

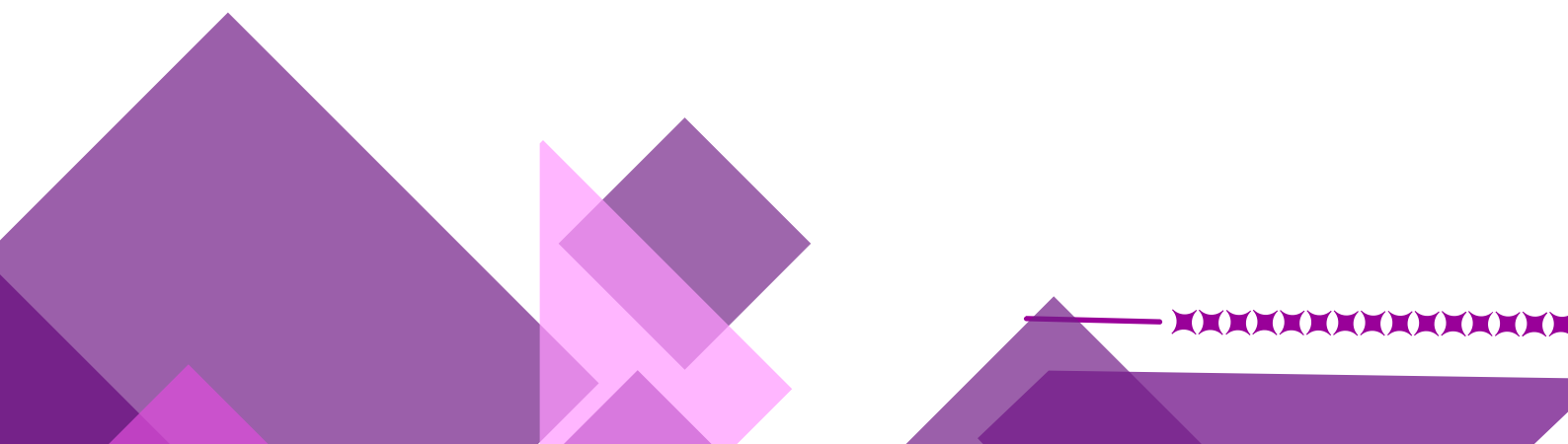
**BCCA**

**SCM &  
DM**

**PAPER 16**

**PROF. RAJESH**

**CMA FINAL**



**CMA FINAL. SCM SYLLABUS 2022**

| No                    | Module Description  | Weight     | SMQ's   | Page      | Remarks |
|-----------------------|---|------------|---------|-----------|---------|
| <b>Section A: SCM</b> |   | <b>60%</b> |         |           |         |
| <b>1</b>              | <b>Introduction to Strategic Cost Management</b> <ol style="list-style-type: none"> <li>Value Chain</li> <li>Cost Control and Cost Reduction</li> <li>Business Process Re-engineering</li> <li>Supply Chain Management</li> </ol>   | <b>5%</b>  |         | 1 - 11    |         |
| <b>2</b>              | <b>Quality Cost Management</b> <ol style="list-style-type: none"> <li>Managing Quality</li> <li>Cost of Quality ( 4 pr )</li> <li>Total Quality Management</li> <li>Lean Accounting</li> <li>Six Sigma</li> </ol>   | <b>5%</b>  |         | 12 - 28   |         |
| <b>3</b>              | <b>Decision Making Techniques (60 Q)</b> <ol style="list-style-type: none"> <li>Decisions involving Alternative Choices</li> <li>Pricing Decisions and Strategies</li> <li>Transfer Pricing</li> <li>Relevant Cost Analysis</li> <li>Target Costing</li> <li>Product Life Cycle Costing</li> <li>Asset Life Cycle Costing</li> <li>Decision Making using Probability</li> </ol> | <b>25%</b> | 60<br>Q | 29 - 86   |         |
| <b>4</b>              | <b>Activity Based Management and Just in Time (JIT)</b> <ol style="list-style-type: none"> <li>Activity Based Cost Management</li> <li>JIT - introduction,</li> <li>Throughput Accounting</li> <li>Back flush Accounting</li> <li>Benchmarking</li> </ol>   | <b>10%</b> | 20<br>Q | 87 - 111  |         |
| <b>5</b>              | <b>Evaluating Performance</b> <ol style="list-style-type: none"> <li>Variance Analyses</li> <li>Uniform Costing and Inter-firm Comparison</li> </ol>  | <b>15%</b> | 23<br>Q | 112 - 125 |         |

**CONCENTRATE ONLY ON YOUR ACTIONS NOT ON THE RESULTS**

|     |  |
|-----|--|
| 1.1 | Concepts of Strategic Cost Management in Different Stages of Value Chain     |
| 1.2 | Cost Control and Cost Reduction - Contemporary Techniques                    |
| 1.3 | Value Chain Analysis and Value Engineering - Business Process Re-engineering |
| 1.4 | Supply Chain Management  |

## 1.1 STRATEGIC COST MANAGEMENT

Strategic cost management is the application of cost management techniques so that they improve the strategic position of a business as well as control costs.

It also involves integrating cost information with the decision-making framework to support the overall organisational strategy. It is not limited to controlling costs but using cost information for management decision making

### Components of Strategic Cost Management

Strategic Cost Management primary revolves around three business themes -



#### 1) Strategic Positioning Analysis

Strategic Positioning Analysis is a company's relative position within its industry matters for performance. Strategic positioning reflects choices a company makes about the kind of value it will create and how that value will be created differently than rivals.

Strategic Positioning Analysis is concerned with impact of external and internal environment on the overall strategy of a company. It is important to take account of the future and to assess whether the current strategy is a suitable fit with the strategic position.

**The following factors affect the strategic position of a company:**

- 1) Organisations values, culture and systems
- 2) External Environment
- 3) Internal Environment (Resources and competencies)

External environment can be analysed using models like PESTEL (Political, Economic, Social, Technological, Environmental and Legal factors) and Porter's 5 forces

#### 2) Cost Driver Analysis

Cost is caused or driven by various factors which are interrelated. Cost is not a simple function of volume or output as considered by traditional cost accounting systems.

Cost driver concept is explained in 2 broad ways in strategic cost management parlance -

##### **Structural cost drivers.**

These are the **organisational factors** which affect the costs of a firm's product. The **scale and scope** of operation of a company will impact the costs.

A **larger scale of operations** is likely to give an advantage of **economies of scale**.

The **usage of technology and complexity** of operations also determine the costs of various activities within a firm.

The experience or **learning curve** also impacts the costs being incurred by a firm.

The **product development process** could be costlier earlier and cheaper in later stages of alifecycle. A simple **volume based cost** allocation would **not be appropriate** in such cases.

## Executorial cost drivers

These are based on **firm's operational decision** on how the various resources are employed to achieve the goals and objectives.

These cost drivers are determined by management **style and policy**.

Examples - The participation of workforce towards continuous improvement, importance of total quality management, efficiency of plant layout etc.

## 3) Value Chain Analysis

Value-chain analysis is a process by which a firm identifies & analyses various activities that add value to the final product. The idea is to identify those activities which do not add value to the final product/service and eliminate such non-value adding activities.

## Value Chain

Developed by Michael Porter in 1985 -Porter describes the value chain as

*"internal processes or activities a company performs to design, produce, market, deliver and support its product."* He further stated that *"a firm's value chain and the way it performs individual activities are a reflection of its history, its strategy, its approach of implementing its strategy, and the underlying economics of the activities themselves."*

## Primary Activities and Secondary Activities:

|                             |   |
|-----------------------------|---|
| <b>Primary activities</b>   | are those which are <b>directly involved in transforming of inputs</b> (RawMaterial) into outputs (Finished Products) or in <b>provision of service</b>   |
| <b>Secondary activities</b> | Also known as <b>support activities</b> ; support the primary activities. Though, secondary activities are <b>not directly involved in creation</b> of product, it doesn't mean that they are of less importance as compared to primary activities. |

**Primary Activities include:**

• Receiving, storing, and distributing the inputs (raw materials) to the production process. The relationship with suppliers is a key component in this

Inbound Logistics



• Transforming inputs into final product. Activities such as machining, packaging, testing and equipment maintenance form part of Operations.

Operations



• Collecting, storing and distributing the products from the factory line to end consumers. This may include finished goods warehousing, delivery vehicle operation, order

Outbound Logistics



• these provide the means by which the customers are made aware of the product. The activities include advertising, promotion, distribution channel selection, sales

Marketing and Sales



• This includes activities related to after sales service like Installation, repair and parts replacement

Service



**Support Activities include:**

• involves purchasing of raw material, supplies and other consumables required as inputs for the primary activities

Procurement



• includes technical knowledge, equipment, hardware, software and any other knowledge which is used in the transformation of inputs to outputs

• includes activities around selection, recruitment, placement, training, appraisal, rewards and promotion; management development; and labour/employee relations

Human Resource Management



• consists of activities such as planning, finance, accounting, legal, government affairs and quality management

Firm Infrastructure



## Value Innovation

- Value innovation is a process in which a company introduces new technologies or upgrades that are designed to achieve both product differentiation and low costs.
- The changes implemented through value innovation create new or improved elements for the product or service, but also result in cost savings by eliminating or reducing unnecessary aspects during the product lifecycle.
- Value innovation places equal emphasis on 'Value' as also 'Innovation'. Value innovation, thus, can improve on existing services and lowers the costs of that service for both the company and their customers.
- Value innovation was first outlined in a 1997 article in Harvard Business Review by W. Chan Kim and Renée Mauborgne, who would later write the book Blue Ocean Strategy in 2005. Value innovation is a key principle of "blue ocean strategy," a business approach that focuses on creating new market spaces instead of fighting competitors existing market share. Instead of competing for market share, valueinnovation is designed to create new markets. The goal of value innovation is to create new demand and change the market enough to render the competition irrelevant in thatmarket

## Red Ocean vs Blue Ocean Strategy

| Red Ocean   | Blue Ocean Strategy  |
|---|--|
| Red oceans are all the industries in existence today - the known market space, where industry boundaries are defined and companies try to outperform their rivals to grab a greater share of the existing market. | Blue oceans denote all the industries not in existence today - the unknown market space, unexplored and untainted by competition.<br><br>The creation of blue ocean enables driving costs down while simultaneously pushingvalue up. |
| focus on building advantages over the competition, usually by assessing what competitors do and striving to do it better  | Blue ocean strategists recognize that market boundaries exist only in managers' minds, and they do not let existing market structures limit their thinking   |
| grabbing a bigger share of a finite market is seen as a zero-sum game in which one company's gain is achieved at another company's loss.  |  |

## Remember --

| Red Ocean Strategy               | Blue Ocean Strategy             |
|----------------------------------|---------------------------------|
| Compete in existing market space | Create uncontested market space |
| Beat the competition             | Make the competition irrelevant |
| Exploit existing demand          | Create and capture new demand   |

|  |  |
|--|--|
| Make the value-cost trade-off  | Break the value-cost trade-off   |
| Align the whole system of a firm's activities with its strategic choice of differentiation or low cost | Align the whole system of a firm's activities in pursuit of differentiation and low cost |

## 1.2 Cost Control and Cost Reduction - Contemporary Techniques

Profit is feature of the gap between sales and cost, hence it can be enhanced either by increasing the sale or reducing cost; & can also be maintained by controlling the cost. In the competitive business environment, it not easy to increase the sales; hence cost reduction or cost control, as the case may be; is available

### Cost control

Cost control implies regulation of the cost of operation through the action of executives. It involves setting up the **targets** (yardstick) for managers who are responsible for cost centres and comparing their performance against such targets. Therefore, Cost Control involves continuous comparisons of actual with the standards or budgets to regulate the former

Cost control involves the following steps and covers the various facets of the management:

- (a) **Planning**: First step in cost control is to establish plans/targets. The plan/target may be in the form of budgets, standards, estimates and even past actual may be expressed in physical as well as monetary terms. These plans/targets serve as yardsticks by which the planned objective can be assessed.
- (b) **Communication**: The plan and the policy laid down by the management are made known to all those responsible for carrying them out. Communication is established in two directions; directives are issued by higher level of management to the lower level for compliance and the lower-level executives report performances to the higher level.
- (c) **Motivation**: The plan is given effect to and performances starts. The performance is evaluated, costs are ascertained and information about results achieved are collected and reported. The fact that costs are being complied for measuring performances acts as a motivating force and makes individuals endeavour to better their performances.
- (d) **Appraisal and Reporting**: The actual performance is compared with the predetermined plan and variances i.e., deviations from the plan are analyzed as to their causes. The variances are reported to the proper level of management.
- (e) **Decision Making**: The variances are reviewed and decisions taken. Corrective actions and remedial measures or revision of the target, as required, are taken.

### Cost Reduction

Cost reduction is the real and permanent reduction in the unit cost of goods manufactured or service rendered without impairing the utility for the intended use. Therefore, cost reduction is

continuous effort to reduce cost through economics standardization of product or component) and savings in costs of manufacture, administration, selling and distribution. It believes in reducing to cost till the optimal level rather any specified level such as standards or budget.

| Sl. | Nomenclature | Cost Control   | Cost Reduction   |
|-----|--------------|--|--|
| 1   | Objective    | Containing the cost in accordance with the pre-set targets       | Exploring ways and means of improving the targets  |
| 2   | Approach     | Attaining lowest possible costs under the existing circumstances | A continuous process of analysis to find out new ways & means to achieve reduction in costs. |
| 3   | Nature       | Preventive function  | Corrective function  |
| 4   | Emphasis     | The emphasis is on the past i.e., on predetermined standards     | The emphasis is on the present and the future i.e., on feasible permanent reductions         |
| 5   | Assumptions  | Assumes the existence of certain standards or norms              | Assumes the existence of concealed potential savings in the standards or norms               |

## 1.3 Value Analysis and Value Engineering - Business Process Re-engineering

Value Analysis (VA) is one of the important techniques of cost reduction and control. It is a scientific approach that ensures all the functions of a product or service are carried out at the minimum cost without compromising quality, reliability, performance and appearance.

Value analysis is a methodical approach to sharpening the efficiency and effectiveness of any process. Value, in the context of value analysis, refers to economic value, which may reflect:

| 1. Use value   | 2. Cost value  | 3. Exchange value   | 4. Esteem value  |
|--|--|---|--|
| <ul style="list-style-type: none"> <li>reflects the intrinsic value. It is the measure of properties, qualities and features which make the product or service useful for the consumer</li> <li>is the price paid by the buyer or the cost incurred by the manufacturer in order to ensure that the product or service performs its intended function efficiently</li> </ul> | <ul style="list-style-type: none"> <li>is the sum of all costs incurred in producing the product or rendering a service</li> <li>is the sum of raw material cost, labour cost, and overheads expended to produce the product or service</li> </ul> | <ul style="list-style-type: none"> <li>is the measure of all the properties, qualities and features of the product or service which make the product or service possible of being traded for another product or service or for money</li> </ul> | <ul style="list-style-type: none"> <li>is the measure of properties, features, attractiveness, graphic packaging and the like which increases sales appeal or which attracts customers and create in them a strong desire to own the product.</li> <li>is the price paid by the buyer or the cost incurred by the manufacturer beyond the use value.</li> <li>It is the</li> </ul> |

### Value Equation

Value analysis aims to simplify products and process, thereby increasing efficiency. Value analysis enables

people to contribute towards value addition by continuous focus on product design and services. Value analysis provides a structure through initiatives in the direction of cost saving, cost reduction and continuous improvement.

$$\text{Value equation : value} = \frac{\text{performance} + \text{capability}}{\text{cost}} = \frac{\text{function}}{\text{cost}}$$

## Focus of Value Analysis

The rules governing the application of the VA approach are -

- **No cost can be removed if it compromises the quality of the product or its reliability**, as this would lower customer value, create complaints and inevitably lead to the withdrawal of the product or lost sales.
- **Marketability / Saleability is another issue that cannot be compromised**, as this is an aspect of the product that makes it attractive to the market and gives it appeal value.
- **Any activity that reduces the maintainability of the product increases the cost of ownership** to the customer and can lower the value attached to the product

## Value Engineering (VE)

| Value Analysis   | Value Engineering   |
|--|---|
| "Value Analysis" is the application of a set of techniques to an existing product with a view to improve its value. Thus, it is a remedial process | "Value Engineering" is the application of exactly the same set of techniques to a new product at the design stage to ensure that bad features are not added |
| Value Analysis is collateral   | Value Engineering is fundamental  |

## BUSINESS PROCESS REENGINEERING

Hammer defines Business Process Reengineering (BPR) as

- "The fundamental rethinking and radical redesign of business
- processes, to achieve dramatic improvements,
- in critical contemporary measures of
- performance, such as cost, quality, service, and speed."

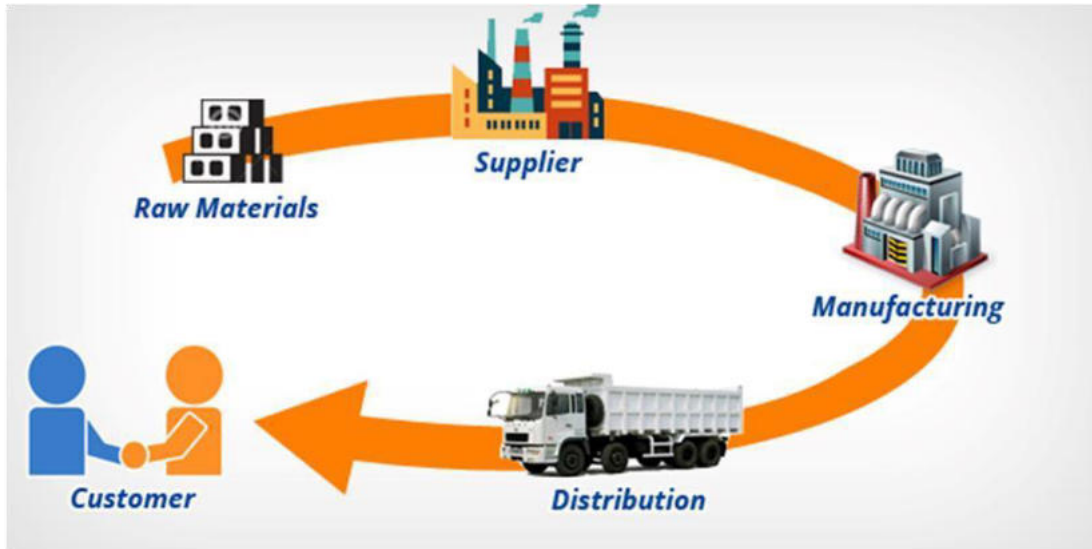
Thus, the **four key components of BPR** are as follows:

1. **Fundamental rethinking** of business processes requires management to challenge the very basic assumptions under which it operates and to ask such rudimentary questions as "Why do we do what we do?" and "Why do we do it the way we do it?"
2. **Radical redesign** relies on a fresh-start, clean-slate approach to examining an organization's business processes. This approach focuses on answers to the question, "If we were a brand- new business, how would we operate our company?"
3. Achieving **dramatic improvements** in performance measurements is related to the preceding two elements. The fundamental rethinking and radical redesign of business processes are aimed toward making quantum leaps in performance, however measured. BPR is not about improvement inequality, speed, and the like that is on the order of 10%. For example, the reengineering of Ford's procurement process reduced the number of persons employed in the process by 75%.
4. Reengineering focuses on **end-to-end business processes** rather than on the individual activities that comprise the processes. BPR is concerned with the results of the process (i.e., with those activities that add value to the process). This cross- functional focus has been used for many years by manufacturing companies. Reengineering would apply that view to all business processes

## Seven Principles

- (i) Processes should be designed to achieve a desired outcome rather than focusing on existing tasks
- (ii) Personnel who use the output from a process should perform the process
- (iii) Information processing should be included in the work, which produces the information
- (iv) Geographically dispersed resources should be treated, as if they are centralized
- (v) Parallel activities should be linked rather than integrated
- (vi) Doers should be allowed to be self-managing
- (vii) Information should be captured once at source

## Supply chain management



Supply chain management encompasses every activity involved in maintaining the supply chain. The goal of supply chain management is to look holistically at the entire supply chain from supplier through to the consumer, and review three core areas of people, process and systems in order to maximise value from all activities.

Behind every product one uses - electronics, coffee, clothing, lawn mowers - there lies SCM which makes it possible to get the products better, faster, and cheaper

### Supply Chain Strategy

- Supply chain strategy **follows the corporate strategy**.
- Once the corporate strategy is defined, this will cascade into the functional areas of the business where **each function will set their strategy** that is aligned to the corporate strategy.
- The supply chain strategy may be set for example as "We aspire to reduce waste in our supplychain activities to support the company's strategy to be a cost leader in our market".

There are **three core areas** to consider when developing the supply chain strategy and business case:

- **People** - Do you have the right number of staff with the right skill set?
- **Process** - Are there waste activities within your current operating processes?
- **Systems** - Are your systems enablers to the strategy or are legacy systems holding youback?

|                                |          |
|--------------------------------|----------|
| <b>Quality Cost Management</b> | <b>2</b> |
|--------------------------------|----------|

|            |  |
|------------|--|
| <b>2.1</b> | <b>Managing Quality in Competitive Environment</b> |
| <b>2.2</b> | <b>Cost of Quality</b>                             |
| <b>2.3</b> | <b>Total Quality Management</b>                    |
| <b>2.4</b> | <b>Lean Accounting</b>                             |
| <b>2.5</b> | <b>Six Sigma</b>                                   |

## 2.1 MANAGING QUALITY IN COMPETITIVE ENVIRONMENT

### Quality

The main characteristics that determine the quality of an article may include such elements as design, size, materials, chemical composition, mechanical functioning, electrical properties, workmanship, finish and appearance. The quality of a product may, thus, be defined as the sum of a number of related characteristics such as shape, dimension, composition, strength, workmanship, adjustment, finish and colour.

### Dimensions of Quality for Manufacturing Versus Service Organizations

| Manufacturing organizations   | Service organizations            |
|-------------------------------|----------------------------------|
| Conformance to specifications | Tangible factors                 |
| Performance                   | Consistency                      |
| Reliability                   | Responsiveness to customer needs |
| Features                      | Courtesy/friendliness            |
| Durability                    | Timeliness/ promptness           |
| Serviceability                | Atmosphere                       |

### Quality Management

Quality management is defined as "coordinated activities to direct and control an organization with regard to quality" (ISO 9000:2000).

## 2.2 COST OF QUALITY (COQ)

Quality is concerned with conformance to specification; ability to satisfy customer expectations and value for money. Recognising the importance of cost of quality is important in terms of continuous improvement process.

The cost of control/conformance and the cost of failure of control/non-conformance is the quantitative measure of COQ.

It is the sum of the costs related to prevention and detection of defects and the costs incurred due to occurrences of defects.

## Views Regarding Cost Of Quality

Today view of quality cost among practitioners seems fall into **THREE** categories:

### 1. Higher quality means higher cost

- Quality attributes such as performance and features cost more in terms of labour, material, design, and other costly resources

### 2. The resultant savings are greater than the cost of improving quality

- The savings result from less rework, scrap, and other direct expenses related to defects.

### 3. Quality costs are those incurred in excess

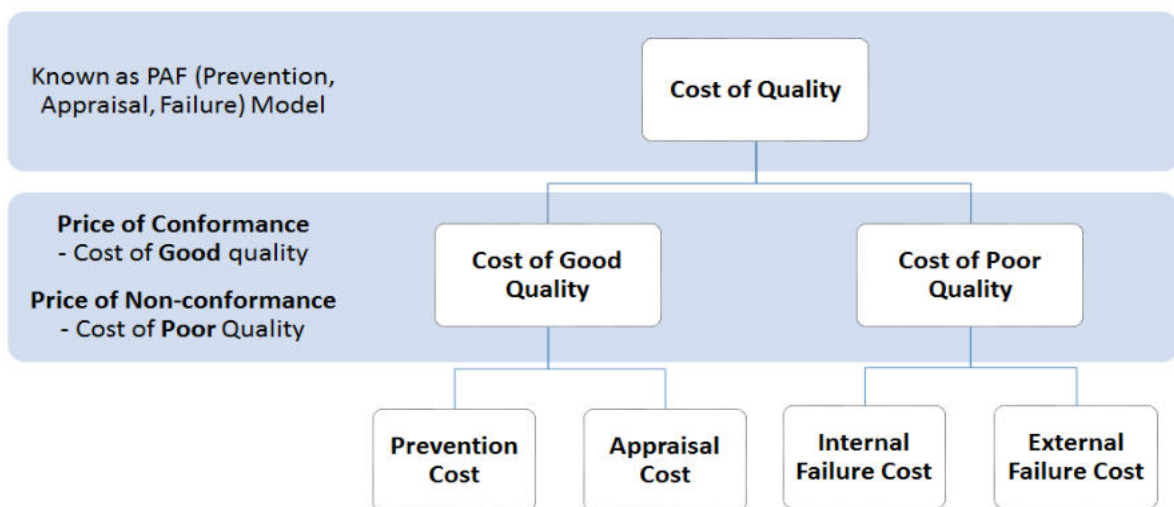
- of those that would have been incurred if product was built or service performed exactly right the first time

## Components Of Cost Of Quality

The COQ costs in two broad categories namely '**Price of Conformance**' and '**Price of Non-conformance**'.

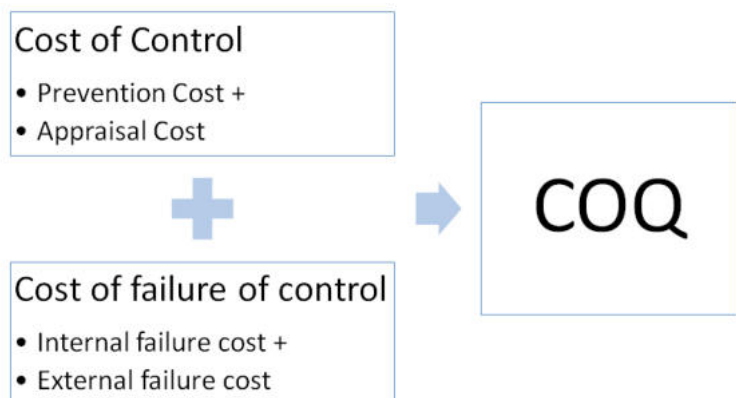
Thesetwo canbe bifurcated further in to prevention & appraisal costs and internal & external failure costs. Hence, **COQ is often referred as PAF (Prevention, appraisal & failure) model**.

In other words, '**Price of Conformance**' is known as '**Cost of Good quality**' and '**Price of Non-conformance**' is often termed as '**Cost of Poor Quality**'.



| Prevention Costs  | Appraisal Costs   | Internal Failure Costs  | External Failure Costs  |
|---|---|---|---|
| The cost incurred for preventing the poor quality of products and services may be termed as Prevention Cost | The need of control in product and services to ensure high quality level in all stages, conformance + quality standards and performance requirements is Appraisal Costs | Internal Failure Cost associated with defects found BEFORE the customer receives the product or service | Fail to reach design quality standards are not detected until after transfer to the customer. AFTER the product or service is delivered and then the defects is found then it is an external failure. |
| Quality Engineering   | Inspection  | Scrap   | Revenue Loss  |
| Quality Training  | Product Acceptance  | Rework  | Warranties  |
| Quality Audits  | Packaging Inspection  | Re-Inspection   | Discount Due to Defects   |
| Design Review   | Field Testing   | Re-Testing  | Product Liability   |
| Quality Circle etc  | Continuing Supplier Verification etc  | Repair etc  | Warranty etc  |

The total quality costs are then the sum of all these costs.



- In its simplest form, COQ can be calculated in terms of effort (hours/days).
- A better approach will be to calculate COQ in terms of money (converting the effort into money and adding any other tangible costs like test environment setup).

- The best approach will be to calculate *COQ* as a percentage of total cost. This allows for comparison of *COQ* across projects or companies.
- To ensure impartiality, an external person say the accountant must determine the Cost of Quality of a project/ product rather than a person who is a core member of the project/ product team (Say, someone from the Accounts Department).

## 2.3 TOTAL QUALITY MANAGEMENT (TQM)

TQM is a management philosophy that seeks to integrate all organizational functions (marketing, finance, design, engineering, and production, customer service, etc.) to focus on meeting customer needs and organizational objectives.

CIMA defines 'Total Quality Management' as

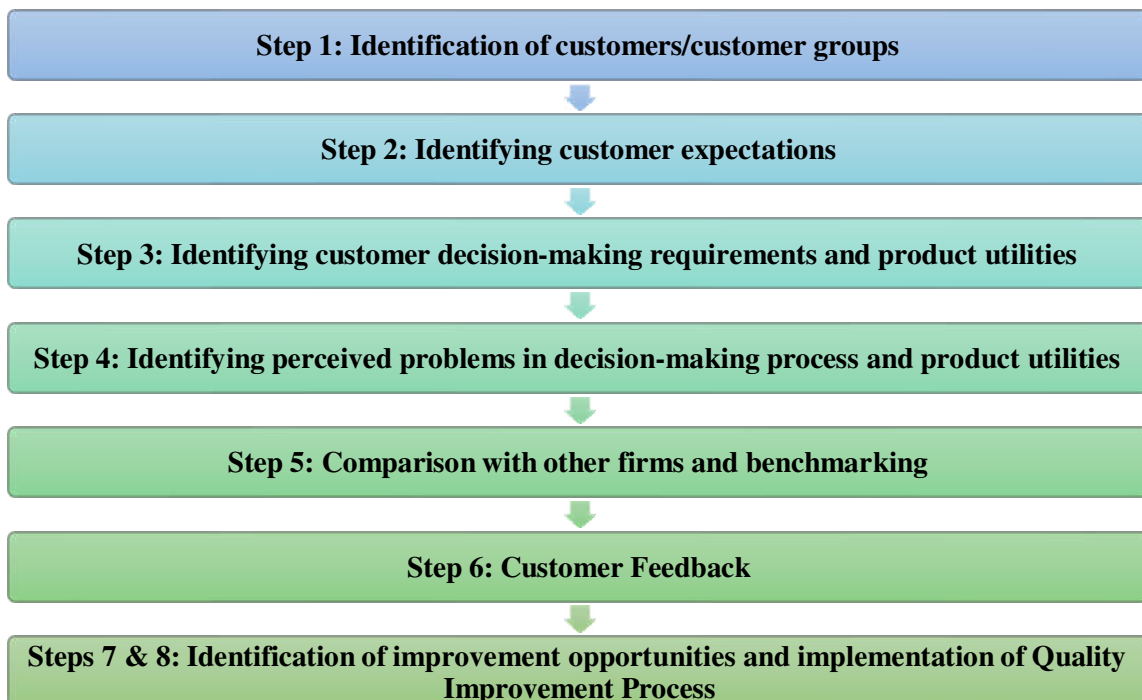
- "Integrated and comprehensive system of planning and controlling all business functions
- so that products or services are produced which meet or exceed customer expectations.
- TQM is a philosophy of business behaviour, embracing principles
- such as employee involvement, continuous improvement at all levels and customer focus,
- as well as being a collection of related techniques aimed at improving quality
- such as full documentation of activities, clear goal-setting and performance measurement from the customer perspective."

