate and rank decisions.
- Organizations tend to approximate the principles of ZBB rather than applying the full scale approach. E.g. applied to some areas of the organization selectively.

Transfer pricing

- Financial means for evaluating divisional performance
- Established transfer price is a cost to the receiving division and revenue to the supplying division
- Transfer price will affect profitability of both divisions
- Transfer pricing can also apply to cost centers i.e. support / service centers, sometimes there is no need for a profit element to be included.

Purpose of transfer pricing

- To provide information that motivates divisional managers to make good economic decisions.
- To provide information useful for evaluating managerial performance, and economic performance of divisions and cost centers.
- To intentionally move profits between divisions or locations.
- To encourage divisional autonomy.

Information for good economic decisions

- Goods transferred from one division to another are known as intermediate products, where as those sold to the outside world are known as final products.
- Transfer prices are used to determine the values of intermediate products.
- It can also be used for decisions on whether the product should be sold or processed further. This is done on incremental cost basis.
- Managers must take care not to treat transfer price as incremental cost.

- For example assume the incremental cost of a intermediate product is Rs 100 and additional cost of further processing is Rs 60.
- The incremental cost of the final product will therefore be Rs 160.
- Also assume there is temporary excess capacity, and that the market price of the final product is Rs 200.
- The correct decision would be to convert intermediate product to final product.
- If the transfer price was based on full cost plus profit margin and set at Rs 150, the incremental cost of the final product would be Rs 210 (150 + 60).

- The manager would decide not to purchase the intermediate product for further processing, as the incremental cost is more than the selling price . This would be an incorrect decision.
- The problem would be overcome if transfer price is set at the incremental cost which is Rs 100 in this example.

Evaluating divisional performance

- The price at which goods are transferred from one division to another, will influence the division's reported profits.
- An unsound transfer price will result in a misleading performance measure.
- The divisional manager may feel the transfer price is affecting his performance unfairly.
- This may have negative motivational consequences.

Conflict of objectives

- No single transfer price will perfectly serve all four specified purposes. They often conflict and managers are forced to make trade-offs.
- The decision-making and the performance evaluation may conflict with each other.
- E.g. sometimes in the short-term, the transfer price for optimal economic decision is the marginal cost. Very often this will equal variable cost.

- The supplying division will fail to recover its fixed overheads and may report a loss.
- Further, as shown, transfer price satisfactory for divisional performance (Rs 150) leads to incorrect decisions from a company wide perspective.

LECTURE # 23

Topic: Alternative transfer pricing methods

- There are five different types of transfer pricing methods which can be used by companies.
- Market-based transfer prices: these are listed prices of identical or similar products.
- Marginal cost transfer prices, mostly variable cost in the short run. Interpreted as direct costs and variable indirect costs.
- Full cost transfer prices, include cost of all resources committed to a product in the long run
- A cost-plus transfer price, a mark-up is added to enable supplying division to make a profit.
- Negotiated transfer prices, by managers of supplying and receiving divisions.

Market based transfer prices

- Where perfectly competitive market for an intermediate product exists, it is optimal for both decision making and performance evaluation to set transfer price at the competitive market price.
- Perfect competition exists where the product is homogeneous and no individual buyer or seller can affect price.
- When transfers are recorded at market price, divisional performance is likely to represent real economic contribution to the company profits. Profits are likely to be similar as if the divisions were separate companies.

The effect of selling expenses

- In practice company profits will be different when the intermediate product is acquired internally or externally.
- Selling expenses will be incurred when selling intermediate product in the external market.
- Companies modify the market prices to allow a margin to account for selling expenses

Other market imperfections

- Markets are unlikely to be perfectly competitive.
- Also, transferred products may have special characteristics. Market price is appropriate only when quality, delivery and discounts are identical.
- It may be possible to purchase intermediate product in the market at a temporary low price. If supplying division has excess capacity, incorrect decisions may arise from the market price rule.

Example

- A supply division has spare capacity and produces intermediate product at an incremental cost of Rs 1000; transfer price of this product is set at the external market price Rs 1600.
- Suppose a supplier sells in the market at a temporary distress price of Rs 1500, the receiving division will prefer to purchase from the external supplier.
- The relevant cost for the company of making the product is Rs1000; hence the market price rule can motivate the manager to take decisions not in the best interest of the company.

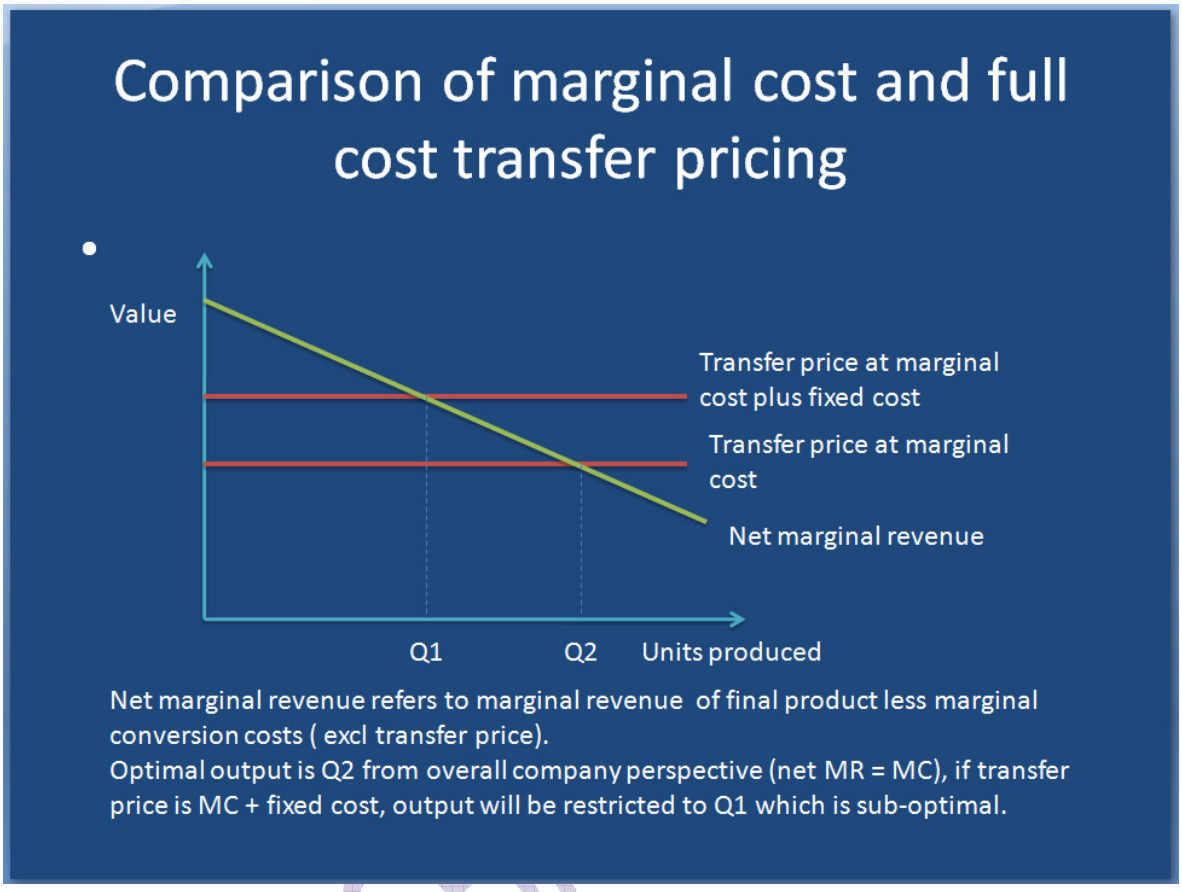
Market imperfections

- These complications arise as markets are not perfectly competitive.
- Many companies use adjusted market-based transfer price to reflect temporary imperfection of markets.
- Such transfer prices are perceived as being fair by the divisional managers for performance evaluation.
- Also divisional autonomy is unlikely to be undermined.

Marginal Cost Transfer Prices

- Marginal cost transfer prices can motivate both supplying and receiving managers to operate at output levels that will maximize overall company profits.
- Marginal cost is constant per unit throughout the relevant output range and equivalent to short-term variable cost.
- Variable cost is optimal only when the short-term perspective is adopted.

Comparison of marginal cost and full cost transfer pricing



Marginal cost transfer pricing

- Surveys have shown that less than 10% of companies transfer goods at marginal cost.
- The major reason is that supplying division does not cover its full cost, and profits are understated, whereas receiving division is not charged with full cost and its profits are over stated.
- This is inaccurate information for evaluating performance.
- A further problem is that marginal costs may not remain constant over the entire range of output.
- Low usage of marginal cost transfer prices suggests that managers do not view product related decisions as short-term, and marginal cost is taken as short-term variable cost. A long run marginal cost is more appropriate.

Full cost transfer prices

- Full cost transfer prices or full cost plus mark-up are widely used in practice.
- Managers view product related decisions as long-run decisions.
- They are preferable for performance evaluation.
- Transfer pricing above variable cost may be consistent with 'economist's marginal cost.
- E.g. the economist would argue that extra wear and tear caused by plant usage is part of marginal cost. The accountant allows for this in depreciation which is taken as fixed cost.
- The major problem with full cost transfer prices is that they are derived from traditional costing systems, which can provide poor estimates of long run marginal costs.
- Ideally full cost transfer prices should be derived from activity based costing systems.
- A further problem with full cost transfer prices is that they do not provide an incentive to the supplying division as they do not include a profit margin.

Cost plus mark-up transfer prices.

- Cost plus transfer prices attempt to meet the performance evaluation purpose of transfer pricing.
- Sometimes variable costs are used as the base cost and a mark-up added to cover fixed cost as well as profit margin. In such cases the full cost will be more inaccurate than traditional systems.
- A further problem arises when we extend our analysis beyond two divisions. If each division transfer product at cost plus 20%, then the mark-up can be enormous by the time mark-up is added by the final division.

Negotiated transfer prices

- Negotiated transfer prices are most suited where some market imperfection exists.
- Managers have the freedom to buy and sell outside the company and engage in a bargaining process.
- It is claimed that the friction and ill-feeling of centrally controlled transfer prices will be eliminated.
- It is important that managers have equal bargaining power. Unequal bargaining power can occur if transfers are a small proportion of business for one division and a larger proportion of the other division.

