STRATEGIC COST MANAGEMENT AND PERFORMANCE EVALUATION REVISION BOOK

FOR CA FINAL

BY CA. DINESH JAIN

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Chapter 1 – Introduction to strategic cost management

Traditional cost management (TCM):

- Traditional cost management involved **allocation of costs and overhead** and focused largely on **cost control and cost reduction**
- TCM focused on **comparing actual results with standard expectations** (typically budgets or standard costs) and analyzing the difference. This process was also known as **variance analysis**

Limitations of TCM:

- Ignores competition, market growth and customer requirement
- Excessive focus on cost reduction
- Ignore dynamics of marketing and economics
- Limited focus on review and improvisation
- Reactive approach
- Short-term outlook

Strategic cost management (SCM):

- Strategic cost management (SCM) is the application of cost management techniques to **improve the strategic position of business** as well as **control costs**
- SCM involves **integrating cost information** with **decision –making framework** to support the **overall organizational strategy**
- SCM advocates that cost management techniques should be such that they **improve strategic position** of a business apart from **controlling costs**
- SCM aims to help the organization to **achieve sustainable competitive advantage** through **product differentiation and cost leadership**

Examples:

Preventive maintenance versus break-down maintenance:

A manufacturing company does not carry out preventive maintenance of its machineries on a regular basis to save costs. Repairs of machinery is carried out as and when a machinery breaks down. **This is a traditional approach to cost management where the focus is on cost reduction and cost saving**. This is a short- term approach to manage costs. When machinery breaks down, the company loses more in terms of loss of production time and idle labour time. Lack of regular preventive maintenance and planned shutdown time also reduces the life of the machinery and has a longer-term impact. If the loss of production is significant, the company might lose market share to its competitors. **Hence, it is important to look at cost management with a strategic focus**.

Decision on closure of service Centre:

A telecom company closed down some of its customer service centres as a cost cutting measure. This led to overcrowding of customers at other centres and longer waiting time for the customers. The volume of work at other centres increased impacting the performance of employees. **Both the customers and employees, two of the key stakeholders, were not happy with the company's decision**. This type of business decision can impact the reputation and brand image of the company and impact the sales and profitability in the longer run.

Cost reduction can be good and bad:

- Good cost reduction is one wherein we can reduce costs as well as maintain or improve quality
- Bad cost reduction is one wherein a company cut costs without considering the impact on employees, customers and overall loyalty
- **SCM focuses on only good cost reduction whereas TCM can involve both good and bad cost reduction**

Stages of strategic management (Formulation, Communication, Implementation and Control)

- **Stage one:** Formulating strategies
- **Stage two:** Communicating those strategies throughout the organization
- **Stage three:** Developing and carrying out tactics to implement the strategies
- **Stage four:** Developing and implementing controls to monitor the success of objectives

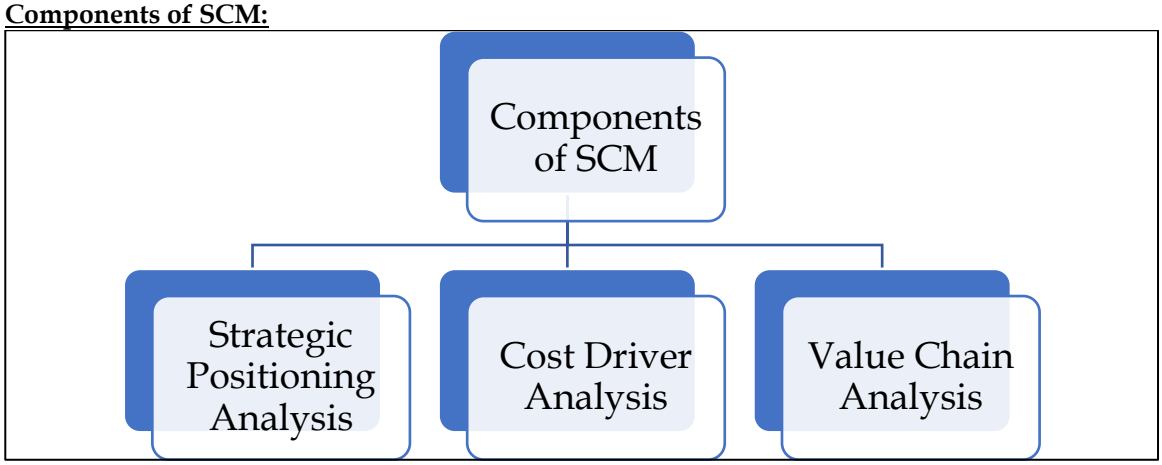
Necessity of SCM:

