UNIT III – MARGINAL COSTING

Marginal costing is a very valuable decision-making technique. It helps management to set prices, compare alternative production methods, set production activity levels, close production lines and choose which of a range of potential products to manufacture. Moreover, the principles of marginal costing can be easily applied to straightforward problems, and although there are some difficulties and limitations to marginal costing, it is nevertheless a very useful technique. In UNIT II we described how the contribution per unit is used to calculate the profit for the organisation. In this chapter we examine the effect of limiting factors on contribution and show how products can be ranked to determine which are the most profitable, thus aiding managers in deciding which products to manufacture. We also look at how marginal costing can be used to decide whether to accept a special order or whether to manufacture or buy a component. We also look at how marginal costing can be used in decision making based on the analysis of incremental cost and revenue.

Overheads

- Overhead is a cost incurred in the course of:
  - Making a product,
  - Providing a service or
  - Running a department,
- Cannot normally be traced directly to the product, and not easily divisible into the final units of activity.
- Overheads is actually the total of the following:-
  - Indirect materials
  - Indirect labour
  - Indirect expenses
- They tend to be mainly fixed costs
- Overhead includes a large number of types of indirect costs
- Direct cost are identifiable to cost units, but overhead which are often considerable, cannot be related directly to cost units
- The key issue is traceability.

EXAMPLE: The depreciation of an expensive paint machine which is used on all products.

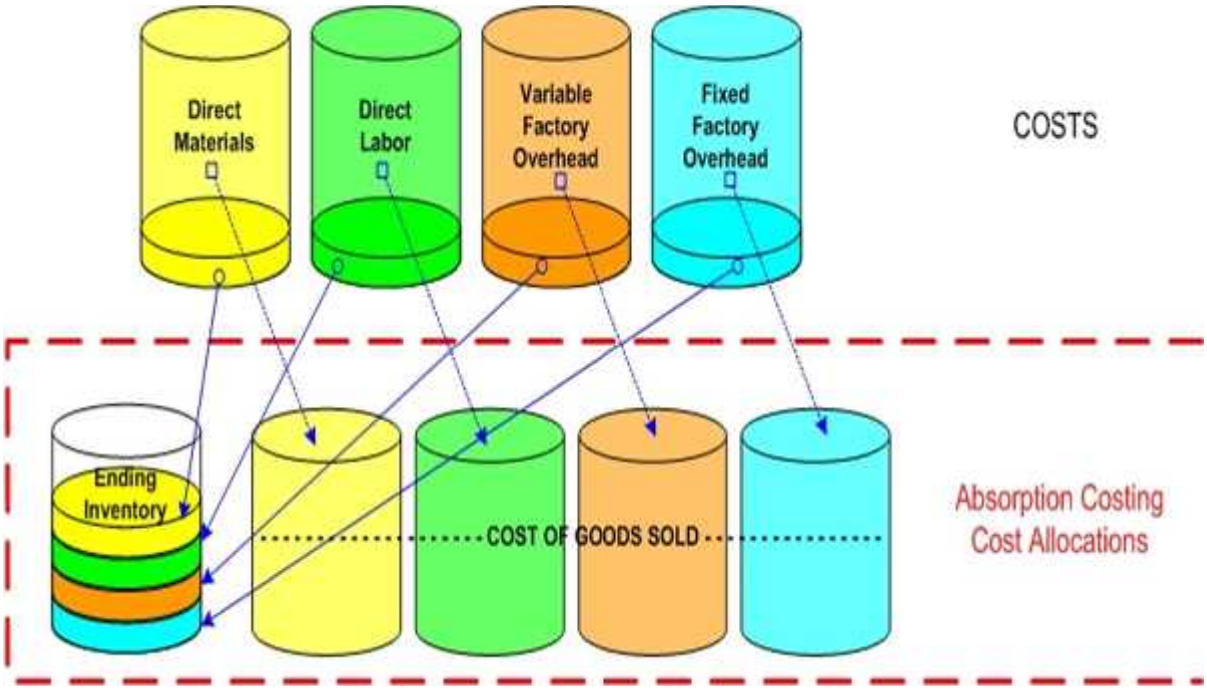
- Overheads

In cost accounting there are two schools of thoughts as to the correct method of dealing with overheads:-

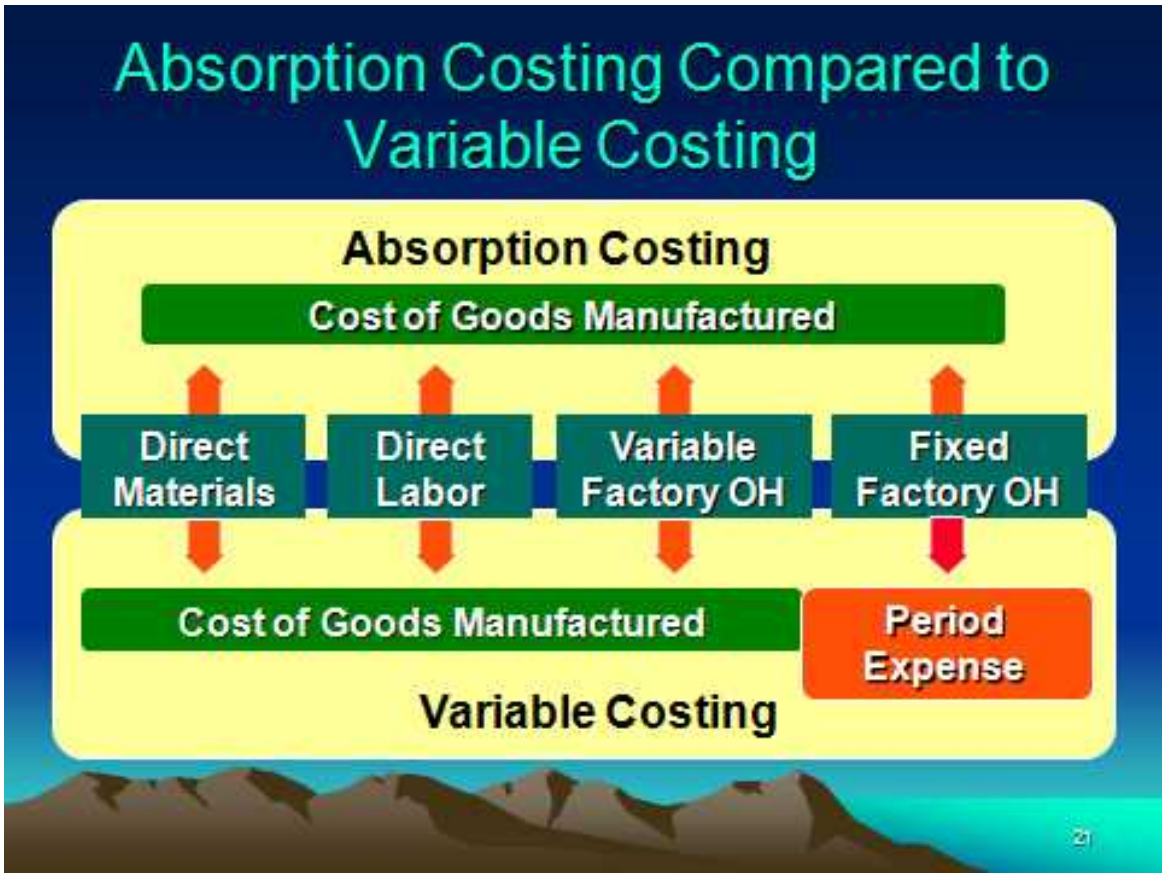
  - Absorption costing
  - Marginal costing