- The situation may arise where divisional managers cannot agree on a mutually satisfactory transfer price. Central headquarter may then have to resolve the dispute.
- This raises behavioral problem with respect to morale and motivation, it also means at the time of performance evaluation, managers will be held responsible for decisions they did not make.
- Nevertheless the support and involvement of top management must be available to intervene to avoid sub-optimal decisions.

Limitations of negotiated transfer prices

- They depend on negotiating skills and bargaining power of managers, final outcome may not be optimal.
- They can lead to conflict between divisions.
- Managers may have unequal bargaining power.
- They are time-consuming where a large number of transactions are involved.

LECTURE # 24

An illustration of transfer pricing

- The Thar division and the Makran division are divisions within the Balochistan Group.
- One of the products manufactured by the Thar division is an intermediate product for which there is no external market.
- This intermediate product is transferred to the Makran division where it is converted into a final product for sale in the external market.
- One unit of the intermediate product is used in the production of the final product.

An illustration of transfer pricing:

- The expected units of the final product which the Makran division estimates it can sell at various prices is as follows:

Selling price	Quantity sold
100	1000
90	2000
80	3000

70	4000
60	5000
50	6000

An illustration of transfer pricing:

- The costs of each division are as follows:
- Thar Makran
- Variable cost per unit 11 7
- Fixed cost attributable 60,000 90,000
- The transfer price of the intermediate product has been set at Rs 35 based on full-cost plus mark-up.

An illustration of transfer pricing:

- At transfer price of Rs 35, profit computation for each division will be:

Thar division (supplying division):

Output	Revenue	Variable Cost	Fixed cost	Profit
1000	35000	11000	60000	(36000)
2000	70000	22000	60000	(12000)
3000	105000	33000	60000	12000
4000	140000	44000	60000	36000
5000	175000	55000	60000	60000
6000	210000	66000	60000	84000

An illustration of transfer pricing

- **Makran Division (receiving):**

Output	Revenue	variable	transfer	fixed cost	profit
2000	100000	7000	35000	90000	(32000)
2000	180000	14000	70000	90000	6000
3000	240000	21000	105000	90000	24000
4000	280000	28000	140000	90000	22000
5000	300000	35000	175000	90000	0
6000	300000	42000	210000	90000	(42000)

An illustration of transfer pricing

- The supplying division maximizes profits at an output level of 6000 units whereas the receiving division maximizes profits at an output level of 3000 units.
- Receiving division will therefore purchase 3000 units from the supplying division.
- This is because Makran will expand output as long as net marginal revenue exceeds transfer price.
- Net marginal revenue = marginal revenue from sale less marginal cost of conversion (excl transfer price)

An illustration of transfer pricing

Units	Net marginal revenue
1000	93000 (100000 – 7000)
2000	73000 (80000 – 7000)
3000	53000 (60000 – 7000)
4000	33000 (40000 – 7000)
5000	13000 (20000 – 7000)
6000	-7000 (0 – 7000)

Faced with a transfer price of Rs 35000 per 1000 units, the Makran division will not expand output beyond 3000 units because the transfer price for each batch will exceed the net marginal revenue.

An illustration of transfer pricing

- Profits at different output levels for the company as a whole. Note these calculations do not incorporate transfer prices as they are inter-company items and will cancel out.

output	Revenues	variable cost	fixed	profit
1000	100000	18000	150000	(68000)
2000	180000	36000	150000	(6000)
3000	240000	54000	150000	36000
4000	280000	72000	150000	58000
5000	300000	90000	150000	60000
6000	300000	108000	150000	42000

- The profit maximizing output for the company as a whole is 5000 units. Therefore the current transfer pricing system does not motivate divisional managers to operate at the optimum level for the company as a whole.

An illustration of transfer pricing

- To induce overall company optimality the transfer price must be set at the marginal cost of the supplying division, which is the unit variable cost of Rs 11 per unit.
- Therefore transfer price for a batch of 1000 units should be Rs 11000.
- Now the receiving division will expand output as long as net marginal revenue exceeds transfer price.
- Net marginal revenue at 5000 units is Rs 13000, the transfer price is Rs 11000, therefore expanding output to this level will increase profits.
- Setting the transfer price at the unit marginal cost of the supplying division will motivate managers to operate at the optimum output level for the company as a whole.
- It is not a suitable measure for divisional performance, as fixed costs are not recovered, and loss is reported.

An illustration of transfer pricing

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- It is not a suitable measure for divisional performance, as fixed costs are not recovered, and loss is reported.

An illustration of transfer pricing

- Consider a full cost transfer price with mark-up. Unit fixed cost has to be estimated at the planning stage using a pre-determined fixed overhead rate.

- At 5000 units output level for the company, fixed cost per unit for the intermediate product will be Rs 12 per unit (60000 fixed cost / 5000 units), giving a full cost of Rs 23 (Rs 12 plus Rs 11 variable cost).
- If the transfer price is set at Rs 23 per unit (Rs 23000 per 1000 batch) receiving division will expend output as long as net marginal revenue exceeds transfer price.
- This will be 4000 units where the net marginal revenue is Rs 33000. At 5000 units net marginal revenue is Rs 13000 and manager will not choose to expand output to 5000.

An illustration of transfer pricing

- At 4000 units the revenue of the supplying division will be Rs 92000 (4000 x 23) but the cost shown for the Thar division will be Rs 104000 (60000 fixed cost + 44000 variable).
- Thar division will report a loss as fixed costs have not been fully recovered.
- Hence this transfer price is neither suitable for performance evaluation nor optimal output decisions.
- We can conclude from this illustration that to ensure overall company optimality the transfer price must be set at the marginal cost of the supplying division.

Slides 25

LECTURE # 25

Domestic transfer pricing recommendations

1: Where a competitive market exists for the intermediate product, the market price (less any adjustments to reflect additional selling and distribution expense) should be used as the transfer price.

- If supplying division has spare capacity, receiving division should be instructed to purchase the agreed quantities from the supplying division to ensure overall optimality.

2. where no external market exists for the intermediate product, transfers should be made at the long run marginal costs.

- The long run marginal cost should consist of two elements: a short run marginal cost per unit of product and a fixed lump sum fee based on budgeted use of average capacity of the supplying division.
- This is to ensure the receiving division incorporates the full cost of the supplying division's resources.

3. Where an imperfect market for the intermediate product exists, and a small number of transactions are involved, a negotiated transfer pricing system is likely to be most suitable.

- Some external benchmarking is likely to be used to enable a meaningful bargaining process to take place.

- 4. where cost based transfer prices are used, standard costs and not actual costs per unit should be used. If actual costs are used, supplying division will be able to pass on the cost of any inefficiencies to the receiving division.

International transfer pricing

- Supplying and receiving divisions may be located in different countries with different taxation rates, and the taxation rates in one country may be much lower than the other.
- It would be in the company's interest that most of the profits are located in the country with low tax rates.
- For example an organization manufactures products in country A which has a marginal tax rate of 25% and sells those products in country B where marginal tax rate id 40%. Company will use highest possible transfer price so that country be will have higher costs and lower profits. The opposite for country A.
- In many multi-national organizations, the taxation issues outweigh other transfer pricing issues and the dominant consideration is the minimization of global taxes.
- Taxation authorities are aware that companies can use the transfer pricing system to manipulate the taxable profits. The arms length principle is used:
    - Similar transactions involving unrelated parties
    - Deduction of profit from selling price
    - Cost- plus method.

Example

- X Ltd, a manufacturing company has two divisions: Division A and Division B.
- Division A produces one type of product, Xeno, which it transfers to division B and also sells externally. Division B has been approached by another company which has offered to supply 2500 units of Xeno for Rs 35 each.
- The following details are available:
- Sales revenue

_ Sales to division B @ Rs 40	400,000
_ External sales @ Rs 45	270,000

Less:

Variable cost @ Rs 22	352,000
Fixed costs	100,000
Profit	218,000

if division B decides to buy from the other company, what will be impact of the profits of division A and on X Ltd, assuming external sales of Xeno cannot be increased.

Solution

- The loss of contribution in division A from lost sales of 2500 @ Rs 18 (40 – 22) = Rs 45000.
- The impact on the whole company is:
  - external purchase cost (2500x35) = 87500
  - incremental cost of manufacture (2500x22) = 55000
  - Additional cost to company = Rs 32,500

Example

Effects of transfer pricing on Division and Company profits

- Division A of a large organization manufactures a single standardized product. Some of the output is sold externally whilst the remainder is sold to Division B. In Division B it is a subassembly in an manufacture of that Division's product. The unit costs of Division A's product are as follows:

– Direct material	4
– Direct labor	2
– Direct expenses	2
– Variable manufacturing expenses	2
– Fixed manufacturing expenses	4
– Selling and packing exp – variable	1
	15

Example…

- Annually 10000 units of the product are sold externally at the standard price of Rs 30.
- In addition to external sales, 5000 units are transferred annually to Division B at an internal transfer charge of Rs 29 per unit.
- This transfer price is obtained by deducting variable selling and packing expense from the external price.
- Division B incorporates the transferred-in goods into a more advanced product.

Example…

- The unit costs of this product are as follows:

– Transferred-in item (from div A)	29
– Direct material and components	23
– Direct labor	3

– Variable overheads	12
– Fixed overheads	12
– Selling and packing exp –var	1
	80

Example…

- Division B's manager disagrees with the basis used to set the transfer price.
- He argues hat the transfers should be made at variable cost plus an agreed (minimal) mark-up.
- He claims that his division is taking output that Division A would be unable to sell at the price of Rs 30.
- Partly because of this disagreement, a study of the relationship between selling price and demand has recently been made by the sales director. The resulting report contains:

Example….

- Division A
  - Selling price 20 30 40
  - Demand 15000 10000 5000
- Division B
  - Selling price 80 90 100
  - Demand 7200 5000 2800
- The manager of division B claims that the study supports his case.
- He suggests that a price of Rs 12 would give Division A a reasonable contribution to its fixed overheads while allowing Division B to earn a reasonable profit.
- He also believes that it would lead to an increase in output and an improvement in the overall company profits.

Example…

- Required:
  - (a) to calculate the effect that the transfer pricing system has had on the company's profits, and
  - (b) to establish the likely effect on profits of a transfer price of Rs 12, as suggested by the manager of Division B.