TQM is a management strategy aimed at embedding awareness of quality in all organizational processes.

TQM is a comprehensive management system which:

- Focuses on meeting owner's/ customer's needs, by providing quality services at a reasonable cost.
- Focuses on continuous improvement.
- Recognizes role of everyone in the organization.
- Views organization as an internal system with a common aim.
- Focuses on the way tasks are accomplished.
- Emphasizes teamwork.

### Steps in Total Quality Management

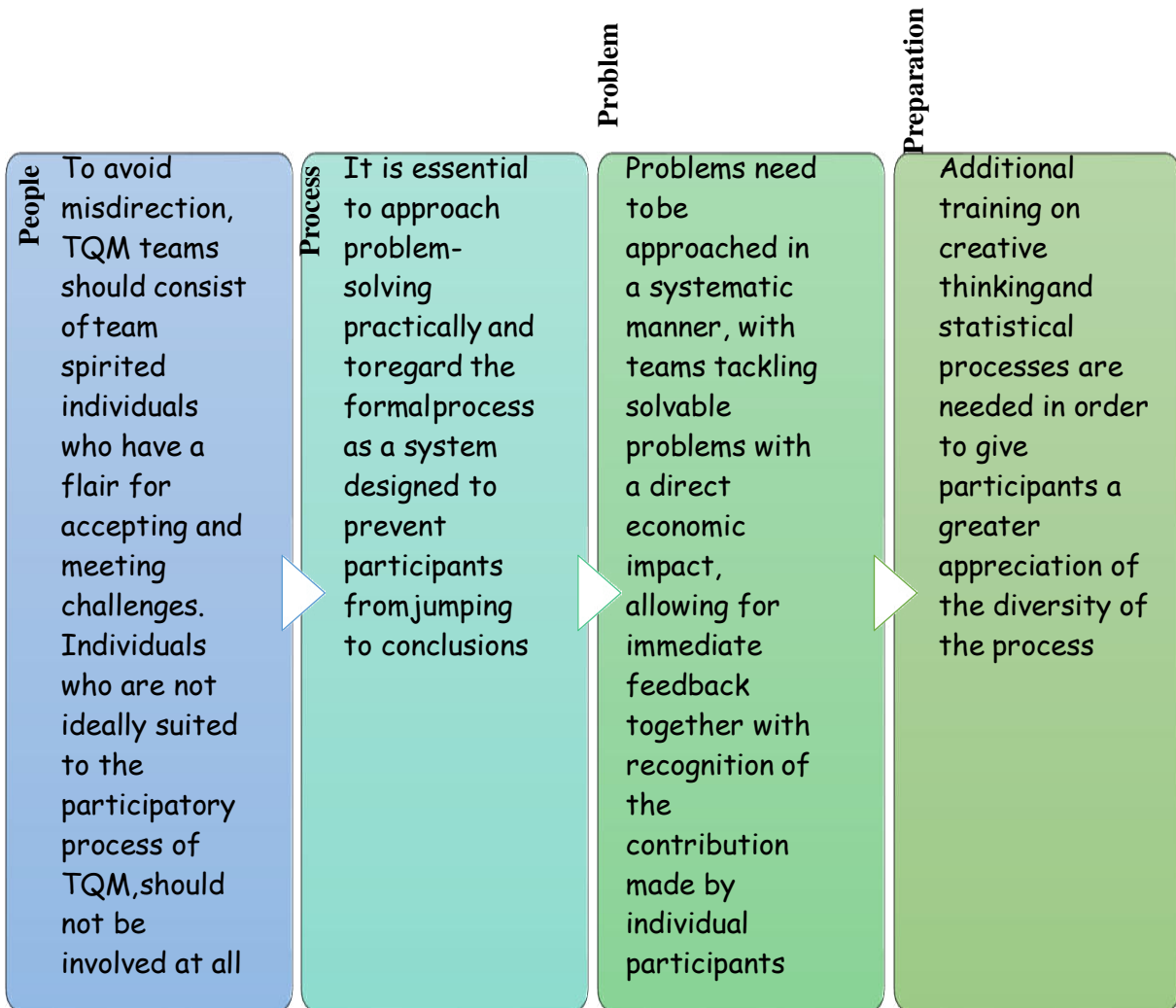


## Six C's of TQM

The Six Cs for successful implementation of a Total Quality Management (TQM) process is depicted as follows:

|  |  |   |
|--|--|---|
| <b>1. Commitment</b> <ul style="list-style-type: none"><li>• It is not sufficient to delegate 'quality' issues to a single person since this will not provide an environment for changing attitudes and breaking down the barriers to quality improvement.</li><li>• Such expectations must be made clear,</li></ul> | <b>2. Culture</b> <ul style="list-style-type: none"><li>• negative perceptions must be changed to encourage individual contributions and to make 'quality' a normal part of everyone's job</li></ul>   | <b>3. Continuous</b> <ul style="list-style-type: none"><li>• Recognition that TQM is a 'process' not a 'programme' necessitates that we are committed in the long term to the never-ending search for ways to do the job better.</li></ul>      |
| <b>4. Co-operation</b> <ul style="list-style-type: none"><li>• The on-the-job experience of all employees must be fully utilised and their involvement and co-operation sought in the development of improvement strategies and</li></ul>  | <b>5. Customer Focus</b> <ul style="list-style-type: none"><li>• TQM implementations focus entirely on the external customer to the exclusion of internal relationships; they will not survive in the short term unless they foster the mutual respect</li></ul> | <b>6. Control</b> <ul style="list-style-type: none"><li>• The need for control mechanisms is necessary in customer service and employee empowerment. Unless procedures are in place improvements cannot be monitored and measured nor</li></ul> |

## The 4P's



## PRAISE

Identification of improvement opportunities and implementation of quality improvement process, of the TQM Process is through a six-step activity sequence, identified by the acronym 'PRAISE'.

| Steps | Activity                      |          | Elements   |
|-------|-------------------------------|----------|--|
| 1     | <b>Problem Identification</b> | <b>P</b> | <ul style="list-style-type: none"> <li>• Areas of customer dissatisfaction.</li> <li>• Absence of competitive advantage.</li> </ul>  |
| 2     | <b>Ranking</b>                | <b>R</b> | <ul style="list-style-type: none"> <li>• Prioritise problems and opportunities by -                             <ol style="list-style-type: none"> <li>1. Perceived importance, and</li> <li>2. Ease of measurement and solution.</li> </ol> </li> </ul>   |
| 3     | <b>Analysis</b>               | <b>A</b> | <ul style="list-style-type: none"> <li>• Ask "Why?" to identify possible causes. Keep asking 'Why?' beyond to the move symptoms and to avoid jumping to premature conclusion.</li> <li>• Ask 'What?' to consider potential implications.</li> <li>• Ask 'How much?' to quantify cause and effect.</li> </ul>   |
| 4     | <b>Innovation</b>             | <b>I</b> | <ul style="list-style-type: none"> <li>• Use creative thinking to generate potential solutions.</li> <li>• Operationalise these solutions by identifying:                             <ol style="list-style-type: none"> <li>1. Barriers to implementation,</li> <li>2. Available enablers, and</li> <li>3. People whose co-operation must be sought.</li> </ol> </li> </ul> |
| 5     | <b>Solution</b>               | <b>S</b> | <ul style="list-style-type: none"> <li>• Implement the preferred solution.</li> <li>• Take appropriate action to bring about the required changes.</li> <li>• Reinforce with training and documentation back-up.</li> </ul>  |
| 6     | <b>Evaluation</b>             | <b>E</b> | <ul style="list-style-type: none"> <li>• Monitor the effectiveness of actions.</li> <li>• Establish and interpret performance indicators to track progress towards objectives</li> <li>• Identify the potential for further improvements and return to Step 1.</li> </ul>  |

## Pareto Analysis

Pareto Analysis is a rule that recommends focus on the most important aspects of the decision making in order to simplify the process of decision making.

It is based on the 80:20 rule that was a phenomenon first observed by Vilfredo Pareto, a nineteenth century Italian economist. He noticed that 80% of the wealth of Milan was owned by 20% of its citizens.

This phenomenon, or some kind of approximation of it say, (70: 30 etc.) can be observed in many different business situations.

The management can use it in a number of different circumstances (including TQM) to direct management attention to the key control mechanism or planning aspects. It helps to clearly establish top priorities and to identify both profitable and unprofitable targets.

## Usefulness of Pareto Analysis

It provides the mechanism to control and direct effort by fact and not by emotions. It helps to clearly establish top priorities and to identify both profitable and unprofitable targets. Pareto analysis is useful to:

1. Prioritize problems, goals, and objectives to Identify root causes.
2. Select and define key quality improvement programs.
3. Select key customer relations and service programs.
4. Select key employee relations improvement programs.
5. Select and define key performance improvement programs.
6. Maximize research and product development time.
7. Verify operating procedures and manufacturing processes.
8. Boosts / Assists Product or services sales and distribution.
9. Allocate physical, financial and human resources

### Example 1

A Toy company performs a Pareto analysis, given a set of 'defect types' and frequencies of their occurrence. The sample data consists of information about 84 defective items. The items have been classified by their 'defect types' as follows:

| Defect Type                                 | No. of Items |
|---|--------------|
| Cracks (due to mishandling of raw material) | 10           |
| Improper shapes                             | 8            |
| Incomplete                                  | 8            |
| Surface scratches                           | 53           |
| Others (due to bad quality raw material)    | 5            |

Frequency table indicating the frequency of occurrence of defects in decreasing order of their occurrence will be as follows:

| Defect Type       | No. of items | (%)   | Cumulative % |
|-------------------|--------------|-------|--------------|
| Surface scratches | 53           | 63.10 | 63.10        |
| Cracks            | 10           | 11.90 | 75.00        |
| Improper shape    | 8            | 9.52  | 84.52        |
| Incomplete        | 8            | 9.53  | 94.05        |
| Others            | 5            | 5.95  | 100.00       |

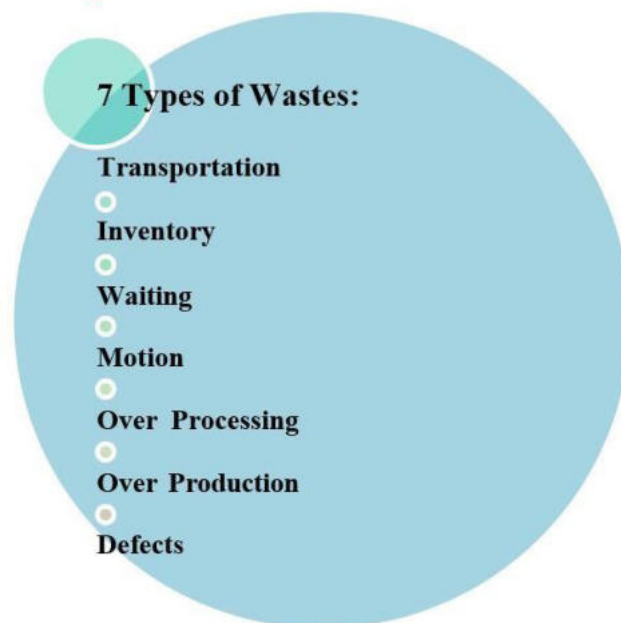
The purpose of Pareto analysis in this example, is to direct attention to the area where best returns can be achieved by solving most of the quality problems, perhaps just with a single action. In this case, use of good quality raw material say plastic may solve 63% of problem and if raw material is handled properly at least 75% the problems may be overcome.

## 2. 4 LEAN ACCOUNTING

**Lean System** is an organized method for waste minimization without sacrificing productivity within a manufacturing system.

Lean implementation emphasizes the importance of optimizing work flow through strategic operational procedures while minimizing waste and being adaptable.

**Waste** is any step or action in a process that is not required to complete a process successfully (called "Non-Value Adding"). When Waste is removed, only the steps that are required (called "Value-Adding") to deliver a satisfactory product or service to the customer remain in the process



**Three principles** guide Lean Accounting and form the foundation for all of accounting's work and interaction with the organization:

- i. **Customer value:** Delivering the relevant and reliable information in a timely manner to all users of the information inside the organization.
- ii. **Continuous improvement:** Improving accounting processes, cross-functional business processes and the information used inside the business for analysis and decision making.
- iii. **Respect for people:** Adopting a learning attitude by seeking to understand root causes of business problems and issues in a cross-functional, collaborative manner

## Principles, Practices and Tools of Lean Accounting

| Sl. | Principles  | Practices   | Tools of lean accounting  |
|-----|---|---|---|
| 1   | Lean & simple business accounting                     | Continuously eliminates waste from the transactions, processes, reports, and other accounting methods                               | <ul style="list-style-type: none"> <li>• Value stream mapping; current &amp; future state</li> <li>• Kaizen (lean continuous improvement).</li> <li>• PDCA (Planning, Doing, Checking and Acting) problem solving</li> </ul>  |
| 2   | Accounting processes that support lean transformation | <p>Management control &amp; continuous improvement<br/>Cost management</p> <p>Customer &amp; supplier value and cost management</p> | <ul style="list-style-type: none"> <li>• Performance Measurement Linkage Chart; linking metrics for cell/process, value streams, plant &amp; corporate reporting to the business strategy, target costs, and lean improvement</li> <li>• Value stream performance boards containing break-through and continuous improvement projects</li> <li>• Box scores showing value stream performance</li> <li>• Value stream costing</li> <li>• Value stream income statements</li> <li>• Target costing</li> </ul> |
| 3   | Clear & timely communication of information           | <p>Financial reporting Visual reporting of financial &amp; non-financial performance measurements<br/>Decision-making</p>           | <ul style="list-style-type: none"> <li>• "Plain English" financial statements</li> <li>• Simple, largely cash-based accounting</li> <li>• Primary reporting using visual performance boards; division, plant, value stream, cell/ process in production, product design, sales/marketing, administration, etc.</li> <li>• Incremental cost &amp; profitability analysis using value stream costing and box scores</li> </ul>  |
| 4   | Planning from a lean perspective                      | Planning & budgeting  | <ul style="list-style-type: none"> <li>• Hoshin policy deployment. (Hosin Kanri (also called Policy Deployment is a method for ensuring that a company's strategic goals drive progress and action at every level within that company. This method eliminates the waste that comes from inconsistent direction and poor communication).</li> <li>• Sales, operations, &amp; financial</li> </ul>  |

|   |  |   |  |
|---|--|---|--|
|   |  |   | <p>planning (SOFP)</p> <ul style="list-style-type: none"> <li>• Value stream cost and capacity analysis</li> <li>• Current state &amp; future state value stream maps</li> <li>• Box scores showing operational, financial, and capacity changes from lean improvement.</li> <li>• Plan for financial benefit from the lean changes</li> </ul>   |
|   |  | Impact of lean improvement                          |  |
|   |  | Capital planning                                    | <ul style="list-style-type: none"> <li>• Incremental impact of capital expenditure on value stream box-score. Often used with 3P approaches. (Production Preparation Process)</li> </ul>   |
|   |  | Invest in people                                    | <ul style="list-style-type: none"> <li>• Performance measurements tracking continuous improvement participation, employee satisfaction &amp; cross-training</li> <li>• Profit sharing</li> </ul>   |
| 5 | Strengthen internal accounting control | Internal control based on lean operational controls | <ul style="list-style-type: none"> <li>• Transaction elimination matrix</li> <li>• Process maps showing controls and SOX risks. (A SOX control is a rule that prevents and detects error within a process cycle of financial reporting. These controls fall under the Sarbanes-Oxley Act of 2002 (SOX). SOX is a U.S. federal law requiring all public companies doing business in the United States to comply with the regulation).</li> <li>• Simple methods to value inventory without the requirement for perpetual inventory records and product costs can be used when the inventory is low and under visual control.</li> </ul> |
|   |  | Inventory valuation                                 |  |

## 2.5 Six Sigma

Engineer Bill Smith introduced Six Sigma while working at Motorola in 1986.

It is a quality improvement technique whose objective is to eliminate defects in any aspect that affects customer satisfaction.

The premise of Six Sigma is that by measuring defects in a process, a company can develop ways to eliminate them and practically achieve "zero defects".

Six Sigma can be used with a balanced scorecard by providing a more rigorous measurement system based on statistics.

The **PRIMARY FOCUS** of Six Sigma

Primary Focus -

- Customer Satisfaction
- Decision Based Data-Driven Facts
- Management, Improvements, Processes
- Proactive Management Team
- Collaboration Within Business
- Goal for Perfection

### Numerical Concept Of Six Sigma

'Sigma' is a statistical term that measures how far a process deviates from perfection. The higher the sigma number, the closer the process is to perfection. The values of Defect Percentage Six Sigma is 3.4 defects per million opportunities or getting things right 99.99966% of the time. It is possible to develop ways of reducing defects by measuring the level of defects in a process and discovering the causes.

| Sigma Level | Defects per Million Opportunities (DPMO) | Percentage Defective (%) | Percentage Yield (%) | Quality/ Profitability     |
|-------------|--|--------------------------|----------------------|----------------------------|
| 1σ          | 6,91,462                                 | 69                       | 31                   | Loss                       |
| 2σ          | 3,08,538                                 | 31                       | 69                   | Non- Competitive           |
| 3σ          | 66,807                                   | 6.7                      | 93.3                 | Average Industries         |
| 4σ          | 6,210                                    | 0.62                     | 99.38                | Above Average              |
| 5σ          | 233                                      | 0.023                    | 99.977               | Below Maximum Productivity |

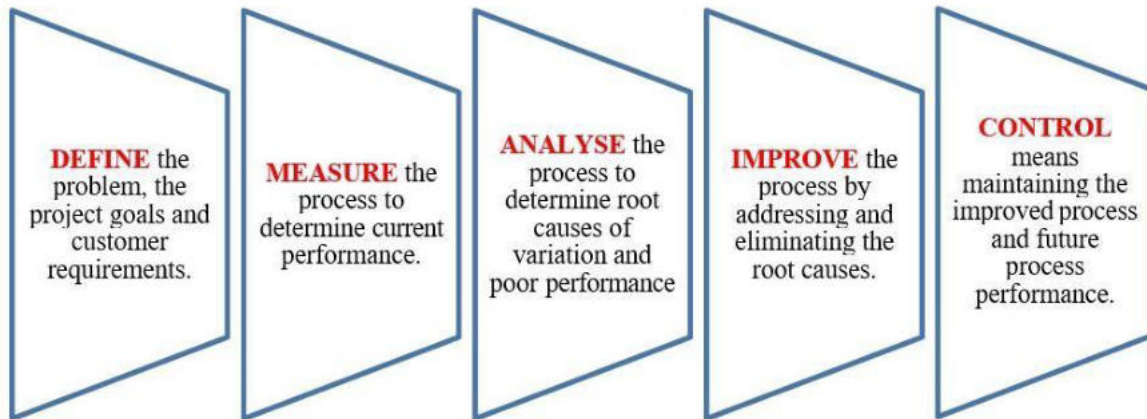
|    |     |        |          |                 |
|----|-----|--------|----------|-----------------|
| 6σ | 3.4 | 0.0034 | 99.99966 | Near Perfection |
|----|-----|--------|----------|-----------------|

## Implementation Of Six Sigma

There are **two methodologies** for the implementation of Six Sigma **DMAIC**

This method is very robust. It is used to improve existing business process. To **produce dramatic improvement** in business process, many entities have used it successfully.

### It has FIVE PHASES



**DMAIC** is used under the following circumstances:

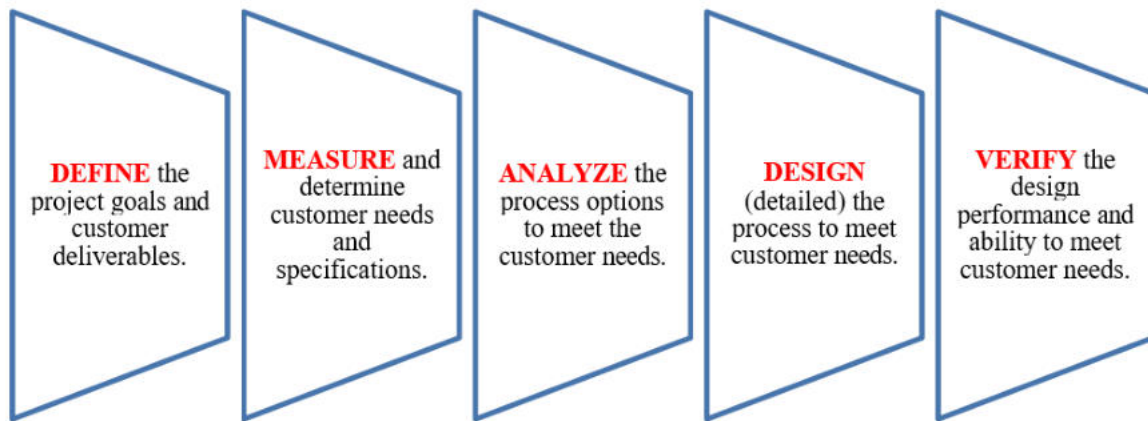
- A product or process exists.
- The project is part of ongoing continuous improvement process.
- Only a single process needs to be altered.
- Competitor's actions are stable.
- Customer's behavior is unchanging.
- Technology is stable

## DMADV

The application of these methods is aimed at creating a **high-quality product keeping in mind customer requirements at every stage of the product.**

It is an improvement system which is used to develop new processes or products at Six Sigma quality levels.

It has **FIVE PHASES**



**DMDAV** is used under the following circumstances:

- A product or process is not in existence
- Existing process has been optimised using either DMAIC or some other process.
- Project have strategic importance.
- Multiple process need to be altered.
- Competitor's performance is changing.
- Customer's behaviour is changing.
- Technology is growing.

**Similarities between DMADV and DMAIC**

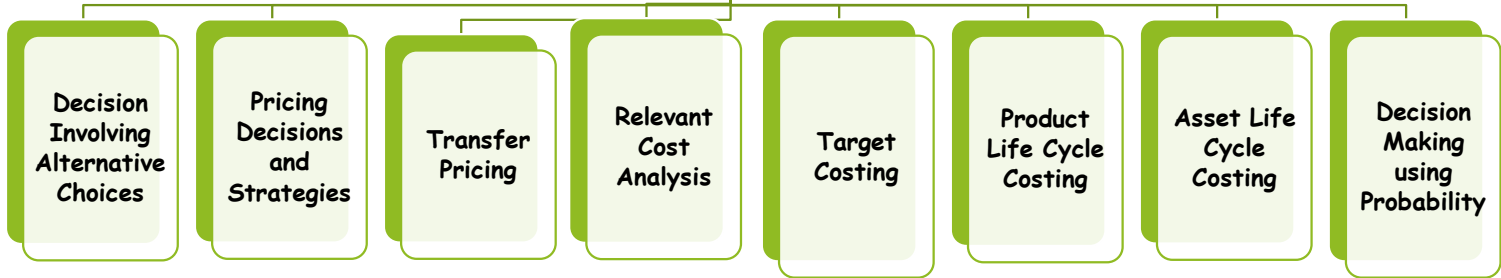
- Both of these six sigma methodologies are based on defects per million opportunities(DPMO).
- Both DMADV and DMAIC use the **same kind of six sigma quality management tools.**
- **Customer's needs are the basic parameter** for both six sigma methodologies.

**Difference DMAIC and DMADV**

| DMAIC   | DMADV   |
|---|---|
| Review the existing processes and fixes problem(s)  | Emphases on the design of the product and processes.  |
| More reactive process.  | Proactive process.  |
| Increase the capability.  | Increase the capacity.  |
| Rupee benefits quantified rather quickly.   | Rupee benefits more difficult to quantify and tend to be much more long term  |
| Examples of DMAIC problem-solving methods: <ul style="list-style-type: none"> <li>□ Reduce the cycle time to process a patent.</li> <li>□ Reduce the number of errors in saleslist.</li> <li>□ Improve search time for critical information.</li> </ul> | Examples of procedures that the DMADV development method is designed to address: <ul style="list-style-type: none"> <li>□ Add a new service</li> <li>□ Create a real-time system.</li> <li>□ Create a multiple-source lead tracking system</li> </ul> |



## 3. Decision Making Techniques



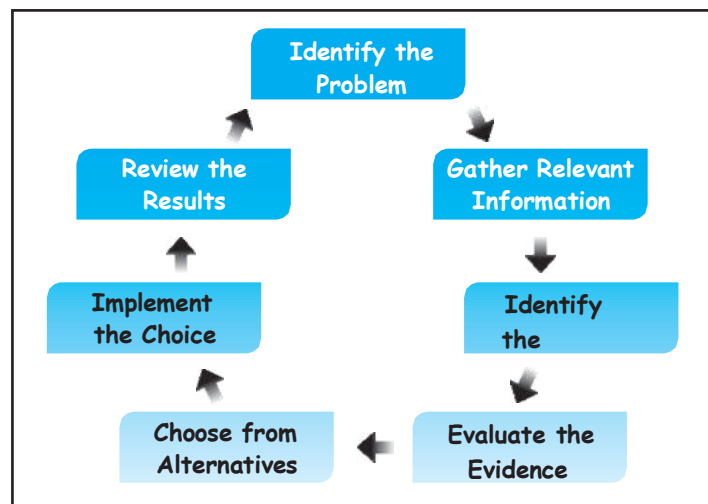
## 3.1 : Decision Involving Alternative Choices

### Decision Making

Decision making is the outcome resulting from the process of evaluation of the available alternatives and choosing the best.

Some instances of alternative choice decisions are:

- Make or buy,
- Change the product- mix,
- Take or refuse orders,
- Place special orders,
- Export versus local,
- Shut down or continue,
- Expand or contract,
- Own or lease,
- Retain or replace,
- Repair or renovate,
- Now or later,
- Change versus status quo,
- Slower or faster,
- Select sale territories,
- Replace present equipment with new machinery,
- Sell at split-up point
- Or process further, et



## Cost Behaviour

Cost Behaviour refers to the changes in input costs in relation to the level of production. Costs may increase or decrease proportionately with increasing or decreasing level of production,

### General Behavior Pattern of Elements of Cost

| Item                               | Traceability   | Behaviour                |
|------------------------------------|--|--------------------------|
| Raw Materials                      | Direct   | Variable                 |
| Process Materials and Chemicals    | Direct   | Variable                 |
| Utilities (Power, Fuel, etc.)      | Direct   | Variable                 |
| Direct Employee Cost               | Direct   | Variable                 |
| Direct Expenses                    | Direct   | Variable                 |
| Consumables, Stores & Spares       | Indirect   | Semi Variable            |
| Repairs & Maintenance              | Indirect   | Semi Variable            |
| Quality control Expenses           | Indirect   | Semi Variable            |
| Research & Development Expenses    | Indirect   | Discretionary            |
| Technical know-how Fee /Royalty    | Indirect   | Contractual              |
| Depreciation / Amortization        | Indirect   | Fixed                    |
| Other Production Overheads         | Direct (Eg.Machinery hired charges) / Indirect (Eg. Repairs & Maintenance) | Variable / Semi Variable |
| Primary Packing Cost               | Direct   | Variable                 |
| Administrative Overheads           | Indirect   | Semi Fixed               |
| Secondary Packing Cost             | Indirect   | Variable                 |
| Selling and distribution overheads | Direct (Eg.Sales Commission) / Indirect (Eg. Travelling Expense)           | Variable / Semi Variable |
| Interest and Financing charges     | Indirect   | Semi Variable / Fixed    |

## Key Factor Analysis

- Key Factor Analysis enables allocation of the available resources towards achieving maximum contribution and thereby maximum profits.
- When there is any limitation in relation to any of the input factors, the choice can be made by ascertaining the contribution per unit of that factor of production which is limited in the given situation. Such a factor of production which is limited in the question is called Key Factor or Limiting Factor.
- The limiting factors could be any of the critical input resources such as scarce raw materials, skilled labour hours, or special machine hours, and so on. In such an eventuality, the input resources can be allocated amongst the competing products on the basis of contribution per unit of the input.
- The product with the highest contribution is given the first preference followed by others in a similar suit.

## Basics in Marginal Costing

Example:

Selling price per unit = Rs.10  
 Variable cost per unit = Rs.6  
 Fixed Cost = Rs.10,000  
 Sales = 6,000 Units

Prepare or Calculate:

- 1) Income Statement
- 2) PV Ratio
- 3) Break-even point or Break-even sales (Units/Value)
- 4) Margin of Safety (Units & Value)
- 5) Profit Solution:

## Income Statement

### Step 1: Income Statement

| Particulars         | Computation         | Amount (Rs.)  |
|---------------------|---------------------|---------------|
| Sales               | 6,000 Units x Rs.10 | 60,000        |
| Less: Variable Cost | 6,000 Units x Rs.6  | (30,000)      |
| <b>Contribution</b> |                     | <b>24,000</b> |
| Less: Fixed Cost    | Given               | (10,000)      |
| <b>Profit</b>       |                     | <b>14,000</b> |

### Notes:

- 1) The above income statement is very helpful in assessing the impact of volume on cost and profit.
- 2) Hence, the chapter is also referred as Cost Volume Profit analysis (CVP analysis).

### Step 2: PV Ratio

$$\text{PV Ratio} = \frac{\text{Contribution per unit}}{\text{Selling Price}} = \frac{\text{Rs.4}}{\text{Rs.10}} = 40\%$$

$$\text{PV Ratio} = \frac{\text{Contribution}}{\text{Sales}} = \frac{\text{Rs.24,000}}{\text{Rs.60,000}} = 40\%$$

- 1) A PV ratio of 40% means, when the sales is Rs.100 contribution is Rs.40.
- 2) It also means when the sales changes by Rs.100, the profit and contribution changes by Rs.40.

3) Change in Profit = Change in Contribution because fixed cost does not change.