Absorption Costing

- Costs & Absorption Costing


Direct Materials
Direct Labor
Variable Factory Overhead
Fixed Factory Overhead
COSTS
Ending Inventory
COST OF GOODS SOLD
Absorption Costing Cost Allocations


Overview of Absorption and Variable Costing
Absorption Costing
Variable Costing
Product Costs
Period Costs
Direct Materials
Direct Labor
Variable Manufacturing Overhead
Fixed Manufacturing Overhead
Variable Selling and Administrative Expenses
Fixed Selling and Administrative Expenses
Product Costs
Period Costs
29



Introduction to Absorption Costing

- The objective of absorption costing is to include in the total cost of a product an appropriate share of the organization's total overheads.
- An appropriate share is generally taken to mean an amount which reflects the amount of time and effort which has gone into producing a unit or completing a job.
- The justification for using absorption costing is that all costs are incurred to generate products.
- Overheads are part of these costs, so each unit of the product receives some benefits from these.
- Therefore each unit of output should be charged with some of the overhead costs.

Absorption Costing

- Treats all manufacturing costs as product costs, and non-manufacturing costs as period costs
- Unit costs consist of direct material and direct labour and both variable and fixed manufacturing overhead.
- Therefore all traceable costs are allocated.

Marginal/Variable Costing

So what is the difference to Marginal Costing!

- Only those costs of manufacturing that vary with output (variable costs) are treated as product costs
- This would include direct material, direct labor and variable manufacturing overhead
- Fixed manufacturing overhead is expensed during the current period
- Variable costing is used for internal planning and control only.

MARGINAL COST

- The amount at any volume of output by which aggregate costs are changed it the volume of output is increased by one unit.
- In general it is measured as to total variable cost attributable to one unit.
- Marginal Cost = Variable Cost = Direct Labour + Direct Material + Direct Expenses + Variable Overheads.
- Marginal Cost = Prime Cost + Variable Overheads.
- It is a relevant cost useful for decision making.

MARGINAL COSTING

- Marginal costing is not a distinct method of costing like job costing, process costing etc.
- It uses a special technique for managerial making.
- It is used to provide a basis for interpretation of cost data to measure the profitability.
- Here, cost is classified on the basis of behaviour or nature (ie Fixed cost, Variable cost and Semi-variable cost).

THEORY OF MARGINAL COSTING

- In relation to a given volume of output, additional output can normally be obtained at less than proportionate cost.
- This is because of the reason that within certain limits the aggregate of certain items of cost will tend to remain fixed.
- Increase in the volume of output will normally be accompanied by less than proportionate increase in total cost (fixed + variable).
- Similarly, decrease in the volume of output will normally be accompanied by less than proportionate decrease in total cost.
- This is because fixed cost remains constant irrespective of the level of output (upto a certain level), and it is only the variable cost which changes according to the change in the output level.

DECISION MAKING INDICATORS IN MARGINAL COSTING

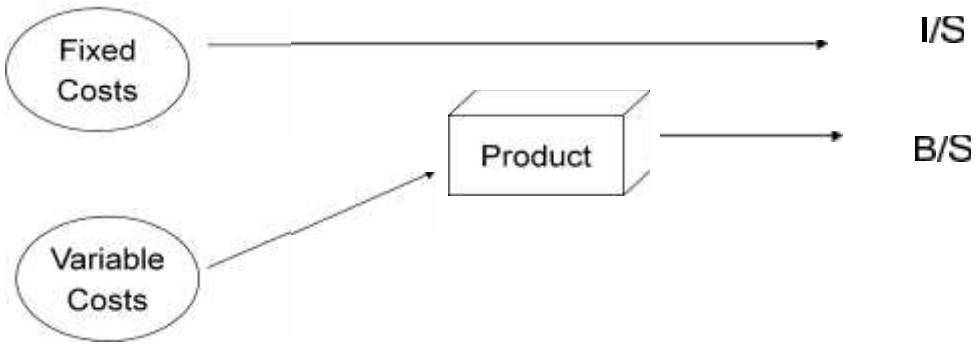
1. Profit Volume Ratio (PV Ratio)
2. Break-even Point (BEP)
3. Margin of safety (MOS)
4. Indifference Point and
5. Shut down Point

Marginal costing and Absorption costing

- In marginal costing, fixed production costs are treated as period cost and are written off as they are incurred.
- In absorption costing, all costs are absorbed into production and thus operating statements do not distinguish between fixed and variable costs.
- The valuation of stock and work in progress contains both fixed and variable elements.
- Absorption Inventory values are therefore greater than those calculated using marginal costing

What is a Variable Costing System?