Solution…

- The variable cost per unit of output for sales outside the company are Rs 11 for the intermediate product and Rs 49 (10A + 39B) for the final product.
- Selling and packing expense are not incurred for internal transfers.
- Optimal output of intermediate product for sale on external market:

• Selling price	20	30	40
• Unit contribution	9	19	29
• Demand (units)	15000	10000	5000
• Total contribution	135000	190000	145000

- Optimal output is 10000 units at a selling price of Rs 30

Solution…

- Optimal output for final product
- Selling price 80 90 100
- Unit contribution 31 41 51
- Demand (units) 7200 5000 2800
- Total contribution 23200 205000 142800
- Optimal output is 7200 units at a selling price of Rs 80.
- Optimal output of Division B based on transfer price of Rs 29.

Solution…

- Division B will regard transfer price as variable cost. Therefore total variable cost will be Rs 68 (29+39) and division B will calculate contribution as follows:
  - Selling price (Rs) 80 90 100
  - Unit contribution 12 22 32
  - Demand units 7200 5000 2800
  - Total contribution 86400 110000 89600

The management of Division B will choose output level of 5000 units at a selling price of Rs 90. This is sub-optimal for the company as a whole.

Solution…

- Profits for the company as a whole are reduced from Rs 223000 (7200 units) to Rs 205000 (5000 units).
- The Rs 205000 profits would be allocated as follows:
- Division A Rs 95000 (5000 @ (29-10))
- Division B Rs 110000

Solution…

- (b) at a transfer price of Rs 12, the variable cost per unit produced in Division B will be Rs 51 (12+39).
- Division B will calculate the following contributions:
  - Selling price 80 90 100
  - Unit contribution 29 39 49
  - Demand 7200 5000 2800
  - Total contribution 208800 195000 137200

Solution…

- The manager of Division B will choose an output of 7200 units and sell at Rs 80. This is optimum level of output for the company as a whole.
- Division would obtain a contribution of Rs 14400 (7200x(12=10)) from internal transfer of the immediate product, and Division B would get a contribution of Rs 208,800.
- Total contribution for the company as a whole would be Rs 223200. Division A would also earn a contribution of Rs 190,000 from sale of intermediate product in the external market.

LECTURE # 26

Cost Management

- In some previous lectures features of traditional management accounting and mechanisms used to control costs were described.
- The focus was on comparing actual results with a pre-set standard (usually budget), and taking remedial action.
- The emphasis is on cost containment rather than cost reduction.
- Cost management focuses on cost reduction and continuous improvement rather than cost containment.
- Cost management consists of those actions that are taken by managers to reduce costs.
- Some of the actions are taken on the basis of information extracted from the accounting systems.
- Other actions are taken without the use of accounting information. They involve process improvements, where such opportunities have been identified.
- Ideally, the aim is to take action that will both reduce costs and enhance customer satisfaction.

Life-cycle costing

- Life-cycle costing estimates and accumulates costs over a product's entire life-cycle.
- This will determine whether profits earned from manufacturing, will cover costs incurred in the pre and post manufacturing stages.
- Life-cycle costing helps management to understand the cost consequences of developing a product.
- It helps identify areas in which cost reduction efforts are most likely to be effective.
- Most accounting systems report on a period by period basis, and product profits are not monitored over their life-cycles.
- Product life-cycle reporting involves tracing costs and revenues on a product by product basis over their life cycle.
- Three stages of a product life-cycle are
    - Planning and design stage
    - Manufacturing stage
    - Service and abandonment stage

Target costing

- We have looked at target costing as a mechanism for determining selling prices.
- As a cost management tool, target costing involves the following stages:

  - ***Stage 1:*** determine the target price which customers will be prepared to pay for the product.
  - ***Stage 2:*** deduct a target profit margin to determine target cost.
  - ***Stage 3:*** estimate actual cost of the product.
  - ***Stage 4:*** it estimated actual cost exceeds target cost, investigate ways of driving down the actual cost.
- The first stage requires market research to determine customer perceived value. This will be based on its differentiation value compared to competing products, and the price of competing products.
- The target profit margin depends on the planned return on investment.
- A major feature of target costing is that a team approach is adopted to achieve the target cost. Team members include designers, engineers, purchasing, manufacturing, marketing and management accounting personnel.
- The aim during the product design process is to eliminate product functions that add cost, but which do not increase market price.
- The major advantage of target costing is that it is deployed during the design and planning stage. This way it can have maximum effect in determining the level of locked-in costs.
- If the target cost cannot be attained, the product should not be launched.
- Design teams should not be allowed to achieve target costs by eliminating desirable product functionality.

Tear-down analysis

- Tear-down analysis (also known as reverse engineering) involves examining a competitor's product to identify opportunities for improvement and /or cost reduction.
- The competitor's product is dismantled to identify its functionality and design. This provides insight about the processes and the cost.
- The aim is to benchmark provisional product design with the design of competitors.

Value engineering

- Value engineering (known as value analysis) is a systematic examination of cost of a product.
- Aim is to devise means of achieving standard quality and reliability, at the target cost.
- This is achieved by:
  - Identifying improved product design with reduced cost,
  - Eliminating unnecessary functions that increase product cost for which customers are not prepared to pay.
- Value engineering requires the use of functional analysis. This involves decomposing the product into its elements or attributes.
- E.g in automobiles functions might consist of : style, comfort, reliability, attractiveness etc.
- Surveys are conducted to determine the price customers are willing to pay for the various attributes.
- Where cost of a function exceeds the value to the customer, either the function should be eliminated or modified.

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The need for accurate cost measurement systems

- Target costing should be supported by an accurate cost system.
- Cost drivers should be established that determine cost of the activities consumed.
- Arbitrary cost allocations should be avoided.
- Target costing exercise should result in reduction of cost to the organization and not only the product.

An illustration of Target Costing

- The Micro Electronics Company manufactures cameras and video equipment. It is in the process of introducing a new state of the art combined digital video and still camera.
- The company has undertaken market research to ascertain customer perception and compare with competitors products.
- As a result, target selling price has been established and a life-time projected volume.
- Cost estimates have been prepared based on proposed product specifications.

An illustration of Target Costing

- The company has set a target profit margin of 30% of selling price.
- This has been deducted from the proposed selling price to determine the target cost.
- Following summary information has been presented to management
  - Projected lifetime sales volume 300,000 units
  - Target selling price Rs 800
  - Target profit margin (30%) Rs 240
  - Target cost (800 – 240) Rs 560
  - Projected cost Rs 700

An illustration of Target Costing

- The excess of the projected cost over the target cost results in an intensive target costing exercise.
- After completion of the target costing exercise, the projected cost is Rs 555, i.e. below target cost of Rs560.
- the analysis of the projected cost before and after the target costing exercise is as follows:
•

An illustration of Target Costing

	Before	**after**
Manufacturing cost		
direct materials (bought in)	390	325
direct labor	100	80
direct machining costs	20	20
ordering and receiving	8	2
quality assurance	60	50

rework	15		6	
engineering and design	10	603	8	491
Non-manufacturing costs				
marketing	40		25	
distribution	30		20	
After-sales services and warranty	27	97	19	64
Total cost		700		555

An illustration of Target Costing

- To achieve the target cost the company establishes a project team to undertake the intense target costing exercise.
- In response to the need to reduce projected cost, the team starts with purchasing a video camera from its main competitors and undertake a tear-down analysis.
- This process involves dismantling the cameras to provide insights into potential design improvements.
- Value engineering is also undertaken to identify new designs that will accomplish the same functions at a lower cost.

An illustration of Target Costing

- The outcome is a significant reduction in projected direct materials, labor and rework costs.
- Next the team engages in functional analysis.
- This process indicated several functions included in the prototype are not valued by customers.
- The functional analysis results in further cost reductions.
- The team now turn their attention to redesigning the production and support processes.
- They redesign the ordering and receiving process by reducing the number of suppliers and working closely with smaller suppliers.
- When projected cost is below the target cost, the exercise is concluded.

LECTURE # 27

Kaizen costing

- Widely used by Japanese organizations as a mechanism for reducing and managing costs.
- Kaizen is the Japanese word for making small improvements to a process rather than through large innovations.
- Target costing is applied during the design stage whereas Kaizen costing is applied during the manufacturing stage.
- Kaizen costing focuses on the production process and cost reductions are derived primarily through increased efficiency of the production process.
- Kaizen costing relies heavily on employee empowerment. Workers are given responsibility to improve process and reduce costs.

Activity based management

- The terms activity based management (ABM) or activity based cost management (ABCM) are used to describe cost management applications of ABC.
- Three stages are required:
  - Identifying major activities that take place
  - Assigning costs to cost pools / centers for each activity
  - Determining the cost driver for each major activity.
- ABM focuses on managing a business on the basis of activities performed.
- ABM is based on the fact the activities consume costs, hence managing activities will manage costs.
- ABM provides information on what activities are performed, what they cost, why undertaken and how well performed.

Traditional vs ABM analysis

- Traditional analysis
- Salaries 320
- Stationery 40
- Travel 140
- Telephone 40
- Depreciation 40
- 580

- ABM analysis
- Preparing quotations 120
- Receiving cust orders 190
- Assessing credit 100
- Expediting 80
- Resolving custprobs 90
- 580

Traditional budget and control reports analyze costs by type of expense. In contrast ABM analyzes costs by activities and thus provides management with information on why costs are incurred, and the output from the activity.

- To identify and prioritize the potential for cost reduction, organizations classify activities as either value-added or non value-added.
- Value-added is what customers perceive as useful and are prepared to pay for. E.gpainting a car.

- Non value added activities include inspecting, storing and moving raw material. Actions taken to carry these out efficiently will reduce costs.
- Care is needed as cost driver rates can encourage dysfunctional behavior. Rate can be improved by splitting the purchase orders, thus increasing number of orders. Ultimately this may increase costs.

Business process re-engineering

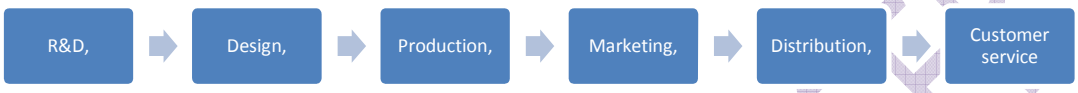
- Involves examining business processes and making substantial changes to how the organization currently operates.
- A business process is a collection activities linked together in a co-ordinated manner.
- E.g material handling is a business process consisting of scheduling production, storing materials, processing purchase orders, inspecting materials and paying suppliers.
- The aim is to improve key business processes by focusing on simplification, cost reduction, improve quality and enhance customer satisfaction.
- The process might be re-engineered by sending production schedule direct to nominated suppliers, and entering into contractual agreements to deliver materials according to production schedule.
- Quality guarantees and inspection prior to delivery can also be included.
- End result might be the elimination or reduction of storing, purchasing and inspecting activities.
- In BPR focus is on major changes rather than marginal improvements.