## Step 3: Break-even Point

- 1) Break-even point is the sales level at which the profit is '0'.
- 2) At that sales level sales = Total cost & contribution = fixed cost.
- 3) This break-even point or sales can be expressed in two ways:

a. In units =  $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{Rs.10,000}}{\text{Rs.4}} = 2,500 \text{ Units}$

b. In Value

i. Break-even point in units x Selling price per unit – 2,500 Units x Rs.10 = Rs.25,000

ii.  $\frac{\text{Fixed Cost}}{\text{PV Ratio}} = \frac{\text{Rs.10,000}}{40\%} = \text{Rs.25,000}$

## Step 4 : margin of safety

- 1) It is the sales above the break even sales
- 2) It is the sales that can drop before the company starts incurring losses.
- 3) It is profit generating sales.
- 4) This Margin of Safety also can be expressed in units or value:

a. In Units

i. Actual Sales – Break-even Point = 6,000 Units – 2,500 Units = 3,500 Units

ii.  $\frac{\text{Profit}}{\text{Contribution per Unit}} = \frac{\text{Rs.14,000}}{\text{Rs.4}} = 3,500 \text{ Units}$

b. In Value

i. Actual Sales – Break-even Sales = Rs.60,000 – Rs.25,000 = Rs.35,000

ii. Margin of Safety x Selling Price = 3,500 Units x Rs.10 = Rs.35,000

iii.  $\frac{\text{Profit}}{\text{PV Ratio}} = \frac{\text{Rs.14,000}}{40\%} = \text{Rs.35,000}$

### Notes:

- 1) Contribution is linked to sales, fixed cost to break-even sales and profit to Margin of Safety.
- 2) When we produce and sell 1 unit, we incur variable cost and also receive selling price. What stays in hand is Contribution.
- 3) Contribution contributes:
  - a. Towards Fixed Cost Recovery - Up to Breakeven Sales
  - b. Towards Profit - For Margin of Safety Sales.

**Step 5: Profit**

- 1) Profit = Sales - Cost = Rs.60,000 - Rs.46,000 = Rs.14,000
- 2) Profit = Contribution - Fixed Cost = Rs.24,000 - Rs.10,000 = Rs.14,000
- 3) Profit = Margin of Safety in Units x Contribution per unit = 3,500 Units x Rs.4 = Rs.14,000
- 4) Profit = Margin of Safety in value x PV Ratio = Rs.35,000 x 40% = Rs.14,000

**Conclusion:** For the all above formulas to be true the volume should not affect selling price, variable cost per unit or the total fixed cost. In other words we assume in linearity in relationship. If the linearity assumption does not hold good what happens is the subject matter of discussion.

**Multiple break-even points (Step fixed cost)**

- 1) Whenever the fixed cost and variable cost/unit are varying at different levels, then the usage of formula will not be rewarding.
- 2) Use the spirit of basic knowledge of marginal costing in solving the Break-even Point.
- 3) At Break-even Point, Sales = Cost (or) Profit = 0

**Notes:**

- 1) When we have step fixed cost i.e. fixed cost increases at output different output ranges, we may have multiple breakeven points.
- 2) In such situation break-even should be analyzed range by range.  
Generally higher volumes results in higher profit only when linearity is satisfied. In case of step fixed cost this linearity is absent. Hence, more volume need not give higher profits.

**Marginal Costing (vs.) Absorption Costing Break-even point :**

- 1) It is known that at a given sales level, marginal costing income statement and absorption costing statement reports different profits when there exists stock.
- 2) This means when there is stock, the sales level at which the marginal costing reports '0' profit will not be the sales level at which the absorption costing has '0' profit. Thus break-even point is different for marginal and absorption costing systems.
- 3) In absorption costing system the sales need not recover the entire current year's fixed cost when there is net closing stock because that portion of fixed cost inside net closing stock escapes to next year.
- 4) Similarly, when there is net opening stock the sales should recover not only the current year fixed stock but also a portion of fixed cost from previous year.
- 5) Thus when stock are given absorption costing break-even point is calculated as follows:

$$a. \text{ Net Closing Stock - Break-even point} = \frac{\text{Total Fixed Cost - Fixed Cost in net Closing Stock}}{\text{Contribution per unit}}$$

b. Net Opening Stock – Break-even point = 
$$\frac{\text{Total Fixed Cost} + \text{Fixed Cost in net Opening Stock}}{\text{Contribution per unit}}$$

- For decision making purpose always use marginal costing break-even point.
- When manager's financial rewards are linked to division's profits calculated using absorption costing system, they would like to know the sales demand to break-even and work towards achieving that demand.

## Introduction to Indifference point

- 1) Concept of indifference point will arise when we have two options:
  - a. Option 1 - Low fixed cost and high variable cost per unit
  - b. Option 2 - Low variable cost per unit and high fixed cost
- 2) When the volume is high it is better to go for low variable cost option and at low volume low fixed cost option.
- 3) At some volume, both options will give same profit or have same cost which is called indifference point.
- 4) This indifference point volume can be expressed in two ways:

a. In Units

- i. 
$$\frac{\text{Difference in Fixed Cost}}{\text{Difference in Variable Cost per Unit}}$$
- ii. 
$$\frac{\text{Difference in Fixed Cost}}{\text{Difference in Contribution per Unit}}$$

b. In Volume

- i. 
$$\frac{\text{Difference in Fixed Cost}}{\text{Difference in Variable Cost Ratio}}$$
- ii. 
$$\frac{\text{Difference in Fixed Cost}}{\text{Difference in PV Ratio}}$$

## Understanding how to analyze a semi-variable cost

### Example 1:

| Units | Cost (Rs.) |
|-------|------------|
| 1,000 | 15,000     |
| 2,000 | 20,000     |
| 3,000 | 25,000     |

- 1) The above cost is not fixed because it changes with volume. It is neither variable because it is not constant per unit. This is semi-variable cost.
- 2) Semi-variable cost should be analyzed into variable and fixed portion which is done as follows:

$$\text{Variable cost per unit} = \frac{\text{Change in cost}}{\text{Change in units}} = \frac{20,000 - 15,000}{2,000 - 1,000} = \text{Rs.5 per unit}$$

$$\text{Fixed cost} = \text{Total Cost} - \text{Variable Cost} = \text{Rs.15,000} - \text{Rs.5,000 (1,000 Units} \times \text{Rs.5)} = \text{Rs.10,000}$$

## Limiting factor in Make or Buy Situation

- 1) Generally, it is believed that making is cheaper than buying because making involved only variable cost and buying includes share of fixed cost, supplier's profit etc., in purchase price.

## Make (or) buy decision can be classified into types

- i. A Long term investment decision → For making we require machine. Hence capital outlay occurs in year 0. Due to making operationally we saved cost each year which results in inflow. If NPV is positive make by investing in machine else buy.
- ii. A Short term limiting factor allocation → In this case we have facilities to make but limiting factor exists that prevents making the entire requirement. Here what should be made using limited source and what should be bought from outside is the decision to be made.

## Short term vs long term decision

- 1) Short term decisions should be purely short term, should not be extended to long periods. For example, a company's plant capacity is 1,00,000 units and current demand is 80,000 units with a selling price of Rs.50, variable cost of Rs.30. An offer comes for purchase of 20,000 units at a selling price of Rs.31. Should this offer be accepted?
  - a) If it is a one-time offer?
  - b) If it is an offer for next four years?

### Answer:

- a) Instead of having the capacity idle it is better to accept the offer and have contribution of Rs.20,000 (20,000 Units  $\times$  Rs.1) towards the factory fixed cost but this decision should be purely short term (or) one time.
- b) If it is for four years, it becomes long term decision for which short term decision making concepts should not be applied. If we feel that for next four years, the demand is going to be only 80,000 units, the company should think of downsizing the plant and save fixed cost rather than use the idle capacity for a nominal Rs.1 contribution.

## Shut down (or) Continue decisions

- 1) During the periods of lean demand management may consider temporary shutdown of operations. Such a decision is called "Shutdown Decision".
- 2) The shutdown decision should be made after doing cost - benefit analysis.
- 3) Shutdown Decision
  - i. Benefit → Avoidable Fixed Cost
  - ii. Cost → Shut Down cost & Contribution lost on possible shut down period demand
- 4) Avoidable fixed cost are those fixed costs that can be avoided when the plant is shut down and shutdown costs are costs specifically incurred during the shutdown period to maintain the

factory inworking condition.

- 5) If the benefit exceeds cost shutdown else continue.
- 6) The shutdown decision greatly depends on the possible shutdown period. If the shutdown period demand is high continue, if it is low shutdown.
- 7) The volume at which the company is indifferent between shutting down or continuing is called 'ShutDown Point'. It can be calculated as follows:

i. In Units  $\rightarrow \frac{\text{Avoidable Fixed Cost-Shutdown Cost}}{\text{Contribution per unit}}$

ii. In Value  $\rightarrow \frac{\text{Avoidable Fixed Cost-Shutdown Cost}}{\text{PV Ratio}}$

## Standalone product

- Standalone product means when the demand for other products becomes '0' can this product survive?
- When a product becomes standalone it should recover it's specific fixed cost and entire general fixed cost to break even

## Illustration-1 (Computation of BEP & Profit Planning)

The income statement of Ashok Gears Ltd. is summarized as below:

|  |             |
|--|-------------|
| Net Revenue.....   | ₹ 80,00,000 |
| Less: Expenses (including ₹40,00,000 of Fixed Cost)..... | ₹ 88,00,000 |
| Net Loss.....  | ₹ 8,00,000  |

The manager believes that an increase of ₹20,00,000 as fixed expenditure in advertising outlays will increase the sales substantially. His plan was approved by the Board.

**You are required to calculate:**

- At what sales volume will the Company have break even?
- What sales volume will result in a Net Profit of ₹ 4,00,000?

## Illustration-2

A manufacturing company currently operating at 80% capacity has received an export order from Middle East, which will utilise 40% of the capacity of the factory. The order has to be either taken in full and executed at 10% below the current domestic prices or rejected totally. The current sales and cost data are given below:

|                           |                       |
|---------------------------|-----------------------|
| <b>Sales</b>              | <b>RS 16.00 lakhs</b> |
| <b>Direct Material</b>    | <b>RS 5.80 lakhs</b>  |
| <b>Direct Labour</b>      | <b>RS 2.40 lakhs</b>  |
| <b>Variable Overheads</b> | <b>RS 0.60 lakhs</b>  |
| <b>Fixed Overheads</b>    | <b>RS 5.20 lakhs</b>  |

The following alternatives are available to the management:

- Continue with domestic sales and reject the export order.
- Accept the export order and allow the domestic market to starve to the extent of excess of demand.
- Increase capacity so as to accept the export order and maintain the domestic demand by:
  - Purchasing additional plant and increasing 10% capacity and thereby increasing fixed overheads by ₹ 65,000, and
  - Working overtime at one and half time the normal rate to meet balance of the required capacity.

Required: Evaluate each of the above alternatives and suggest the best one.

## Illustration-3 (Limiting Factor Analysis & Optimum Mix)

A manufacturer has three products A, B, and C. Current sales, cost and selling price details and

processing time requirements are as follows:

|  | Product A | Product B | Product C |
|--|-----------|-----------|-----------|
| Annual sales (units)                     | 6000      | 6000      | 750       |
| Selling Price (₹)                        | 20        | 31        | 39        |
| Unit Cost (₹)                            | 18        | 24        | 30        |
| Processing time required per unit (hour) | 1         | 1         | 2         |

The firm is working at full capacity (13,500 processing hours per year). Fixed manufacturing overheads are absorbed into unit costs by a charge of 200% of variable costs. This procedure fully absorbs the fixed manufacturing overhead.

Assuming that:

- (i) Processing time can be switched from one product line to another.
- (ii) The demand at current selling price (₹) is:

| Product A | Product B | Product C |
|-----------|-----------|-----------|
| 11,000    | 8,000     | 2,000     |

- (iii) The selling prices are not be altered.

You are required to calculate the best production programme for the next operating period and to indicate the increase in net profit that this programme should yield. In addition, identify the shadow price of processing hour.

**Illustration-4 (Optimum Product Mix & Maximisation of Profit, Multiple limiting factors / constraints)**

As a part of its rural upliftment programme, the Government has put under cultivation a farm of 96 hectares to grow tomatoes of four varieties: Royal Red, Golden Yellow, Juicy Crimson and Sunny Scarlet. Of the total 96 hectares, 68 hectares are suitable for all four varieties, but the remaining 28 hectares are suitable for growing only Golden Yellow and Juicy Crimson. Labour is available for all kinds of farm work and there is no constraint. The market requirement is that all four varieties of tomatoes must be produced with a minimum of 1,000 boxes of anyone variety. The farmers engaged have decided that the area devoted to any crop should be in terms of complete hectares and not in fractions of a hectare. The other limitation is that not more than 22,750 boxes of any one variety should be produced. The following data are given.

| Particulars                           | Royal Red | Golden Yellow | Juicy Crimson | Sunny Scarlet |
|---------------------------------------|-----------|---------------|---------------|---------------|
| Annual Yield (Boxes per hectare)      | 350       | 100           | 70            | 180           |
| Direct Material Costs (₹ per hectare) | 4,760     | 2,160         | 1,960         | 3,120         |
| Labour Costs (₹)                      |           |               |               |               |
| a. Growing per hectare                | 8,960     | 6,080         | 3,710         | 5,280         |
| b. Harvesting & packing per box       | 36        | 32            | 44            | 52            |
|                                       | 52        | 52            | 40            | 96            |

|                           |        |        |        |        |
|---------------------------|--------|--------|--------|--------|
| c. Transportation per box |        |        |        |        |
| Market price per box      | 153.80 | 158.70 | 183.80 | 222.70 |

Fixed Overheads per annum

|                        |            |
|------------------------|------------|
| Growing                | ₹ 1,12,000 |
| Harvesting             | ₹ 74,000   |
| Transportation         | ₹ 72,000   |
| General Administration | ₹ 1,02,000 |

### Required

- (i) Product Preference within the given constraints
- (ii) Optimum Product Mix & Maximum Profit
- (iii) A nationalized bank has come forward to help in an improvement programme for the piece of 28 hectares in which only Golden Yellow and Juicy Crimson used to grow, with a loan of ₹50,000 at a very nominal interest of 6% per annum. After this improvement is carried out, there will be a saving of ₹12.50 per box in the harvesting cost of Golden Yellow and the 28 hectares will become suitable for growing Royal Red in addition to the existing Golden Yellow and Juicy Crimson varieties. Assuming that other constraints continue, find the maximum total profit that would be achieved after the improvement programme is carried out.

### Explanatory Comments

While seeking solutions in terms of product preference, optimum product mix, maximum profit and evaluation of alternatives, the problem sets certain constraints. The constraints are:

- (i) 68 hectares are suitable for all four varieties, but the remaining 28 hectares are suitable for growing only Golden Yellow and Juicy Crimson
- (ii) All four varieties of tomato must be produced with a minimum of 1,000 boxes of any one variety
- (iii) The area devoted to any crop should be in terms of complete hectares
- (iv) Not more than 22,750 boxes of any one variety should be produced
- (v) After an improvement is carried out the 28 hectares will become suitable for growing Royal Red in addition to the existing Golden Yellow and Juicy Crimson varieties

The problem can be solved by adopting five steps:

- (i) Determination of Contribution per hectare & product preference
- (ii) Computation of Optimum Product Mix
- (iii) Computation of Maximum Profit
- (iv) Computation of Optimum Mix after the improvement programme
- (v) Computation of Profit after the improvement programme

Here follows the stepwise solution. In order to assimilate the concepts, the students are advised to go

through the notes, furnished at relevant places, carefully.

### Illustration-5 (Profit Planning)

MN Agarwal owns a Gift-Shop, a Restaurant and a Lodge in Shillong. Typically, he operates these only during the season period of 4 months in a year. For the past season the occupancy rate in the Lodge was 90% and level of activity in case of Gift-Shop and Restaurant was 80%. The relevant data for the past season were as under-

(Amounts in ₹)

|                     | Gift-Shop     |           | Restaurant    |            | Lodge           |              |
|---------------------|---------------|-----------|---------------|------------|-----------------|--------------|
|                     | Amount (₹)    | %         | Amount (₹)    | %          | Amount (₹)      | %            |
| 1. Receipts/ Sales  | 48,000        | 100       | 64,000        | 100        | 1,80,000        | 100          |
| 2. Expenditure:     |               |           |               |            |                 |              |
| Cost of Sales       | 26,400        | 55        | 35,200        | 55         | -               | -            |
| Supplies            | 2,400         | 5         | 6,400         | 10         | 14,400          | 8            |
| Insurance & Taxes   | 1,920         | 4         | 6,400         | 10         | 36,000          | 20           |
| Depreciation        | 2,880         | 6         | 8,000         | 12.50      | 39,600          | 22           |
| Salaries            | 4,800         | 10        | 4,800         | 7.50       | 25,200          | 14           |
| Electricity Charges | 960           | 2         | 3,200         | 5          | 13,500          | 7.50         |
| <b>Total</b>        | <b>39,360</b> | <b>82</b> | <b>64,000</b> | <b>100</b> | <b>1,28,700</b> | <b>71.50</b> |
| 3. Profit           | 8,640         | 18        | -             | -          | 51,300          | 28.50        |

#### Additional information:

- Cost of Sales and Supplies vary directly with the occupancy rate in case of Lodge and level of activity in case of Gift Shop and Restaurant.
- Insurances and Taxes and Depreciation are for the entire period of twelve months.
- Salaries paid are for the season period except a Chowkidar for the Lodge who is paid for the full year at ₹400 per month.
- Electricity Charges include Fixed Charges of ₹640, ₹1,920 and ₹9,900 for Gift-shop, Restaurant and Lodge respectively.

The balance amount varies directly with occupancy rate in case of Lodge and level of activity in case of Gift- Shop and Restaurant. Fixed Electric Charges are for the season except in case of Lodge where ₹6,900 is for the season and ₹3,000 for the entire period of twelve months.

Mr. Agarwal is interested in increasing his Net Income. The following options are under consideration -

- To continue the operations during the season period only by inserting advertisement in newspapers thereby occupancy rate to reach 100% in case of Lodge and 90% level of activity in respect of Gift-Shop and Restaurant. The costs of advertisement are estimated at ₹12,000.
- To continue operations throughout the entire period of twelve months comprising season period of four months and off-season period of eight months. The occupancy rate is expected at 90% and 40% during season period and off-season period respectively in case of the Lodge. The room rents are

bound to be reduced to 50% of the original rates during off-season period. The level of activity of Gift-Shop and Restaurant is expected at 80% and 30% during season and off-season period respectively but 5% discount on the original rates will have to be offered during off-season period.

Which option is profitable? As a Cost Accountant would you like to suggest him any other alternative based upon the above figures, which can be adopted to earn more net profit? (Use Incremental Revenue and Cost Approach.)

### **Illustration-6** (Make or Buy)

S.H.Ltd., a cycle manufacturing company, has drawn up a programme for the manufacture of a new product for the purpose of fuller utilization of its capacity. The scheme envisages the manufacture of baby tricycle fitted with a bell. The company estimates the sales of tricycles at 10,000 during the first year and expects that from the second year onwards the sales estimates will stabilize at 20,000 tricycles. Since the company has no provision for the manufacture of the small bells specially required for the tricycles, the requirement of the bells is initially proposed to be met by way of purchase from the market at ₹8 each. However, if the company desires to manufacture the bell in its factory by installation of new equipment, it has two alternative proposals as under:-

|  | Installation of Super X Machine | Installation of Janta Machine |
|--|---------------------------------|-------------------------------|
| Initial Cost of Machine                      | ₹ 3.00 Lakhs                    | ₹ 2.00 Lakhs                  |
| Life   | 10 Years                        | 10 Years                      |
| Fixed Overheads p.a. other than depreciation | ₹ 54,000                        | ₹ 28,000                      |
| Variable expenses per unit                   | ₹ 4.00                          | ₹ 5.00                        |

#### **Required:**

- For each of the two levels of output namely 10,000 and 20,000 bells state with suitable workings whether the company should purchase the bells from market or install new equipment for manufacture of bells. If your decision is in favour of the installation of new equipment, which of the two new machines should be installed?
- What would be your decision in case the forecast of requirement from the second year onwards is estimated at 40,000 bells instead of 20,000 bells?
- At what volume of bells will the installation of the two machines break even.

### **Illustration-7** (Make or Buy & Evaluation of Alternatives)

Household Equipments Ltd. is producing kitchen equipment from five components three of which are made using general purpose machines and two by manual labour. The data for the manufacture of the equipment is as follows:

| Components                    | A  | B  | C  | D | E | Total  |
|-------------------------------|----|----|----|---|---|--------|
| Machines hours reqd. per unit | 10 | 14 | 12 |   |   | 36 hrs |
| Labour hours reqd. per unit   |    |    |    | 2 | 1 | 3hrs   |

|                                     |    |     |     |    |    |       |
|-------------------------------------|----|-----|-----|----|----|-------|
| Variable cost per unit (in ₹)       | 32 | 54  | 58  | 12 | 4  | 160   |
| Fixed cost per unit (apportioned) ₹ | 48 | 102 | 106 | 24 | 36 | 316   |
| Total component cost ₹              | 80 | 156 | 176 | 36 | 30 | 478   |
| Assembly cost/unit (all variable)   |    |     |     |    |    | ₹ 40  |
| Selling price/unit                  |    |     |     |    |    | ₹ 600 |

The marketing department of the company anticipates 50% increase in demand during the next period. General purpose machinery used to manufacture. A, B and C is already working to the maximum capacity of 4752 hours and there is no possibility of increasing this capacity during the next period. But labour is available for making components D and E and also for assembly according to demand. The management is considering the purchase of one of the components A, B or C from the market to meet the increase in demand. These components are available in the market at the following prices: Components A: ₹ 80, Components B: ₹ 160, Components C: ₹ 125

**Required:**

- (a) Profit made by the company from current operations.  
If the company buys any one of the components A, B or C, what is the extent of additional capacity that can be created?
- (b) Assuming 50% increase in demand during the next period, which components A, B or C should the company buy from the market?
- (c) The increase in profit, if any, if the component suggested in (c) is purchased from the market.

**Illustration-8 (Evaluation of Alternatives for Profit Planning)**

AB Limited has two divisions Alpha & Beta. Alpha produces components, two units of which are required for one unit of final product produced by Beta. Alpha has a capacity to produce 20,000 units and entire quantity is supplied to Beta @ ₹ 200/unit. Variable cost component at Alpha is ₹ 190 & fixed cost ₹ 20 per unit. For final product of Beta, per unit variable cost excluding component is ₹ 700, fixed cost ₹ 200 and selling price is ₹ 1500. Alpha has placed a proposal for increasing the transfer price to ₹ 220 i.e.. the market price. Facility at Alpha can be rented out @ ₹ 3.00 Lakhs p.a. Manager at Alpha wants to opt for this alternative. Beta can buy this component from outside market @ ₹ 210. If capacity of Alpha is augmented to 40,000 units with an additional investment of ₹ 15 lakhs, it can sell 20,000 units to external market and balance to Beta @ ₹ 210 per unit. Fixed cost for Alpha will be up by ₹ 1.00 lakh. Evaluate and give your opinion on:

- a. Facility of Alpha is rented out and Beta buys from market @ ₹210 per unit
- b. Alfa sells to outside market @ ₹220 and Beta buys @ 210 per unit from market
- c. Capacity enhancement at a cost of capital of 12% p.a.

**Illustration-9 (Optimum Crop Mix & Profit Planning)**

An agro-based farm is planning its production for next year. The following is relating to the current year:

| Product/Crop               | M     | N     | O    | P     |
|----------------------------|-------|-------|------|-------|
| Area Occupied (Acres)      | 125   | 100   | 150  | 125   |
| Yield per acre (ton)       | 50    | 40    | 45   | 60    |
| Selling Price per ton (₹)  | 100   | 125   | 150  | 135   |
| Variable Cost per acre (₹) |       |       |      |       |
| Seeds                      | 150   | 125   | 225  | 200   |
| Pesticides                 | 75    | 100   | 150  | 125   |
| Fertilizers                | 62.50 | 37.50 | 50   | 62.50 |
| Cultivation                | 62.50 | 37.50 | 50   | 62.50 |
| Direct Wages               | 2000  | 2250  | 2500 | 2850  |

Fixed overhead per annum ₹13,44,000. The land that is being used for the production of O and P can be used for either crop. But not for M and N; the land that is being used for the production of M and N can be used for either crop, but not for O and P. In order to provide adequate market service, the company must produce each year at least 1,000 tons of each of M and N and 900 tons each of O and P.

**Required:**

- (i) Determine the profit for the production mix fulfilling market commitment.
- (ii) Assuming the land could be cultivated to produce any of the four products and there was no market commitment, calculate the profit amount of most profitable crop and break-even point of most profitable crop in terms of acres and sales value.

**Illustration-10 (Continue or Discontinue)**

S.G Ltd produces four products in its factory. The volume of production and sales achieved is considerably lower than normal and so there has been substantial under recovery of factory overheads. The sales and cost particulars are as under:

| (₹ In lakhs)                |          |     |      |    |       |
|-----------------------------|----------|-----|------|----|-------|
|                             | Products |     |      |    | Total |
|                             | A        | B   | C    | D  |       |
| Sales                       | 160      | 200 | 80   | 40 | 480   |
| Costs:                      |          |     |      |    |       |
| Direct Material             | 24       | 32  | 16   | 3  | 75    |
| Direct Wages                | 40       | 48  | 32   | 8  | 128   |
| Factory Overheads           | 48       | 64  | 40   | 8  | 160   |
| Selling & Admn. (15% Sales) | 24       | 30  | 12   | 6  | 72    |
| Total                       | 136      | 174 | 100  | 25 | 435   |
| Profit / Loss               | 24       | 26  | (20) | 15 | 45    |
| Under recovery of overheads |          |     |      |    | 24    |

|                   |  |  |  |  |    |
|-------------------|--|--|--|--|----|
| Profit before tax |  |  |  |  | 21 |
|-------------------|--|--|--|--|----|

40% of factory overheads are variable at normal volume and the selling and administration overheads are variable to the extent of 5% of sales. 20% of sales of product C are done in connection with Product A in as much as the discontinuance of Product C will bring down the sale of Product A by 10%. Alternatively, the sale of product C can be reduced to 20% of the present level to maintain the sales of product A.

In view of the loss reported for Product C the management has for consideration three proposals, viz:

- (a) Discontinue product C. In that event the co. can save a sum of ₹8 lakhs p.a. in fixed expenses.
- (b) Maintain the sales of product C to the extent of 20% of the present sales as sales service to product A. In that event the reduction of fixed expenses will be ₹ 3 lakhs p.a.
- (c) Discontinue product C totally and increase the sales of product D for which demand is available to the extent of another ₹40 lakhs. This can be done without any change in fixed expenses.

Present the data to the management bringing out the financial implications of the aforesaid three proposals as compared with the annual operating results generating a profit before tax of ₹21 lakhs. Suggest a course of action to be followed by the S.G Ltd.

### Illustration-11 (Make or Buy & Choosing between the Alternatives)

T.T.D Ltd., manufacturing a single product, has normal working capacity of 8,000 units per annum. The sales manager has projected a sale of 10,000 units for the year 2021-22 at a price of ₹ 250 per unit. The operating budget for 2021-22 is as under:

|  | ₹ in lakhs | ₹ in lakhs |
|--|------------|------------|
| Sales: 8,000 units @ ₹ 250 each        |            | 20.00      |
| Cost of production                     |            |            |
| Raw material                           | 12.00      |            |
| Direct wages                           | 3.00       |            |
| Works overhead (50% Fixed)             | 1.40       |            |
| Admn. overhead (all fixed)             | 0.60       |            |
| Selling & Distribution O H (80% Fixed) | 1.00       | 18.00      |
| Profit                                 |            | 2.00       |

In order to increase production to meet the sales demand, two proposals have been put forward as under:

- (1) Sub-contracting the production of 2,000 units at ₹ 225 per unit.
- (2) Installing additional machine which will entail the following expenses:
  - a. Cost of machine ₹ 2,00,000; Life 20 years
  - b. Recruitment of 10 workers including direct workers to operate the machine at a wage rate of ₹ 500 each per month. Add 25% towards fringe benefits. (None of the existing workers will be utilised for this purpose).
  - c. Interest on capital required for the purchase of machine 15% p.a.

The following additional fixed expenses will be required in respect of both alternatives:  
 Administration expenses - ₹ 10,000 per year & Selling & Distribution expenses- ₹ 20,000 per year.  
 You are required to prepare:

1. A statement showing respective profitability of the two methods of increasing the production.
2. Comment upon the choice of one of the two proposals.

### **Illustration-12 (Make or Buy and Evaluation of Alternatives)**

A Company manufacturing a highly successful line of cosmetics intends to diversify the product line to achieve fuller utilization of its plant capacity. As a result of considerable research made the company has been able to develop a new product called 'EMO'. EMO is packed in tubes of 50 grams capacity and is sold to the wholesalers in cartons of 24 tubes at ₹240 per carton. Since the company uses its spare capacity for the manufacture of EMO, no additional fixed expenses will be incurred. However, the cost accountant has allocated a share of ₹4,50,000 per month as fixed expenses to be absorbed by EMO as a fair share of the company's present fixed costs to the new production for costing purposes.

The company estimated the production and sale of EMO at 3,00,000 tubes per month and on this basis the following cost estimates have been developed.

|                  | ₹ per carton |
|------------------|--------------|
| Direct Materials | 108          |
| Direct Wages     | 72           |
| All overheads    | 54           |
| Total costs      | 234          |

After a detailed market survey, the company is confident that the production and sales of EMO can be increased to 3,50,000 tubes and the cost of empty tubes, purchased from outside will result in a saving of 20% in material and 10% in direct wages and variable overhead costs of EMO. The price at which the outside firm is willing to supply the empty tubes is ₹1.35 per empty tube. If the company desires to manufacture empty tubes in excess of 3,00,000 tubes, new machine involving an additional fixed overheads ₹30,000 per month will have to be installed.

#### **Required:**

- (i) State by showing your working whether company should make or buy the empty tubes at each of the three volumes of production of EMO namely 3,00,000; 3,50,000 and 4,50,000 tubes.
- (ii) At what volume of sales will it be economical for the company to install the additional equipment for the manufacture of empty tubes?
- (iii) Evaluate the profitability on the sale of EMO at each, of the aforesaid three levels of output based on your decision and showing the cost of empty tubes as a separate element of cost.