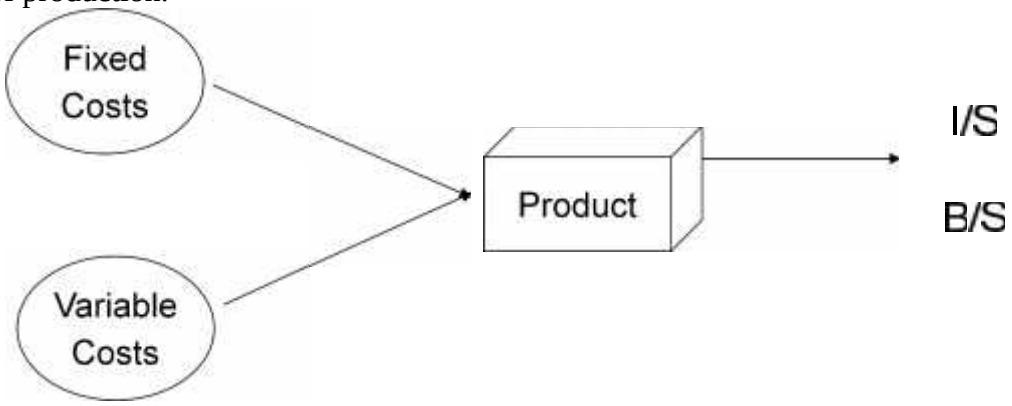
- A *cost accounting system* which treats fixed manufacturing overheads as a period cost and values stock on hand at the variable cost of production.



- Technique/Method of reporting
- Internal Reporting
- Contribution Concept

What is an Absorption Costing System?

- A *financial accounting system* which values stock on hand at the variable and fixed cost of production.



- Technique/Method of reporting
- External and Internal Reporting
- **GAAP, AC108**

Marginal Costing and Absorption Costing

Introduction

The costs that vary with a decision should only be included in decision analysis. For many decisions that involve relatively small variations from existing practice and/or are for relatively limited periods of time, fixed costs are not relevant to the decision. This is because either fixed costs tend to be impossible to alter in the short term or managers are reluctant to alter them in the short term.

Marginal costing - definition

Marginal costing distinguishes between fixed costs and variable costs as convention ally classified.

The marginal cost of a product –" is its variable cost". This is normally taken to be; direct labour, direct material, direct expenses and the variable part of overheads.

Marginal costing is formally defined as:
'the accounting system in which variable costs are charged to cost units and the fixed costs of the period are written-off in full against the aggregate contribution. Its special value is in decision making'. (Terminology.)

The term 'contribution' mentioned in the formal definition is the term given to the difference between Sales and Marginal cost. Thus

MARGINAL COST = VARIABLE COST DIRECT LABOUR
+
DIRECT MATERIAL
+
DIRECT EXPENSE
+
VARIABLE OVERHEADS

CONTRIBUTION SALES - MARGINAL COST
The term marginal cost sometimes refers to the marginal cost per unit and sometimes to the total marginal costs of a department or batch or operation. The meaning is usually clear from the context.
Note
Alternative names for marginal costing are the contribution approach and direct costing In this lesson, we will study marginal costing as a technique quite distinct from absorption costing.

Theory of Marginal Costing

The theory of marginal costing as set out in "A report on Marginal Costing" published by CIMA, London is as follows:

In relation to a given volume of output, additional output can normally be obtained at less than proportionate cost because within limits, the aggregate of certain items of cost will tend to remain fixed and only the aggregate of the remainder will tend to rise proportionately with an increase in output. Conversely, a decrease in the volume of output will normally be accompanied by less than proportionate fall in the aggregate cost.

The theory of marginal costing may, therefore, by understood in the following two steps:

1. If the volume of output increases, the cost per unit in normal circumstances reduces. Conversely, if an output reduces, the cost per unit increases. If a factory produces 1000 units at a total cost of Rs.3,000 and if by increasing the output by one unit the cost goes up to Rs.3,002, the marginal cost of additional output will be Rs..2.
2. If an increase in output is more than one, the total increase in cost divided by the total increase in output will give the average marginal cost per unit. If, for example, the output

is increased to 1020 units from 1000 units and the total cost to produce these units is Rs.1,045, the average marginal cost per unit is Rs.2.25. It can be described as follows:

$$\frac{\text{Additional cost}}{\text{Additional units}} = \frac{\text{Rs. 45}}{20} = \text{Rs.2.25}$$

The ascertainment of marginal cost is based on the classification and segregation of cost into fixed and variable cost. In order to understand the marginal costing technique, it is essential to understand the meaning of marginal cost.

Marginal cost means the cost of the marginal or last unit produced. It is also defined as the cost of one more or one less unit produced besides existing level of production. In this connection, a unit may mean a single commodity, a dozen, a gross or any other measure of goods.

For example, if a manufacturing firm produces X unit at a cost of Rs. 300 and X+1 units at a cost of Rs. 320, the cost of an additional unit will be Rs. 20 which is marginal cost. Similarly if the production of X-1 units comes down to Rs. 280, the cost of marginal unit will be Rs. 20 (300–280).

The marginal cost varies directly with the volume of production and marginal cost per unit remains the same. It consists of prime cost, i.e. cost of direct materials, direct labor and all variable overheads. It does not contain any element of fixed cost which is kept separate under marginal cost technique.

Marginal costing may be defined as the technique of presenting cost data wherein variable costs and fixed costs are shown separately for managerial decision-making. It should be clearly understood that marginal costing is not a method of costing like process costing or job costing. Rather it is simply a method or technique of the analysis of cost information for the guidance of management which tries to find out an effect on profit due to changes in the volume of output.

There are different phrases being used for this technique of costing. In UK, marginal costing is a popular phrase whereas in US, it is known as direct costing and is used in place of marginal costing. Variable costing is another name of marginal costing.

Marginal costing technique has given birth to a very useful concept of contribution where contribution is given by: Sales revenue less variable cost (marginal cost)

Contribution may be defined as the profit before the recovery of fixed costs. Thus, contribution goes toward the recovery of fixed cost and profit, and is equal to fixed cost plus profit (C = F + P).

In case a firm neither makes profit nor suffers loss, contribution will be just equal to fixed cost (C = F). this is known as break even point.

The concept of contribution is very useful in marginal costing. It has a fixed relation with sales. The proportion of contribution to sales is known as P/V ratio which remains the same under given conditions of production and sales.