Cost of quality

- Quality has become one of the key competitive variables.
- TQM is a customer oriented process of continuous improvement that focuses on delivery of consistent high quality, on time.
- Companies discovered it was cheaper to produce items correctly the first time. It is a waste of resources to make sub-standard items, then detect and rework, or scrap them.
- Emphasis of TQM is to design and build in quality.
- Managers need to know the costs of quality and how they are changing over time.
- A cost of quality report should be prepared showing:

- Prevention costs; i.e preventive maintenance, quality planning, training, extra cost of high quality material.
- Appraisal costs; cost of inspection at each stage, quality audits, and field tests.
- Internal failure costs; such as scrap, downtime, repair
- External failure costs; customer complaints, warranty replacements, damaged reputation.

Cost management and the value chain



- Value chain analysis is increasingly being used to manage costs more efficiently.
- Value chain is the linked set of value creating activities all the way from basic raw materials to the end-use product.
- A firm which performs value chain activities more efficiently and at a lower cost than its competitors, will gain an advantage.
- It is a system of inter-dependent activities in which performance of one activity affects the performance and cost of another.
- Each link is seen as the customer of the previous link. If each link satisfies the needs of its customer, then end-customer satisfaction should follow.

Benchmarking

- In order to identify the best way of performing activities and business processes, organizations are turning to benchmarking.
- This involves comparing key activities to world-class best practices.
- Benchmarking identifies an activity, such as customer order processing, that needs to be improved.
- It finds a non-rival organization, considered to represent world class best practice for this activity, and studies how it performs the activity.
- The objective is to find out how the activity can be improved, and implement the improvements.

- Benchmarking is cost beneficial since an organization can save time and money avoiding mistakes that other companies have made.
- The overall aim is find and implement best practices.

Just-in-time Systems (JIT)

- JIT seeks to achieve the following goals:
  - Elimination of non-value added activities
  - Zero inventory
  - Zero defects
  - Batch size of one
  - Zero breakdowns
  - 100% on time delivery

Whether achieved or not, they set targets and create a climate for continuous improvement.

Elimination of non value-added activities

- JIT is a philosophy of management dedicated to elimination of waste. Waste is anything that does not add value to the product.
- The lead time involved in manufacturing and selling a product consists of process time, inspection time, move time, and storage time. Of these, only process time actually adds value to the product.
- Research has shown that process time is less than 10% of total lead time in many organizations. Therefore 90% of lead time adds no value, and in JIT philosophy, related cost can be significantly reduced.
- JIT system is a mechanism for reducing non value-added costs and long run costs.
- The implementation of JIT production methods was considered to be one of the major factors of the success of the Japanese firms in international markets.
- The JIT approach involves a continuous commitment to the pursuit of excellence in all phases manufacturing operations.
- The aims of JIT are to produce at the required quality, in the required quantity , and at the required time.

LECTURE # 28

Business process re-engineering*

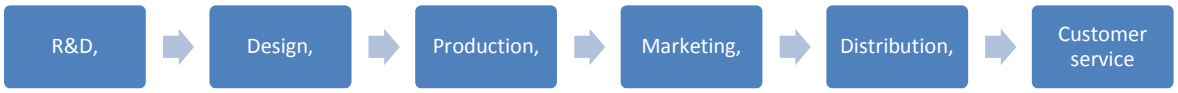
- Involves examining business processes and making substantial changes to how the organization currently operates.
- A business process is a collection of activities linked together in a co-ordinated manner.
- E.g material handling is a business process consisting of scheduling production, storing materials, processing purchase orders, inspecting materials and paying suppliers.
- The aim is to improve key business processes by focusing on simplification , cost reduction, improve quality and enhance customer satisfaction.
- The process might be re-engineered by sending production schedule direct to nominated suppliers, and entering into contractual agreements to deliver materials according to production schedule.
- Quality guarantees and inspection prior to delivery can also be included.
- End result might be the elimination or reduction of storing, purchasing and inspecting activities.
- In BPR focus is on major changes rather than marginal improvements.

Cost of quality*

- Quality has become one of the key competitive variables.
- TQM is a customer oriented process of continuous improvement that focuses on delivery of consistent high quality, on time.
- Companies discovered it was cheaper to produce items correctly the first time. It is a waste of resources to make sub-standard items, then detect and rework, or scrap them.
- Emphasis of TQM is to design and build in quality.
- Managers need to know the costs of quality and how they are changing over time.
- A cost of quality report should be prepared showing:
    - Prevention costs;i.e preventive maintenance, quality planning, training, extra cost of high quality material.
    - Appraisal costs; cost of inspection at each stage, quality audits, and field tests.
    - Internal failure costs; such as scrap, downtime, repair

- External failure costs; customer complaints, warranty replacements, damaged reputation.

Cost management and the value chain



- Value chain analysis is increasingly being used to manage costs more efficiently.
- Value chain is the linked set of value creating activities all the way from basic raw materials to the end-use product.
- A firm which performs value chain activities more efficiently and at a lower cost than its competitors will gain an advantage.
- It is a system of inter-dependent activities in which performance of one activity affects the performance and cost of another.
- Each link is seen as the customer of the previous link. If each link satisfies the needs of its customer, then end-customer satisfaction should follow.

Example - Traditional vs activity based budgets, and life-cycle costing

- The budget for the production, planning and development dept of Okaraplc is currently prepared on traditional system.
- The analysis of costs by expense type for period ended 30 November 20X0 is as follows:

Expense	budget %	Actual %
Salaries	60	63
Supplies	6	5
Travel cost	12	12
Technology cost	10	7
Occupancy cost	12	13

  - Total budget and actual costs for the dept for period ended November 30 are Rs 1,000,000 and Rs 1,060,000 respectively.

Traditional and activity based budget, and life-cycle costing

- The company now feels an Activity Based Budgeting approach should be used.
- A number of activities have been identified, and budget and actual cost should be attributed as follows:

	Budget %	Actual %
– Scheduling new products	20	16
– Scheduling existing products	40	34
– Remedial scheduling	5	12
– Special studies –specific orders	10	8
– Training	10	15
– Management and administration	15	15

Traditional and activity based budget statements, and life-cycle costing

- Required:
- (a) prepare two budget control statements for department and compare with actual, showing variances, using
  - traditional expense based analysis, and
  - Activity based analysis

Solution

- (a) Performance report – traditional:

Expense	Budget	Actual	variance
– Salaries	600000	667800	67800A
– Supplies	60000	53000	7000 F
– Travel cost	120000	127200	7200A
– Technology	100000	74200	25800F
Occupancy	120000	137800	17800A
	1000000	1060000	60000A

- **Performance report – activity based**

Activity	Budget	Actual	Variance

Scheduling new	200000	169600	30400F
Scheduling existing	400000	360400	39600F
Remedial	50000	127200	77200A
Special studies	100000	84800	15200F
Training		100000	159000 59000A
Mgt and admin	150000	159000	9000F
	1000000	1060000	60000

LECTURE # 29

Traditional and activity based budget statements, and life-cycle costing

- (b) Other activities have been identified and the budget quantified for the three months ended March 31, 20X1 is as follows:

Activity	cost driver	units	Cost(000)
Product design	hours	8000	2000
– Purchasing	P.Orders	4000	200
– Production	mach hours	12000	1500*
– Packing	volume(cu.m)	20000	400
– Distribution	weight (kg)	120000	600

*this includes depreciation provision of Rs 300k of which Rs 8000 applies to 3 mths for a new product (NPD)

Example cont...

- New product NPD is included in the above budget. The following additional information applies to NPD:
  - Estimated output over life-cycle: 5000 (4 yrs)
  - Product design requirement: 400 design hours
  - Output in qtr ended march 31, 20X1: 250 units

- Equivalent batch size per purchase order:50 units
- Production time .75 machhr; vol 4cu.m; wt 3kg.
- Prepare unit overhead cost for NPD using activity based approach which includes a share of life-cycle costs.

Solution

- (b) The cost driver rates are as follows:
  - Product design (Rs 2m/8000 hrs) = Rs 250 per hr
  - Purchasing (200,000/400) = Rs 50 per P.O
  - Production (excldepn) (1500,000 – 300,000) / 12000hrs = Rs 100 per machhr
  - Packing (400,000/20000) = Rs 20 per cu.m
  - Distribution (600,000 / 120,000) = Rs 5 per kg Solution
- The activity-based overhead cost per unit is as follows:

- Product design (400hrs at Rs 250 = 100,000 divided by life-cycle output of 5000 units) = 20
- Purchasing (5 Pos at 50 units per order costing Rs 250 for output of 250 units = 1
- Production (.75 machhr at Rs 100) = 75
- Depreciation (Rs 8000 / qtr for 4 years divided by life-cycle output of 5000 units= =25.6
  Packing (.4 cu m at Rs 20) = 8
- Distribution (3 kg at Rs 5) = 15
- Total cost 144.6

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- The JIT approach involves a continuous commitment to the pursuit of excellence in all phases of manufacturing operations.

- The aims of JIT are to produce at the required quality, in the required quantity , and at the required time.

Batch sizes of one

- Set up time is the time required to adjust equipment and retool for a different product.
- Long set up time makes production of small batches uneconomic.
- However, production in large batches leads to substantial throughput delays and creation of high inventory levels.
- JIT philosophy is to reduce set up time to zero. By investing in advanced manufacturing technologies, some machine settings can be adjusted automatically.
- If setup time approaches zero, there is no advantage in producing in batches, and optimal batch size can be one.

JIT Purchasing Arrangements

- Delivery of materials immediately precedes their use.
- Frequent deliveries so stocks can be cut to a minimum.
- Suppliers to inspect material before delivery, and guarantee quality.
- More business to fewer suppliers and placing longer-term purchase orders.
- Reduction in paper-work arising from blanket long-term orders to a few suppliers

LECTURE # 30

JIT and Management Accounting*

- Management accounting must support just-in-time manufacturing by monitoring, identifying and communicating to decision makers, any delay, error and waste in the system.
- Emphasis on providing information on supplier reliability, set up times, throughput cycle times, percentage of deliveries that are on time, and defect rates.