### **Illustration-13 (Evaluation of Alternative Choices)**

ABC Computer Ltd. is planning to introduce a new computer "Speedo". The maximum production capacity will be 40,000 units per annum. The company plans to produce full capacity in the first year. The cost per computer is as follows:

|                 |       |
|-----------------|-------|
|                 | (₹)   |
| Direct material | 6,000 |

|                            |       |
|----------------------------|-------|
| Direct labour              | 5,000 |
| Variable factory overheads | 3,000 |

Fixed factory overheads is ₹1600 Lakhs and selling and distribution overheads will be ₹800 lakhs per annum. Fixed factory overheads are estimated on the basis of full capacity. The marketing department has come out with the following price and demand forecast for the first year.

| Selling Price Range | Sales Volume |
|---------------------|--------------|
| 14001 -24000        | 36000        |
| 24001 - 30000       | 32000        |
| 30001 - 36000       | 18000        |
| 36001 - 42000       | 10000        |

ABC Computers has decided to price the computers at full cost plus 20% for the first year

- Work out the price/unit at which ABC wishes to sell the computer for the first year and arrive at the demand.
- Can you work out a better proposal?
- Determine the profit and the value of stock for year 1 for figures obtained under (a) above following Marginal cost approach (for the demand arrived at based on company's pricing policy for 1st year)
- Determine the profit and the value of stock for year 1 for figures obtained under (a) above following Absorption cost approach (for the demand determined for better proposal for 1st year)

### Illustration-14 (BE Sales and Profit Analysis)

S K started a catering service to supply food to patients admitted in hospitals and those who were recovering from the pandemic. The cost of food and the disposable packing during a month of 30 days is ₹ 100 per meal. She sells each meal at ₹ 160. She has an arrangement with a delivery agency that quickly reaches for pick up and delivers to the customers. The agency charges her ₹ 120 per delivery, on condition that not more than 10 meals be transported by one person on one trip, i.e., ₹ 120 is charged irrespective of the number of meals subject to a maximum of 10 meals. She incurs a fixed expense of ₹ 1,44,000 per month.

- At what volume of sales will she break-even at the earliest? How many deliveries will be required?
- If she is able to sell 5000 meals in a month, what will be her maximum profits?
- What will be her worst income at this level? Assume she will not entertain any delivery for less than 3 meals per trip.

### Illustration-15 (Fixation of Selling Price)

Look Ahead Ltd. wants to fix proper selling prices for their products 'A' and 'B' which they are newly introducing in the market. Both these products will be manufactured in Department D, which is considered as a Profit Centre.

The estimated data are as under: -

|                           | A        | B        |
|---------------------------|----------|----------|
| Annual Production (units) | 1,00,000 | 2,00,000 |

|   |       |       |
|---|-------|-------|
|   | ₹     | ₹     |
| Direct Materials per unit                                 | 15.00 | 14.00 |
| Direct Labour per unit<br>(Direct Labour Hour Rate = ₹ 3) | 9.00  | 6.00  |

The proportion of overheads other than interest, chargeable to the two products are as under:

Factory overheads (50% fixed) 100% of Direct Wages. Administration overheads (100% fixed) 10% of factory costs. Selling and Distribution overheads (50% variable) ₹ 3 and ₹ 4 respectively per unit of products A and B.

The fixed capital investment in the Department is ₹50 lakhs. The working capital requirement is equivalent to 6 months stock of cost of sales of both the products. For this project a term loan amounting to ₹40 lakhs has been obtained from Financial Institutions on an interest rate of 14% per annum. 50% of the working capital needs are met by bank borrowing carrying interest at 18% per annum. The Department is expected to give a return of 20% on capital employed.

You are required to:

- Fix the selling price of products A and B such that the contribution per direct labour hour is the same for both the products.
- Prepare a statement showing in details of the overall profit that would be made by the Department.

### **Illustration-16 (Fixation of Selling Price)**

S.V.Ltd budgets to make 1,00,000 units of product P. The variable cost per unit is ₹ 10. Fixed costs are ₹6,00,000. The Finance Director suggested that the cost-plus approach should be used with a profit mark-up of 25%. However, the Marketing Director disagreed and has supplied the following information:

| Selling Price per unit<br>(₹) | Demand<br>(Unit) |
|-------------------------------|------------------|
| 18                            | 84,000           |
| 20                            | 76,000           |
| 22                            | 70,000           |
| 24                            | 64,000           |
| 26                            | 54,000           |

As Management Accountant of the Company, analyse the above proposals and comment.

## 3.2 : Pricing Decisions and Strategies

### Pricing Decisions and Strategies:

Pricing can make or break a business. Setting prices for the products or services does not simply come down to a simple calculation.

### Key Strategies

The key pricing strategies may, broadly, be listed as:

- i. Profit Orientation
  - ii. Competition Based
  - iii. Demand Based
  - iv. Cost Plus
  - v. Mark-up
- i. **Profit-Oriented:** In a sense, all pricing strategies are profit-oriented because, even if the prices are set with other objectives in mind, the entity still needs to earn a profit to stay in business.
  - ii. **Competitor-Based Pricing:** Competitor-based pricing uses the price that is set to appeal to customers and define the niche relative to the entity's competitors. Competitive pricing is charging a price that is comparable to other vendors selling the same item.
  - iii. **Demand Based:** Demand Based Pricing is a pricing method based on the customer's demand and the perceived value of the product. In this method the customer's responsiveness to purchase the product at different prices is compared and then an acceptable price is set..  
**Price Skimming,** the initial price is set very high so that only the customers with more purchasing power can buy the product. After that the price is reduced gradually so that the price-sensitive customers who were not able to buy the product at first can now buy.

**Price Discrimination** is where customers are charged differently based on different demand levels. For example, the airline ticket prices increase as the travel date gets closer. Inelastic demand during the end makes the price very high. Another type of price discrimination is when customers in different markets/areas are charged differently for the same product or service.

**Price Penetration** is the exact opposite to the price skimming. In this method the initial price is kept really low to attract more customers and increase the market share. Discounts, inaugural price, first 100 buyers etc are some of the methods.

- iv. **Cost Plus Pricing:** In cost-plus pricing, a set profit margin is added to the total cost of a product - including materials, labour and overhead. In cost-plus pricing, a company first determines its break-even price for the product..
- v. **Mark-up pricing:** Mark-up pricing is where a percentage is added to the wholesale cost of a product. Markup refers to the value that a firm adds to the cost price of a product. The value added is called the mark-up.

## Effective Pricing

Effective Pricing is the one that satisfies all the stakeholders, viz. the producer, distributor and the consumer.

Three important approaches that warrant discussion in relation to effective pricing are:

- (i) Product Differentiation
  - (ii) Cost Leadership
  - (iii) Yield Management
- (i) **Product Differentiation**

Product Differentiation is the process of distinguishing a product or service from others, to make it more attractive to a particular target market. This involves differentiating it from competitors' products as well as the firm's own products<sup>1</sup>.

The strategy of Product Differentiation is adopted to build up specific competitive advantages over competitors by tapping the unique resource endowments exclusive to an entity.

(ii) **Cost Leadership**

Cost Leadership is a generic strategy adopted to gain competitive advantage. The Strategy aims at the firm winning market share by appealing to cost-conscious or price-sensitive customers. This is achieved by having the lowest prices in the target market segment, or at least the lowest price to value ratio (price compared to what customers receive).

Cost leadership strategy drives the management to constantly work on reducing costs at every level and to remain competitive as also profitable. The three-fold dimensions, in this context, consist of:

- (a) Optimum Utilisation of Assets
- (b) Cost Conscious Culture
- (c) Concurrent Value Chain Control

(iii) **Yield Management**

The core strength of Cost Management is 'Prudent Deployment and Optimum Utilisation of the Available Resources'. At the same time, it is one of the biggest challenges too for every Cost

Manager, for many a resource tends remain idle for incomprehensible reasons. I

t could be an unfilled seat in a flight, a vacant berth in a train, an unoccupied hotel room, or an empty bed in a hospital. In all such eventualities, capacity unutilised is revenue lost. Yield Management, also known, as Revenue Management is the innovation that addresses the ticklish issue of underutilisation of available capacity.

## Example-1

A review, made by the top management of Sweat and Struggle Ltd. which makes only one product, of the result of the first quarter of the year revealed the following:

|                                     |          |
|-------------------------------------|----------|
| Sales in units                      | 10,000   |
| Loss                                | ₹ 10,000 |
| Fixed cost (for the year ₹1,20,000) | ₹ 30,000 |
| Variable cost per unit              | ₹ 8.00   |

The Finance Manager who feels perturbed suggests that the company should at least break-even in the second quarter with a drive for increased sales. Towards this, the company should introduce better packing which will increase the cost by ₹0.50 per unit.

The Sales Manager has an alternative proposal. For the second quarter additional sales promotion expenses can be increased to the extent of ₹5,000 and a profit of ₹ 5,000 can be aimed at during the period with increased sales. The Production Manager feels otherwise. To improve the demand, the selling price per unit has to be reduced by 3%. As a result the sales volume can be increased to attain a profit level of ₹ 4,000 for the quarter.

The Manager Director asks you as a Cost Accountant to evaluate the three proposals and calculate the additional sales volume that would be required in each case, in order to help him to take a decision.

## Example-2

Forward and Foundry Ltd. is feeling the effects of a general recession in the industry. Its budget for the coming half year is based on an output of only 500 tones of casting a month which is less than half of its capacity. The prices of casting vary with the composition of the metal and the shape of the mould, but they average ₹ 175 a tone. The following details are from the Monthly Production Cost Budget at 500 tone levels:

|                   | Core making | Melting and Pouring | Moulding | Cleaning and Grinding |
|-------------------|-------------|---------------------|----------|-----------------------|
|                   | ₹           | ₹                   | ₹        | ₹                     |
| Labour            | 10,000      | 16,000              | 6,000    | 4,500                 |
| Variable overhead | 3,000       | 1,000               | 1,000    | 1,000                 |

|   |        |        |       |       |
|---|--------|--------|-------|-------|
| Fixed overhead                              | 5,000  | 9,000  | 2,000 | 1,000 |
|   | 18,000 | 26,000 | 9,000 | 6,500 |
| Labour and O.H. rate per direct labour hour | 9.00   | 6.50   | 6.00  | 5.2   |

Operation at this level has brought the company to the brink of break-even. It is feared that if the lack of work continues, the company may have to lay off some of the most highly skilled workers whom it would be difficult to get back when the volume picks up later on. No wonder, the work's Manager at this Juncture, welcomes an order for 90,000 casting, each weighing about 40 lbs., to be delivered on a regular schedule during the next six months. As the immediate concern of the Works Manager is to keep his work force occupied, he does not want to lose the order and is ready to recommended a quotation on a no-profit and no-loss basis.

Materials required would cost ₹ 1 per casting after deducting scrap credits. The direct labour hour per casting required for each department would be:

|                              |      |
|------------------------------|------|
| <b>Core Making</b>           | 0.09 |
| <b>Melting and pouring</b>   | 0.15 |
| <b>Moulding</b>              | 0.06 |
| <b>Cleaning and grinding</b> | 0.06 |

Variable overheads would bear a normal relationship to labour cost in the melting and pouring department and in the moulding department. In core making, cleaning and grinding however, the extra labour requirements would not be accompanied by proportionate increases in variable overhead. Variable overhead would increase by ₹1.20 for every additional labour hour in core making and by 30 paise for every additional labour hour in cleaning and grinding. Standard wage rates are in operation in each department and no labour variances are anticipated. To handle an order as large as this, certain increases in factory overheads would be necessary amounting to ₹ 1,000 a month for all departments put together. Production for this order would be spread evenly over the six months period.

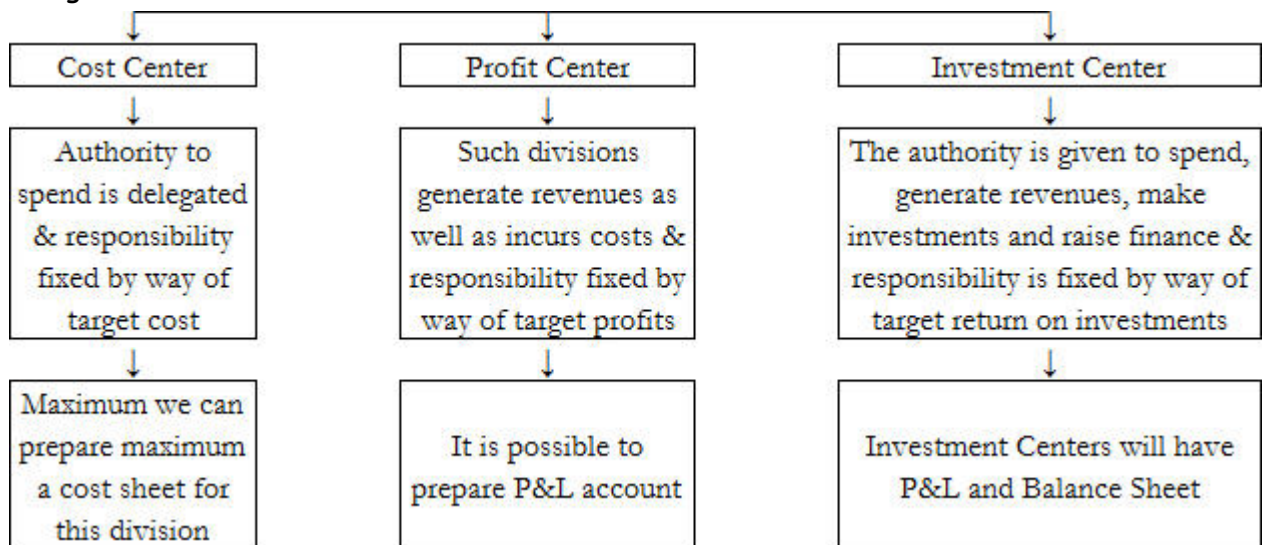
You are required to:

- Prepare a revised monthly labour and overhead cost budget, reflecting the addition of this order.
- Determine the lowest price at which quotation can be given for 90,000 castings without incurring a loss.

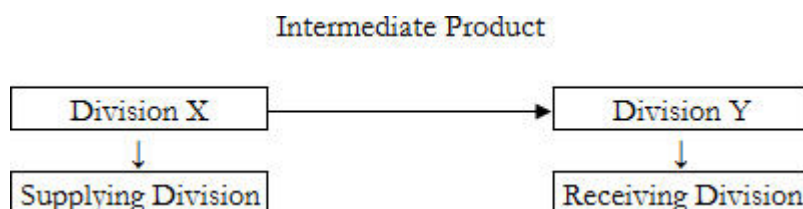
## 3.3 - Transfer Pricing

### Introduction

- 1) In a decentralized form of organization, the companies will be having divisions which can be categorized as follows:



- 2)



- 3) Division X manufactures Intermediate Product (IP) and transfers to Division Y which further process it and sell to outsiders as final product.  
 4) Basically the supplying division is a cost center. However, to promote inter-divisional

competition and improve efficiency companies may treat the supplying division as profit center.

- 5) The transfer of intermediate product will be deemed to be sales of the supplying division and the transfer is made at a price higher than cost which is called "**Transfer Price**".
- 6) Transfer price is selling price to supplying division, purchase cost to receiving division and neither selling price nor purchase cost for the company.
- 7) Thus transfer price will affect divisional profits but prima facie does not affect company's profit.
- 8) Transfer price affects the company's profits through output decision of divisions

## Concept:

Transfer Price (TP) is the notional value of goods and services transferred from one division to the other division of an organisation

## **Methods of Transfer Pricing**

There are several methods of fixation of 'Transfer Price' some of which are mentioned below:

- i. Pricing based on Cost: In these methods, "cost" is the base and following methods fall under this category
  - a. Actual cost
  - b. Cost Plus
  - c. Standard Cost
  - d. Marginal Cost
- ii. Market price as transfer price: Under this method, transfer price will be determined according to the prevailing market price
- iii. Negotiated pricing: Under this method, the transfer prices are fixed through negotiations between the selling and buying divisions.
- iv. Pricing based on opportunity cost: This pricing recognizes the minimum price that the selling division is ready to accept and the maximum price that the buying division is ready to pay.

The benefits of Transfer Pricing Policy may be listed as under:

- i. Divisional performance evaluation is made easier.
- ii. It will develop healthy inter-divisional competitive spirit.
- iii. Management by exception is possible.
- iv. It helps in co-ordination of divisional objectives in achieving organizational goals.
- v. It provides useful information to the top management in making policy decisions like expansion, sub-contracting, closing down of a division, make or buy decisions, etc.,
- vi. Transfer Price will act as a check on supplier's prices.
- vii. It fosters economic entity and free enterprise system.

## SMQs

**Illustration-17**

Your company fixes the inter-divisional transfer prices for its products on the basis of cost, plus a return on investment in the division. The Budget for Division A for 2021-22 appears as under:

| Particulars                       | (RS)                    |
|-----------------------------------|-------------------------|
| Fixed Assets                      | 5,00,000                |
| Current assets                    | 3,00,000                |
| Debtors                           | 2,00,000                |
| Annual Fixed Cost of the Division | 8,00,000                |
| Variable Cost per unit of Product | 10                      |
| Budgeted Volume                   | 4,00,000 units per year |
| Desired ROI                       | 28%                     |

Determine the transfer price for Division A.

**Illustration-18**

Transferor Ltd. has two processes, Preparing and Finishing. The normal output per week is 7,500 units (Completed) at a capacity of 75%. Transferee Ltd. had production problems in preparing and requires 2,000 units per week of prepared material for their finishing processes. The existing cost structure of one prepared unit of Transferor Ltd. at existing capacity is as follows:

Material = ₹ 2.00 (variable 100%) Labour = ₹2.00 (Variable 50%) Overhead = ₹4.00 (variable 25%)

The sale price of a completed unit of Transferor Ltd is ₹16 with a profit of ₹4 per unit.

**Required:**

Construct the effect on the profits of Transferor Ltd., for six months (25 weeks) of supplying units to Transferee Ltd. with the following alternative transfer prices per unit:

- (i) Marginal Cost
- (ii) Marginal Cost + 25%
- (iii) Marginal Cost + 15% Return on capital (assume capital employed as ₹20 lakhs)

- (iv) Existing Cost
- (v) Existing Cost + a portion of profit on the basis of  $\{(Preparing\ cost \div Total\ Cost) \times Unit\ Profit\}$
- (vi) At an agreed market price of ₹8.50. Assume no increase in fixed cost.

### Illustration-19

A Company with two manufacturing divisions is organised on profit centre basis. Division 'A' is the only source for the supply of a component that is used in Division B in the manufacture of a product KLIM. One such part is used in each unit of the product KLIM. As the demand for the product is not steady, Division B can obtain orders for increased quantities only by spending more on sales promotion and by reducing the selling prices. The Manager of Division B has accordingly prepared the following forecast of sales quantities and selling prices.

| Sales units per day | Average Selling price per unit of KLIM (₹) |
|---------------------|--|
| 1,000               | 5.25                                       |
| 2,000               | 3.98                                       |
| 3,000               | 3.30                                       |
| 4,000               | 2.78                                       |
| 5,000               | 2.40                                       |
| 6,000               | 2.01                                       |

The manufacturing cost of KLIM in Division B is ₹3,750 for first 1,000 units and ₹750 per 1,000 units in excess of 1,000 units. Division A incurs a total cost of ₹1,500 per day for an output to 1,000 components and the total cost will increase by ₹900 per day for every additional 1,000 components manufactured. The Manager of Division A states that the operating results of his Division will be optimised if the transfer price of the component is set at ₹1.20 per unit and he has accordingly set the aforesaid transfer price for his supplies of the component to Division A.

You are required to:

- (a) Prepare a schedule showing the profit at each level of output for Division A and Division B.
- (b) Find the profit of the company as a whole at the output level which
  - (i) Division A's net profit is maximum.
  - (ii) Division B's net profit is maximum.
- (c) If the Company is not organised on profit centre basis, what level of output will be chosen to yield the maximum profit.

### Illustration-20

Division A is a profit centre which produces three products X, Y and Z. Each product has an external market. The details are as follows:

|   | X  | Y  | Z  |
|---|----|----|----|
| External market price per unit (₹)            | 48 | 46 | 40 |
| Variable cost of production in division A (₹) | 33 | 24 | 28 |

|  |   |   |   |
|--|---|---|---|
| Labour hours required per unit in division A | 3 | 4 | 2 |
|--|---|---|---|

Product Y can be transferred to Division B, but the maximum quantity that might be required for transfer is 300 units of Y.

|                                 |           |           |           |
|---------------------------------|-----------|-----------|-----------|
|                                 | X         | Y         | Z         |
| The maximum external sales are: | 800 units | 500 units | 300 units |

Instead of receiving transfers of Product Y from Division A, Division B could buy similar product in the open market at a slightly cheaper price of ₹45 per unit.

What should the transfer price be for each unit for 300 units of Y, if the total labour hours available in Division A are?

- (a) 3800 hours
- (b) 5600 hours.

### Illustration-21

P.H. Ltd. has two manufacturing departments organised into separate profit centres known as the Basic unit and Processing unit. The Basic unit has a production capacity of 4,000 tonnes per month of Chemvax but at present its sales are limited 2,000 tonnes to outside market and 1,200 tonnes to the Processing unit.

The transfer price for the year 2021 was agreed at ₹ 400 per tonne. This price has been fixed in line with the external wholesale trade price on 1st January 2021. However due to heavy competition the Basic unit has been forced to reduce the wholesale trade price to ₹360 per tonne with effect from 1st June, 2021. This price however was not made applicable to the sales made to the Processing unit of the company. The Processing unit applied for revision of the price as applicable to the outside market buyers as from 1st June 2021 but the same was turned down by the basic unit.

The Processing unit refines Chemvax and packs the output known as Colour-X in drums of 50kgs each. The selling price of colour-X is ₹ 40 per drum. The Processing unit has a potential of selling a further quantity of 16,000 drums of colour-X provided the overall price is reduced to ₹32 per drum. In that event it can buy the additional 800 tonnes of Chemvex from the basic unit whose capacity can be fully utilised. The outside market will not however absorb more than the present quantity of 2,000 tonnes. The cost data relevant to the operations are:

|                      | Basic Unit (₹) | Processing Unit (₹) |
|----------------------|----------------|---------------------|
| Raw Materials /tonne | 70             | Transfer price      |
| Variable Cost /tonne | 140            | 170                 |
| Fixed Costs /month   | 3,00,000       | 1,20,000            |

Required:

- (i) Prepare statement showing the estimated profitability for June 2021 for each unit and the company as a whole on the following bases:
- At 80% and 100% capacity utilisation of the Basic unit at the market price and transfer price to the Processing unit of ₹400 per tonne.
  - At 80% capacity utilisation of the basic unit at the market price of ₹360 per tonne and the transfer price to the Processing unit of ₹400 per tonne.
  - At 100% capacity utilisation of the Basic unit at the market price and transfer price to the Processing unit of ₹360 per tonne.
- (ii) Comment on the effect of the company's transfer pricing policy on the profitability of the Processing Unit.

## Illustration-22

SV Ltd. manufactures a product which is obtained basically from a series of mixing operations. The finished product is packaged in the company made glass bottles and packed in attractive cartons. The company is organized into two independent divisions viz. one for the manufacture of the end product and the other for the manufacture of glass bottles. The Product manufacturing division can buy all the bottle requirements from the bottle manufacturing division.

The General Manager of the bottle manufacturing division has obtained the following quotations from the outside manufacturers for the empty bottles.

| Volume               | Purchase Value   |
|----------------------|------------------|
| <b>Empty bottles</b> | <b>Total (₹)</b> |
| 8,00,000             | 14,00,000        |
| 12,00,000            | 20,00,00         |

A cost analysis of the bottle manufacturing division for the manufacture of empty bottles reveals the following production costs:

| Volume               | Purchase Value   |
|----------------------|------------------|
| <b>Empty bottles</b> | <b>Total (₹)</b> |
| 8,00,000             | 10,40,000        |
| 12,00,000            | 14,40,000        |

The production cost and sales value of the end product marketed by the product manufacturing division are as under.

| Volume                         | Total cost of end product* | Sales Value                |
|--------------------------------|----------------------------|----------------------------|
| <b>(Bottle of end product)</b> |                            | <b>(Packed in bottles)</b> |
| 8,00,000                       | ₹ 64,80,000                | ₹ 91,20,000                |
| 12,00,000                      | ₹ 96,80,000                | ₹ 1,27,80,000              |

There has been considerable discussion at the corporate level as to the use of proper price for transfer of empty bottles from the bottle manufacturing division to product manufacturing division. This interest is heightened because a significant portion of the Divisional General Manager's salary is in incentive bonus based on profit centre results. As the corporate management accountant responsible for defining the proper transfer prices for the supply of empty bottles by the bottle manufacturing division to the product manufacturing division, you are required to show for the two levels of volume of 8,00,000 and

12,00,000 bottles, the profitability by using

- i. Market price and
- ii. Shared profit relative to the cost involved basis for the determination of transfer prices.

The profitability position should be furnished separately for the two divisions and the company as a whole under each method. Discuss also the effect of these methods on the profitability of the two divisions.

\* (Excluding cost of empty bottles)

### **Illustration-23**

XYZ Ltd which has a system of assessment of Divisional Performance on the basis of residual income has two Divisions, Alpha and Beta. Alpha has annual capacity to manufacture 15,00,000 numbers of a special component that it sells to outside customers, but has idle capacity. The budgeted residual income of Beta is ₹ 1,20,00,000 while that of Alpha is ₹1,00,00,000.

Other relevant details extracted from the budget of Alpha for the current year were as follows.

| Particulars              |                                 |
|--------------------------|---------------------------------|
| Sale (outside customers) | 12,00,000 units @ ₹180 per unit |
| Variable cost per unit   | ₹160                            |
| Divisional fixed cost    | ₹80,00,000                      |
| Capital employed         | ₹7,50,00,000                    |
| Cost of Capital          | 12%                             |

Beta has just received a special order for which it requires components similar to the ones made by Alpha. Fully aware of the idle capacity of Alpha, beta has asked Alpha to quote for manufacture and supply of 3,00,000 numbers of the components with a slight modification during final processing. Alpha and Beta agree that this will involve an extra variable cost of ₹5 per unit. Calculate the transfer price which Alpha should quote to Beta to achieve its budgeted residual income.

### **Illustration-24**

XY Co. has Profit Centre Divisions X and Y, making products X and Y respectively. Each unit of Y requires one unit of X and Y can sell a maximum of 50,000 units in the external market at a selling price of ₹150 per unit. X has the capacity to produce 1,00,000 units of X. The variable cost per unit is 12. Fixed costs are ₹7,20,000. X can sell the following quantities in the external market:

| Price per unit (₹) | Demand Units   |
|--------------------|----------------|
| 18                 | 84,000         |
| 20                 | 76,000         |
| 22                 | 70,000         |
| 24                 | 64,000         |
| 26                 | 54,000 or less |

Assume no stock to build up for X or Y.

Y can purchase its requirement from the external market at ₹22 per unit, but has to incur a bulk transportation cost of ₹1,50,000 for any quantity, which will not be incurred on transfers from X.

**Required:**

- (i) Assuming no demand from Y, what will be the best strategy for X?
- (ii) What will be the minimum transfer price that X will agree to if X has to supply 50,000 units to Y? What price will Y offer as the maximum?
- (iii) If Y is acceptable to partial supplies, what will be X's best strategy under no compulsion to transfer, but with the option to transfer as many units that it wants to? What will be the quantity that X will agree to transfer and the corresponding price, assuming both divisions agree to share the benefits of transfer equally?
- (iv) What is the best strategy of the company? Will the company's overall strategy differ from the individual divisions' strategy? Compute the benefits/disadvantages/indifference between the divisional best and company best strategies.

Present relevant calculations to substantiate all your answers.

### **Illustration-25**

A company is organized on decentralized lines, with each manufacturing division operating as a separate profit centre. Each division has full authority to decide on sale of the division's output to outsiders and to other divisions.

Division C has always purchased its requirements of a component from Division A. but when informed that Division A was increasing its selling price to ₹150, the manager of Division C decided to look at outside suppliers. Division C can buy the components from an outside supplier for ₹135. But Division A refuses to lower its price in view of its need to maintain its return on the investment. The top management has the following information:

C's annual purchase of the component: 1,000 units A's variable costs per unit: ₹120

A's fixed cost per unit: ₹20

**Required:**

- (i) Will the company as a whole benefit, if Division C buys the component at ₹135 from an outside supplier?
- (ii) If Division A did not produce the material for Division C, it could use the facilities for other activities resulting in a cash operating savings of ₹18,000. Should Division C then purchase from outside sources?
- (iii) Suppose there is no alternative use of Division A's facilities and the market price per unit for the component drops by ₹20. Should Division C now buy from outside?

### **Illustration-26**

A Company is organized on decentralized lines, with each manufacturing division operating as a separate profit centre. Each Division Manager has full authority to decide on sale of division's output to outsiders

or to other divisions. Division A manufactures a single standardized product. Some output is sold externally and remaining is transferred to Division X wherein is a sub-assembly in the manufacture of that Division's product. The unit cost of Division A and Division X is as follows:

| Particulars                         | Division A | Division X |
|-------------------------------------|------------|------------|
| Transfer from Division A to X       | -          | ₹ 42.00    |
| Direct Material                     | ₹6.00      | ₹ 35.00    |
| Direct Labour                       | ₹3.00      | ₹4.50      |
| Direct Expenses                     | ₹3.00      | -          |
| Variable Manufacturing Overheads    | ₹3.00      | ₹18.00     |
| Fixed Manufacturing Overheads       | ₹6.00      | ₹18.00     |
| Variable Selling & Packing Expenses | ₹3.00      | ₹2.50      |
| Total                               | ₹24.00     | ₹120.00    |

Division A sold 40,000 units annually at the Standard Price of ₹45 in the external market. In addition to the external sales 10,000 units are transferred annually to Division X at an internal price of ₹42 per unit. Variable Selling and Packing Expenses are not incurred by the Supplying Division for the internal transfer of the product. Division X incorporates the transferred goods into a more advanced product. The Manager of Division X disagrees with the basis used to set the Transfer Price. He argues that Transfer Price should be made at Variable Cost, since he claims that his Division is taking output that Division A should be unable to sell at a price of ₹45. He also submitted a report of the relationship between Selling Price and demand, to support of his disagreement.