The principles of marginal costing

The principles of marginal costing are as follows.

a. For any given period of time, fixed costs will be the same, for any volume of sales and production (provided that the level of activity is within the 'relevant range'). Therefore, by selling an extra item of product or service the following will happen.
    - Revenue will increase by the sales value of the item sold.
    - Costs will increase by the variable cost per unit.
    - Profit will increase by the amount of contribution earned from the extra item.
b. Similarly, if the volume of sales falls by one item, the profit will fall by the amount of contribution earned from the item.
c. Profit measurement should therefore be based on an analysis of total contribution. Since fixed costs relate to a period of time, and do not change with increases or decreases in sales volume, it is misleading to charge units of sale with a share of fixed costs.
d. When a unit of product is made, the extra costs incurred in its manufacture are the variable production costs. Fixed costs are unaffected, and no extra fixed costs are incurred when output is increased.

Features of Marginal Costing

The main features of marginal costing are as follows:

1. ***Cost Classification***
   The marginal costing technique makes a sharp distinction between variable costs and fixed costs. It is the variable cost on the basis of which production and sales policies are designed by a firm following the marginal costing technique.
2. ***Stock/Inventory Valuation***
   Under marginal costing, inventory/stock for profit measurement is valued at marginal cost. It is in sharp contrast to the total unit cost under absorption costing method.
3. ***Marginal Contribution***
   Marginal costing technique makes use of marginal contribution for marking various decisions. Marginal contribution is the difference between sales and marginal cost. It forms the basis for judging the profitability of different products or departments.

Advantages and Disadvantages of Marginal Costing Technique

Advantages

1. Marginal costing is simple to understand.
2. By not charging fixed overhead to cost of production, the effect of varying charges per unit is avoided.

3. It prevents the illogical carry forward in stock valuation of some proportion of current year's fixed overhead.
4. The effects of alternative sales or production policies can be more readily available and assessed, and decisions taken would yield the maximum return to business.
5. It eliminates large balances left in overhead control accounts which indicate the difficulty of ascertaining an accurate overhead recovery rate.
6. Practical cost control is greatly facilitated. By avoiding arbitrary allocation of fixed overhead, efforts can be concentrated on maintaining a uniform and consistent marginal cost. It is useful to various levels of management.
7. It helps in short-term profit planning by breakeven and profitability analysis, both in terms of quantity and graphs. Comparative profitability and performance between two or more products and divisions can easily be assessed and brought to the notice of management for decision making.

Disadvantages

1. The separation of costs into fixed and variable is difficult and sometimes gives misleading results.
2. Normal costing systems also apply overhead under normal operating volume and this shows that no advantage is gained by marginal costing.
3. Under marginal costing, stocks and work in progress are understated. The exclusion of fixed costs from inventories affect profit, and true and fair view of financial affairs of an organization may not be clearly transparent.
4. Volume variance in standard costing also discloses the effect of fluctuating output on fixed overhead. Marginal cost data becomes unrealistic in case of highly fluctuating levels of production, e.g., in case of seasonal factories.
5. Application of fixed overhead depends on estimates and not on the actuals and as such there may be under or over absorption of the same.
6. Control affected by means of budgetary control is also accepted by many. In order to know the net profit, we should not be satisfied with contribution and hence, fixed overhead is also a valuable item. A system which ignores fixed costs is less effective since a major portion of fixed cost is not taken care of under marginal costing.
7. In practice, sales price, fixed cost and variable cost per unit may vary. Thus, the assumptions underlying the theory of marginal costing sometimes becomes unrealistic. For long term profit planning, absorption costing is the only answer.

Presentation of Cost Data under Marginal Costing and Absorption Costing

Marginal costing is not a method of costing but a technique of presentation of sales and cost data with a view to guide management in decision-making.

The traditional technique popularly known as total cost or absorption costing technique does not make any difference between variable and fixed cost in the calculation of profits. But marginal cost statement very clearly indicates this difference in arriving at the net operational results of a firm.

Following presentation of two Performa shows the difference between the presentation of information according to absorption and marginal costing techniques:

MARGINAL COSTING PRO-FORMA

	Rs.	Rs.
Sales Revenue		xxxxx
Less Marginal Cost of Sales		
Opening Stock (Valued @ marginal cost)	xxxx	
Add Production Cost (Valued @ marginal cost)	xxxx	
Total Production Cost	xxxx	
Less Closing Stock (Valued @ marginal cost)	(xxx)	
Marginal Cost of Production	xxxx	
Add Selling, Admin & Distribution Cost	xxxx	
Marginal Cost of Sales		(xxxx)
Contribution		xxxxx
Less Fixed Cost		(xxxx)
Marginal Costing Profit		xxxxx

ABSORPTION COSTING PRO-FORMA

	Rs.	Rs.
Sales Revenue		xxxxx
Less Absorption Cost of Sales		
Opening Stock (Valued @ absorption cost)	xxxx	
Add Production Cost (Valued @ absorption cost)	xxxx	
Total Production Cost	xxxx	
Less Closing Stock (Valued @ absorption cost)	(xxx)	
Absorption Cost of Production	xxxx	
Add Selling, Admin & Distribution Cost	xxxx	
Absorption Cost of Sales		(xxxx)
Un-Adjusted Profit		xxxxx
Fixed Production O/H absorbed	xxxx	
Fixed Production O/H incurred	(xxxx)	
(Under)/Over Absorption		xxxxx
Adjusted Profit		xxxxx

Reconciliation Statement for Marginal Costing and Absorption Costing Profit

	Rs.
Marginal Costing Profit	xx
ADD (Closing stock – opening Stock) x OAR	xx

= Absorption Costing Profit	xx

Where OAR(overhead absorption rate) = $\frac{\text{Budgeted fixed production overhead}}{\text{Budgeted levels of activities}}$

Marginal Costing versus Absorption Costing

After knowing the two techniques of marginal costing and absorption costing, we have seen that the net profits are not the same because of the following reasons:

1. Over and Under Absorbed Overheads

In absorption costing, fixed overheads can never be absorbed exactly because of difficulty in forecasting costs and volume of output. If these balances of under or over absorbed/recovery are not written off to costing profit and loss account, the actual amount incurred is not shown in it. In marginal costing, however, the actual fixed overhead incurred is wholly charged against contribution and hence, there will be some difference in net profits.

2. Difference in Stock Valuation

In marginal costing, work in progress and finished stocks are valued at marginal cost, but in absorption costing, they are valued at total production cost. Hence, profit will differ as different amounts of fixed overheads are considered in two accounts.