Savings from JIT and determination of optimal selling price

- A Ltd manufactures and distributes three types of cars (the T1, T2, and T3). Each type of car has its own production line. The company forecast loss for the forthcoming year is as follows:

Current operations – budgeted details for the next year:

	T1	T2	T3
Direct materials	2520	2924	3960
Direct labor	1120	1292	1980
Total direct cost	3640	4216	5940
Budgeted production (cars)	75000	75000	75000
Number of production runs	1000	1000	1500
Number of orders executed	4000	5000	5600
Machine hours	1080k	1800k	1680k

Savings from JIT and determination of optimal selling price

Annual Overheads	Fixed	Variable
Set ups	42660	13000 per prod run
Materials handling	52890	4000 per order
Inspection	59880	18000 per prod run
Machining	144540	40 per machine hour
Distribution and warehousing	42900	3000 per order

Impact of Proposed JIT system:

direct labor	increase by 20%
set ups	decrease by 30%
materials handling	decrease by 30%
inspection	decrease by 30%
machining	decrease by 15%
distribution and warehouse	eliminated

- **Required (a)**

Based on the budgeted production levels, calculate the total annual savings that would be achieved by introducing the JIT system.

Savings from JIT

Solution:

The annual cost savings are as follows:	(Rs 000s)
Direct labor 0.2(1120+1292+1980) x 75000	+65880
Variable set ups (30% x 13000) x 3500	- 13650
Materials handling (30% x 4000 x 14600)	-17520
Variable inspection (30% x 18000 x 3500)	-18900
Machining (15% x 40 x 4560k)	-27360
Distribution and warehousing (3000 x 14600)	- 43800
Fixed [30%(42660+52890+59880) + (15% x 144540) +42900]	-111210
Total savings	166560

Determination of optimal selling price

- The following table shows the price/demand relationship for each type of car per annum:

T1		T2		T3	
Price	demand	price	demand	price	demand
5000	75000	5750	75000	6500	75000
5750	65000	6250	60000	6750	60000
6000	50000	6500	45000	7750	45000
6500	35000	7500	35000	8000	30000

Determination of optimal selling price

- Required (b)
- Assuming that A Ltd adopts the JIT system and that the revised variable overhead cost per car remains constant (as per the proposed JIT system budget), calculate the profit-maximizing price and output level for each type of car.

The total variable overhead costs allocated to each product is as follows:

(all 000s)	T1	T2	T3
Set up (9100 per prod run)	9100	9100	13650
Materials hand (2800/order)	11200	14000	15680
Inspection (12600/prod run)	12600	12600	18900
Machining (34 per mach hr)	36720	61200	57120
Total output	75	75	75
Variable overheads per car	928.26	1292	1404.67
Direct materials	2520	2924	3960
Direct labor	1344	1550.4	2376
Total variable cost per car	4792.26	5766.4	7740.67

Determination of optimal selling price

The above variable costs are now used to derive the contributions for the various price levels: T1 car

Price	demand	unit contr	total
5000	75000	207.74	15581
5750	65000	957.74	62253
6000	50000	1207.74	60387
6500	35000	1707.74	59771

Similarly the total contributions for the other cars can be calculated.

The profit maximizing price and output level for T1 is Rs 5750 and 65000 respectively.

LECTURE # 31

Strategic Management Accounting*

- Strategy – to accomplish a task, win against an opponent.
- Information for formulation and implementation of organization strategy.

- To develop an integrated framework of performance measurement that can be used to clarify, communicate and manage strategy.
- Strategic decisions usually involve the longer term and have a significant effect on the organization.

External information about competitors

- To protect organization's strategic position, and determine future strategies.
- Help evaluate its competitive position relative to rest of industry.
- Collecting data on costs and prices, sales volumes and market shares, cash flows and resource availability for main competitors.
- Information available from public source i.e. annual reports, press, official institutions and informal sources. (sales personnel, consultants, industry specialist)

Strategic positioning*

- A firm has a choice of three generic strategies in order to achieve sustainable competitive advantage:
  - Cost leadership – compete on the basis of lower selling prices. Advantage may be due to economies of scale, access to favorable raw material prices, superior technology.
  - Differentiation – superior and unique products. E.g. dependability of product, after-sale service, wide availability.
  - Focus – on a narrow segment of the market that has special needs.

Accounting in relation to strategic positioning

- There will be more emphasis on particular accounting techniques depending on the strategic position adopted.
- Tight cost controls are more appropriate where cost leadership strategy is followed.
- Manufacturing cost standards are likely to be less important for a firm following product differentiation strategy.

Target costing and strategic management accounting

- Target costing falls within the domain of strategic management accounting.
- Justification for this is the external focus and the market-driven approach to product pricing and cost management.
- The aim is to achieve target cost, which involves examining cost reduction opportunities throughout the entire value chain.

The Balanced Scorecard

- Attention is being given to encourage behavior that is consistent with organization's strategy.
- Development of an integrated framework of performance measurement that can be used to clarify, communicate and manage strategy implementation.
- The approach will attempt to integrate both financial and non-financial measures, and incorporate performance measurement within the strategic management process.

The Balanced Scorecard

- Product quality, delivery, reliability, after-sale service and customer satisfaction have become key competitive variables.
- None of these were given much importance measured by traditional management accounting performance measurement systems.
- The need to integrate financial and non-financial measures of performance and identify key performance indicators that link to strategy, led to the emergence of the balanced scorecard.

LECTURE #32

The Balanced Scorecard philosophy*

- The balanced scorecard philosophy assumes that an organization's vision and strategy is best achieved when the organization is viewed from the following four perspectives:
  - Customer perspective (how do customers see us)
  - Internal business process perspective (what must we excel at)
  - Learning and growth perspective (can we continue to improve and create value)
  - Financial perspective (how do we look to shareholders)

The Balanced Scorecard

- The balanced scorecard is a strategic management technique for communicating and evaluating the achievement of the mission and strategy of the organization.
- (Insert fig 23 page 1002)
-

The Balanced Scorecard

	Objectives	Measures	Targets	Initiatives	
FINANCIAL					
CUSTOMER					
INTERNAL BUSINESS PROCESS					
LEARNING AND GROWTH					

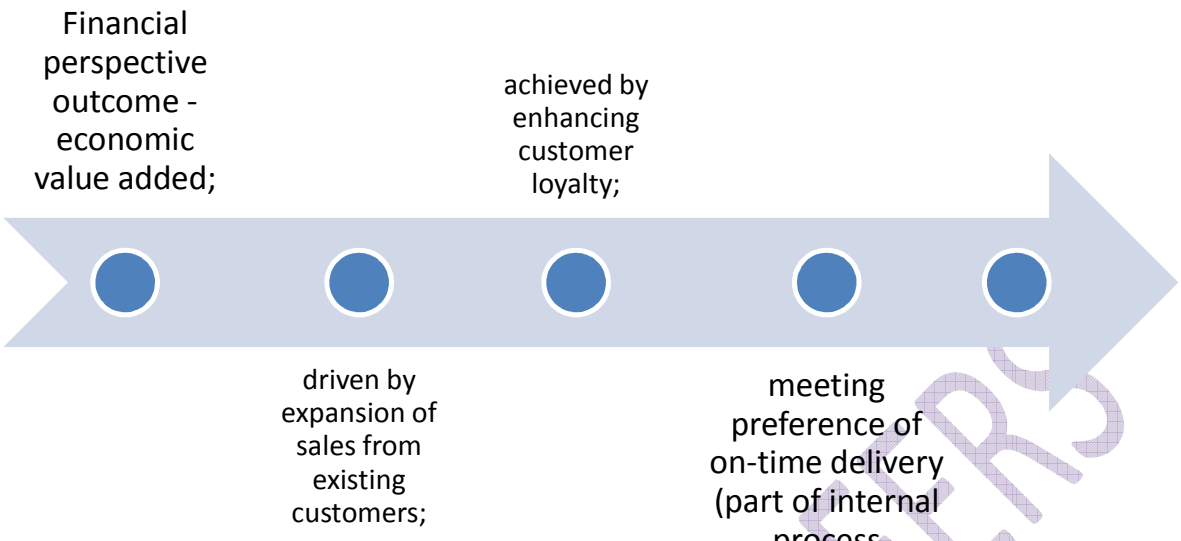
Implementation

- To implement the balanced scorecard, the major objectives of each of the four perspectives should be stated.
- The chart shows that these objectives should then be translated into specific performance measures.
- There may be one or more objectives to each perspective, and one or more performance measure linked to each.
- In the scorecard, firms should identify major initiatives for achieving each objective and also establish targets for each performance measure.

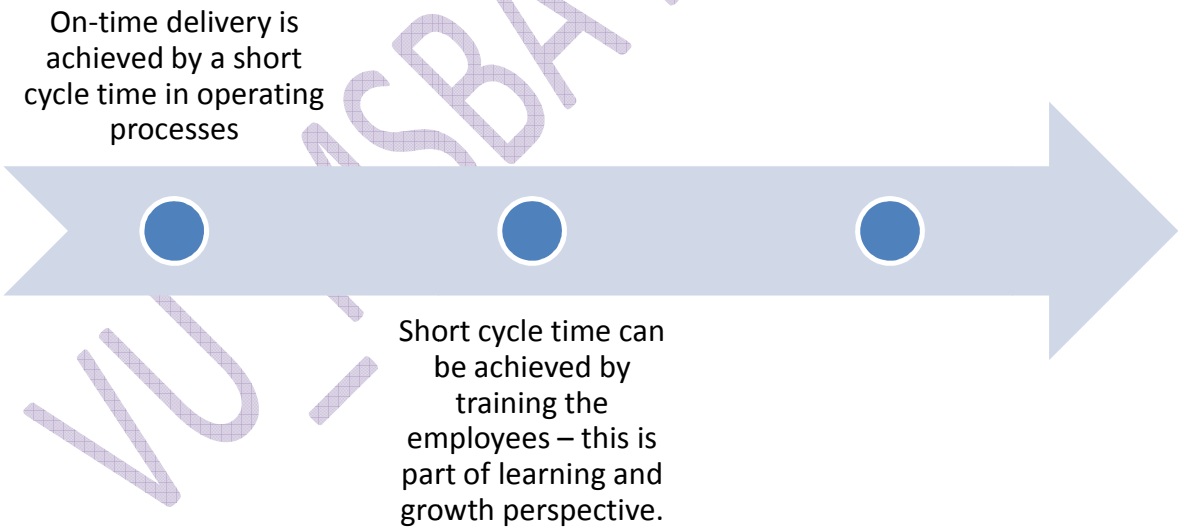
The aim of balanced scorecard

- The aim of the scorecard is to provide a comprehensive framework for translating a company's strategic objectives into a coherent set of performance measures.
- Only critical measures are incorporated in the scorecard.
- Cause and effect relationship encompasses all four perspectives of the balanced scorecard.