The report of customer demand at various Selling Prices for Division A and for Division X is as follows -

|                   |                        |              |              |              |
|-------------------|------------------------|--------------|--------------|--------------|
| <b>Division A</b> | Selling Price per unit | ₹30          | ₹45          | ₹60          |
|                   | Demand                 | 60,000 units | 40,000 units | 20,000 units |
| <b>Division X</b> | Selling Price per unit | ₹120         | ₹135         | ₹150         |
|                   | Demand                 | 15,000 units | 10,000 units | 5,000 units  |

The Company has sufficient capacity to meet demand at various Selling Prices. Internal transfer demanded units will be decided by X Division.

**Required:**

1. To calculate Divisional Overall Profitability, if Division A transfers demanded units to X at a price of ₹42.
2. To calculate Divisional and Overall Profitability, if Division A transfers demanded units to X at Variable Cost.
3. In place of Internal Transfers, Division A can sell 10,000 units of its product in a new external market without affecting existing market, at a price of ₹32 per unit and X Division can purchase these units at the rate of ₹31 in the open market. Calculate Company's Profit by following the above strategies.

## 3.4 : Relevant Cost Analysis

### Relevant Costs

The costs which should be used for decision making are often referred to as "Relevant Costs".

**Relevant Cost Analysis enables managers to choose between alternative choices in situations such as:**

- i. Accept or reject an order when there is excess capacity
- ii. Accept or reject an order when there is no excess capacity
- iii. Outsource a product or service
- iv. Add, drop a product, service or department
- v. Sell or process further
- vi. Optimization of limited resources or working under constraint.

Relevant cost analysis is an incremental analysis which considers only relevant costs i.e., the costs that differ between alternatives and ignores sunk costs i.e., costs which have been incurred, which cannot be changed and hence are irrelevant to the situation.

**Normally, the following categories of costs are considered as Relevant Costs:**

- i. Differential Costs
  - ii. Incremental or Marginal Costs
  - iii. Opportunity Costs
  - iv. Avoidable costs
  - v. Replacement Costs
  - vi. Imputed Costs
  - vii. Out-of-Pocket Costs
- (i) **Differential Costs:** A differential cost is the difference in costs under two or more decision alternatives, specifically, two different projects or situations. It is also the change in the cost due to change in activity from one level to another.
- (ii) **Incremental or Marginal Costs:** Incremental or marginal cost is a cost associated with producing an additional unit.

- (iii) **Opportunity Costs:** Opportunity cost is the cost of an opportunity of Income or benefits foregone.
- (iv) **Avoidable costs:** Avoidable Costs are those which under given conditions of performance efficiency should not have been incurred. These are costs that can be eliminated in whole or in part by choosing one alternative over another.
- (v) **Replacement Costs:** Replacement cost is the cost of replacement at current market price and is relevant for decision-making.

It is the cost at which there could be purchase of an asset or material identical to that which is being replaced.
- (vi) **Imputed Costs:** Imputed costs are hypothetical or notional costs, not involving cash outlay. Imputed costs are computed only for the purpose of decision making.

In this respect, imputed costs are similar to opportunity costs. Interest on funds generated internally, payment for which is not actually made is an example of imputed cost.

When alternative capital investment projects are being considered out of which one or more are to be financed from internal funds, it is necessary to take into account the imputed interest on own funds before a decision is arrived at.
- (vii) **Out-of-Pocket Costs:** These are costs that entail current or near future cash outlays for the decision at hand. Such costs are relevant for decision - making, as these will occur in near future.

This cost concept is a short-run concept and is used in decisions on fixing Selling Price in recession, Make or Buy, etc. Out-of-Pocket costs can be avoided or saved if a particular proposal under consideration is not accepted.

## Irrelevant Costs

Irrelevant costs are costs which are not relevant for a specific purpose or situation. The examples of irrelevant cost includes:

- i. Sunk Costs
  - ii. Committed Costs
  - iii. Unavoidable Costs
  - iv. Absorbed Costs
- (i) **Sunk Costs:** Sunk costs are historical costs which are incurred i.e., sunk in the past and are not relevant to the particular decision.
  - (ii) **Committed Costs:** Committed Costs are costs that will occur in the future, and cannot be changed.
  - (iii) **Unavoidable Costs:** Unavoidable Costs are costs that are inescapable costs, and which are essentially to be incurred, within the limits or norms provided for.
  - (iv) **Absorbed Costs:** Absorbed costs are indirect costs that are absorbed by the product or service. Absorbed fixed costs which do not change due to increase or decrease in activity is irrelevant to decision-making. However, if Fixed Costs are specific, they become relevant for decision-making.

## Relevant Cost of Materials

- 1) In Stock

- i. Regularly Used - Relevant Cost (RC) = Purchase Price (or) Replacement Cost
  - ii. Not Regularly Used
    - a) Has Disposal Value - Relevant Cost (RC) = Realizable Value
    - b) Has Alternative Use - Relevant Cost (RC) = The Cost of Material Substituted
    - c) Has Both - Relevant Cost (RC) = Higher of the Two
- 2) Not in Stock - Relevant Cost (RC) = Purchase Price

## Relevant Cost of Labour

- 1) Skilled Labour - Paid on Time guaranteed basis
  - i. Currently Idle - Relevant Cost (RC) = Nil
  - ii. Busy
    - a) Cannot be substituted - Relevant Cost = Contribution lost from abandoned job
    - b) Can be substituted - Relevant Cost = Wages paid to the substitute worker
- 2) Unskilled Labour - Appointed on Hire & Fire Basis, hence Relevant Cost is Wages paid

## Relevant Cost of Overheads

- 1) Variable Overheads - Always Relevant
- 2) Fixed Overheads
  - i. General Fixed Cost - Irrelevant
  - ii. Specific Fixed Cost - Relevant

## SMQs

### Illustration-27

Company A manufactures bicycles. It can produce 1,000 units in a month for a fixed cost of ₹3,00,000 and variable cost of ₹ 500 per unit. Its current demand is 600 units which it sells at ₹1,000 per unit. It is approached by Company B for an order of 200 units at ₹700 per unit. Should the company accept the order?

### Illustration-28

A machine which originally cost ₹12,000 has an estimated life of 10 years and it depreciated at the rate of ₹1,200 per year. It has been unused for some time, however, as expected production orders did not materialise. A special order has now been received which would require the use of the machine for two months. The current net realisable value of the machine is ₹8,000. If it is used for the job, its value is expected to fall to ₹7,500. The net book value of the machine is ₹8,400. Routine maintenance of the machine currently costs ₹40 per month. With use, the cost of maintenance and repairs would increase to ₹60 per month. What would be the relevant cost of using the machine for the order so that it can be charged as the minimum price for the order?

### Illustration-29

X Ltd. has been approached by a customer who would like a special job to be done for him and is willing

to pay ₹22,000 for it. The job would require the following materials:

| Materials | Total units required | Units already in stock | Book Value of units in stock | Realisable Value | Replacement Cost |
|-----------|----------------------|------------------------|------------------------------|------------------|------------------|
|           |                      |                        | (₹)/unit                     | (₹)/unit         | (₹)/unit         |
| A         | 1,000                | 0                      | —                            | —                | 6                |
| B         | 1,000                | 600                    | 2                            | 2.5              | 5                |
| C         | 1,000                | 700                    | 3                            | 2.5              | 4                |
| D         | 200                  | 200                    | 4                            | 6                | 9                |

- (i) Material B is used regularly by X Ltd. and if stocks were required for this job, they would need to be replaced to meet other production demand.
- (ii) Materials C and D are in stock as the result of previous excess purchase and they have a restricted use. No other use could be found for material C but material D could be used in another job as substitute for 300 units of material which currently costs ₹5 per unit (of which the company has no units in stock at the moment.)

What are the relevant costs of material, in deciding whether or not to accept the contract? Assume all other expenses on this contract to be specially incurred besides the relevant cost of material is ₹550.

### Illustration-30

Chakra Ltd. manufactures Mixer Grinders. The manufacture involves an assembly of various parts which are processed in the machine shop and purchased components. The on/off switch is presently being purchased from a vendor at ₹4.50 each, annual requirement being 20,000 pieces. The production manager has put up a proposal two months back to make the switch in the machine shop. He had suggested that the company would make profit and save taxes on bought out switch. The costing department was asked to make an estimate of making the item which showed that the cost of making was ₹4.73. The purchase department continues buying the item on the basis of the cost estimate given to them. Recently, the Vendor has sent a letter requesting the purchase department to grant increase in price of 10% minimum per switch as the input costs had gone up. The costing department was once again requested to estimate cost of making the switch. The costing department re-estimated the costs using current prices and observed that the cost of making has gone up to ₹5.33. Purchase department again decided to continue buying as it was cheaper to buy than make.

The cost estimate prepared by the costing department was as under:

|                  | Annual costs |             |
|------------------|--------------|-------------|
|                  | Previous (₹) | Current (₹) |
| Direct Materials | 40,000       | 48,000      |
| Direct Labour    | 20,000       | 22,000      |
| Overheads        | 30,000       | 31,500      |

|                             |        |          |
|-----------------------------|--------|----------|
| Total cost at current price | 90,000 | 1,01,500 |
| Add: expected increase 5%   | 4,500  | 5,075    |
| Expected manufacturing cost | 94,500 | 1,06,575 |
| Cost per price              | 4.73   | 5.33     |

Twenty-five per cent of the overheads are fixed.

**Required:** Do you agree with the decision of buying considering the relevant costs? If the cost of making or buying is more or less, what factors other than cost will influence making decision?

### Illustration-31

The Officers' Recreation Club of a large public sector undertaking has a cinema theater for the exclusive use of themselves and their families. It is a bit difficult to get good motion pictures for show and so pictures are booked as and when available.

The theater has been showing the picture 'Blood Bath' for the past two weeks. This picture, which is strictly for adults only has been a great hit and the manager of the theater is convinced that the attendance will continue to be above normal for another two weeks, if the show of 'Blood Bath' is extended. However, another popular movie, eagerly looked forward to by both adults and children alike, 'Appu on the Airbus' is booked for next two weeks. Even if 'Blood Bath' is extended the theater has to pay the regular rental on 'Appu on the Airbus' as well.

Normal attendance at theater is 2,000 patrons per week, approximately one fourth of whom are children under the age of 12. Attendance of 'Blood Bath' has been 50% greater than the normal total. The manager believes that this would taper off during the second two weeks, 25% below that of the first two weeks, during the third week and  $33\frac{1}{3}$  % below that of the first two weeks during the fourth week. Attendance for 'Appu on the Airbus' would be expected to be normal throughout its run regardless of the duration.

All runs at the theater are shown at a regular price of ₹2 for adults and ₹1.20 for children lower than 12. The rental charge for 'Blood Bath' is ₹900 for one week or ₹1,500 for two weeks. For 'Appu on the Airbus' it is ₹750 for one week or ₹1,200 for two weeks. All other operating costs are fixed - ₹4,200 per week, except for the cost of potato wafers and cakes, which average 60% of their selling price. Sales of potato wafers and cakes regularly average ₹1.20 per patron, regardless of age.

The Manager can arrange to show 'Blood Bath' for one week and 'Appu on the Airbus' for the following week or he can extend the show of 'Blood Bath' for two weeks or else he can show 'Appu on the Airbus' for two weeks as originally booked.

Show by computation, the most profitable course of action he has to pursue.

### Illustration-32

Tiptop Textiles manufactures a wide range of fashion fabrics. The company is considering whether to add a further product 'Superb' to the range. A market research survey recently undertaken at a cost of ₹50,000 suggests that demand of the 'Superb' will last for only one year, during which 50,000 units could be sold at ₹25 per unit. Production and sale of 'Superb' would take place evenly throughout the year. The following information is available regarding the cost of manufacturing 'Superb'.

**Raw Materials:** Each 'Superb' would require 3 types of raw materials Posh, Flash and Splash. Quantities required, current stock levels and cost of each raw material are shown below. Posh is used regularly by the company and stocks are replaced as they are used. The current stock of Flash is the result of over buying for an earlier contract. The material is not used regularly by Tiptop Textiles and any stock that was not used to manufacture 'Superb' would be sold. The Company does not carry a stock of splash and the units required would be specially purchased.

| Raw Material | Meters reqd. per unit of Superb | Current Stock | Costs per meter of Raw Material |                          |                     |
|--------------|---------------------------------|---------------|---------------------------------|--------------------------|---------------------|
|              |                                 |               | Original Cost                   | Current Replacement Cost | Current Resale cost |
|              |                                 |               | (₹)                             | (₹)                      | (₹)                 |
| Posh         | 1.00                            | 1,00,000      | 2.10                            | 2.50                     | 1.80                |
| Flash        | 2.00                            | 60,000        | 3.30                            | 2.80                     | 1.10                |
| Splash       | 0.50                            | 0             | 5.50                            | 5.00                     | 5.00                |

**Labour:** Production of each 'Superb' would require a quarter of an hour of skilled labour and two hours of unskilled labour @ ₹20 per hour for unskilled labour. In addition, one foreman would be required to devote all his working time for one year in supervision of the production of superb. He is currently paid an annual salary of ₹1,50,000. Tiptop Textiles is currently finding it very difficult to get skilled labour. The skilled workers needed to manufacture 'Superb' would be transferred from another job on which they are earning a contribution surplus of ₹4.50 per labour hour, comprising sales revenue of ₹40.00 less skilled labour wages of ₹30.00 and other variable costs of ₹5.50. It should not be possible to employ additional skilled labour during the coming year. If 'Superb' are not manufactured, the company expects to have available 2,00,000 surplus unskilled labour hours during the coming year. Because the company intends to expand in the future, it has decided not to terminate the services of any unskilled worker in the foreseeable future. The foreman is due to retire immediately on an annual pension payable by the company of ₹60,000. He has been prevailed upon to stay on for a further year and to defer his pension for one year in return for his annual salary.

**Machinery:** Two Machines would be required to manufacture 'Superb' MT 4 and MT 7. Details of each machine are as under:

|      |                  | Start of the year (₹) | End of the year (₹) |
|------|------------------|-----------------------|---------------------|
| MT 4 | Replacement cost | 80,000                | 65,000              |
|      | Resale Value     | 60,000                | 47,000              |
| MT 7 | Replacement cost | 13,000                | 9,000               |
|      | Resale Value     | 11,000                | 8,000               |

Straight-line depreciation has been charged on each machine for each year of its life. Tiptop Textiles owns a number of MT 4 machines, which are used regularly for various products. Each MT 4 is replaced as soon it reaches the end of its useful life. MT 7 machines are no longer used and the one which would

be used for 'Superb' is the only one the company now has. If it were not used to produce 'Superb' it would be sold immediately.

**Overheads:** A predetermined rate of recovery for overheads is in operation and the fixed overheads are recovered fully from the regular production at ₹3.50 per labour hour. Variable overhead costs for Superb are estimated at ₹1.20 per unit produced.

For decision-making, incremental costs based on relevant costs and opportunity costs are usually computed. You are required to compute such a cost sheet for 'Superb' with all details of material, labour overhead etc., substantiating the figures with necessary explanations.

### Illustration-33

A Company can produce any of its 4 products, A, B, C and D. Only one product can be produced in a production period and this has to be determined at the beginning of the production run. The production Capacity is 1,000 hours. Whatever is produced has to be sold and there is no Inventory build-up to be considered beyond the production period. The following information is given:

| Particulars  | A      | B                     | C                     | D       |
|--|--------|-----------------------|-----------------------|---------|
| Selling Price (₹ Per unit)                           | 40     | 50                    | 60                    | 70      |
| Variable Cost (₹ Per unit)                           | 30     | 20                    | 20                    | 30      |
| No. of units that can be sold                        | 1,000  | 600                   | 900                   | 600     |
| No. of production hours required per unit of product | 1 hour | 1 hour and 15 minutes | 1 hour and 15 minutes | 2 hours |

What are the Opportunity Costs of A, B, C and D?

### Illustration-34

The accountant of XYZ Ltd. has prepared the following estimate on the basis of which he has advised that a contract should not be accepted at the price offered. The estimate (₹) was as follows:

|  |                  |
|--|------------------|
| Material X in stock at original cost         |                  |
| Material Y on order at contract price        |                  |
| Material Z to be ordered at current price    |                  |
| Skilled Labour                               |                  |
| Unskilled Labour                             |                  |
| Supervisory Cost                             |                  |
| General Overheads                            |                  |
| <b>Total Cost</b>                            | <b>17,50,000</b> |
| Price offered                                |                  |
| <b>Net Loss (Price offered - Total Cost)</b> | <b>3,50,000</b>  |

The following details are available about the cost components listed above.

a. Material X is an obsolete material. It can be used on another product W, the material for which is

available at ₹1,35,000 (Material X requires some adaptation to be used which costs ₹15,000). It may take some time before W's order is confirmed. Until then storage will cost ₹12,000.

- b. Material Y is ordered for some other product which is no longer required. It now has a residual value of ₹1,55,000.
- c. Skilled labour can work on other contracts which are presently operated by semi-skilled labour at a cost of ₹4,00,000.
- d. Unskilled labour are specifically employed for this contract
- e. Supervisory staff will remain whether or not the contract is accepted. Only two of them can replace other positions where the salary is ₹50,000.
- f. Overheads are charged at  $33\frac{1}{3}\%$  of skilled labour. Only ₹1,25,000 would be avoidable.

You are required to answer the following questions using relevant cost approach:

- (a) Relevant costs of material X, Y and Z
- (b) Relevant cost of labour-skilled and unskilled
- (c) Relevant cost of Supervisory cost and General overheads
- (d) If the contract is accepted, what would be the resulting financial impact on XYZ's profit

## 3.5 : Target Costing

### Introduction:

Target costing popular among Japanese firms such as



1. It is a management technique wherein prices are **determined by market conditions**.
2. The company is a **price taker rather than a price maker**.
3. It aims at **profit planning**.
4. It is a part of management's strategy to focus on **cost reduction & effective cost management**.

### Advantages of Target costing:

1. Innovation
2. Competitive advantage.
3. Market driven management.
4. Cost reduction.

### Kaizen Costing

- Kaizen costing refers to the ongoing continuous improvement program that focuses on the reduction of waste in the production process, thereby further lowering costs below the initial targets specified during the design phase.
- Activities in kaizen costing include elimination of waste in production, assembly, and distribution processes, as well as the elimination of unnecessary work steps in any of these areas. Thus, kaizen costing is intended to repeat many of the value engineering steps, continuously and constantly refining the process, thereby eliminating out extra costs at each stage.
- Cost reductions resulting from kaizen costing are much smaller than those achieved with value engineering



**Toyota's experience of kaizen costing:**

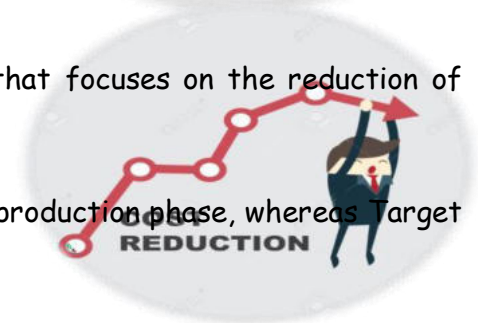
Toyota aggressively implemented kaizen costing to reduce costs in a manufacturing phase.

- (a) Kaizen goals have been set by top management.
- (b) About 2 millions suggestions were received from Toyota employees in 1 year. 95% of them were adopted.
- (c) This is a prime example of employee empowerment



**Cost Reduction:**

- (a) It refers to ongoing continuous improvement program that focuses on the reduction of waste in the production process.
- (b) It is a cost reduction technique.
- (c) Kaizen costing is applied to products that are already in production phase, whereas Target costing is applied when the products are in development phase.



## Difference between Kaizen Costing and Standard Costing

| Kaizen Costing   | Standard Costing                                  |
|--|---|
| It is used for cost Control.   | It is used for cost reduction.                    |
| The aim is to meet cost standards                                      | The aim is to achieve cost reduction targets      |
| Employees are often viewed as the cause of problems                    | Employees are viewed as source to find solutions. |
| It is assumed that current manufacturing conditions remains unchanged. | It assumes continuous improvement                 |

### Illustration-35

A Company requires ₹ 85,00,000 in sales to meet its target net profit. Its contribution margin is 30% and the fixed costs are ₹15,00,000. What is the target net profit?

### Illustration-36

Marketing department of an organisation estimates that 40,000 new mixers could be sold annually at a price of ₹6,000 each. To design, develop and produce these new mixers an investment of ₹40,00,00,000 would be required. The company desires a 15% return on investment (ROI). What should be the target cost to manufacture, sell, distribute and service one mixer?

### Illustration-37

T Ltd. produces and sells a product. The company expects the following revenues and costs in 2022:

Revenues (400 sets sold @ ₹600 per product) = ₹2,40,000

Variable costs = ₹ 1,60,000

Fixed costs = ₹ 50,000

What amount of sales must T Ltd. has to earn a target net income of ₹63,000 if they have a tax rate of 30%?

### Illustration-38

Desktop Co. manufactures and sells 7,500 units of a product. The full cost per unit is ₹100. The Company has fixed Its price so as to earn a 20% return on an Investment of ₹ 9,00,000. What will be the Target selling price?

### Illustration-39

'B' manufacturing Company sells its product at ₹1,000 per unit. Due to competition, its competitors are likely to reduce the price by 15%. B wants to respond aggressively by cutting down its price by 20% and expects that the present volume of 1,50,000 units p.a. will increase to 2,00,000 p.a. B wants to earn a 10% target profit on sales. What should be the Target cost per unit of the product?

## Illustration-40

You, the manager of a paper mill (XYZ Ltd.), have recently come across a particular type of paper, which is being sold at a substantially lower rate (by another company ABC Ltd.) than the price being charged by your own mill. The value chain for one of MT of such paper for ABC Ltd is follows:

“ABC Ltd. → Merchant → Printer → Customer”.

ABC Ltd sells this particular paper to the merchant at the rate of ₹30,400 per MT. ABC Ltd pays for the freight which amounts to ₹600 per MT. Average sales returns and allowances amount to 4% of sales and approximately equal to ₹1200 per MT.

The value chain of your company, through which the paper reaches the ultimate customer, is similar to that of ABC Ltd. However, your mill does not sell directly to the merchant. The latter receives the paper from a huge distribution center maintained by your company at Haryana. Shipment costs from the mill to the Distribution Center amount to ₹200 per MT while the operating costs in the Distribution Center have been estimated to be ₹125 per MT. The return on investments required by the Distribution Center for the investments made amount to an estimated ₹ 120 per MT.

You are required to compute the “Mill Manufacturing Target Cost” for this particular paper for your company.

You may assume that the return on the investment expected by your company equals ₹ 120 per MT of such paper.

## Illustration-41

CELO Company has the capacity of production of 80,000 units and presently sells 20,000 units at ₹100 each. The demand is sensitive to selling price and it has been observed that for every reduction of ₹10 in Selling Price, the demand is doubled.

### **Required:**

- a. What should be the Target Cost at full capacity, if Profit Margin on Sale is 25%?
- b. What should be the Cost Reduction Scheme at full capacity if at the present level 40% of the cost is variable and Total Fixed Cost is ₹36 lakhs?
- c. If Rate of Return desired is 16%, what will be the maximum investment at full capacity?

## Illustration-42

K & Co. manufactures and sells 15,000 units of a product. The Full Cost per unit is ₹200. The Company has fixed its price so as to earn a 20% Return on an Investment of ₹18,00,000.

### **Required:**

- (i) Calculate the Selling Price per unit from the above. Also, calculate the Mark-up % on the Full Cost per unit.
- (ii) If the Selling Price as calculated above represents a Mark-up of 40% on Variable cost per unit, calculate the Variable cost per unit.
- (iii) Calculate the Company's Income if it had increased the Selling Price to ₹230. At this price, the

company would have sold 13,500 units. Should the Company have increased the Selling price to ₹230?

- (iv) In response to competitive pressures, the Company must reduce the price to ₹210 next year, in order to achieve sales of 15,000 units. The Company also plans to reduce its investment to ₹16,50,000. If a 20% Return on Investment should be maintained, what is the Target Cost per unit for the next year?

### Illustration-43

ABC Enterprises has prepared a draft budget for one of its products for the next year as follows:

| Quantity                        | 10,000 units |
|---------------------------------|--------------|
|                                 | (₹)          |
| Sales price per unit            | 300          |
| <b>Variable costs per unit:</b> |              |
| Direct materials                | 80           |
| Direct labour (2 hrs × 30)      | 60           |
| Variable overhead (2 hrs × 5)   | 10           |
| Contribution per unit           | 150          |
| Budgeted contribution           | 15,00,000    |
| Budgeted fixed costs            | 14,00,000    |
| Budgeted profit                 | 1,00,000     |

The Board of Directors is dissatisfied with this budget, and asks working party to come up with alternate budget with higher target profit figures.

The working party reports back with the following suggestions that will lead to budgeted profit of ₹2,50,000. The company should spend ₹2,46,000 on advertising, & set the target sales price up to ₹316.75 per unit. It is expected that the sales volume will also rise, in spite of the price rise, to 12,000 units.

In order to achieve the extra production capacity, however, the workforce must be able to reduce the time taken to make each unit of the product. It is proposed to offer a pay and productivity deal in which the wage rate per hour is increased to ₹40. The hourly rate for variable overhead will be unaffected. Ascertain the target labour time required to achieve the target profit.

### Illustration-44

The operation costs of a product produced by ABC Ltd are ₹53. Presently, the company produces only 600 units p.a. to sell at ₹55 per unit due to hard competition in the market. But with existing facilities, production can be increased to 1,000 units if additional production can be sold in the market. The company accordingly introduced target costing on market research, new design for the product and changes in the process so that costs are brought down substantially and market share can be increased. The estimates for the next year are:

|                      |              |
|----------------------|--------------|
| Target selling price | ₹50 per unit |
| Target profit margin | 10% on sales |

|               |           |
|---------------|-----------|
| Target volume | 900 units |
|---------------|-----------|

**Required:**

- (a) Calculate target costs per unit and target costs for the expected volume; and
- (b) Compare existing profit with target profit.

**Illustration-45**

A manufacturing company "Bee" sells its product at ₹1,000 per unit. Due to competition, its competitors are likely to reduce price by 15%. Bee wants to respond aggressively by cutting price by 20% and expects that the present volume of 1,50,000 units p.a. will increase to 2,00,000. Bee wants to earn a 10% target profit on sales. Based on a detailed value engineering the comparative position is given below:

| Particulars                          | Existing (₹) | Target (₹) |
|--------------------------------------|--------------|------------|
| Direct material cost per unit        | 400          | 385        |
| Direct manufacturing labour per unit | 55           | 50         |
| Direct machinery costs per unit      | 70           | 60         |
| Direct manufacturing costs per unit  | 525          | 495        |
| Manufacturing overheads :            |              |            |
| No. of orders (₹80 per order)        | 22,500       | 21,250     |
| Testing hours (₹2 per hour)          | 4,500,000    | 3,000,000  |
| Units reworked (₹100 per unit)       | 12,000       | 13,000     |

Manufacturing overheads are allocated using relevant cost drivers. Other operating costs per unit for the expected volume are estimated as follows:

|                                |      |
|--------------------------------|------|
| Research and Design            | ₹50  |
| Marketing and customer service | ₹130 |
| Total                          | ₹180 |

**Required:**

- 1. Calculate target costs per unit and target costs for the proposed volume showing break up of different elements.
- 2. Prepare target product profitability statement.

**Illustration-46**

S Ltd. has sales of 2,00,000 units at a price of ₹100.00 per unit and profit of ₹70.00 Lakhs in the current year. Due to stiff competition, next year the Company has to reduce its price of product @ 3% to achieve same target volume of sales. The cost structure and profit for the current year is given as below:

| Particulars     | (₹ Lakhs) |
|-----------------|-----------|
| Direct Material | 50.00     |

|  |        |
|--|--------|
| Direct Wages                                     | 40.00  |
| Variable Factory Overheads                       | 15.00  |
| Fixed Overheads including Sales & Admin Expenses | 25.00  |
| Total Cost                                       | 130.00 |

To achieve the Target Cost to maintain the same profit, the Company is evaluating the proposal to reduce Labour Cost and Fixed Factory Overheads. A Vendor supplying the Machine suitable for the Company's operations has offered an advanced technology Semi-Automatic Machine of ₹10 Lakhs as replacement of Old Machine worth ₹3 Lakhs. The Vendor is agreeable to take back the Old Machine at ₹1 Lakh only. The Company's policy is to charge depreciation at 15% on WDV. The Maintenance Charge of the Existing Machine is ₹1 Lakh per annum whereas there will be warranty of services free of cost for the New Machine first two years. There are 7 Supervisors whose Salary is ₹1.50 Lakhs per annum. The New Machine having Conveyor Belt is expected to help in cost cutting measures in the following ways -

- (1) Improve Productivity of workers by 10%
- (2) Cut-down Material Wastage by 5%
- (3) Elimination of services of Supervisors because of automatic facilities of the machine
- (4) Saving in Packaging Cost by ₹1 Lakhs.

Assuming Cost of Capital to be 15%, calculate how many Supervisors should be removed from the production activities to achieve the Target Cost.

## 3.6

## Product Life Cycle Costing

### Introduction:



Cost = ₹ 3,00,000  
Maintenance p.a = ₹ 50,000

Life = 5 years



Cost = ₹ 10,00,000  
Maintenance p.a = ₹ 30,000

Life = 10 years

### 1. Meaning of Life Cycle Costing

- Life Cycle Costing aims at cost ascertainment of a product, project etc. over its projected life.
- It is a system that accumulates the actual costs and revenues of product from its inception to its abandonment.
- Traces research, design and development costs for each individual product and compared with product revenue.