The profit difference due to difference in stock valuation is summarized as follows:

a. When there is no opening and closing stocks, there will be no difference in profit.
b. When opening and closing stocks are same, there will be no difference in profit, provided the fixed cost element in opening and closing stocks are of the same amount.
c. When closing stock is more than opening stock, the profit under absorption costing will be higher as comparatively a greater portion of fixed cost is included in closing stock and carried over to next period.
d. When closing stock is less than opening stock, the profit under absorption costing will be less as comparatively a higher amount of fixed cost contained in opening stock is debited during the current period.

The features which distinguish marginal costing from absorption costing are as follows.

a. In absorption costing, items of stock are costed to include a ‘fair share’ of fixed production overhead, whereas in marginal costing, stocks are valued at variable production cost only. The value of closing stock will be higher in absorption costing than in marginal costing.
b. As a consequence of carrying forward an element of fixed production overheads in closing stock values, the cost of sales used to determine profit in absorption costing will:
    i. include some fixed production overhead costs incurred in a previous period but carried forward into opening stock values of the current period;

ii. exclude some fixed production overhead costs incurred in the current period by including them in closing stock values.

In contrast marginal costing charges the actual fixed costs of a period in full into the profit and loss account of the period. (Marginal costing is therefore sometimes known as period costing.)

c. In absorption costing, 'actual' fully absorbed unit costs are reduced by producing in greater quantities, whereas in marginal costing, unit variable costs are unaffected by the volume of production (that is, provided that variable costs per unit remain unaltered at the changed level of production activity). Profit per unit in any period can be affected by the actual volume of production in absorption costing; this is not the case in marginal costing.
d. In marginal costing, the identification of variable costs and of contribution enables management to use cost information more easily for decision-making purposes (such as in budget decision making). It is easy to decide by how much contribution (and therefore profit) will be affected by changes in sales volume. (Profit would be unaffected by changes in production volume).

   In absorption costing, however, the effect on profit in a period of changes in both:

   i. production volume; and
   ii. sales volume;
   is not easily seen, because behaviour is not analysed and incremental costs are not used in the calculation of actual profit.

Limitations of Absorption Costing The following are the criticisms against absorption costing:

1. You might have observed that in absorption costing, a portion of fixed cost is carried over to the subsequent accounting period as part of closing stock. This is an unsound practice because costs pertaining to a period should not be allowed to be vitiated by the inclusion of costs pertaining to the previous period and vice versa.
2. Further, absorption costing is dependent on the levels of output which may vary from period to period, and consequently cost per unit changes due to the existence of fixed overhead. Unless fixed overhead rate is based on normal capacity, such changed costs are not helpful for the purposes of comparison and control.

The cost to produce an extra unit is variable production cost. It is realistic to the value of closing stock items as this is a directly attributable cost. The size of total contribution varies directly with sales volume at a constant rate per unit. For the decision-making purpose of management, better information about expected profit is obtained from the use of variable costs and contribution approach in the accounting system.

INCREMENTAL ANALYSIS

Nature of Incremental Analysis

Decision-making is essentially a process of selecting the best alternative given the available information for comparison of strengths and weaknesses of each alternative. If there exists no alternative to the current course of action, then there is no decision to be made. However, it is rare regarding any course of action for there not be alternatives. In personal decision-making, factors other than income and expenses such as qualitative factors may be more important than cost in deciding. However, in business decisions are generally made by identifying the alternative with the most revenue or the least cost.

Incremental analysis is a decision-making tool in which the relevant costs and revenues of one alternative are compared to the relevant costs and revenues of another alternative. Relevant costs may be defined as those future costs that are different between alternatives. Costs that are the same are considered irrelevant. Incremental analysis is sometimes called differential costing, marginal costing, or relevant costing.

Incremental analysis is basically a worksheet technique in which the relevant costs of one alternative are listed in one column and the relevant costs of another alternative are listed in an adjacent column. Frequently, an optional third column is used to show the difference in the costs. The differences in relevant costs are called incremental costs. Technically, incremental cost may be defined as the difference between the sum of the relevant costs of two alternatives. In short, it is a tool for choosing between two alternatives. The best decision is the one with the least amount of relevant costs or the greatest relevant revenue.

Incremental analysis is not an optimization technique. Rather it is a tool for using appropriate cost concepts to measure and evaluate the relevant cost inputs. It is basic tool for measuring the difference in revenues or costs between two alternatives. Incremental analysis is a tool which first requires that the appropriate costs be identified and then measured.

Under appropriate circumstances, incremental analysis is a tool for evaluating decision alternatives such as:

- Keep or replace
- Make or buy
- Sell now or process further
- Lease space or continue operations
- Continue or discontinue product line
- Accept or reject special offer
- Change credit terms
- Open new territory
- Buy or lease

As a tool, incremental analysis can be used in all areas of a business. The tool is just as useful in the area of marketing as it is in the area of production.

The objective in using incremental analysis is to identify the alternative with the least relevant cost or the most relevant revenue. The difference in the sum of relevant costs is either called incremental cost or net benefit. Consequently, the alternative with a favorable incremental cost (sometimes called net benefit) is the desirable alternative.

Since this tool relies strictly on estimated costs/revenues and because the margin of error can be significant, different computations of incremental cost should be made based on different cost assumptions. Both optimistic and pessimistic arrays of cost data should be used. Incremental analysis is an ideal tool for what-if analysis.

The basic problem with incremental analysis, as commonly used, is that the time period in which costs are incurred or revenue realized is usually ignored.
Consequently, a major weakness of the technique is that the time value of money is not considered. Technically, there is a major different between two identical costs if one is incurred at the beginning of a period and the other is incurred at the end of the period. For many of the decisions listed above, the use of present value concepts may be appropriate. Therefore, ***The Management/Accounting Simulation*** incremental analysis software program that comes with the student software package is innovative in that it has present value and net-of-tax cash flow options.

Relevant and Irrelevant Costs

The most important concept to understand in using incremental analysis is relevant costs. In any decision involving two alternatives, the irrelevant cost may always be ignored. Only relevant costs must be identified and included in the analysis.
Relevant costs are often defined as follows:

1. Those future costs that will be different under available alternatives.
2. Those costs that would be changed by making the decision.
3. Costs that will be different between two alternatives.