- SCM gives a clear understanding of the company's cost structure in search of **sustainable competitive advantage**
- SCM can help in **four stages of strategic management** – formulation, communication, implementation and control
- Cost data is analyzed and used strategically to **develop alternative measures in search of sustainable competitive advantage**

Traditional versus Strategic Cost Management:

Particulars	TCM	SCM
Time span	Short term concept	Long term concept
Focus	Internal	Both internal and external
Cost driver concept	Based on volume of the product	Each activity has a separate cost driver
Objective	Score keeping, attention directing and problem solving	Cost leadership or product differentiation
Cost reduction	Primary objective is **cost reduction**	Primary objective is **cost containment** – cost reduction and value improvement at the same time
Approach	Risk-averse	Risk taking and ability to adapt to changing environment

Components of SCM:



Strategic Positioning Analysis (SPA):

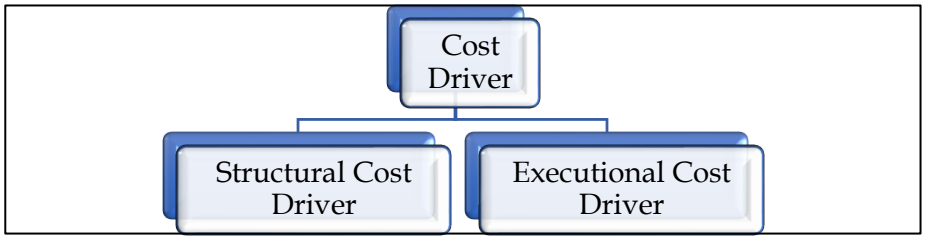
- SPA analysis the **company's relative position** within an industry for its performance
- It reflects choices a company makes **about the kind of value it will create and how the value be created differently than rivals**
- SPA is concerned with the **impact of external and internal environment** on the overall strategy of a company
- Following factors impact the strategic position of a company:
  - Organization values, culture and systems
  - External environment (Analysed through PESTEL and Porter's 5 forces)
  - Internal environment (Resources and competencies)

Example:

Consider the coffee war that erupted between Starbucks and Dunkin' Donuts. Several years ago, Starbucks positioned itself as a provider of high-end café beverages. Their strategic position wasn't based on Price but based on the quality of the products and the experience itself. In response, Dunkin Donuts staked out their own strategic position based on price, targeting a different market segment with a different value proposition. **In this case Starbucks has positioned itself as a unique product provider (product differentiation strategy) whereas Dunkin has positioned itself as a cost leader (low cost strategy**.

Cost Driver Analysis:

- Cost is caused or driven by various inter-related factors and is not simply driven by volume or output



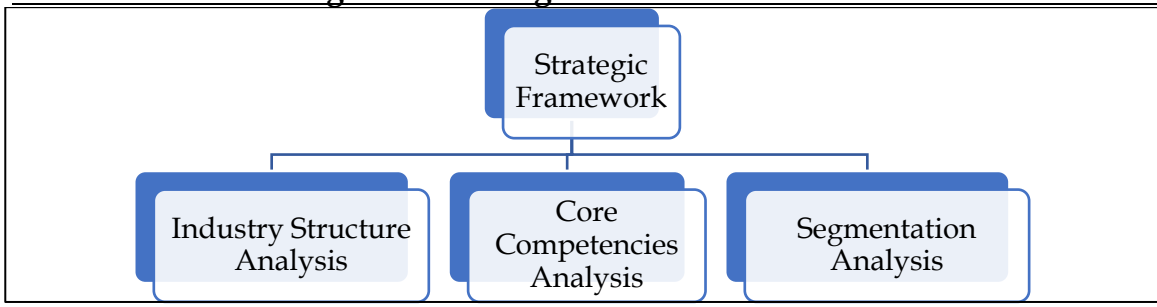
- Structural and executional cost drivers **involve strategic and operational decisions** that affect the relationship between cost drivers and total cost
- Structural cost drivers **facilitate strategic decision making because they involve plans and decisions that have long term effects**. It involves choices by the firm that drive product cost. **Scale, experience, technology and complexity are considered to improve a firm's competitive position.**
- **Executional cost drivers facilitate operational decision making by focussing on short-term effects**. These are the determinants of a firm's cost position that hinge on its ability to execute successfully. Workforce involvement, design of production process, efficiency of plant layout, importance of TQM, supplier relationships among others are considered in an attempt to reduce costs