Cause and Effect



Cause and Effect



Non-financial measures

- So financial performance measures show financial impact of decisions, as their impact materializes. This can be long after the decisions were made.
- Drivers of future performance are the non-financial measures relating to the customer, internal business process and learning and growth perspectives.

Organization's strategy

- Most companies do not align performance measures to their strategy.
- Instead they try to improve performance of existing processes. (lower cost, improved quality, shorter customer response time).
- They do not identify the processes that are truly strategic. (i.e. those that require exceptional performance)
- The objectives and accompanying performance measures relating to each of the four perspectives, should reflect and operationalize an organization's mission and strategy.

Linkage between strategy and performance measurement

- A company following a low cost strategy will have different objectives and key performance measures than another which follows a product differentiation strategy.
- Experience shows where companies implement the balanced scorecard, they not only clarify and communicate strategy, but also manage strategy.
- The distinguishing features of a balanced scorecard approach are the linkages between strategy and performance measurement, and financial and non-financial performance measures, (cause and effect).

LECTURE #33

Southwest airlines – balanced scorecard analysis.

- Strategic theme: operating efficiency

- Financial: what will drive operating efficiency? Answer: more customers on fewer planes.
- Customer: how will we get more customers on fewer planes? Answer: attract segment of customers who value price and on-time arrivals.
- Internal: what must our internal focus be? Answer: fast aircraft turnaround time.
- Learning: how will our people accomplish fast turnaround time? Answer: educate and compensate ground crew, use employer stockholder programme.

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Southwest Airlines' Balanced Scorecard Framework.

	Objectives	Measurement	Target	Initiative
Financial	Profitability More customers Fewer planes	Market value Seat revenue Plane lease cost	30% CAGR 20% CAGR 5% CAGR	
Customer	Flight is on time Lowest prices	On-time arrival rating Market survey	#1 #1	Quality management. Customer loyalty program
Internal	Fast ground turnaround	On ground time On time depart	30 minutes 90%	Cycle time optimization
Learning	Ground crew alignment	% ground crew trained % ground crew stockholders	Yr 1 – 70% Yr 3 – 90% Yr 5 – 100%	ESOP. Ground crew training

Balanced scorecard as a strategic management system*

- The scorecard is being used to accomplish the following critical management processes:
  - Clarifying and translating vision and strategy into specific strategic objectives, and identifying the critical drivers of the strategic objectives.
  - Communicating and linking strategic objectives and measures. Establish local objectives that support global strategy.
  - Plan, set targets and align initiatives. Include and monitor the longer term (3 – 5 years) targets.
  - Enhance feedback and learning, strategy implementation can be monitored and adjusted.
- Measuring scale; tractor ploughingland, sowing of seeds, adding fertilizer, crops have grown.

- ***Benefits:***

- A single report shows four perspectives on company performance.
- Developing major goals for four perspectives and translating these into specific performance.
- It helps managers to see whether improvements in one area may have been at the expense of another.
- The approach improves communication within the organization and promotes active formulation and implementation of organizational strategy.

Limitations

- Criticism mostly questions the assumption of cause and effect relationship on the grounds that they are too ambiguous, and lack empirical support.
- Others relate to omission of employee and environment perspectives. The response is that there is nothing to prevent additional perspectives. However too many perspectives should be avoided as a major benefit of the balanced scorecard is its conciseness and clarity of presentation.

LECTURE # 34

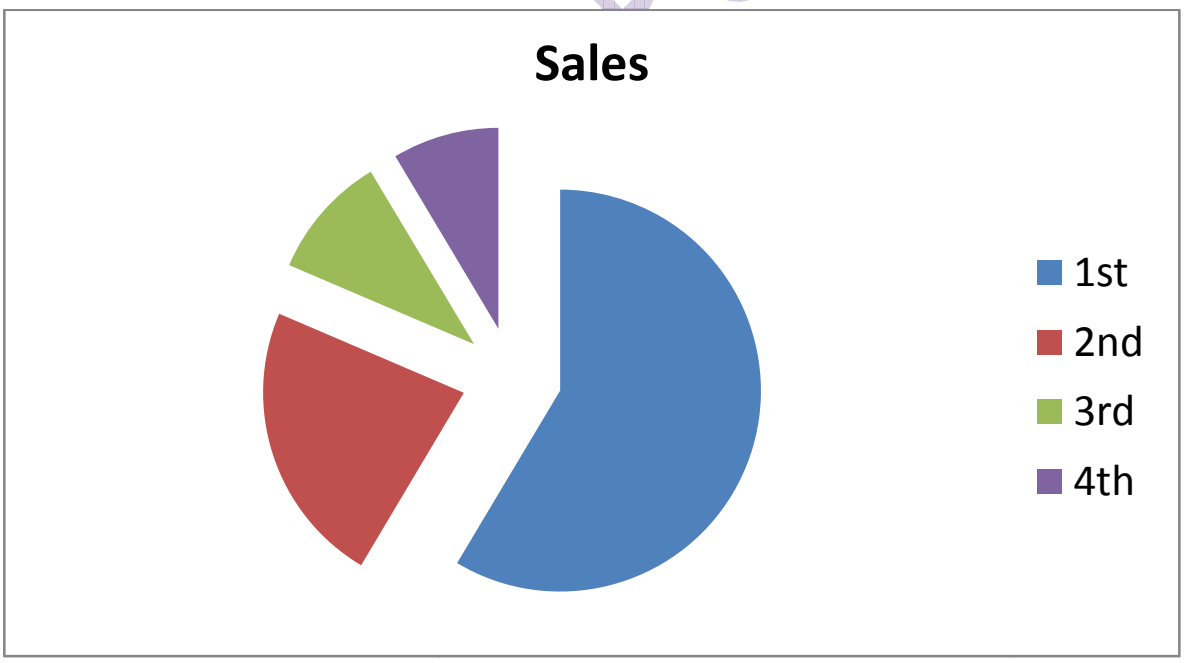
Establishing objectives and performance measures – Financial

- **Objectives**
  - operating profit, return on investment, net profit, economic value added. In addition, revenue growth, cost reduction and asset utilization.
  - typical financial objectives are to increase return on investment by 20%, and/or to increase sales and operating income by 100% over the next five years.
  - Financial measures provide feedback on whether improvements in operational performance measures are being translated into improved financial performance.

The Customer Perspective

- Objectives:
  - Market share
  - Customer retention
  - New customer acquisition
  - Customer satisfaction
  - Customer profitability
  -

Measuring Market Share



Measuring market share

–

– proportion of sales in a particular market.

– Measured as sales revenue, sales volume or number of customers.

– Estimates of total market size obtained from trade associations and industry groupings.

– Indicates whether strategy adopted is achieving expected results in the target markets.

Customer retention

– Ensuring existing customers are retained, this will maintain or increase market share.

– Measured in terms of average duration of customer relationship.

– Surveying defecting customers and their reasons can provide valuable feedback.

– Customer loyalty can be measured by number of new customers referred by existing customers.

Customer acquisition / satisfaction

– Measured by either number of new customers or total sales to new customers in the desired segment.

– Other measures include the number of new customers expressed as a percentage of prospective inquiries, or the ratio of new customers per sales call.

- Customer satisfaction

– Involves use of questionnaire surveys and customer response cards.

– Also measured by letters of complaint, and other means of feedback.

Customer profitability

- Profitability should be analysed by different customer segments.
- Unprofitable segments identified.
- Newly acquired customers may initially be unprofitable, life-cycle profitability analysis should be used.
- Actions to make customers profitable may include altering their buying behavior so they consume less resources, or price increases.

LECTURE # 35

The internal business perspective*

- Creating satisfied and loyal customers only translates into achieving financial objectives by ensuring that the key internal business processes are effective and efficient.
- The internal business process measures should focus on the internal processes that are required to achieve the organizations customer and financial objectives.
- Three principal internal processes are:
  - Innovation processes
  - Operation processes
  - Post-sales service processes

Innovation processes

- In innovation processes managers research the needs of customers and then create the products or services that will meet those needs.
- Objectives of innovation process include:
  - Increasing the number of new products
  - Decreasing the time to develop new products
  - Identifying new markets and customers

Innovation processes

- Companies are becoming increasingly aware that success in developing a continuous stream of innovative products services can provide a competitive advantage.
- Research and development has become a more important element in the value chain of most businesses.
- Measures observed in organizations include:
  - Percentage sales from new products
  - New product introduction vs competition / plan
  - Number of key items in which Co is 1st or 2nd .

Operation processes

- The operation process starts with the receipt of the customer order, and finishes with the delivery of the product to the customer.
- Objectives of operation process include:
  - Decreasing process time
  - Increasing process efficiency
  - Improving product quality
  - Decreasing processing cost
- Performance and control measures have traditionally relied on financial measures such as standard costs, budgets and variance analysis.
- This over-emphasis sometimes motivated dysfunctional actions. E.g.
  - Pursuit of efficiency encouraged maximum utilization of labor and machines, resulting in excessive inventories, not related to current customer orders.

Cos have added measures of quality, reliability, delivery, that provide value to customers as a result of global competitive environment.

Cycle time measures

- Many customers place a high value on short and reliable lead time.
- This is measured by the time taken from placing an order until the time the desired product is received.
- Traditionally companies met this requirement by holding large inventories of many different products. This is not consistent with being low cost producer.
- Companies are adopting JIT systems to achieve both low cost and short lead-time objectives.
- Reducing cycle time is hence critical for JIT companies.

Post sales service processes

- The final category relating to internal business process perspective includes warranty and repairs, treatment of defects and returns, and the process and administration of customer payments.
- Post sale service performance can be measured by applying some of the time, quality and cost measures that have been suggested for the operating processes.
- E.g cycle time to measure speed of response to failures; activity cost to measure cost of resources being used for the post sale service.