### 2. Meaning of Product Life Cycle

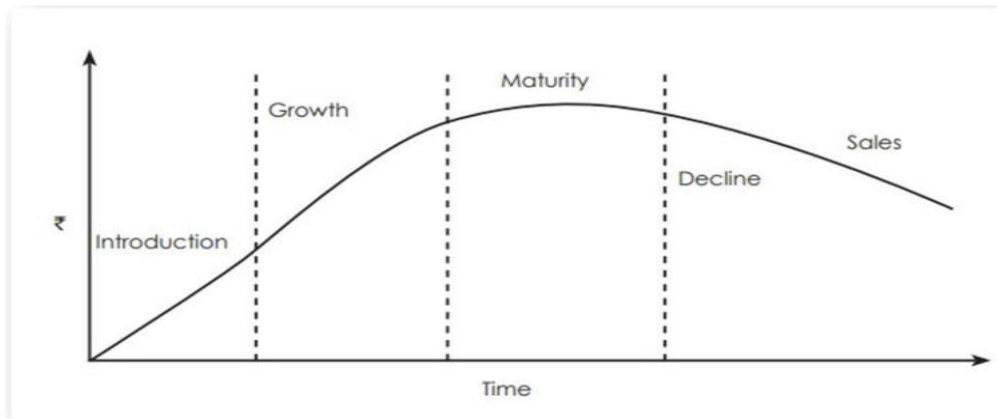
Product Life Cycle is the time span from initial R&D to when customer servicing is no longer offered for the product.

### Example:

For motor vehicles, this time-span may range from 5 to 7 years.



### 3. Phases in Product Life Cycle



#### Illustration-47

Wipro is examining the profitability and pricing policies of its Software Division. The Software Division develops Software Packages for Engineers. It has collected data on three of its more recent packages - (a) ECE Package for Electronics and Communication Engineers, (b) CE Package for Computer Engineers, and (c) IE Package for Industrial Engineers. Summary details on each package over their two-year Life Cycle product lives are -

| Package | Selling Price | Number of units sold |       |
|---------|---------------|----------------------|-------|
| ECE     | 250           | 2,000                | 8,000 |
| CE      | 300           | 2,000                | 3,000 |
| IE      | 200           | 5,000                | 3,000 |

Assume that no inventory remains on hand at the end of year 2. Wipro is deciding which product lines to emphasize in its software division. In the past two years, the profitability of this division has been mediocre. Wipro is particularly concerned with the increase in R&D costs in several of its divisions. An analyst at the Software Division pointed out that for one of its most recent packages (IE) major efforts had been made to reduce R&D costs. Last week, Amit, the Software Division Manager, decides to use Life Cycle Costing in his own division. He collects the following Life Cycle Revenue and Cost information for the packages -

| Particulars  | Amount (₹)  |           |            |          |            |          |
|--------------|-------------|-----------|------------|----------|------------|----------|
|              | Package ECE |           | Package CE |          | Package IE |          |
|              | Year 1      | Year 2    | Year 1     | Year 2   | Year 1     | Year 2   |
| Revenues     | 5,00,000    | 20,00,000 | 6,00,000   | 9,00,000 | 10,00,000  | 6,00,000 |
| <b>Costs</b> |             |           |            |          |            |          |
| R&D          | 7,00,000    | -         | 4,50,000   | -        | 2,40,000   | -        |

|                   |          |          |          |          |          |          |
|-------------------|----------|----------|----------|----------|----------|----------|
| Design of Product | 1,15,000 | 85,000   | 1,05,000 | 15,000   | 76,000   | 20,000   |
| Manufacturing     | 25,000   | 2,75,000 | 1,10,000 | 1,00,000 | 1,65,000 | 43,000   |
| Marketing         | 1,60,000 | 3,40,000 | 1,50,000 | 1,20,000 | 2,08,000 | 2,40,000 |
| Distribution      | 15,000   | 60,000   | 24,000   | 36,000   | 60,000   | 36,000   |
| Customer Service  | 50,000   | 3,25,000 | 45,000   | 1,05,000 | 2,20,000 | 3,88,000 |

Present a Product Life Cycle Income Statement for each Software Package. Which package is most profitable and which is the least profitable? How do the three packages differ in their cost structure (the percentage of total costs in each category)?

### Illustration-48

Zenith Ltd. manufactures tablet batteries. The company is preparing a product life cycle budget for a new type of battery. Development on the new battery is to start shortly. Estimates for the new battery are as follows:

|  |             |
|--|-------------|
| Life cycle units manufactured and sold       | 2,00,000    |
| Selling price per battery                    | ₹ 55        |
| <b>Life cycle costs:</b>                     |             |
| R & D and design cost                        | ₹ 8,00,000  |
| <b>Manufacturing:</b>                        |             |
| Variable cost per battery                    | ₹ 25        |
| Variable cost per batch                      | ₹ 300       |
| Batteries per batch                          | 250         |
| Fixed costs                                  | ₹ 12,00,000 |
| <b>Marketing:</b>                            |             |
| Variable cost per battery                    | ₹ 3.50      |
| Fixed costs                                  | ₹ 8,00,000  |
| <b>Distribution:</b>                         |             |
| Variable cost per batch                      | ₹ 140       |
| Batteries per batch                          | 100         |
| Fixed costs                                  | ₹ 4,60,000  |
| Customer service cost per battery (Variable) | ₹ 1.70      |

Ignore the time value of money.

**Required:**

- (i) Calculate the budgeted life cycle operating income for the new battery.

- (ii) What percentage of the budget total product life cycle costs will be incurred by the end of the R&D and design stages?
- (iii) Company's market research department estimates that reducing price by ₹ 2.50 will increase life cycle units sales by 8%. If unit sale increases by 8%, the company plans to increase manufacturing and distribution batch sizes by 8% as well. Assume that all variable costs per battery, per batch and fixed costs will remain the same. Should the company reduce battery price by ₹ 2.50? Show your calculations.

### Illustration-49

SRM Ltd. has developed a new product 'Kent' which is about to be launched into the market and anticipates to sell 80,000 of these units at a sale price of ₹ 300 over the product's life cycle of four years. Data pertaining to product 'Kent' are as follows:

|  |  |
|--|--|
| Costs of Design and Development of Moulding Dies and Other tools | ₹ 10,25,000  |
| Manufacturing costs  | ₹ 125 per unit   |
| Selling costs  | ₹ 12,500 per year + ₹ 100 per unit   |
| Administration costs   | ₹ 50,000 per year  |
| Warranty expenses  | 5 replacement parts per 25 units @ ₹ 10 per part, 1 visit per 500 units (cost ₹ 500 per visit) |

#### **Required:**

- (i) Compute the product Kent's Life Cycle Cost.
- (ii) Suppose SRM Ltd. can increase sales volume by 25% through 15% decrease in selling price, should SRM Ltd. choose the lower price?

### 3.7 : Asset Life Cycle Costing

#### Concept:

CIMA defines Life-Cycle Costing as 'Maintenance of physical asset cost records over entire asset lives, so that decisions concerning the acquisition, use or disposal of asset can be made in a way that achieves the optimum asset usage at the lowest possible cost to the entity.

Life Cycle cost analysis appropriately weighs the money spent today as compared to money spent in the future. The basic formula is:

$$LCC = C + PV \text{ Recurring} - PV \text{ Residual Value}$$

Where:

- 'LCC' is the life cycle cost
- 'C' is the 0-year acquisition cost
- 'PV' recurring is the present value of all recurring costs
- 'PV' residual value is the present value of residual-value at the end of the life of the asset.

Life Cycle Costs of an Asset includes:

- Acquisition
- Installation
- Operating
- Maintenance
- Financing (e.g., interest)
- Depreciation
- Disposal

Example of Life Cycle Cost of a printer

- **Purchase:** The price is ₹ 20,000.
- **Installation:** ₹ 500 for setting up and delivery purposes.
- **Operating:** ₹ 2,000 for ink cartridges and paper for it. Cost of electricity is expected at ₹ 300.
- **Maintenance:** Repairs will cost ₹ 500.
- **Financing:** Interest rate of 9% per annum.
- **Depreciation:** Value will be reduced by ₹ 2,000 each year.
- **Disposal:** Estimation of hiring a contractor to remove the printer is ₹ 150.

Even though the price of the printer is ₹ 20,000, the life cycle cost of the printer will end up costing the business much more

## Illustration-50

A2Z plc. supports the concept of zero technology or life cycle costing for new investment decisions covering its engineering activities. The financial side of this philosophy is now well established, and its principles extended to all other areas of decision making. The company is to replace a number of its machines and the Production Manager is torn between the Exe Machine, a more expensive machine with a life of 12 years, and the Wye machine with an estimated life of 6 years. If the Wye machine is chosen it is likely that it would be replaced at the end of 6 years by another Wye machine. The pattern of maintenance and running costs differs between the two types of machine and relevant data are shown below:

|                              | Exe (₹)           | Wye (₹)           |
|------------------------------|-------------------|-------------------|
| Purchase Price               | 19,000            | 13,000            |
| Trade-in value/breakup/scrap | 3,000             | 3,000             |
| Annual repair costs          | 2,000             | 2,600             |
| Overhaul costs               | (at year 8) 4,000 | (at year 4) 2,000 |

Estimated financing costs averaged over machine life 10% p.a - Exe; 10% p.a. - Wye.

You are required to: recommend with supporting figures, which machine to purchase, stating any assumptions made.

## Illustration-51

Company X is forced to choose between two machines A and B. The two machines are designed differently but have identical capacity and do exactly the same job. Machine A costs ₹ 1,50,000 and will last for 3 years. It costs ₹ 40,000 per year to run. Machine B is an 'economy' model costing only ₹ 1,00,000, but will last only for 2 years, and costs ₹ 60,000 per year to run. These are real cash flows. The costs are forecasted in rupees of constant purchasing power. Ignore tax. Opportunity cost of capital is 10%.

Which machine Company X should buy?

## Illustration-52

**(Computation of Equivalent Annual Cost and Identification of Year to Replace the Machine)**

A & Co. is contemplating whether to replace an existing machine or to spend money on overhauling it. A & Co. currently pays no taxes. The replacement machine costs ₹ 90,000 now and requires maintenance of ₹ 10,000 at the end of every year for eight years. At the end of eight years, it would have a salvage value of ₹ 20,000 and would be sold. The existing machine requires increasing amounts of maintenance each year and its salvage value falls each year as follows:

| Year      | Maintenance | Salvage |
|-----------|-------------|---------|
| Present % | 0           | 40,000  |
| 1         | 10,000      | 25,000  |
| 2         | 20,000      | 15,000  |
| 3         | 30,000      | 10,000  |

|   |        |   |
|---|--------|---|
| 4 | 40,000 | 0 |
|---|--------|---|

The opportunity cost of capital for A & Co. is 15%. When should the company replace the machine?

(Notes: Present value of an annuity of ₹1 per period for 8 years at interest rate of 15%: 4.4873; present value of ₹ 1 to be received after 8 years at interest rate of 15%: 0.3269)

### Illustration-53 (Expected NPV)

A company is considering the purchase of a machine for ₹ 3,50,000. It feels quite confident that it can sell the goods produced by the machine as to yield an annual cash surplus of ₹ 1,00,000. There is however uncertainty as to the machine working life. A recently published Trade Association Survey shows that members of the Association have between them owned 250 of these machines and have found the lives of the machines vary as under:

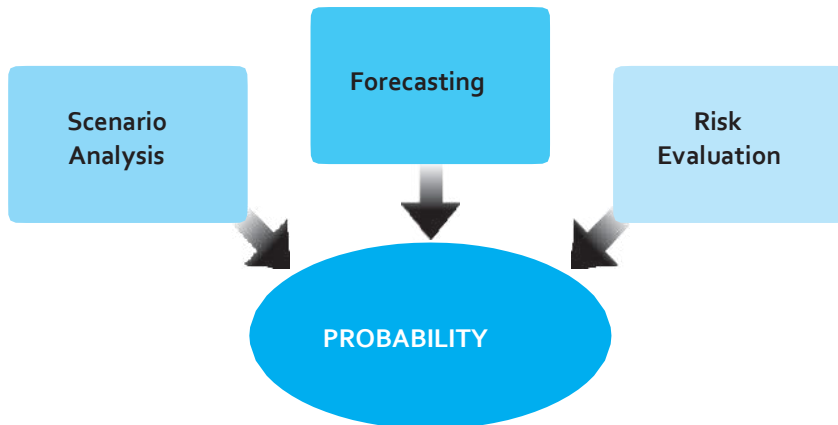
| No. of year of Machine life       | 3  | 4  | 5   | 6  | 7  | Total |
|-----------------------------------|----|----|-----|----|----|-------|
| No. of machines having given life | 20 | 50 | 100 | 70 | 10 | 250   |

Assuming discount rate of 10% the net present value for each different machine life is follows:

| Machine life | 3          | 4        | 5      | 6      | 7        |
|--------------|------------|----------|--------|--------|----------|
| NPV (₹)      | (1,01,000) | (33,000) | 29,000 | 86,000 | 1,37,000 |

You required to advice whether the company should purchase a machine or not.

## 3.8 Decision Making Using Probability



### Illustration-54

A company has a choice among three products A, B and C for which the following estimates are available:

Estimated profits based on demand forecast (₹ '000)

|           | Market X | Market Y | Market Z |
|-----------|----------|----------|----------|
| Product A | 380      | 100      | 30       |
| Product B | 300      | 280      | 220      |
| Product C | 220      | 400      | 320      |

Probabilities are: X = 0.60, Y = 0.20, Z = 0.20

Which project should be undertaken by the company?

### Illustration-55

You are given the following estimates for next year's budgeted sales and costs of a single product produced by Bee Ltd.:

|                               |               |             |
|-------------------------------|---------------|-------------|
| <b>Selling Price</b>          | ₹ 12 per unit |             |
| <b>Sales Demand:</b>          | Units         | Probability |
|                               | 3200          | 0.50        |
|                               | 4000          | 0.30        |
|                               | 5000          | 0.20        |
| <b>Variable Cost per unit</b> | (RS)          | Probability |
|                               | 5.00          | 0.30        |

|                                  |          |      |
|----------------------------------|----------|------|
|                                  | 6.00     | 0.50 |
|                                  | 7.00     | 0.20 |
| <b>Fixed Cost for the period</b> | ₹ 20,000 |      |

**Required:**

- (i) Expected value of sales for the period.
- (ii) Expected variable cost and contribution for the period.
- (iii) Expected profit or loss for the budgeted period.

**Illustration-56**

A company has estimated the following demand level of its product:

|                             |       |       |       |       |       |
|-----------------------------|-------|-------|-------|-------|-------|
| <b>Sales Volume (units)</b> | 10000 | 12000 | 14000 | 16000 | 18000 |
| <b>Probability</b>          | 0.10  | 0.15  | 0.25  | 0.30  | 0.20  |

It has assumed that the sales price of ₹ 6 per unit, marginal cost of ₹ 3.50 per unit, and fixed costs of ₹ 34,000. What is the probability that:

- (a) The company will break-even in the period?
- (b) The company will make a profit of at least ₹ 10,000?

**Illustration-57**

A company has estimated the unit variable cost of a Product to be ₹ 10, and the selling price is ₹ 15 per unit. Budgeted sales for the year are 20,000 units. Estimated fixed costs are as follows:

|                            |        |        |        |        |        |
|----------------------------|--------|--------|--------|--------|--------|
| <b>Fixed Cost p.a. (₹)</b> | 50,000 | 60,000 | 70,000 | 80,000 | 90,000 |
| <b>Probability</b>         | 0.1    | 0.3    | 0.3    | 0.2    | 0.1    |

What is the probability that the company will equal or exceed its target profit of ₹ 25,000 for the year?

**Illustration-58**

The Managing Director of Y Ltd. has evolved some decision making to the operating division of the firm. He is anxious to extend this process but first wishes to be assured that decisions are being taken properly in accordance with group policy. As a check on existing practice, he has asked for an investigation to be made into a recent decision to increase the price of the sole product of Z division to ₹ 14.50 per unit but to rising costs. The following information and estimates were available for the management of Z division:

Last year 75,000 units were sold at ₹ 12 each with total units cost of ₹ 9 of which ₹ 6 were variable costs. For the year ahead the following cost and demand estimates have been made:

**Variable costs:**

|                    |                  |                 |
|--------------------|------------------|-----------------|
| <b>Pessimistic</b> | Probability 0.15 | ₹ 7.00 per unit |
| <b>Most likely</b> | Probability 0.65 | ₹ 6.50 per unit |

|            |                  |                 |
|------------|------------------|-----------------|
| Optimistic | Probability 0.20 | ₹ 6.20 per unit |
|------------|------------------|-----------------|

Total fixed costs:

|             |                 |                 |
|-------------|-----------------|-----------------|
| Pessimistic | Probability 0.3 | Increase by 50% |
| Most likely | Probability 0.5 | Increase by 25% |
| Optimistic  | Probability 0.2 | Increase by 10% |

Demand estimates at various prices

| Particulars | Probability | ₹ 13.50 per unit | ₹ 14.50 unit |
|-------------|-------------|------------------|--------------|
| Pessimistic | 0.30        | 45,000           | 35,000       |
| Most likely | 0.50        | 60,000           | 55,000       |
| Optimistic  | 0.20        | 70,000           | 68,000       |

(Unit variable costs, fixed costs and demand estimates are statistically independent)

For this type of decision the group has decided that the option should be chosen which has the highest expected outcome with at least an 80% chance of breaking even.

**You are required:**

- to assess whether the decision was made in accordance with group guidelines,
- to obtain what is the group attitude to risk as evidenced by the guidelines

|     |   |
|-----|---|
| 4.1 | Activity Based Cost Management  |
| 4.2 | JIT - introduction, Benefits, Use of JIT in measuring the Performance |
| 4.3 | Throughput Accounting   |
| 4.4 | Back flush Accounting   |
| 4.5 | Benchmarking  |

## 4.1 : ACTIVITY BASED COST MANAGEMENT

Activity Based Costing has been introduced with a view to overcome the limitations of traditional costing systems.

CIMA defines Activity Based Costing as, 'cost attribution to cost units on the basis of benefit received from indirect activities e.g., ordering, setting up, and assuring quality.

|                    |  |
|--------------------|--|
| <b>Activity</b>    | An activity means an aggregate of closely related tasks having some specific functions which are used for completion of a goal or objective.   |
| <b>Resource</b>    | Resources are elements that are used for performing the activities or factors helping in the activities.   |
| <b>Cost</b>        | Cost is the amount paid for the resources consumed by the activity   |
| <b>Cost Object</b> | Cost Object refers to an item for which cost measurement is required   |
| <b>Cost Pool</b>   | A Cost pool is a term used to indicate grouping of costs incurred on a particular activity which drives them   |
| <b>Cost Driver</b> | Any element that would cause a change in the cost of an activity is cost driver. Cost drivers are the basis of charging cost of an activity to a cost object. Cost drivers are used to trace the costs to a product or service by using a measure of the resources consumed by each activity |

Examples of activities, resources, cost pools and cost drivers are tabulated below:

| Activities                  | Resources                  | Cost pools   | Cost driver  |
|-----------------------------|----------------------------|--|--|
| Consulting                  | Consultant, Computer       | Employee cost, Maintenance cost                    | Level of consultant, Time spent  |
| Laser Printing              | Printing Staff, Printer    | Colour cost, Maintenance cost, Printing stationary | No. of pages printed, Font   |
| Accounting & Administration | Administration Staff       | Salaries   | No. of times account is produced   |
| Customer Service            | Telephone, Staff           | Telephone bill, Salaries                           | Frequency of orders, No. of orders, Time spent in servicing, No. of servicecalls     |
| Research & Development      | Staff, Equipment, Material | Salaries, Maintenance cost, Material cost          | No. of research projects, Time spent on a project, Technical complexities of project |

The **cost drivers** for some of the other functional avenues such as production, marketing and customer service may be stated as:

**Production:** Number of units, Number of set-ups

**Marketing:** Number of sales personnel, Number of sales orders

**Customer Service:** Number of service calls, Number of products serviced, Hours spent on servicing products

## Activity Based Budgeting (ABB)

A budget is defined as a statement expressed in quantitative and monetary terms prepared prior to a defined period of time for the policy to be pursued during that period for the purpose of achieving a given objective. In other words, a budget is always prepared ahead of time; it is expressed either in quantitative terms or monetary terms or both; it reflects the objective to be achieved during that period and hence the policy to be followed during that period is put in the budget.

### The following are the features of Activity Based Budgeting.

1. It uses the activity analysis to relate costs to activities.
2. It identifies cost improvement opportunities.
3. There is a clear link between strategic objectives, planning and the tactical planning of the ABC process.

There are three **main steps** in ABB viz. identifying cost drivers, projecting total units, and estimating the cost per unit.

- (i) **Identifying the cost drivers of various activities:** For example, the cost drivers for a

manufacturing facility can be the total labour hours and wages paid to employees.

(ii) **Projecting the number of units required within each cost driver:** For example, the manufacturing facility may always need three people on the production line, translating to 240 labour hours per week.

(iii) **Estimating the cost per unit of activity relating to that cost driver:** For example, wages for warehouse labour can be ₹ 150 per hour.

## SMQs

### Illustration-1

A company manufactures 500 units of product AX. The following details are available: Material cost to manufacture: ₹ 1,50,000

Labour cost: ₹ 2,65,000

Material Reordering Cost: ₹ 4,500 Material Handling Cost: ₹ 2,500 Material orders: 35

Material movements: 20

What is the Total Material cost under Activity based costing?

### Illustration-2

Production overheads of XYZ Manufacturers Pvt. Ltd. for 500 units of product X are Machine oriented activity cost: ₹ 1,35,400

Material ordering overheads: ₹ 69,570

Machine hours are 1.50 hrs per unit and No. of material orders are 6 per unit.

Raw material cost ₹ 300 per unit and labour cost ₹ 150 per unit. What is the Total cost of X per Unit?

### Illustration-3

A company produces four products, viz. P, Q, R and S. The data relating to production activity are as under

| Product | Quantity of production | Material cost/ ₹. per unit | Direct labour hours/unit | Machine hours/ unit | Direct Labour cost/₹ per unit |
|---------|------------------------|----------------------------|--------------------------|---------------------|-------------------------------|
| P       | 4,500                  | 12                         | 2                        | 1.50                | 8                             |
| Q       | 13,640                 | 15                         | 2                        | 0.75                | 9                             |
| R       | 2,340                  | 25                         | 5                        | 2.50                | 27                            |
| S       | 18,350                 | 21                         | 4                        | 4.00                | 25                            |

|  |          |
|--|----------|
| Production overheads are as under:                     | ₹        |
| (i) Overheads applicable to machine-oriented activity: | 1,65,900 |

|   |        |
|---|--------|
| (ii) Overheads relating to ordering materials | 8,760  |
| (iii) Set up costs                            | 21,400 |
| (iv) Administration overheads for spare parts | 44,690 |
| (v) Material handling costs                   | 25,545 |

The following further information have been compiled:

| Product      | No. of set up | No. of materials orders | No. of times materials handled | No. of spare parts |
|--------------|---------------|-------------------------|--------------------------------|--------------------|
| P            | 3             | 3                       | 6                              | 6                  |
| Q            | 18            | 12                      | 30                             | 15                 |
| R            | 5             | 3                       | 9                              | 3                  |
| S            | 24            | 12                      | 36                             | 12                 |
| <b>Total</b> | <b>50</b>     | <b>30</b>               | <b>81</b>                      | <b>36</b>          |

**Required:**

- (i) Select a suitable cost driver for each item of overhead expense and calculate the cost per unit of cost driver.
- (ii) Using the concept of activity-based costing, compute the factory cost per unit of each product.

### Illustration-4

The budgeted overheads and cost driver volumes of XYZ are as follows.

| Cost Pool            | Budgeted Overheads (₹) | Cost Driver          | Budgeted Volume |
|----------------------|------------------------|----------------------|-----------------|
| Material procurement | 5,80,000               | No. of orders        | 1,100           |
| Material handling    | 2,50,000               | No. of movements     | 680             |
| Set-up               | 4,15,000               | No. of set ups       | 520             |
| Maintenance          | 9,70,000               | Maintenance hours    | 8,400           |
| Quality control      | 1,76,000               | No. of inspections   | 900             |
| Machinery            | 7,20,000               | No. of machine hours | 24,000          |

The company has produced a batch of 2,600 components of AX-15; its material cost was ₹ 1,30,000 and labour cost ₹ 2,45,000. The usage activities of the said batch are as follows:

Material orders - 26, maintenance hours - 690, material movements - 18, inspections - 28, set ups - 25, machinehours - 1,800

Calculate - cost driver rates that are used for tracing appropriate amount of overheads to the said batch and ascertain the cost of batch of components using Activity Based Costing.

### Illustration-5

AML Ltd is engaged in the production of three types of ice-cream products viz. Coco, Strawberry & Vanilla. The Company presently sells 50,000 units of Coco @ ₹ 25 per unit, Strawberry 20,000 units @ ₹ 20 per unit and Vanilla 60,000 units @ ₹ 15 per unit. The demand is sensitive to selling price and it has been observed that every reduction of ₹ 1 per unit in selling price increases the demand for each product by 10% to the previous level. The company has the production capacity of 60,500 units of Coco, 24,200 units of Strawberry, and 72600 units of Vanilla. The company marks up 25% of the cost of product. The management decides to apply ABC analysis. For this purpose, it identifies four activities as store support costs. The cost driver rates are as follows.

| Activity                        | Cost Driver Rate         |
|---------------------------------|--------------------------|
| Ordering                        | ₹ 800 per purchase order |
| Delivery                        | ₹ 700 per delivery       |
| Shelf Stocking                  | ₹ 199 per hour           |
| Customer Support and Assistance | ₹ 1.10 per unit sold     |

The other relevant information for the products is as follows

|                          | Coco | Strawberry | Vanilla |
|--------------------------|------|------------|---------|
| Direct Material p.u. (₹) | 8    | 6          | 5       |
| Direct Wages p.u. (₹)    | 5    | 4          | 3       |
| No. of purchase orders   | 35   | 30         | 15      |
| No. of Deliveries        | 112  | 66         | 48      |
| Shelf stocking hours     | 130  | 150        | 160     |

Under the traditional costing system, store support costs are charged @ 30% of prime cost.

### Required:

- Calculate the unit cost and total cost of each product at the maximum level using traditional costing.
- Calculate the unit cost and total cost of each product at the maximum level using activity-based Costing.

### Illustration-6

XYZ Limited makes three main products, using broadly the same production methods and equipment for each.

A conventional product costing system is used at present, although Activity Based Costing (ABC) system is being considered. Details of the three products, for a typical period are:

| Product | Labour Hours per Unit | Machine Hours per unit | Material (₹ Per unit) | Volume Units |
|---------|-----------------------|------------------------|-----------------------|--------------|
| X       | 1 $\frac{1}{2}$       | 3 $\frac{1}{2}$        | 25                    | 3,500        |
| Y       | $\frac{1}{2}$         | 2                      | 15                    | 2,250        |

|   |   |   |    |       |
|---|---|---|----|-------|
| Z | 2 | 5 | 30 | 6,000 |
|---|---|---|----|-------|

Direct labour costs are ₹8 per hour and production overheads are absorbed on machine hour rate basis. The rate for the period is ₹ 18 per machine hour. Further analysis shows that the total of production overheads can be divided as follows:

| Activity                             | %   |
|--------------------------------------|-----|
| Costs relating to set-ups            | 30  |
| Costs relating to machinery          | 25  |
| Costs relating to materials handling | 22  |
| Costs relating to inspection         | 23  |
| Total production overhead            | 100 |

The following activity volumes are associated with the product line for the period as a whole.

| Product      | Number of Set-ups | Number of movements of materials | Number of Inspections |
|--------------|-------------------|----------------------------------|-----------------------|
| X            | 65                | 15                               | 150                   |
| Y            | 110               | 26                               | 190                   |
| Z            | 485               | 79                               | 570                   |
| <b>Total</b> | <b>660</b>        | <b>120</b>                       | <b>910</b>            |

You are required to:

- Calculate the cost per unit for each product using conventional method
- Calculate the cost per unit for each product using ABC principles

### Illustration-7

Vikas Associates, a firm of Cost and Management Accountants, offers three different types of services, namely, Accounting and Auditing, Taxation and Management Consultancy. Each service is charged on the basis of number of billable hours. The average charge per billable hours is ₹ 500. For the year ending 31.03.2022 the firm projects the following estimate of direct and indirect costs:

| Costs                  | Particulars                   | ( ₹ Lakhs) | ( ₹ Lakhs) |
|------------------------|-------------------------------|------------|------------|
| <b>Direct Costs:</b>   | Accounting & Auditing         | 100.00     |            |
|                        | Taxation                      | 100.00     |            |
|                        | Management Consultancy        | 50.00      | 250.00     |
| <b>Indirect Costs:</b> | Planning & Review             | 7.50       |            |
|                        | Computer Processing           | 7.20       |            |
|                        | Professional Salaries         | 5.60       |            |
|                        | Books, Seminars & Periodicals | 1.80       |            |
|                        | Programming Costs             | 8.00       |            |
|                        | Building Costs                | 4.90       |            |
|                        | General Administration Costs  | 15.00      | 50.00      |

|              |  |  |        |
|--------------|--|--|--------|
| <b>Total</b> |  |  | 300.00 |
|--------------|--|--|--------|

Until 31.03.2021 the firm has been allocating the indirect costs on the basis of billable hours. For the year ending 31.03.2022 it was decided to introduce a system of activity based costing to capture the indirect costs more accurately. The following data were gathered accordingly:

| Particulars                                | Accounting & Auditing | Taxation | Management Consultancy |
|--|-----------------------|----------|------------------------|
| Billable Hours                             | 55000                 | 35000    | 10000                  |
| EDP Hours / CEP Hours Professionals (Nos.) | 5000                  | 2500     | 500                    |
| Books, Seminars & Periodicals (₹)          | 30                    | 16       | 10                     |
| Programming Hours                          | 57500                 | 62500    | 60000                  |
| Building (Sqft.) space occupied            | 1250                  | 500      | 2250                   |
| Administration (No. of clients)            | 8000                  | 4000     | 2000                   |
|  | 150                   | 250      | 100                    |

**Required:**

- (i) Prepare a profitability statement on the basis of conventional costing
- (ii) Prepare a profitability statement on the basis of activity-based costing
- (iii) Draw a comparative Statement of Indirect Costs & Profits
- (iv) Any suggestion for improving the billable charge on the basis of ABC assuming the same rate of margin of 66.667% on total cost?