Value Chain Analysis (VCA):

- VCA is a process by which firm **identifies & analyses various activities** that add value to the final product.
- VCA focuses on identifying those activities that **do not add value to the final products/services and eliminate such non-value-added activities**
- Michael Porter was the first to suggest the idea of value chain in 1985. **Michael Porter has classified the activities into Primary and Support activities**
- Value chain has been defined as the internal processes or activities a company performs to **design, produce, market, deliver and support its product.**

Primary Activities	Support Activities
• **Inbound Logistics** (Raw Materials, Handling and Warehousing) • **Operations** (Machining, Assembling, Testing Products) • **Outbound Logistics** (Warehousing and Distribution of Finished Products) • **Marketing & Sales** (Advertising, Promotion, Pricing, Channel Relations) • **Service** (Installation, Repair Parts)	• **Firm Infrastructure** (General Management, Accounting, Finance, Strategic Planning) • **Human Resource Management** (Recruiting, Training, Development) • **Technology Development** (R&D, Product and Process Improvement) • **Procurement** (Purchasing of Raw Materials, Machines & Supplies)

Strategic Frameworks for Value Chain Analysis:



Industry Structure Analysis [Porter's 5 forces Analysis]

Bargaining Power of Buyers	✓ Bargaining power of buyers **determines the ability of buyer to push the price down**. This happens when the buyers are concentrated or when the volume purchased by buyers is very high ✓ Buyer also have higher bargaining power if the cost of switching suppliers is very low ✓ Higher **bargaining power results in lower profitability**
Bargaining Power of Suppliers	✓ Bargaining Power of Suppliers is **relatively higher when the input is important to the buying firm** or when there are few suppliers of the input ✓ Suppliers also dictate terms if the input supplied is not replaceable or when an alternate input is not available ✓ **Profitability of the companies can shrink if suppliers have a higher bargaining power**
Threat of substitute products or services	✓ **Multiple and closer substitutes can make customers to switch the suppliers easily**. Hence a firm should resort to competitive pricing to retain its customers ✓ When few substitutes exist for a product, consumers are willing to pay a potentially high price. If close substitutes for a product exist, then there is a limit to what price customers are willing to pay ✓ **A company should strive to build its brand and customer loyalty to prevent the threat of substitutes**
Threat of new entrants	✓ **Threat to new entrants largely depends on the barrier to entry and perceived profitability** in an industry ✓ Some examples of barriers to entry are intensive capital equipment, sophisticated technology, legal factors, limited access to raw material and labour ✓ **An industry where threat of new entrants is low is more profitable than an industry where new entrants can easily enter the industry**
Intensity of competition / rivalry amongst firms	✓ In Highly competitive markets, **firms resort to cut-throat competition to win more customers** ✓ The competitive rivalry is higher when an industry has high number of firms and lower when there are few large players dominating the market ✓ Intensity of competition is influenced by number of firms, existence of extra capacity, difficulty in differentiation of products, high exit barriers and higher fixed costs

Core Competencies Analysis:

- Core competence is a **distinctive or unique skill** that creates distinctive customer value
- Core competencies are a **function of the collective skillset of people, organisation structure resources & technological knowhow**
- Core competence is the **primary source of an organization's competitive advantage**. The competitive advantage could result from cost leadership or product differentiation
- **Loss of core competence can prove disaster for firms. Example: Nokia** was a leader in feature phone segment till smart phones were introduced. The changing dynamics of industry meant that Nokia lost top position in mobile phone market
- Core competencies stem from two sources:

- **Resources** – Resources **are factors that enable a company to create value for customers**. **They can be tangible** (land, buildings, inventory, machinery, money) **or intangible** (employee's skills, brand, patent, technology)
- **Capabilities** – **Capabilities refer to the company's ability to co-ordinate resources and put them to productive use.** Availability of resources does not guarantee core competence and success. Capabilities stem from organisational structure, processes and control systems