The key element in these definitions of relevant costs is that between the two alternatives each cost should be different in amount. Secondly, the cost must be a future cost. Historical costs, as will be explained, are always irrelevant and may be safely excluded from the analysis;

Practical Applications of Incremental Analysis

Incremental analysis is a practical and commonly used tool by both individuals and businesses regarding many different kinds of decisions. As individuals, we weigh the cost of many decisions such as what car to buy, whether or own a home or rent, and continue to paint our house or put on vinyl siding. The same is true in business.
Incremental analysis is used in all functions of the business on a daily basis both formally and informally. The use of incremental analysis does not guarantee that the best decision has been made; However, it does provide a framework for organizing relevant data and looking at the decision to be made from a broader and more analytical perspective.
Management's decision-making process frequently involves the following steps:
1) Identify the problem and assign responsibility
2) Determine and evaluate possible courses of action
3) Make a decision
4) Review results of the decision

Business decisions involve a choice among alternative courses of action.
In making such decisions, management ordinarily considers both *financial* and *non-financial* information.
Nonfinancial information relates to:

- Effect of decision on employee turnover
- The environment
- Overall image of company in community.

The process used to identify the financial data that change under alternative courses of action is called incremental analysis.

- Incremental analysis includes the probable effects of the decision on future earnings.

- Data for incremental analysis involves estimates and uncertainty.
- Gathering data may involve market analysts, engineers, and accountants.
- In incremental analysis, both costs and revenues may change. However, in some cases:
    - Sometimes both costs and revenues vary.
    - Sometimes only revenues vary.
    - Sometimes only costs vary.
        - (1) variable costs may not change under the alternative courses of action, and
        - (2) fixed costs do change

The basic approach in incremental analysis is illustrated in the following example:

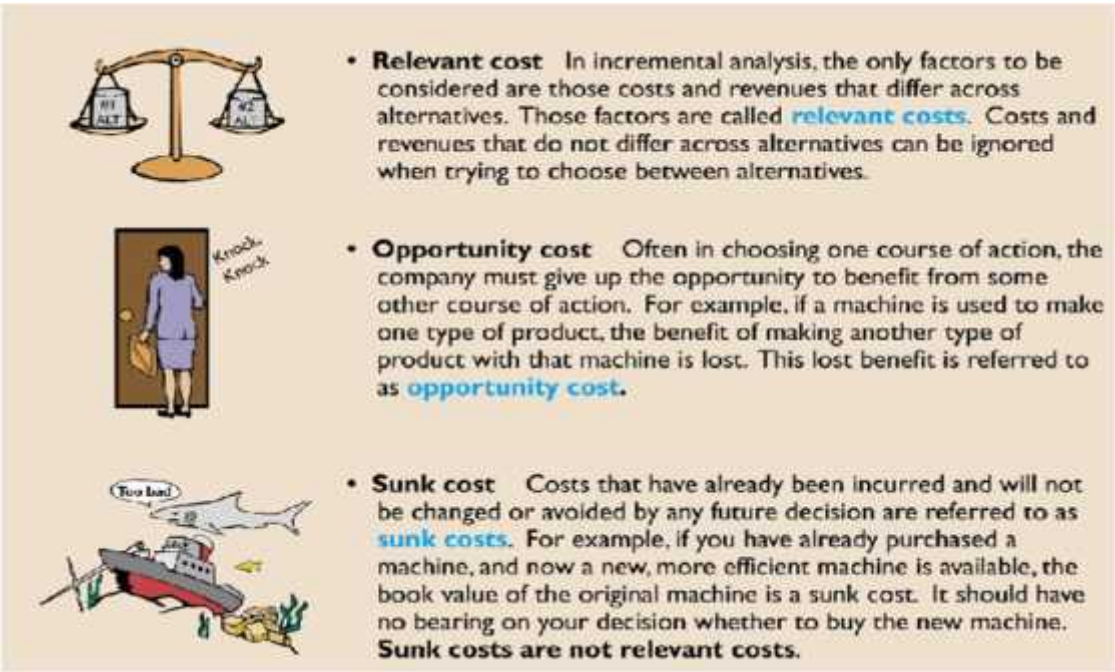
	Alternative A	Alternative B	Net Income Increase (Decrease)
Revenues	Rs.125,000	Rs.110,000	Rs.(15,000)
Costs	100,000	80,000	20,000
Net income	Rs. 25,000	Rs. 30,000	Rs. 5,000

In this example, alternative B is being compared with alternative A. The net income column shows the differences between the alternatives. Alternative B will produce Rs.5,000 more net income than alternative A.

Types of Incremental Analysis

A number of different types of decisions involve incremental analysis. The more common types of decisions are whether to:

1) Accept an order at a special price.
2) Make or buy.
3) Sell or process further.
4) Retain or replace equipment.
5) Eliminate an unprofitable business segment.
6) Allocate limited resources.



Accept an Order at a Special Price

- Sometimes, a company may have an opportunity to obtain additional business if it is willing to make major price concessions to a specific customer.
- An order at a special price should be accepted when the *incremental revenue from the order exceeds the incremental costs.*
- It is assumed that sales in other markets will not be affected by the special order.
- If the units can be produced within existing plant capacity, generally only variable costs will be affected.

To illustrate, assume that Sunbelt Company produces 100,000 automatic blenders per month, which is 80% of plant capacity. Variable manufacturing costs are Rs.8 per unit, and fixed manufacturing costs are Rs.400,000, or Rs.4 per unit. The blenders are normally sold to retailers at Rs.20 each.

Incremental Analysis and Decision-making Costs

PROBLEM:

Sunbelt has an offer from Mexico Co. to purchase an additional 2,000 blenders at Rs.11 per unit. Acceptance of this offer would not affect normal sales of the product, and the additional units can be manufactured without increasing plant capacity.

If management makes its decision on the basis of total cost per unit of Rs.12 (Rs.8 + Rs.4), the order would be rejected, because costs (Rs.12) would exceed revenues (Rs.11) by Rs.1 per unit. However, since the units can be produced within existing plant capacity, the special order WILL NOT INCREASE FIXED COSTS. The relevant data for the decision, therefore, are the variable manufacturing costs per unit of Rs.8 and the expected revenue of Rs.11 per unit.