**Illustration-8**

Precision Auto company Ltd. manufactures and sells two automobile components A and B. Both are identical with slight variation in design. Although the market for both the products is the same, the market share of the company for product A is very high and that of product B very low. The company's accountant has prepared the following profitability statement for the two products (Cost of production: same for both the products)

|  |   |     |
|--|---|-----|
| Direct Material                        | ₹ | 125 |
| Direct Labour                          | ₹ | 24  |
| Direct Expenses (sub-contract charges) | ₹ | 36  |
| Overheads (400% of direct labour)      | ₹ | 96  |

|            |   |     |
|------------|---|-----|
| Total Cost | ₹ | 281 |
|------------|---|-----|

| Particulars   |     | Product A | Product B | Total       |
|---|-----|-----------|-----------|-------------|
| Quantity sold (in Unit)                             | No. | 1,24,000  | 23,150    | 1,47,150    |
| Unit sale price                                     | ₹   | 300       | 290       |             |
| Total sales realization (Quantity Sold × Unit S.P.) | ₹   |           |           | 4,39,13,500 |
| Cost of sales as above                              | ₹   |           |           | 4,13,49,150 |
| Margin  | ₹   |           |           | 25,64,350   |

The company's marketing manager, after attending a workshop on activity-based costing challenges the accountant's figures. The nearest competitor's prices for the two products are ₹ 330 and ₹ 275 per unit respectively and, if the company can match the competitor's prices, it can sell 75,000 nos. each of the two products. The Production Manager confirms that he can produce this product mix with the existing facilities.

The management engages you as consultant, and the following facts have been identified by you:

- Product A undergoes 5 operations and product B undergoes two operations by sub-contractors, although the total subcontract charges are the same for both the products, and
- 75% of the overheads is accounted for under three major heads relating to sub-contracting operations, viz., ordering, inspection and movement of components, to and from the sub-contractor's works.

Prepare a revised profitability statement to find out if the marketing manager's proposal is viable.

### Illustration-9

State with brief reason whether you would recommend an Activity Based Costing system in each of the following independent situations:

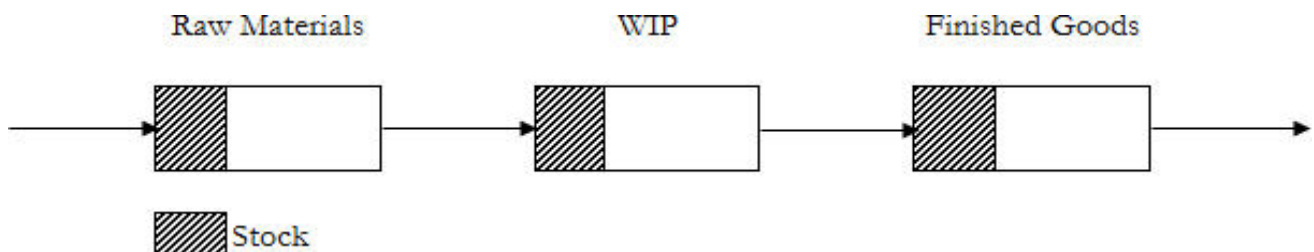
- A consultancy firm consisting of Lawyers, Accountants and Computer Engineers who provides management consultancy services to clients.
- Company X produces one product. The overhead costs mainly consist of Depreciation.
- Company Z produces two different labour intensive products. The contribution per unit in both products is very high. The BEP is very low. All the work is carried on efficiently to meet target costs.
- Company Y produces 4 different products using different production facilities.

## 4.2 ; JIT - introduction, Benefits, Use of JIT in measuring the Performance

### Just-In-Time (JIT)

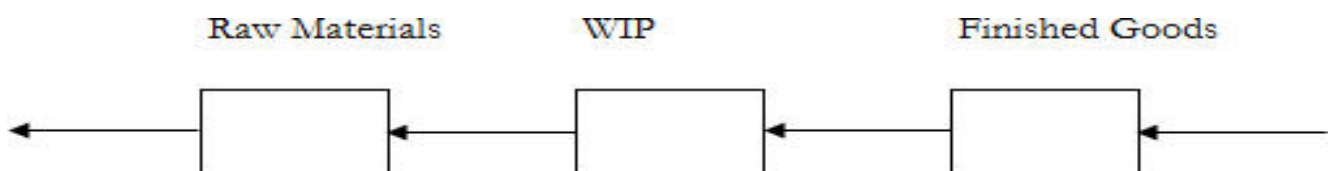
- Just-In-Time is a management technique in which goods are received from suppliers only as and when they are needed.
- The main objective of this method is to reduce inventory holding costs and increase inventory turnover. Just in time is a demand-pull system of production, wherein actual orders provide a signal for as to when a product should be manufactured.

#### 1) Push Approach:



- The stores purchases Raw Material on reaching re-order level (or) the purchasing time. The Raw Material is issued to the factory when it is required for production. The factory produces at it's full capacity and transfers the finished goods to the warehouse where it is sold when the demand arises.
- In this approach we don't purchase Raw Material for requirement and we don't produce for the demand due to which inventories build up in different stages.
- The Money tied up on these inventories does not increase the throughput. Hence are non value added investments.

#### 2) Pull Approach (JIT System):



- Here customer orders finished goods which triggers production in the factory which results in Raw Material Purchase.
- As soon as materials are purchased it gets consumed and as soon as production is complete it gets sold.
- Hence, there is no buildup of inventories in the system.

## Benefits of Just-In-Time System

Following are the advantages of adopting Just-In-Time Manufacturing System:

- i. Just-in-time manufacturing keeps stock holding costs to a bare minimum.
- ii. Just-in-time manufacturing eliminates waste
- iii. As under this technique, only essential stocks are obtained, less working capital is required to finance procurement.
- iv. Due to the afore-mentioned low level of stocks held, the organisation's return on investment (referred to as ROI, in management parlance) would generally be high.
- v. As just-in-time production works on a demand-pull basis, all goods made would be sold, and Thus, it incorporates changes in demand with surprising ease.
- vi. High quality products and greater efficiency can be derived from following a just-in-time production system.
- vii. Close relationships are fostered along the production chain under a just-in-time manufacturing system.
- viii. Constant communication with the customer results in high customer satisfaction.
- ix. Over production is eliminated, when just-in-time manufacturing is adopted.

## Precautions:

Following are the things to Remember When Implementing a Just-In-Time Manufacturing System:

- (i) **Management buy-in and support** at all levels of the organisation are required; if a just-in-time manufacturing system is to be successfully adopted.
- (ii) **Adequate resources** should be allocated, so as to obtain technologically advanced software, that is generally required if a just-in-time system is to be a success.
- (iii) **Trusted suppliers** : Building a close, trusting relationship with reputed and time-tested suppliers will minimize unexpected delays in the receipt of inventory.
- (iv) The **design flow** process needs to be redesigned and layouts need to be re-formatted, so as to incorporate just-in-time manufacturing.
- (v) **Lot sizes** need to be minimized.
- (vi) **Work station capacity** should be balanced whenever possible.
- (vii) **Preventive maintenance** should be carried out, so as to minimize machine breakdowns.
- (viii) **Set up times** should be reduced wherever possible.
- (ix) **Quality enhancement** programs should be adopted, so that total quality control practices can be adopted.
- (x) Reduction in **lead times** and frequent deliveries should be incorporated.
- (xi) **Motion waste** should be minimized, so the incorporation of conveyor belts might prove to be a good idea when implementing a just-in-time manufacturing system.

## Impact of JIT on Costs:

|   |   |
|---|---|
| Reduction in Overhead                                       | Material Handling, inspection and facilities  |
| Most overhead cost becomes direct cost due to Machine Cells | Depreciation Electricity<br>Material Handling<br>Consumable and Supplies<br>Repairs and Maintenance Supervision   |
| Reduction in inventory carrying cost                        | Warehouse Rent<br>Insurance Obsolete<br>Stores<br>Cost of stores equipments<br>Employee cost of stores department |
| Reduction in capital investment                             | Number of Small machines in place of big machines<br>Reduction in working capital                                 |
| Simplified accounting procedures                            | Backflush Costing   |

## SMQs

### Illustration-10

B Ltd. has decided to adopt JIT policy for materials. The following effects of JIT policy are identified-

1. To implement JIT, the company has to modify its production and material receipt facilities at a capital cost of ₹ 10,00,000. The new machine will require a cash operating cost ₹ 1,08,000 p.a. The capital cost will be depreciated over 5 years.
2. Raw material stockholding will be reduced from ₹ 40,00,000 to ₹ 10,00,000.
3. The company can earn 15% on its long-term investments.
4. The company can avoid rental expenditure on storage facilities amounting to ₹ 33,000 per annum. Property. Taxes and insurance amounting to ₹ 22,000 will be saved due to JIT programme.
5. Presently there are 7 workers in the store department at a salary of ₹ 5,000 each per month. After implementing JIT scheme, only 5 workers will be required in this department. Balance 2 workers' employment will be terminated.
6. Due to receipt of smaller lots of Raw Materials, there will be some disruption of production. The costs of stock-outs are estimated at ₹ 77,000 per annum.

Determine the financial impact of the JIT policy. Is it advisable for the company to implement JIT system?

### Illustration-11

Altra Video Company sells package of blank video tapes to its customers. It purchases video tapes from

Yash Tape Company at ₹ 150 per packet. Yash Tape Company pays all freight to Altra Video Company. No incoming inspection is necessary because Yash Tape Company has a superb reputation for delivery of quality merchandise. Annual demand of Altra Video Company is 15,600 packages. Altra Video Company requires 10% annual return on its investment. The purchase order lead time is 2 weeks. The purchase order is passed through internet and it costs ₹ 20 per order. The relevant insurance, material handling etc. is ₹ 10 per package per year.

Altra Video has to decide whether or not to shift to JIT purchasing. Yash Tape Company agrees to deliver 100 packages of Video tapes 156 times per year (6 times every 2 weeks) instead of existing delivery system of 1,200 packages 13 times a year, with additional amount of ₹0.05 per package. Altra Video Company incurs no stockout under its current purchasing policy. It is estimated that Altra Video Company will incur stock out cost on 50 video tape packages under a JIT purchasing policy. In the event of stock out, Altra video company has to rush order tape packages, which costs ₹ 8 per package. Comment whether Altra Video Company should implement JIT purchasing system.

Ram Company also supplies video tapes. It agrees to supply at ₹ 145 per package under JIT delivery system. If video tape is purchased from Ram Co. relevant carrying cost would be ₹ 9 per package against ₹ 10 in case of purchasing from Yash Tape Company. However, Ram Company does not enjoy a sterling reputation for quality. Altra Video Company anticipates the following negative aspects of purchasing tapes from Ram Company.

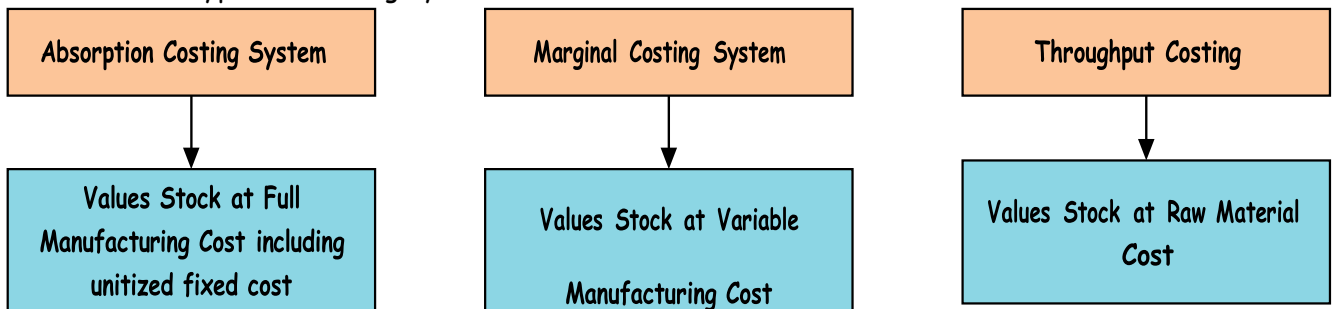
1. Incurring additional inspection cost of ₹ 0.05 per package.
2. Average stock out of 360 tape packages per year would occur, largely resulting from late deliveries. Ram Company. cannot rush order at short notice. Altra Video Company anticipates lost contribution margin per package of ₹ 10 from stock out.
3. Customers would likely return 2% of all packages due to poor quality of the tape and to handle this return, an additional cost of ₹ 25 per package would be incurred.

Comment on whether Altra Video Company can place an order with Ram Company.

## 4.3

## THROUGHPUT ACCOUNTING

- 1) Product costs are those costs considered for stock valuation and period costs are ignored for stock valuation.
- 2) There are 3 types of costing systems:



- 3) Absorption Costing hides inefficiency by allowing fixed manufacturing overhead to go to next year through stock (for more details refer Marginal Costing). Fixed Cost will anyhow be incurred whether or not the production take place. Hence should not go into stock valuation.
- 4) Throughput costing states that wages and variable overheads also should not enter stock value What intangible transferred through stock is only raw materials. We cannot transfer a labour time or a power consumption from one period to another period.
- 5) Even if the finished good is unsalable we can still scrap the raw materials but not labour or variable overhead.
- 6) **Contribution = Sales - Variable Cost** under Marginal Costing.  
In throughput costing we used a term 'Throughput Contribution' which is '**Sales - Material Cost of Goods Sold**'.
- 7) CGS = Cost of Goods Sold,  
VCGS = Variable Cost of Goods Sold,  
TCGS = Throughput Cost of Goods Sold
- 8) GP = Gross Profit, GC = Gross Contribution, GTC = Gross Throughput Contribution

Chicken required per  
unit = 100 Grams  
Demand-80 Units  
Selling Price: ₹150 per unit

Raw Material Available = 10,000 Grams  
Cost per kg = ₹500

Chicken required per unit = 200 Grams  
Demand -100 Units Selling Price: ₹250 per unit

Calculation of contribution per unit of bottleneck



| Particulars                         | Burger    | Chicken Fry |
|-------------------------------------|-----------|-------------|
| Selling Price                       | 150       | 250         |
| Less: Material Cost                 | 50        | 100         |
| Contribution                        | 100       | 150         |
| Material Required per unit          | 100 grams | 200 grams   |
| Contribution per unit of Bottleneck | 1         | 0.75        |

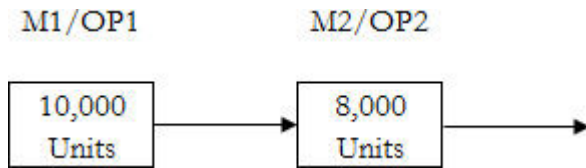
Optimum Mix:

| Product     | Bottleneck Available | Production | Bottleneck Used         | Bottleneck Balance |
|-------------|----------------------|------------|-------------------------|--------------------|
| Burger      | 10,000 grams         | 80 Units   | 8,000 grams<br>(80X100) | 2,000 grams        |
| Chicken Fry | 2,000 grams          | 10 Units   | 2000 grams<br>(10X200)  | -                  |

**Throughput or cycle time** - Time required to convert raw material into finished goods ready to be shipped to customer. It includes

- Material Handling
- Production Processing
- Inspection and Packaging

## BOTTLE NECK



- 1) The Output of the factory is determined by the speed of the slowest Machine or Operation. That Machine (or) Operation is called Bottle Neck Machine (or) Bottle Neck Operation.
- 2) TOC (Theory of Constraints) is all about managing Bottle Necks.
- 3) The following things should be kept in mind while managing Bottle Necks:
  - a) The Production of all the operations should be sub-ordinated to Bottle Neck Operation.
  - b) For example, M1 can produce 10,000 units per day but the production should take place only for 8,000 units because if the full capacity is operated it leads to build up of work-in-progress inventories which involves holding costs.
  - c) The Company should strive to take measures to remove bottle necks.
  - d) Some measures that can be undertaken to remove bottle necks are:
    - i) Sub-contract portion of Bottleneck Operation
    - ii) Improve the capacity of the Bottleneck Operation by adding additional machines.
    - iii) Upgrade the technology to improve the speed of Bottleneck Machines
    - iv) Try for methods to reduce scrap (Both Bottleneck & Non-Bottleneck Machines)
- 4) The company should not spend any money that improves the output of non-bottle neck operations because it is a wasteful expenditure having no impact on the factory output. Similar to crashing a non-critical activity.

The throughput formula for a specific product is as follows

Throughput( t. p contribution ) = Sale revenue from the product - Direct material costs

Throughput Efficiency =  $\frac{\text{throughput cost or standrd allowed}}{\text{actual factory cost}}$

Throughput Time ratio =  $\frac{\text{time spent}}{\text{total cycle tim e}}$

Throughput Accounting Ratio (TAR/TPAR) =  $\frac{\text{Return per factory hour}}{\text{Cost per factory hour}}$

Return per Factory Hour =  $\frac{\text{Throughput per Unit}}{\text{Product's time taken for the Limited Resource}}$

Cost per Factory Hour =  $\frac{\text{Total Factory Cost}}{\text{Total Limited Resource Time Available}}$

Total Factory Cost = Except material costs, most factory costs are fixed these are

called total factory cost.

## SMQs

### Illustration-12

A factory has a key resource (bottleneck) of Facility A which is available for 62,600 minutes per week. The time taken per unit of Product X and Y in Facility A are 5 minutes and 10 minutes respectively. Last week's actual output was 9500 units of product X and 1300 units of Product Y. Actual factory cost was ₹ 1,56,500. What is the throughput cost for the week?

### Illustration-13

Modern Co produces 3 products, A, B and C, details of which are shown below:

| Particulars   | A      | B      | C      |
|---|--------|--------|--------|
| Selling price per unit (₹)                                | 120    | 110    | 130    |
| Direct material cost per unit (₹)                         | 60     | 70     | 85     |
| Variable overhead (₹)                                     | 30     | 20     | 15     |
| Maximum demand (units)                                    | 30,000 | 25,000 | 40,000 |
| Time required on the bottleneck resource (hours per unit) | 5      | 4      | 3      |

There are 3,20,000 bottleneck hours available each month.

#### Required:

Calculate the optimum product mix based on the throughput concept.

### Illustration-14

Cat Co makes a product using three machines - X, Y and Z. The product has to pass through all the three machines.

The capacity of each machine is as follows:

|                                      | X  | Y  | Z   |
|--------------------------------------|----|----|-----|
| Machine capacity per week (in units) | 80 | 60 | 500 |
|                                      | 0  | 0  |     |

The demand for the product is 1,000 units per week. For every additional unit sold per week, profit increases by ₹50,000. Cat Co is considering the following possible purchases (they are not mutually exclusive hence combination of multiple Proposals are to be evaluated):

**Proposal 1:** Replace machine X with a newer model. This will increase capacity to 1,100 units per week and costs ₹60 Lakhs.

**Proposal 2:** Invest in a second machine Y, increasing capacity by 550 units per week. The cost of this machine would be ₹68 Lakhs.

**Proposal 3:** Upgrade machine Z at a cost of ₹75 Lakhs, thereby increasing capacity to 1,050 units.

**Required:** Which is Cat Co's best course of action under throughput accounting?

## Illustration-15

A factory has a key resource (bottleneck) of Facility A which is available for 31,300 minutes per week. Budgeted factory costs and data on two products, X and Y, are shown below:

| Product | Selling Price/Unit | Material Cost/Unit | Time in Facility A |
|---------|--------------------|--------------------|--------------------|
| X       | ₹ 35               | ₹ 20               | 5 minutes          |
| Y       | ₹ 35               | ₹ 17.50            | 10 minutes         |

Budgeted factory costs per week:

|                 | ₹      |
|-----------------|--------|
| Direct labour   | 25,000 |
| Indirect labour | 12,500 |
| Power           | 1,750  |
| Depreciation    | 22,500 |
| Space cost      | 8,000  |
| Engineering     | 3,500  |
| Administration  | 5,000  |

Actual production during the last week is 4,750 units of product X and 650 units of product Y. Actual factory cost was ₹ 78,250.

**Calculate:**

- (i) Total factory costs (TFC)
- (ii) Cost per factory minute
- (iii) Return per Factory Minute for both products
- (iv) TA ratios for both products
- (v) Throughput cost per week
- (vi) Efficiency ratio

## Illustration-16

Given below is the basic data relating to New India Company for three years

|  | Year 1 | Year 2 | Year 3 |
|--|--------|--------|--------|
|  |        |        |        |

| <b>Production and Inventory data:</b>        |       |       |       |
|--|-------|-------|-------|
| Planned production (in units)                | 2,500 | 2,500 | 2,500 |
| Finished goods inventory (in units), Jan 1   | 0     | 0     | 750   |
| Actual production (in units)                 | 2,500 | 2,500 | 2,500 |
| Sales (in units)                             | 2,500 | 1,750 | 3,250 |
| Finished goods inventory (in units), Dec. 31 | 0     | 750   | 0     |

Revenue and Cost data, all three years

|  | ₹         |
|--|-----------|
| Sales price per unit   | 48        |
| Manufacturing costs per unit   |           |
| Direct material  | 12        |
| Direct labour  | 8         |
| Variable manufacturing overheads   | 4         |
| <b>Total variable cost per unit</b>  | <b>24</b> |
| Used only under absorption costing:  |           |
| Fixed manufacturing overhead = Annual fixed OH / Annual Production<br>= ₹ 30,000 / 2,500 | 12        |
| <b>Total absorption cost per unit</b>  | <b>36</b> |
| Variable selling and administration cost per unit  | 4         |
| Fixed selling and administrative cost per year   | 5,000     |

You are required to Prepare:

- Absorption Costing Income Statement
- Marginal Costing Income Statement
- Reconciliation of Income under Absorption and Marginal Costing.
- Throughput Costing Income Statement.
- Draw your observations.

### Illustration-17

T Ltd, produces a product which passes through two processes - cutting and finishing.

The following information is provided:

|   | Cutting   | Finishing |
|---|-----------|-----------|
| Hours available per annum                                     | 50,000    | 60,000    |
| Hours needed per unit of product                              | 5         | 12        |
| Fixed operating costs per annum excluding direct material (₹) | 10,00,000 | 10,00,000 |

The selling price of the product is ₹1,000 per unit and the only variable cost per unit is direct material,

which costs ₹ 400 per unit. There is demand for all units produced.

Evaluate each of the following proposals independent of each other:

- (i) An outside agency is willing to do the finishing operation of any number of units between 5,000 and 7,000 at ₹ 400 per unit.
- (ii) Another outside agency is willing to do the cutting operation of 2,000 units at ₹ 200 per unit
- (iii) Additional equipment for cutting can be bought for ₹ 10,00,000 to increase the cutting facility by 50,000 hours, with annual fixed costs increased by ₹ 2 lakhs.

## Illustration-18

H Ltd. manufactures three products. The material cost, selling price and bottleneck resource details per unit areas follows:

| Particulars                            | Product X | Product Y | Product Z |
|--|-----------|-----------|-----------|
| Selling Price (₹)                      | 66        | 75        | 90        |
| Material and other variable cost (₹)   | 24        | 30        | 40        |
| Bottleneck resource timeline (minutes) | 15        | 15        | 20        |

Budgeted factory costs for the period are ₹ 2,21,600. The bottleneck resources time available is 75,120 minutes per period.

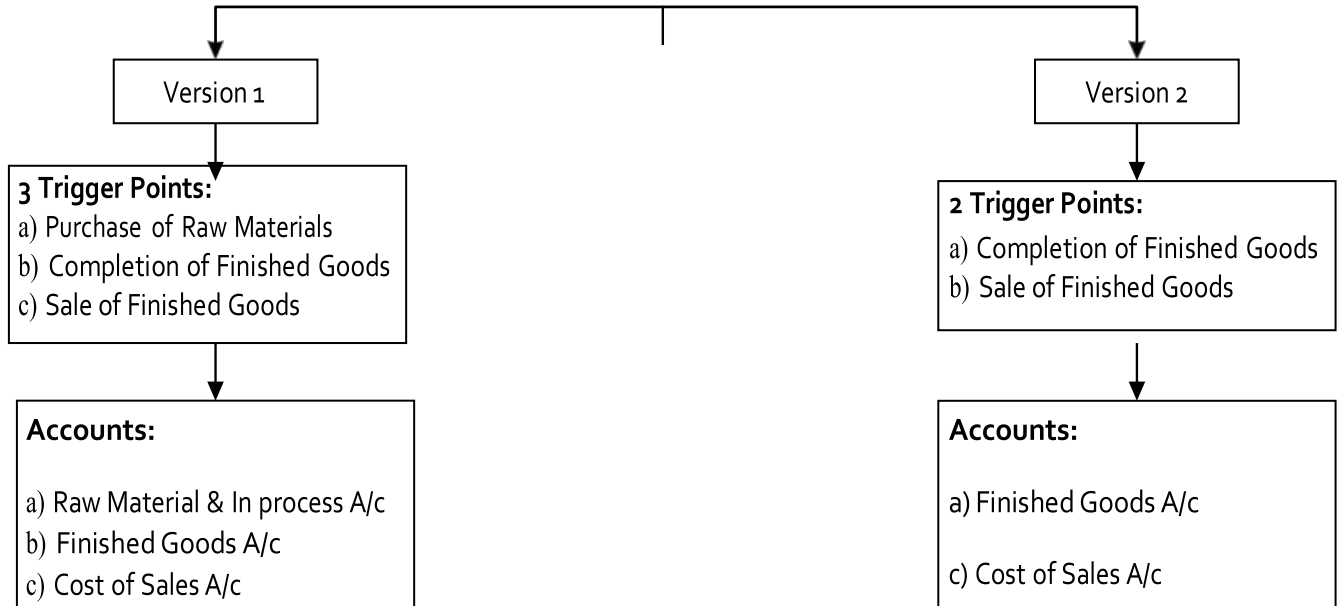
### Required:

- (i) Company adopted throughput accounting and products are ranked according to 'product return per minute'. Select the highest rank product.
- (ii) Calculate throughput accounting ratio (TA Ratio) and comment on it.

## 4.4 : Back Flush Accounting

- 1) Traditional Costing System meticulously traces the various cost items into inventories. The system ensures **high degree of inventory control**.
- 2) The Traditional Costing System operates with **4 trigger points**. A trigger point is an event which makes cost accounting system to pass journal entries.
- 3) The 4 trigger points are:
  - a) Purchase of Raw Materials
  - b) Issue for Production
  - c) Completion of Finished Goods
  - d) Sale of Finished Goods

The accounts maintained are Raw Material Control A/c, WIP Control A/c, Finished Goods Control A/c and Cost of Sales A/c
- 4) Companies operating **Just-In-Time (JIT) system** ideally will have **no inventories (or) very negligible inventory**. Hence there is no necessity to have an elaborate cost accounting system that traces costs to the stocks and control stocks. **A simplified is called 'Backflush Costing System'**.
- 5) There are **2 versions in Backflush Costing System**:



- 6) In **Version 1** Consumption of Raw Materials and charging of Conversion Cost happens not during Production but **recognized only on completion of goods**.  
The completed goods pulls the Standard Cost of Raw Materials Consumed & Conversion Cost into Production.
- 7) In an **ideal Just-In-Time System there should be no Price Variance** because negotiation with supplier happens at the beginning of the period itself.  
There should also be **no usage variance because in Just-In- Time System** there is no time available to

re-work Scrap & Defectives. Still if it arises a separate Scrap Reporting System should capture it and transfer to Abnormal Loss Account.

- 8) In **Version 2** the suppliers are paid only for **standard consumption**. Any excess consumption reported in scrap reporting system should be analyzed with reasons.

If it is due to poor quality Raw Material the supplier will not be paid and if it is due to other reasons they will be paid and the cost booked to Abnormal Loss a/c.

## SMQs

### Illustration-19

The manufacturing cost information for March for a division of XYZ Co. is as follows:

| Cost incurred in March                        | ₹ '000       |
|---|--------------|
| Purchase of Raw Materials                     | 4,250        |
| Labour  | 2,800        |
| Overheads                                     | 1,640        |
| Activity in March                             | Units ('000) |
| Finished goods manufactured during the period | 180          |
| Sales   | 145          |
| Standard cost per unit                        | ₹            |
| Materials                                     | 20           |
| Labour  | 15           |
| Overheads                                     | 9            |
| <b>Total</b>                                  | <b>44</b>    |

There were no opening stocks of raw materials, WIP or finished goods. It should be assumed that there are no direct materials variance for the period. Show the relevant Journal entries and ledger accounts in Variant 1 and Variant 2 of backflush system.

### Illustration-20

Dandia Ltd. follows JIT system. It had following transactions in May, 2021:

- i. Raw materials were purchased for ₹ 2,00,000.
- ii. Direct labour cost incurred ₹ 36,000
- iii. Actual overhead costs ₹ 3,00,000
- iv. Conversion costs applied ₹ 3,16,000

All materials, that were purchased, were placed into production and the production was also completed and sold during the month. The difference between actual and applied costs is computed.

You are required to pass both Traditional journal entries and back flush journal entries.

4.5.

## BENCHMARKING

### Concept

It is believed that the term benchmark, originates from the history of guns and ammunition, and with the same aim as for the business term; comparison and improved performance.

**Benchmarking** is the continuous process of measuring products, services or activities against the best levels of performance that may be found either inside or outside the organisation.

It is a process of comparing a firm's activities with best practices.

### Types of Benchmarking

Noteworthy types of Benchmarking are:

1. **Product Benchmarking (Reverse Engineering)**
2. **Competitive Benchmarking**
3. **Process Benchmarking**
4. **Internal Benchmarking**
5. **Strategic Benchmarking**
6. **Global Benchmarking**

#### 1. **Product Benchmarking (Reverse Engineering):**

Product Benchmarking is an age-old practice of product oriented reverse engineering. Every organisation buys its rival's products and tears down to find out how the features and performances etc., compare with its products. This could be the starting point for improvement.

#### 2. **Competitive Benchmarking:**

Competitive Benchmarking looks at a company's direct competitors and evaluates how the company is doing in comparison. Competitive Benchmarking moves beyond product-oriented comparisons to include comparisons of process with those of competitors. In this type, the process studied may include marketing, finance, HR, R&D etc..

#### 3. **Process Benchmarking:**

Process benchmarking consists of a mechanism for identifying specific work procedures that could be improved by imitating external examples of excellence that can be set as the best standard in the industry.

#### 4. **Internal Benchmarking:**

Internal Benchmarking is an application of process benchmarking, within an organisation by comparing the performance of similar business units or business process..

#### 5. **Strategic Benchmarking:**

Strategic Benchmarking is used to describe the situation when a firm is interested in comparing its performance versus the best-in-class or what is deemed as world-class performance. This process often involves looking beyond the firm's core industry to firms that are known for their success with a particular function or process..