The learning and growth perspective

- Identifies the infrastructure that the business must build to create long-term growth and improvement.
- Investing in the future other than in assets and R&D (which is included in innovation in the internal processes perspective).
- People, systems and organization procedures to provide capabilities that enable accomplishment of other three perspectives.

- **Three principal categories:**
  - Employee capabilities
  - Information system capabilities
  - motivation, empowerment and alignment

Virtually no effort has been devoted to measuring the outcomes relating to the above three categories.

Employee capabilities*

- Three common core measurement outcomes:
  - Employee satisfaction: measured using surveys, typically they are requested to specify on a scale from dissatisfied to highly satisfied, for a list of questions that measure employee satisfaction. Examples of questions relate to: involvement in decisions, encouragement to be creative and use initiative.
  - Employee retention: can be measured by annual percentage of key staff that leave.
  - Employee productivity: many methods can be used, a generic method is sales revenue per employee.

Information system capabilities*

- Excellent information is needed on customers, internal processes and financial consequences of decisions.
- Measures of strategic information availability include: percentage of processes with real time: quality, cycle-time and cost feedback. And percentage of on-line information about customers.

Motivation, empowerment and alignment

- Proposed measure for motivated and empowered employees is the number of suggested improvements per employee.

- Performance drivers focus on whether departments and individuals have their goals aligned with company objectives, and articulated in the balanced scorecard.

LECTURE # 36

Quantitative models for the planning and control of stocks*

- Investment in stocks represents a major asset in most organizations.
- To determine optimum level of investment in stocks, two conflicting requirements must be met.
- First, stocks must be sufficient to meet requirement.
- Second, it must avoid holding surplus stock that are unnecessary and increase the risk of obsolescence.

The optimal stock level

- The optimal stock level lies somewhere between these two extremes.
- We will examine the application of quantitative models for determining the optimum investment in stocks.
- We shall consider the economic order quantity and the level at which stocks should be replenished.

Reasons for holding stocks

There are three general reasons for holding stocks:

  - Transaction motive – to meet production and sales requirements.
  - Precautionary motive – where supply of raw materials is unreliable.
  - Speculative motive – where future input prices are expected to change.

- The quantitative models incorporate only the transactions motive for holding stock

Relevant costs for the quantitative model

- Relevant costs for determining optimum stock level are holding costs and ordering costs.
- Holding costs consist of:
  - Opportunity cost of investment in stocks
  - Variable insurance cost:
  - Variable warehouse and storage cost;
  - Variable material handling cost
  - Cost of obsolescence and deterioration in stocks
- Holding costs not affected by changes in stock levels are not relevant costs.

Relevant holding costs

- Warehousing and storage: salary of storekeeper, depreciation of equipment, fixed rental of buildings and equipment are irrelevant.
- If space can be rented out, it should be included as opportunity cost.
- Insurance cost should be included only when premiums are charged on fluctuating levels of stocks. Fixed annual insurance cost is not a relevant holding cost.
- The opportunity cost of holding stocks is reflected in the required return from investment.

Relevant ordering costs*

- Ordering costs consist of preparing a purchase order, receiving deliveries and paying invoices.
- To estimate variable cost of ordering, the number of orders placed is used.
- The cost of acquiring stock is not relevant as it remains unchanged irrespective of the order size or stock level. (except where quantity discounts are available – discussed later).

- Ordering and holding costs will change in relation to the order size, these will be relevant for decision making models.

Economic order quantity (EOQ)

- If more units are ordered at one time, fewer orders will be required per year. This will mean reduction in ordering cost.
- However, when fewer orders are placed, larger average stocks must be maintained, this leads to an increase in holding stocks.
- The optimum order size is one where the total amount of ordering and holding costs are minimized. This is known as the Economic Order Quantity (EOQ).

Example - EOQ

- A company purchases a raw material from an outside supplier at a cost of Rs 9 per unit. The total annual demand for this product is 40,000 units, and the following additional information is available.
- Required annual return on investment in stocks (10% x Rs9) 0.9
- Other holding cost per unit 0.1
- Holding cost per unit 1.00
- Cost per purchase order 2.00

Determine optimal order quantity.

Example - EOQ

Order quantity		200	400	600	800
Average units in stock	100	200	300	400	
Number of Purchase orders	200	100	67	50	

Annual holding cost (Rs)		100	200	300	400
Annual ordering cost (Rs)	400	200	134	100	
Total relevant cost(Rs)	500	400	434	500	

The Economic Order Quantity (EOQ) is 400 units. At this point the total annual relevant costs are at a minimum.

Note

No of Pos D/ order qty; Holding cost=avg stock* Rs1 per unit

EOQ Graph

- P 1079
- Fig 25.1
- Please insert from Colin Drury book, 6th edition.

EOQ – formula method

- Economic order quantity can be found by applying a formula.
- The formula incorporates basic relationship between holding and ordering costs, and order quantities.
- Number of orders for a period is the total demand for the period (D) divided by the quantity in each order (Q).
- The ordering cost is obtained by multiplying the number of orders for a period by the cost per order (O).

EOQ – formula method

- Hence ordering cost is given by:
- Demand for the period x cost per order = DO quantity in each order Q

- Holding costs will be the average stock (Q/2) multiplied by the holding cost per unit (H).
- quantity of order/2 x holding cost per unit = QH 2

image slide

- Hence ordering cost is given by:
- Demand for the period x cost per order = DO
  quantity in each order Q
- Holding costs will be the average stock (Q/2) multiplied by the holding cost per unit (H).
- quantity of order x holding cost per unit = QH
  2 2

EOQ – formula method

- Total cost for any order qty (TC) = DO + QH
  Q 2
- We can determine the minimum with respect to Q as Q = 2 DO
  H
  - Q: quantity ordered; D: demand for the period
  - O: cost per order; H: holding cost per uint

Assumptions of EOQ formula

- Holding cost per unit will be constant – additional storekeepers might be hired as the stocks increase beyond a certain level.
- Average stock balance is equal to one half of the order quantity i.e. constant amount of stock is consumed per day.
- Despite the approximations in the data, the calculation of EOQ is still likely to be useful.

Example - EOQ

- In the example discussed earlier, if we apply the formula method, the result is:

Total cost TC for EOQ of 400 units = $\frac{DO}{Q} + \frac{QH}{2}$

$= \frac{40000 \times 2}{400} + \frac{400 \times 1}{2}$

= Rs 400.

LECTURE # 37

Relevant holding costs*

- Warehousing and storage: salary of storekeeper, depreciation of equipment, fixed rental of buildings and equipment are irrelevant.
- If space can be rented out, it should be included as opportunity cost.
- Insurance cost should be included only when premiums are charged on fluctuating levels of stocks. Fixed annual insurance cost is not a relevant holding cost.
- The opportunity cost of holding stocks is reflected in the required return from investment.
- <iframe width="425" height="349" src="http://www.youtube.com/embed/jHZTlEPpOCA" frameborder="0" allowfullscreen></iframe>

Note:EOQ – vehicles at a petrol station filling petrol; people at ATM machines drawing cash; scene of warehouse operation.

Relevant ordering costs*

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- Holding costs will be the average stock (Q/2) multiplied by the holding cost per unit (H).
- quantity of order x holding cost per unit = QH 2
  2
- Total cost for any order qty (TC) = DO + QH Q 2
- We can determine the minimum with respect to Q as Q = square root of 2 DO H
  - Q: quantity ordered; D: demand for the period

O: cost per order; H: holding cost per unit

Assumptions of EOQ formula

- Holding cost per unit will be constant – additional storekeepers might be hired as the stocks increase beyond a certain level.
- Average stock balance is equal to one half of the order quantity i.e. constant amount of stock is consumed per day.
- Despite the approximations in the data, the calculation of EOQ is still likely to be useful.

Example of eoq

- In the example discussed earlier, if we apply the formula method, the result is:

  Total cost TC for EOQ of 400 units = DO + QH
  Q 2

  = 40000 x 2/400 + 400 x 1 /2

  = Rs 400.

LECTURE # 38

Optimum lot size for a production run

- The EOQ formula can be adapted to determine the optimum length of the production run when set-up cost is incurred only once for each production run.
- Set-up costs include: labor, material, machine- down time and other related costs.
- Optimum number of units to be manufactured in each run involves balancing set-up costs with holding costs.
- To apply EOQ formula, simply substitute set-up costs for ordering costs.

- $Q = \frac{2DS}{H}$
- Assume annual demand D for a product is 9000 units. Labour and other expenses for production run require set-up cost of Rs 90. Holding cost is Rs 2 per unit per year. The EOQ model can be used to determine how many units should be scheduled for each run:
- $Q = \frac{2 \times 9000 \times 90}{2} = 900$

- With a demand of 9000, and production run of 900 units per run, there will be 10 production runs.
- If working days are 300 hundred each year, there should be a production run every 30 days.
- If demand is 9000 then 30 units are required each day, (divided by 300 days) and if setup takes three days, production run should be started when stock level reaches 90 units.

Quantity discounts*

- Where firms are able to obtain quantity discounts for large purchase orders, the price per unit will differ, and this must be taken into account in the EOQ.
- The differences will arise as follows:
  - Saving in purchase price

- Reduction in ordering cost,
- Increase in holding cost from higher stock levels.

Example – discounts

- A company purchases raw materials at a cost of Rs 7 per unit. The total annual demand for this product is 9000 units. The holding cost is Rs 4 per unit and the ordering cost is Rs 5 per order.
- A quantity discount of 3% of purchase price is available for orders in excess of 1000 units.
- Should the company order in batches of 1000 units and take advantage of quantity discounts?

- Starting point is to calculate the EOQ, and then decide whether the benefits exceed the cost.
- EOQ = $\frac{2 \times 9000 \times 5}{4}$ = 150 units
- Savings made if purchase is in batches of 1000 instead of 150 units:
  - price: 3% x 63000 1890
  - ordering cost: $\frac{9000 \times 5}{1000} - \frac{9000 \times 5}{150}$ 255
  - Holding cost: $\frac{(1000 - 150) \times 4}{2}$ -1700

The re-order point*

- To determine the re-order point, we must ascertain the lead time (the time taken between placing the order and delivery of stocks).
- The re-order point will be the number days in lead time multiplied by the daily usage during that period.
- For a manufacturer the re-order point is the level of finished goods stock at which production order should be issued.
- For materials and components, it is the time when the purchase requisition is initiated.