	Reject Order	Accept Order	Net Income Increase (Decrease)
Revenues	Rs. -0-	Rs.22,000	Rs. 22,000
Costs	-0-	16,000	(16,000)
Net income	Rs. -0-	Rs. 6,000	Rs. 6,000

DECISION: Sunbelt should accept the special order because it will increase its net income by Rs.6,000.

<u>MAKE OR BUY</u>

- In a make or buy decision, management must determine the costs which are different under the two alternatives.
- If there is an opportunity to use the productive capacity for another purpose, opportunity cost should be considered.
- Opportunity cost is the potential benefit that may be obtained by following an alternative course of action. This cost is an additional cost of making the component.
- Assume sales of the products in other markets would not be affected by special order.
- Assume company is not operating at full capacity.

To illustrate the analysis, assume that Baron Co. incurs the following annual costs in producing 25,000 ignition switches for motor scooters.

COST TO MAKE

Direct materials	Rs. 50,000
Direct labor	75,000
Variable manufacturing overhead	40,000
Fixed manufacturing overhead	60,000
Total manufacturing costs	Rs.225,000
Total cost per unit (Rs.225,000 ÷ 25,000)	Rs.9.00

Alternatively, Baron may purchase the ignition switches from Ignition, Inc. at a price of Rs.8 per unit. PROBLEM: What should management do?

At first glance, it appears that management should buy the switches for Rs.8 instead of make for Rs.9. However, a review of operations indicates that if the switches are purchased all of Baron's variable costs but only Rs.10,000 of its fixed manufacturing costs will be eliminated. Thus, Rs.50,000 of fixed costs will remain. The incremental costs are shown below:

	Make	Buy	Net Income Increase (Decrease)
Direct materials	Rs. 50,000	Rs. - 0 -	Rs. 50,000
Direct labor	75,000	- 0 -	75,000
Variable manufacturing costs	40,000	- 0 -	40,000
Fixed manufacturing costs	60,000	50,000	10,000
Purchase price	-0-	200,000	(200,000)
Total annual cost	Rs.225,000	Rs.250,000	Rs. (25,000)

Decision: Barton Company will incur Rs.25,000 of additional costs by buying the switches. Therefore, Barton should continue to make the switches.

MAKE OR BUY, WITH OPPORTUNITY COST

Assume that through buying the switches, Baron Co. can use the released productive capacity to generate additional income of Rs.28,000. This lost income is an additional cost of continuing to make the switches in the make-or-buy decision. This opportunity cost is added to the "Make" column, for comparison. As shown, it is now advantageous to buy the switches.

	Make	Buy	Net Income Increase (Decrease)
Total annual cost	Rs.225,000	Rs.250,000	Rs.(25,000)
Opportunity cost	28,000	- 0 -	28,000
Total cost	Rs.253,000	Rs.250,000	Rs. 3,000

Decision: It is now advantageous to buy the switches. Barton will save Rs.3,000 worth of costs with this alternative.

<u>SELL OR PROCESS FURTHER:</u>

The basic decision rule in a sell or process further decision is:

- Process further as long as the incremental revenue from such processing exceeds the incremental processing costs.
- Incremental revenue is the increase in sales which results from processing the product further.

Assume that Woodmasters Inc. makes tables. The cost to manufacture an unfinished table is Rs.35, computed as follows:

Direct materials	Rs. 15
Direct labor	10
Variable manufacturing overhead	6
Fixed manufacturing overhead	4
Total manufacturing costs	Rs.35

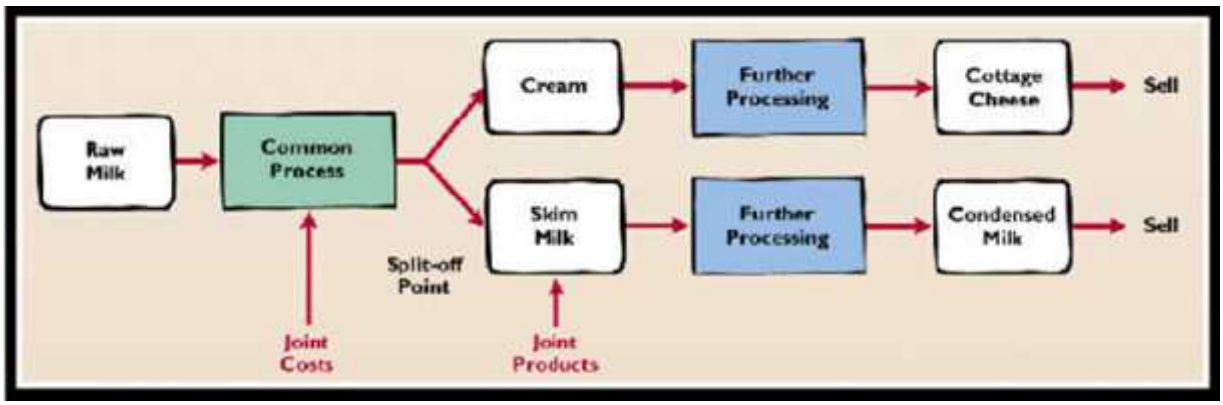
The selling price per unfinished unit is Rs.50. Woodmasters currently has unused productive capacity that can be used to finish the tables and sell them for Rs.60 each. For a finished table direct materials will increase Rs.2 and direct labor costs will increase Rs.4. Variable overhead will increase by Rs.2.40 (60% of direct labor). There will be no increase in fixed overhead.
Question: Should A, INC. sell the unfinished tables or process them further?
The incremental analysis on a per unit basis is as follows:

	Sell	Process Further	Net Income Increase (Decrease)
Sales per unit	Rs.50.00	Rs.60.00	Rs.10.00
Cost per unit			
Direct materials	15.00	17.00	(2.00)
Direct labor	10.00	14.00	(4.00)
Variable manufacturing overhead	6.00	8.40	(2.40)
Fixed manufacturing overhead	4.00	4.00	- 0 -
Total	Rs.35.00	Rs.43.40	Rs.(8.40)
Net income per unit	Rs.15.00	Rs.16.60	Rs. 1.60

DECISION: Woodmasters should process the tables further because incremental revenue is higher than incremental processing costs.

SELL/PROCESS FURTHER-MULTIPLE PRODUCTS

Joint Cost: For joint products, all costs incurred prior to the point at which two products are separately identifiable.



Use Incremental Analysis to Decide.