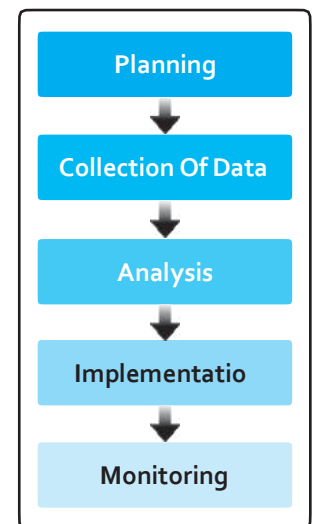
## 6. Global Benchmarking:

Global Benchmarking is an extension of Strategic Benchmarking to include benchmarking partners on a global scale. E.g. Ford Co. of USA benchmarked its account payable functions with that of Mazda in Japan and found to its astonishment that the entire function was managed by 5 persons as against 500 in Ford.

### Process of Benchmarking

The benchmarking process is relatively uncomplicated. Some knowledge and a practical dent are all that is needed to make such a process a success. The key stages in the benchmarking process may be summarized as:

- (i) Planning
- (ii) Collection of Data
- (iii) Analysis of Data
- (iv) Implementation
- (v) Monitoring



#### Planning (Stage 1):

Planning starts with determination of benchmarking goal statement. It is imperative that the organisation identifies the activities that need to be benchmarked prior to engaging in benchmarking. Since benchmarking can be applied to any business process or function, a range of research techniques may be required.

#### Collection of Data and Information (Stage 2):

This stage involves the following steps: -

- a. Compiling information and data on performance. They may include mapping processes.
- b. Selecting and contacting partners.
- c. Developing a mutual understanding about the procedures to be followed and, if necessary, to prepare a Benchmarking Protocol with partners.
- d. Preparing questions and conceiving terminology and performance measures to be used.
- e. Distributing a schedule of questions to each partner.
- f. Undertaking information and data collection by chosen method for example, interviews, site-visits, telephone fax and e-mail.
- g. Collecting the findings to enable analysis.

## Analysis of Data (Stage 3):

Once sufficient data is collected, the proper analysis of such information is of foremost importance. The process may consist of the following steps.

- (a) **Reviewing** the findings and producing tables, charts and graphs to support the analysis
- (b) **Identifying gaps** in performance between our firm and better performers.
- (c) **Seeking explanations** for the gaps in performance. The performance gaps can be positive, negative or zero.
- (d) **Ensuring** that comparisons are meaningful and credible
- (e) **Communicating** the findings to those who are affected.

## Recommendation & Implementation (Stage 4):

This is the stage in the benchmarking process, where it becomes mandatory to walk the talk for success. This usually means that far reaching changes need to be made so that the performance gap between the target and the actual is narrowed and eliminated. It starts with deciding the feasibility of making the improvements in the light of conditions that apply within own firm.

## Monitoring & Review (Stage 5):

Benchmarking process need to be properly monitored in order to reap the maximum benefit out of the benchmarking process. This could involve:

- a. Evaluating the benchmarking process undertaken and the results of the improvements against objectives and success criteria plus overall efficiency and effectiveness.
- b. Documenting the lessons learnt and make them available to others.
- c. Periodically re-considering the benchmarks for continuous improvement.

## Pre-requisites of Benchmarking

1. **Commitment:** Senior Managers should support benchmarking fully and must be committed to continuous improvements.
2. **Clarity of Objectives:** The objectives should be clearly defined at the preliminary stage. Benchmarking teams must have a clear picture of their firm's performance before approaching others for comparisons.
3. **Appropriate Scope:** The scope of the work should be appropriate in the light of the objectives, resources, time available and the experience level of those involved.
4. **Resources:** Sufficient resources must be made available to complete projects within the required time scale.
5. **Skills:** Benchmarking teams should have appropriate skills and competencies.
6. **Communication:** Stakeholders, and also staff and their representatives, are to be kept informed of the reasons for benchmarking.

## Difficulties in implementation of Benchmarking

1. **Time consuming:** Benchmarking is time consuming and at times difficult. It has significant requirement of staff time and Company resources. Companies may waste time in benchmarking non-critical functions.
2. **Lack of management Support:** Benchmarking implementation requires the direct involvement of all managers. The drive to be best in the industry or world cannot be delegated.
3. **Resistance from employees:** It is likely that there may be resistance from employees.
4. **Paper Goals:** Companies can become pre-occupied with the measures. The goal becomes not to improve process, but to match the best practices at any cost.
5. **Copy-paste attitude:** The key element in benchmarking is the adaptation of a best practice to tailor it to a company's needs and culture. Without that step, a company merely adopts another company's process. This approach condemns benchmarking to fail leading to a failure of benchmarking goals

## 5. Evaluating Performance

### STANDARD COSTING

#### DEFINITION

Standard costing is a method of costing to measure the performance of an activity by

- a) Comparing actual costs with standard costs
- b) Analysis of variances, and
- c) reporting of variances for investigation and appropriate action

#### STANDARD COSTING INVOLVING FOLLOWING STEPS

- a) Setting up of standards
- b) Ascertainment of actual costs,
- c) Comparison of actual and standard costs to determine variances,
- d) Investigation of variances and taking appropriate action thereon wherever necessary, and
- e) Disposition of variances suitably by transfer to costing P&L a/c or by absorption to output, as required

#### LEARNING OBJECTIVES

- a) Material Cost Variances
- b) Labour Cost Variances
- c) VOH Cost Variances
- d) FOH Cost Variances
- e) Sales Variances

#### MAIN USES OF STANDARD COSTING SYSTEM

- a) Cost Control
- b) Determination of Selling Price

#### MATERIAL COST VARIANCE

| Material | (1)<br>SQ x SP (₹) | (2)<br>RAQ x SP (₹) | (3)<br>AQ x SP (₹) | (4)<br>AQ x AP (₹) |
|----------|--------------------|---------------------|--------------------|--------------------|
| A        |                    |                     |                    |                    |
| B        |                    |                     |                    |                    |
| C        |                    |                     |                    |                    |

**Material Cost Variance = (1) - (4) = Standard Cost - Actual Cost**

**Material Price Variance = (3) - (4)**

**Material Usage Variance = (1) - (3)**

**Material Mix Variance = (2) - (3)**

**Material Yield Variance = (1) - (2)**

### LABOUR COST VARIANCE (WITH OUT IDLE TIME)

| Labour       | (1)<br>SH x SR (₹) | (2)<br>RAH x SR (₹) | (3)<br>AH x SR (₹) | (4)<br>AH x AR (₹) |
|--------------|--------------------|---------------------|--------------------|--------------------|
| Skilled      |                    |                     |                    |                    |
| Semi skilled |                    |                     |                    |                    |
| Unskilled    |                    |                     |                    |                    |

**Labour Cost Variance = (1) - (4)**

**Labour Rate Variance = (3) - (4)**

**Labour Efficiency Variance = (1) - (3)**

**Labour Mix Variance = (2) - (3)**

**Labour Yield Variance = (1) - (2)**

### LABOUR COST VARIANCE (WITH O IDLE TIME)

| Labour       | (1)<br>SH x SR (₹) | (2)<br>RAH x SR (₹) | (3)<br>Net AH x SR (₹) | (4)<br>AH X SR (₹) | (5)<br>AH x AR (₹) |
|--------------|--------------------|---------------------|------------------------|--------------------|--------------------|
| Skilled      |                    |                     |                        |                    |                    |
| Semi skilled |                    |                     |                        |                    |                    |
| Unskilled    |                    |                     |                        |                    |                    |

**Labour Cost Variance = (1) - (5) = Standard Cost - Actual Cost**

**Labour Rate Variance = (4) - (5)**

**Labour Gross Efficiency Variance = (1) - (4)**

**Labour Efficiency Variance = (1) - (3)**

**Labour Idle time Variance = (3) - (4)**

**Labour Mix Variance = (2) - (3)**

Labour Yield Variance = (1) - (2)

## OVERHEAD COST VARIANCE

### Variable Overhead Cost Variance

|              |             |             |                  |
|--------------|-------------|-------------|------------------|
| Hours Basis  | (1) SH x SR | (2) AH x SR | (3) AH x AR/AVOH |
| Output Basis | (1) AO x SR | (2) SO x SR | (3) AO x AR/AVOH |

Variable OH Cost Variance = (1) - (3) = Standard Cost - Actual Cost Variable

OH Expenditure Variance = (2) - (3)

Variable OH Efficiency Variance = (1) - (2)

### Fixed Overhead Cost Variance

|              |             |             |          |          |                  |
|--------------|-------------|-------------|----------|----------|------------------|
| Hours Basis  | (1) SH x SR | (2) AH x SR | (3) PFOH | (4) BFOH | (5) AH x AR/AFOH |
| Output Basis | (1) AO x SR | (2) SO x SR | (3) PFOH | (4) BFOH | (5) AO x AR/AFOH |

FOH Cost Variance/ Under or Over Absorption/Standard Cost - Actual Cost/OH absorbed - OH Incurred = (1) - (5)

FOH Expenditure Variance = (4) - (5)

FOH Volume Variance = (1) - (4)

FOH Calendar Variance = (3) - (4)

FOH Capacity Variance = (2) - (3)

FOH Efficiency Variance = (1) - (2)

### Fixed Overhead Cost Variance

Possible fixed OH =  $\frac{\text{Budgeted FOH}}{\text{Budgeted days}} \times \text{actual days}$

Standard FOH rate per unit =  $\frac{\text{Budgeted FOH}}{\text{Budgeted output}}$

Standard FOH rate per hour =  $\frac{\text{Budgeted FOH}}{\text{Budgeted hours}}$

### Illustration-1

Rhodes Co manufactures Stops which it is estimated require 2 kg of material XYZ at ₹ 100/kg In week 21 only 250 Stops were produced although budgeted production was 300. 450 kg of XYZ were purchased

and used in the week at a total cost of ₹ 51,000. Later it was found that the standard had failed to allow for a 10% price increase throughout the material supplier's industry. Rhodes Ltd carries no stocks.

## Illustration-2

Green Chemicals produces agriculture fertilizers with following information provided. The management analysed past data and set the budgeted rates as following:

Standard hours per unit of product = 1.1

Standard direct labour rate per hour = ₹

18.50

Standard usage of material per unit = 1.2 kg per

unit Standard price of material per unit = ₹ 70

During production times, the management revised the budgets with updated information as:

Revised price of material per unit = ₹ 71

Revised labour rate per hour = ₹ 20 per

hour Revised hours per unit of product =

1.05

Revised usage of material per unit = 1.175 kg per unit

After the production period the company recorded the following actual results:

Actual Production = 15,400

Raw Material usage = 16,555 KGs

Actual cost of raw material = ₹ 11,91,960 or ₹ 72 per KG

Actual labour costs = 16,632 hours and ₹ 3,24,324 or ₹ 19.50 per hour.

Calculate the Raw Material and Direct labour Planning & Operational Variances.

## Illustration-3

Product X takes 5 hours to make and Product Y requires 10 hours. In a month of 25 effective days of 8 hours a day, 1,000 units of X and 600 units of Y were produced. The company employs 50 workers in the production department, and the budgeted hours for the year are 102,000.

**Required:** Calculate the following control ratios:

- (a) Efficiency ratio
- (b) Activity ratio
- (c) Capacity ratio

## Illustration-4

In a company operating on a standard costing system for a given four-week period budgeted sales of

10,000 units at ₹ 50 per unit, actual sales were 9,000 units at ₹ 51.25 per unit. Costs relating to that period were as follows:

|                         | Standard (₹) | Actuals (₹) |
|-------------------------|--------------|-------------|
| Materials               | 2,50,000     | 2,57,400    |
| Wages                   | 75,000       | 70,875      |
| Fixed Overheads         | 20,000       | 18,810      |
| Variable Overheads      | 10,000       | 9,250       |
|                         |              |             |
| Semi-Variable Overheads | 2,700        | 2430        |
| Standard Hours 50,000   |              |             |
| Actual Hours 40,500     |              |             |

- The Standard material content of each unit is estimated at 25 kg. at ₹ 1 per kg, actual figures were 26 kg at 1.10 per kg.
- Semi-variable Overhead consists of FIVE - NINTHS fixed expenses and FOUR - NINTHS variable.
- The Standard wages per unit are 5 hours at ₹ 1.50, per Unit actual wages were 4.5 hours at ₹ 1.75.
- There were no opening stocks and the whole production for the period was sold.
- at ₹ 50 per unit, actual sales were 9,000 units at ₹ 51.25 per unit. Costs relating to that period were as follows:

The four-week period was normal period. You are required:

- To compute the variances in Sales, Materials, Labour and Over heads due to all possible causes; and
- With the help of such a computation draw a statement reconciling the actual profit for the period with the standard profit.

### Illustration-5

S.V.Ltd. manufactures BXE by mixing three raw materials. For every batch of 100Kg. of BXE, 125 Kg. of raw materials are used. In April 2021, 60 batches were prepared to produce an output of 5,600 Kg. of BXE. The standard and actual particulars for April 2021 are as under:

| Raw material | Standard |              | Actual |              | Quantity of raw materials purchased kg |
|--------------|----------|--------------|--------|--------------|--|
|              | Mix %    | Price per kg | Mix %  | Price per kg |  |
| A            | 50       | 20           | 60     | 21           | 5,000                                  |
| B            | 30       | 10           | 20     | 8            | 2,000                                  |
| C            | 20       | 5            | 20     | 6            | 1,200                                  |

Calculate relevant material variances.

### Illustration-6

A brass foundry making castings which are transferred to the machine shop of the company at standards in regard to material stocks which are kept at standard price are as follows:

Standard Mixture 70% Material C; 30% Material Z

Standard Price Material C ₹ 2,400 per ton; Material Z ₹ 650 per ton

Standard loss in melting 5% of input

Figures in respect of a costing period are as follows:

|                   |            |          |                 |
|-------------------|------------|----------|-----------------|
| Commencing stocks | Material C | 100 tons |                 |
|                   | Material Z | 60 tons  |                 |
| Finishing stocks  | Material C | 110 tons |                 |
|                   | Material Z | 50 tons  |                 |
| Purchases         | Material C | 300 tons | Cost ₹ 7,32,500 |
|                   | Material Z | 100 tons | Cost ₹ 62,500   |
| Metal melted      | 400 tons   |          |                 |
| Casting produced  | 375 tons   |          |                 |

Present figures showing: Material Price, Mixture, and Yield Variance.

### Illustration-7

A company manufacturing a special type of fencing tile 12" × 8" × 1/2" used a system of standard costing. The standard mix of the compound used for making the tiles is:

1,200 kg. of material A @ ₹ 0.30 per

kg. 500 kg. of Material B @ ₹ 0.60

per kg 800 kg. of Material C @ ₹

0.70 per kg

The compound should produce 12,000 square feet of tiles of 1/2" thickness. During a period in which 1,00,000 tiles of the standard size were produced, the material usage was:-

| Kg     |                             | ₹     |
|--------|-----------------------------|-------|
| 7,000  | Material A @ ₹ 0.32 per kg. | 2,240 |
| 3,000  | Material B @ ₹ 0.65 per kg. | 1,950 |
| 5,000  | Material C @ ₹ 0.75 per kg. | 3,750 |
| 15,000 |                             | 7,940 |

Present the cost figures for the period showing Material price, Mixture, Sub-usage Variance.

### Illustration-8

One kilogram of product 'K' requires two chemicals A and B. The following were the details of product 'K' for the month of June, 2021:

Standard mix Chemical 'A' 50% and Chemical 'B' 50%

Standard price per kilogram of Chemical 'A' ₹ 12 and Chemical 'B' ₹ 15

Actual input of Chemical 'B' 70 kilograms.

Actual price per kilogram of Chemical 'A' ₹

15 Standard normal loss 10% of total input.

Materials Cost variance total ₹ 650

adverse. Materials Yield variance total ₹

135 adverse. You are required to

calculate:

Materials mix variance total Materials usage Variance total Materials price variance total Actual loss of actual input Actual input of chemical 'A'

Actual price per kilogram of Chemical 'B'

### Illustration-9

The standard labour component and the actual labour engaged in a week for a job are as under:

| Particulars  | Skilled workers | Semi-skilled workers | Unskilled workers |
|--|-----------------|----------------------|-------------------|
| Standard no. of workers in a gang                          | 32              | 12                   | 6                 |
| Standard wage rate per hour (₹)                            | 3               | 2                    | 1                 |
| Actual no. of workers employed in the gang during the week | 28              | 18                   | 4                 |
| Actual wage rate per hour (₹)                              | 4               | 3                    | 2                 |

During the 40-hour working week the gang produced 1800 standard labour hours of work. Calculate Labour efficiency variance, Mix variance, wage rate variance and labour cost variance.

### Illustration-10

DM is a denim brand specializing in the manufacture and sale of hand-stitched jeans trousers. DM manufactured and sold 10,000 pairs of jeans during a period. Information relating to the direct labour cost and production time per unit is as follows:

|               | Actual Hours Per Unit | Standard Hours Per Unit | Actual Rate Per Hour | Standard Rate Per Hour |
|---------------|-----------------------|-------------------------|----------------------|------------------------|
| Direct Labour | 0.65                  | 0.60                    | ₹ 120                | ₹ 100                  |

During the period, 800 hours of idle time was incurred. In order to motivate and retain experienced workers, DM has devised a policy of paying workers the full hourly rate in case of any idle time. Find

out:

- (a) Idle Time Variance
- (b) Labour Efficiency Variance

### Illustration-11

Calculate material and labour variances from the following:

| Standard |          |       |        | Actual |       |        |
|----------|----------|-------|--------|--------|-------|--------|
| Input    | Material | ₹ /Kg | Total  | Input  | ₹ /Kg | Total  |
| 400      | A        | @ 50  | 20,000 | 420    | @ 45  | 18,900 |
| 200      | B        | @20   | 4,000  | 240    | @ 25  | 6,000  |
| 100      | C        | @15   | 1,500  | 90     | @15   | 1,350  |
| 700      |          |       | 25,500 | 750    |       | 26,250 |

| Labour Hours |                     |      | Labour Hours |                  |             |
|--------------|---------------------|------|--------------|------------------|-------------|
|              | 100 @ ₹ 20 Per hour | 2000 |              | 120 Hrs. @ ₹ 25  | 3000        |
|              | 200 Women @ ₹ 15    | 3000 | 5000         | 240 Women @ ₹ 16 | 3840        |
| 25           | Normal Loss         |      |              | 75               | Actual Loss |
| 675          |                     |      | 30,500       | 675              |             |
|              |                     |      |              |                  | 33,090      |

### Illustration-12

| Item                | Budget     | Actual     |
|---------------------|------------|------------|
| No. of working days | 20         | 22         |
| Output per man hour | 1.0 Units  | 0.9 Units  |
| Overhead cost       | ₹ 1,60,000 | ₹ 1,68,000 |
| Man-hours per day   | 8,000      | 8,400      |

Calculate Overhead Variances.

### Illustration-13

X uses traditional standard costing system. The inspection and setup costs are actually ₹ 1,760 against a budget of ₹ 2,000. ABC system is being implemented and accordingly, the number of batches is identified as the cost driver for inspection and setup costs. The budgeted production is 10,000 units in batches of 1,000 units, whereas actually, 8,800 units were produced in 11 batches.

- a. Find the volume and total fixed overhead variance under the traditional standard costing system.
- b. Find total fixed overhead cost variance under the ABC system.

### Illustration-14

Compute the missing data indicated by the Question marks from the following.

|                | Product 'R' | Product 'S' |
|----------------|-------------|-------------|
| Sales quantity |             |             |

|                       |           |      |
|-----------------------|-----------|------|
| Std.(units)           | ?         | 400  |
| Actual (Units)        | 500       | ?    |
| Price (Unit)          |           |      |
| Standard              | ₹ 12      | ₹ 15 |
| Actual                | ₹ 15      | ₹ 20 |
| Sales price variance  | ?         | ?    |
| Sales volume variance | ₹ 1,200 F | ?    |
| Sales value variance  | ?         | ?    |

Sales mix variance for both the products together was ₹ 450 F. 'F' denotes Favorable.

### Illustration-15

GLOBAL Ltd. is engaged in marketing of wide range of consumer goods. A, B, C and D are the zonal sales officers for four zones. The company fixes annual sales target for them individually. You are furnished with the followings.

- The standard costs of sales target in respect of A, B, C, D are ₹ 5,00,000, ₹ 3,75,000, ₹ 4,00,000 and ₹4,25,000 respectively.
- A, B, C, D respectively earned ₹ 29,900, ₹ 23,500, ₹ 24,500 and ₹ 25,800 as commission at 5% on actual sales effected by them during the previous year.
- The relevant variances as computed by a qualified cost accountant are as follows.

|                       | A       | B       | C        | D       |
|-----------------------|---------|---------|----------|---------|
|                       | ₹       | ₹       | ₹        | ₹       |
| Sales price variance  | 4000(F) | 6000(A) | 5000(A)  | 2000(A) |
| Sales volume variance | 6000(A) | 6000(F) | 15000(F) | 8000(F) |

(A) = Adverse variance and (F) = Favorable variance

You are required to compute the amount of target sales and margin fixed in case of each of the zonal sales officers.

### Illustration-16

|                     | (₹ In Lakhs) |            |
|---------------------|--------------|------------|
|                     | 31-03-2020   | 31-03-2021 |
| Sales               | 120          | 129.60     |
| Prime Cost of Sales | 80           | 91.10      |
| Variable Overheads  | 20           | 24         |
| Fixed expenses      | 15           | 18.50      |
| Profit              | 5            | (4)        |

During 2020-21, average prices increased over those of the previous years

- (1) 20% in case of sales
- (2) 15% in case of prime cost
- (3) 10% in case of Overheads.

Prepare a profit variance statement from the above data.

### Illustration-17

The assistant management accountant of your company has been preparing the profit and loss account for the week ended 31st October. Unfortunately, he has had a traffic accident and is now in a hospital. So, as senior cost analyst you have been asked to complete this statement. The uncompleted statement and relevant data are shown below.

| October                        | Week ended 31st |              |
|--------------------------------|-----------------|--------------|
|                                | ₹               | ₹            |
| Sales                          |                 | 50,000       |
| Standard Cost:                 |                 |              |
| Direct Materials               |                 |              |
| Direct Wages                   |                 |              |
| Overheads                      | ---             | ---          |
| Standard Profit                | ---             | ---          |
| Variances                      | Fav. /(Adv.)    | Fav. /(Adv.) |
| Direct Material:               | ₹               | ₹            |
| Price Variance                 | (400)           |              |
| Usage Variance                 | (300)           |              |
| Total Direct Material Variance |                 | (700)        |
| Direct Labour:                 |                 |              |
| Rate Variance                  |                 |              |
| Efficiency Variance            |                 |              |
| Total Direct Labour Variance   |                 | ---          |
| Overhead Expenditure           |                 |              |
| Variance Overhead Volume       |                 |              |
| Variance Total Overhead        |                 |              |
| Variance                       |                 | ---          |
| Total Variance                 |                 | ---          |
| Actual Profit                  |                 | ---          |

### Standard Data

The standard price of direct material used is ₹ 600 per ton. From each tone of material, it is expected that 2,400 units will be produced. A forty-hour week is operated. Standard labour rate per hour is ₹ 40. There are 60 employees working as direct labour. The standard performance is that each employee

should produce one unit of product in 3 minutes. There are 4 working weeks in October. The budgeted fixed overhead for October is ₹ 76,800.

**Actual data**

Materials used during the week were 20 tones at ₹ 620 per ton. During the week 4 employees were paid of ₹ 42 per hour and 6 were paid ₹ 38 per hour and remaining were paid at standard rate. Overheads incurred was ₹ 18000. You are required to complete the P & L Statement for the week ended 31st Oct.

**Illustration-18**

A Company manufactures two products X and Y. Product X requires 8 hours to produce while Y requires 12 hours. In April, 2021, of 22 effective working days of 8 hours a day. 1,200 units of X and 800 units of Y were produced. The company employs 100 workers in production department to produce X and Y. The budgeted hours are 1,86,000 for the year. Calculate Capacity, Activity and Efficiency ratios and establish their relationship

**Illustration-19**

The following is a flexible budget of FB Co. Ltd. For a production department.

|                       | Level of Activity |       |       |
|-----------------------|-------------------|-------|-------|
| Direct Labour Hours   | 4000              | 5000  | 6000  |
| Number of Units       | 8000              | 10000 | 12000 |
| Fixed Overhead (₹)    | 5000              | 5000  | 5000  |
| Variable Overhead (₹) | 800               | 1000  | 1200  |
| Total Overheads (₹)   | 5800              | 6000  | 6200  |

Normal Level of activity was 5000 direct labour

hours. Actual Results were:

Direct Labour hours -

4800 Variable

Overhead - ₹ 900

Output in Units - 10400

Fixed Overhead - ₹

5100

Compute Fixed overhead cost, volume and expenditure variances, variable overhead cost, efficiency and expenditure variances, efficiency, capacity and activity ratios.

**Illustration-20**

ABC Ltd adopts a standard costing system. The standard output for a period is 20,000 units and the standard cost and profit per unit is as under:

|                                     |       |
|-------------------------------------|-------|
|                                     |       |
| Direct Material (3 units @ ₹ 1.50)  | 4.50  |
| Direct Labour (3 Hrs. @ ₹ 1.00 )    | 3.00  |
| Direct Expenses                     | 0.50  |
| Factory Overheads : Variable        | 0.25  |
| Fixed                               | 0.30  |
| Administration Overheads            | 0.30  |
| Total Cost                          | 8.85  |
| Profit                              | 1.15  |
| Selling Price (Fixed By Government) | 10.00 |

The actual production and sales for the period were 14,400 units. There has been no price revision by the Government during the period. The following are the variances worked out at the end of the period.

| Direct Material          |                        | Favorable (₹) | Adverse (₹) |
|--------------------------|------------------------|---------------|-------------|
|                          | Price                  |               | 4,250       |
|                          | Usage                  | 1,050         |             |
| Direct labour            |                        |               |             |
|                          | Rate                   |               | 4,000       |
|                          | Efficiency             | 3,200         |             |
| Factory Overheads        |                        |               |             |
|                          | Variable - Expenditure | 400           |             |
|                          | Fixed - Expenditure    | 400           |             |
|                          | Fixed - Volume         |               | 1,680       |
| Administration Overheads |                        |               |             |
|                          | Expenditure            |               | 400         |
|                          | Volume                 |               | 1,680       |

You are required to:

- Ascertain the details of actual costs and prepare a Profit and Loss Statement for the period showing the actual Profit/Loss. Show the workings clearly.
- Reconcile the actual Profit with standard profit.

### Illustration-21

X Ltd. produces and sells a single product. Standard cost card per unit of the product is as follows:

(₹)

|                   |   |                     |    |
|-------------------|---|---------------------|----|
| Direct materials: | A |                     |    |
|                   | B | (10 kg.@ 5 per kg.) | 50 |

|                               |                         |     |
|-------------------------------|-------------------------|-----|
| Direct wages                  | (5 hours @ 5 per hour)  | 25  |
| Variable production overheads | (5 hours @ 12 per hour) | 60  |
| Fixed production overheads    |                         | 25  |
| Total standard cost           |                         | 190 |
| Standard gross profit         |                         | 35  |
| Standard selling price        |                         | 225 |

Fixed production overhead has been absorbed on the expected annual output of 25,200 units produced evenly throughout the year. During the month of December, 2018, the following were the actual results for an actual production of 2,000 units.

|                               |   |          |
|-------------------------------|---|----------|
|                               |   | (₹)      |
| Sales                         | (2,000 units @ 225)                         | 4,50,000 |
| Direct materials: A           | 18,900 kg.                                  | 99,225   |
| B                             | 10,750 kg.                                  | 61,275   |
| Direct wages                  | 10,500 hours (actually worked 10,300 hours) | 50,400   |
| Variable production overheads |   | 1,15,000 |
| Fixed production overheads    |   | 56,600   |
| Total                         |   | 3,82,500 |
| Gross profit                  |   | 67,500   |

The material price variance is extracted at the time of receipt of materials. Material purchases were Material A 20,000 kg. @ ₹ 5.25 per kg & B 11,500 kg. @ ₹ 5.70 per kg.

### Required:

- Calculate all variances.
- Prepare an operating statement showing standard gross profit, variances and actual gross profit.
- Explain the reason for the difference, if any, in actual gross profit given in the question and calculated in (ii) above.

### Illustration-22

The summarized results of a company for the two years ended 31st December 2014 and 2015 are given below:

| Year               | 2021   | 2020   |
|--------------------|--------|--------|
| Particulars        | ₹ lacs | ₹ lacs |
| Sales              | 770    | 600    |
| Direct Materials   | 324    | 300    |
| Direct Wages       | 137    | 120    |
| Variable Overheads | 69     | 60     |
| Fixed Overheads    | 150    | 80     |
| Profit             | 90     | 40     |

As a result of re-organisation of production methods and extensive advertisement campaign use, the

company was able to secure an increase in the selling prices by 10% during the year 2015 as compared to the previous year. In the year 2014, the company consumed 1,20,000 Kgs. of raw materials and used 24,00,000 hours of direct labour. In the year 2015, the corresponding figures were 1,35,000 kgs of raw materials and 26,00,000 hours of direct labour.

**You are required to:**

Use information given for the year 2014 as the base year information to analyze the results of the year 2015 and to show in a form suitable to the management the amount each factor has contributed by way of price, usage and volume to the change in profit in 2015.

### Illustration-23

The share of total production and the cost-based fair price computed separately for each of the four units in industry are as follows:

|   | ₹ Per unit |       |       |       |
|---|------------|-------|-------|-------|
|   | 40%        | 25%   | 20%   | 15%   |
| Share of Production                                 | 40%        | 25%   | 20%   | 15%   |
| Material cost                                       | 150        | 180   | 170   | 190   |
| Direct labour                                       | 100        | 120   | 140   | 160   |
| Depreciation  | 300        | 200   | 160   | 100   |
| Other overheads                                     | 300        | 300   | 280   | 240   |
| Total Cost  | 850        | 800   | 750   | 690   |
| 20% Return on Capital employed                      | 630        | 430   | 350   | 230   |
| Fair price  | 1,480      | 1,230 | 1,100 | 920   |
| Capital employed per unit is worked out as follows: |            |       |       |       |
| Net Fixed Assets                                    | 3,000      | 2,000 | 1,600 | 1,000 |
| Working Capital                                     | 140        | 150   | 150   | 150   |
| Total   | 3,140      | 2,150 | 1,750 | 1,150 |

Suggest an Uniform Price that may be adopted by the industry.