Example – reorder point

- Assume annual usage of raw material is 6000 units, and weekly usage is constant.
- In 50 working weeks in a year, the weekly usage will be 120 units.
- If the lead time is 2 weeks, order should be placed when stocks fall to 240 units.
- EOQ can indicate how frequently the stock should be purchased.
- If EOQ = 600, and annual demand = 6000, ten orders will be placed every five weeks.
- However, with a lead time of two weeks, the firm will place an order three weeks after the first delivery, when the stock will have fallen to 240 units. (600 units EOQ less three weeks usage at 120 units per week). The order will then be repeated with five weekly intervals.
- The EOQ model can therefore be used to indicate when to replenish stock and the amount to replenish.

Safety stocks*

- Safety stocks are the amount of stocks that are carried in excess of the expected use during the lead time.
- This provides a cushion against running out of stocks because of fluctuations in demand.
- E.g lead time = 2 weeks, weekly usage = 120 units; re-order point will be 240 units.
- However, if weekly usage increases to 140 units during lead time, or lead time goes up to three weeks, the firm will fall short of stock.

Safety stocks

- Response of a firm may be to re-order at 420 units to allow 140 units usage for three weeks.
- This will consist of re-order point based on normal usage and lead time of 240 units, plus 180 units of safety stock. This covers the possibility that lead time and expected usage will be greater than projected.

- Thus re-order point is computed by adding safety stock to average usage during average lead time.
- Maintaining high safety stock will not be appropriate where the cost of holding the excessive stock is higher than the cost of stock-out.
- Stock-out costs are the opportunity cost of running out of stock. For finished goods, this will be the loss of contribution.
- The level should be set where the cost of stock-out plus the cost of holding the safety stocks are minimized.

LECTURE # 39

Control of stocks through classification*

- Large firms may have thousands of items to be stored. It is not possible to apply EOQ to all.
- Stocks should be classified and elaborate techniques applied to important categories.
- A common procedure is the ABC classification.
- An estimate is made of the total purchase cost of each item of stock for the period. Sales forecast is the basis for estimating quantities.
- A school with children in classrooms, different classes; a supermarket with different sections for different types of goods e.g. toiletries, household, confectionery…

Control of stocks through classification*

- Each item is then grouped in decreasing order of annual purchase cost.
- Top 10% of items in terms of annual purchase cost are included in category A.
- Next 20% is B and the final 70% is C.
- If there are 10000 items, the top 1000 in terms of annual purchase cost are A.
- In practice it will be unnecessary to have elaborate controls on the 7000 C items.
- First division, second div and third div in college results. Show college, students receiving results, convocation ceremony.

Illustration – ABC categories*

- Stage 1: estimate annual purchase cost

Item	usage	price	purchase cost
1	60000	1.00	60,000
2	20000	0.05	1000
3	1000	0.10	100
4	10000	0.02	200
5	100000	0.01	1000
6	80000	2.00	160000

The list continues for all items

- Stage 2: group items, A top 10%, B 20%, C 70%

The analysis may look like:	items	%	Cost	%
Class A	1000	10	730000	73
Class B	2000	20	190000	19
Class C	7000	70	80000	8
10000 100	1000000	100		

Top 30% account for approx 90% of value; 80-20 rule

Other factors influencing order quantity

- Shortage of future supplies:
  - Future supplies may be restricted due to import problems or transport difficulties etc.
  - In anticipation a firm may over order stocks to meet production needs.
- Future price increases:
  - Supplier announces price increase at future date
  - Firm may buy in excess of requirement

- Obsolescence
  - Stocks may be subject to obsolescence due to changes in technology, fashion, perishable goods.
  - purchases of small quantities and low stock may be appropriate.

Steps to reduce safety stocks

- When demand is uncertain, safety stocks are likely to be high.
- Safety stocks may be reduced as follows:
  - New suppliers are identified who promise quicker and more reliable deliveries.
  - Existing suppliers pressurized for faster deliveries.
  - The lower the average delivery time, the lower will be the safety stock, and the firm's investment in stocks.

Performance reporting

- Managers are likely to concentrate only on those variables that are measured.
- They will take action that will improve their performance rating, even if not always in the best interest of the company.
- If annual holding costs are not allocated to managers, they may be induced to obtain larger order sizes. Consequently less frequent production runs will occur.
- This will reduce annual cost charged to the manager.
- This situation can be avoided by charging holding costs to the relevant manager.

Materials Requirement Planning (MRP)

- In complex manufacturing environments, the demand for materials purchases is dependent on the volume of planned output of components and sub-components.
- They include raw materials which have to be purchased.

- Materials requirement planning (MRP) is a computerized approach for coordinating the planning of materials acquisition and production.

MRP

- The major feature of MRP is that it involves an estimation of the quantity and timing of finished goods; and then uses this to determine the requirements for components / sub-components at each stage of production.
- The aim of MRP is to generate a planned coordinated schedule of materials requirement for a specified time period.
- It takes into account scheduled receipts, projected target stock levels, and items allocated to production, but not yet drawn.

MRP and EOQ

- The EOQ model can be used within the MRP systems to determine economic quantity sizes to be purchased.
- Care should be taken to ensure that assumption of EOQ model of constant demand applies broadly.
- MRP has later been extended to management of all manufacturing resources, including machine capacity planning and labor scheduling.

LECTURE # 40:

JIT purchasing arrangements

- **The goals of JIT include:**
  - Eliminating non value added activities
  - A batch size of one, and
  - Zero inventories
- JIT philosophy has been extended to the purchasing function.
- JIT techniques seek to ensure delivery of material immediately precedes their use.

JIT

- Improved service is obtained by giving more business to fewer suppliers, and placing long-term purchase orders.
- Major feature of JIT purchasing is that suppliers are not selected on the basis of price alone.
- Performance on quality, delivery as needed and commitment to JIT are vital.

Other advantages of JIT

- **Include:**
  - significant quantity discounts
  - Savings in time from negotiating with fewer suppliers.
  - Reduction in clerical work from issuing long-term orders.
- By seeking to ensure that production and purchases are timed to coincide with demand, the determination of EOQ and re-order point are no longer required.

Example – Relevant Costs and Optimum Batch-size

- Ferozee Ltd manufactures an item called badam, the annual demand is 4000 units spread evenly throughout the year.
- Production takes place 4 times a year in batches of 1000 units.
- One raw material input for badam is the unnab, also manufactured by Ferozee.
- Unnab is produced in large quantities and there is sufficient production capacity.

The standard costs of producing badams and unnabs are:

	Badam	Unnab
Raw materials	13	8
Unnab standard cost	22	
Labor – unskilled	7	4
- skilled	9	5
Variable overheads	5	3
Fixed overheads	4	2
Standard Cost	60	22

Included in fixed costs for badam are the set up costs for each production run.

Cost per set up are:

Labor costs – skilled labor	66
machine parts	70
total	136

There are no set up costs of unnab.

Example – Relevant Costs and Optimum Batch-size

- The cost of financing stocks of badams is 15%.
- Each unit requires 0.40 square meters of storage space. Warehouse rent is Rs 20 p.a. per sq m. Ferozee only pays for storage space actually used.
- Idle payment is made to all except unskilled labor, these are paid only for work carried out.
- *Required (a)Show optimum batch size for badam. Calculate savings if different from current policy.*

Solution

- Optimum batch size Q = $\frac{2DS}{H}$
- Relevant cost of production of badam is:
  - Raw materials 13
  - Unnab std cost – raw mat 8
  - unskilled lab 4
  - variable overheads 3 15
  - Unskilled labor 7
  - Variable overheads 5
  - Incremental cost of production 40
    - Annual demand of badams is 4000 units
    - Set up cost = Rs 70 (skilled labor Rs 66 is fixed)
    - Annual holding cost is Rs 14 (storage Rs 8 + capital tied up in stock Rs 6.
    - Storage: .4 sq m x Rs 20 = Rs 8
    - Capital cost: 15% x Rs 40 = 6
    - Applying the formula:

Q = square root of$\frac{2 \times 4000 \times 70}{14}$

=200 units

Cost savings

- Current policy:
  - Set up cost (4 x 70) 280
  - Holding cost (1000/2 x 14) 7000 7280

Optimum policy:

Set up cost (4000/200 x 70) 1400

Holding cost (200/2 x 14) 1400 2800

Annual savings 4480

Example (cont) Quantity discount

- The second stock item is the product jamun, this is purchased for resale and annual demand of 10000 units is spread evenly throughout the year.
- Incremental ordering costs are Rs 100 per order and normal unit cost is Rs 20.
- Suppliers of jamun are offering quantity discounts as follows:
- Qty ordered – upto 999 20
- 1000 – 1999 19.8
- 2000 and above 19.6
- Holding costs for jamun are Rs 8 per unit per year.
- Required (b) What is the correct order size for jamun

Solution

Q = 2DO / H

= 2 x 10000 x 100 = 500 units 8

Comparison with savings from discounts at 19.80

- Savings in price: (10000 x .2) 2000
- Savings in ordering cost: (10000/1000 x 100)-(10000/500 x 100)
  1000

total savings 3000

Additional holding cost: 1000-500/2 x 8 = 2000

Savings from order size of 1000 at 19.8 = 1000

Quantity discount

- Discount for 2000 units at 19.60
  - Savings in price (10000 x .4) 4000
  - Savings in order cost (10000/2000 x 100) – (10000/500 x 100) 1500
  - Total savings 5500
  - Additional holding cost:

    (2000 – 500)/2 x 8 = 6000

Additional cost is higher than savings.

Ferozee should purchase batches of 1000 at a price of Rs 19.80

LECTURE # 41

Application of Linear programming*

- We established that where a scarce resource exists, the contribution per unit of the scarce resource should be calculated.
- The resource should then be allocated to different products on the basis of this contribution per unit. This will maximize profits.
- Where more than one scarce resource exists, the optimum production program cannot be easily established by the above process.

Example – 2 scarce resources

The ZB company produces 2 products. The standards per unit of product are as follows:

Product BB Product MB

Standard selling price

Less variable standard costs:

- Materials (BB - 8@4; MB 4@4)
- Labor (BB 6hrs@10; MB 8hrs@1
- Variable overhead (BB 4hr@1; M

Variable cost

Contribution

ERROR: syntaxerror
OFFENDING COMMAND: %ztokenexec_continue

STACK:

-filestream-
454
10798
5