Retain or Replace Equipment

Sunk Cost:- The book value of the old machine is a sunk cost which is a cost that cannot be changed by any present or future decision. Sunk costs are not relevant in incremental analysis.

- In a decision to retain or replace equipment, management compares the costs which are affected by the two alternatives. Generally, these are variable manufacturing costs and the cost of the new equipment.
- The book value of the old machine is a sunk cost which does not affect the decision. A sunk cost is a cost that cannot be changed by any present or future decision.
- Any trade-in allowance or cash disposal value of the existing asset must be considered.

Assume that Jeffcoat Company has a factory machine with a book value of Rs.40,000 and a remaining useful life of four years. A new machine is available that costs Rs.120,000 and is expected to have zero salvage value at the end of its 4-year useful life. If the new machine is acquired, variable manufacturing costs are expected to decrease from Rs.160,000 to Rs.125,000 annually and the old unit will be scrapped.

Question: Should Jeffcoat Company retain or replace the machine?

The incremental analysis for the 4-year period is as follows:

	Retain	Replace	Net Income Increase (Decrease)
Variable manufacturing costs	Rs.640,000[a]	Rs.500,000[b]	Rs.140,000
New machine cost		120,000	(120,000)
Total	Rs.640,000	Rs.620,000	Rs. 20,000

[a](4 years x Rs.160,000)
[b](4 years x Rs.125,000)

Decision: It would be to the company's advantage to replace the equipment. The lower variable manufacturing costs due to replacement more than offset the cost of the new equipment.

<u>ELIMINATE AN UNPROFITABLE SEGMENT</u>

- In deciding whether to eliminate an unprofitable segment, management should choose the alternative which results in the highest net income.
- Often fixed costs allocated to the unprofitable segment must be absorbed by the other segments.

- It is possible, therefore, for net income to decrease when an unprofitable segment is eliminated.

Assume that Martina Company manufactures tennis racquets in three models: Pro, Master, and Champ. Pro and Master are profitable lines, whereas Champ operates at a loss. Condensed income statement data are:

	Pro	Master	Champ	Total
Sales	Rs.800,000	Rs.300,000	Rs.100,000	Rs.1,200,000
Variable expenses	520,000	210,000	90,000	820,000
Contribution margin	280,000	90,000	10,000	380,000
Fixed expenses	80,000	50,000	30,000	160,000
Net income	Rs.200,000	Rs. 40,000	Rs.(20,000)	Rs. 220,000

Question: Should the Champ segment be eliminated?

	Pro	Master	Champ	Total
Sales	Rs.800,000	Rs.300,000	Rs.100,000	Rs.1,200,000
Variable expenses	520,000	210,000	90,000	820,000
Contribution margin	280,000	90,000	10,000	380,000
Fixed expenses	80,000	50,000	30,000	160,000
Net income	Rs.200,000	Rs. 40,000	Rs.(20,000)	Rs. 220,000

Although it appears that income would increase if the Champ line was discontinued, it is possible for income to decrease if Champ was discontinued. The reason is that the fixed expense allocated to Champ will have to be absorbed by the other products.

To illustrate, assume that the Rs.30,000 of fixed costs are allocated 2/3 to Pro and 1/3 to Master. The revised income statement is:

ELIMINATE CHAMP?

	Pro	Master	Total
Sales	Rs.800,000	Rs.300,000	Rs.1,100,000
Variable expenses	520,000	210,000	730,000
Contribution margin	280,000	90,000	370,000
Fixed expenses	100,000	60,000	160,000
Net income	Rs.200,000	Rs. 40,000	Rs. 210,000

Decision: Total net income decreases Rs.10,000 (Rs.220,000 – Rs.210,000) if the Champ line is discontinued.

The loss in net income is attributable to the contribution margin (Rs.10,000) that will not be realized if the segment is discontinued.

	Continue	Eliminate	Net Income Increase (Decrease
Sales	Rs.100,000	Rs. - 0 -	Rs.(100,000)
Variable expenses	90,000	- 0 -	90,000
Contribution margin	10,000	- 0 -	(10,000)
Fixed expenses	30,000	30,000	- 0 -
Net income	Rs.(20,000)	Rs. 30,000)	Rs. (10,000)

DECISION: In deciding on the future status of an unprofitable segment, management should consider the effect of elimination on related product lines. In this case total net income would have decreased if Champ is eliminated.

ALLOCATE LIMITED RESOURCES

- When a company has limited resources (floor space, raw materials, or machine hours), management must decide which products to make and sell.
- In an allocation of limited resources decision, it is necessary to find the *contribution margin per unit of limited resource.*
- This is obtained by dividing the contribution margin per unit of each product by the number of units of the limited resource required for each product.
- Production should be geared to the product with the *highest contribution margin per unit of limited resource.*

Contribution Margin per Unit of Limited Resource

- To illustrate, assume that Collins Co. manufactures deluxe and standard pen and pencil sets.
- The limited resource is machine capacity, which is *3,600 hours per month.*
- Based on the data below, it would appear that deluxe is more profitable since they have a higher contribution margin.
- However, standard sets take fewer machine hours.
- Therefore, it is necessary to find the contribution margin per unit of limited resource.

	Deluxe	Standard
Contribution margin per unit	Rs.8	Rs.6
Machine hours required per unit	.4	.2

Question:- Should Collins Co. shift its sales mix toward deluxe or standard sets?

	Deluxe	Standard
Contribution margin per unit (a)	Rs.8	Rs.6
Machine hours required per unit (b)	.4	.2
Contribution margin per unit of limited resource (a ÷ b)	Rs.20	Rs.30

The computation shows that the standard sets have a higher contribution margin per unit of limited resource.

Computation of Total Contribution Margin

- If Collins Co. can increase machine capacity from 3,600 hours to 4,200 hours, the additional 600 hours could be used to produce either the standard or deluxe pen and pencil sets.
- The total contribution margin under each alternative is found by multiplying the machine hours by the contribution margin per unit of limited resource as shown below:

	Produce Deluxe Sets	Produce Standard Sets
Machine hours (a)	600	600
Contribution margin per unit of limited resource (b)	Rs.2	Rs.3
Contribution margin (a) x (b)	Rs.1,200	Rs.1,800

DECISION: From this analysis, we can see that to maximize net income, all of the increased capacity should be used to make and sell the standard sets.