❖ **Value chain approach can be applied to core competencies for creating competitive advantage** using the following steps:
- **Validate** core competencies in **current businesses**
- **Leverage competencies** to the value chains of **other existing businesses**
- Use core competencies to **reconfigure the value chains** of existing businesses
- Use core competencies to **create new value chains**

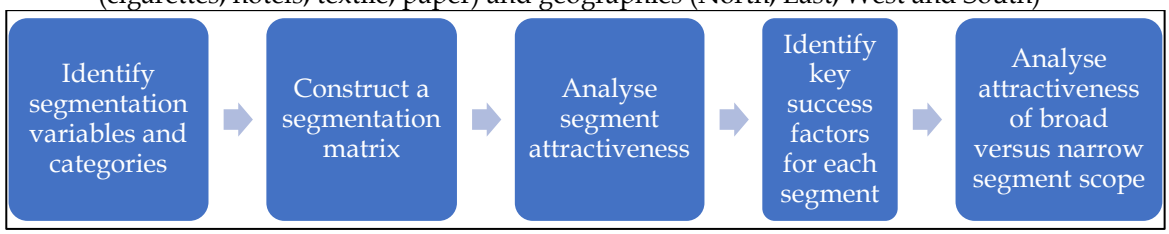
Segmentation Analysis:

❖ **A single industry might be a collection of different market segments**. Example: Motor Vehicle industry can be seen as a composite of tyre, glass, battery, metals among others

❖ Segmentation analysis involve analysis of **structural characteristics of different industry segments**

❖ A firm can use the segmentation analysis information to decide **to exit the segment, to enter a segment, reconfigure one or more segments**, or embark on cost reduction/differentiation programs

❖ **Market segmentation can be done on the basis of demographics** (Age, Gender, Marital Status, Income, Education), **Geography, Lifestyle, Benefit** (convenience, status, value, quality) among others. Example: ITC could create a segmentation matrix on the basis of nature of products (cigarettes, hotels, textile, paper) and geographies (North, East, West and South)



Superior Performance and Competitive advantage:

❖ A **company's profitability is improved with superior performance** which leads to the maximisation of shareholder's wealth

❖ A company needs to do the following **in order to survive and prosper in an industry**
- They must **supply what customers want to buy** and
- They must **survive competition**

❖ Distinctive competencies can take any of the following two firms:
- **An offering or differentiation advantage** – Example: Apple
- **Relative low-cost advantage** – Example: Xiaomi

Differentiation advantage (Product Differentiation):

❖ Differentiation advantage occurs **when customers perceive that a business unit's product offering is of higher quality**, involves fewer risks and/or outperforms products offered by competitors

❖ Differentiation may **include a firm's ability to deliver goods and services in a timely manner, to produce better quality, to offer the customer a wider range of goods** and services and other factors that create unique customer value

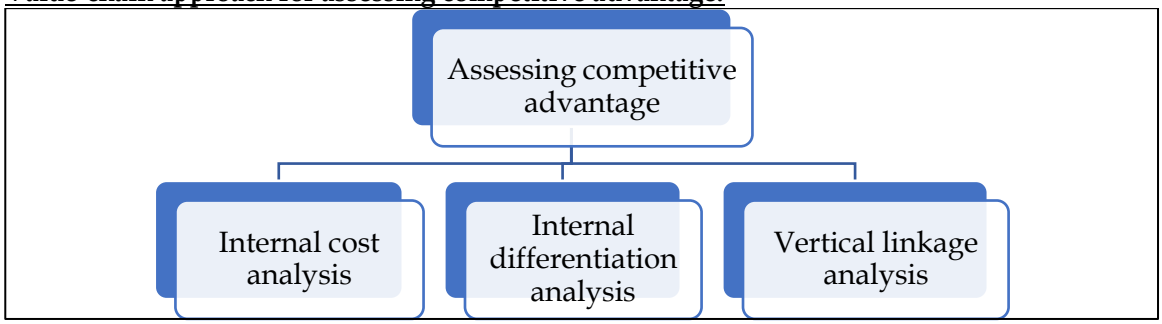
❖ Differentiation advantage can be achieved by adopting the following techniques:
- Superior Quality
- Superior Innovation
- Superior customer responsiveness

❖ Differentiation can help the company in charging a **higher price while maintaining its current market share** or charge a **price below the "full premium" in order to build market share**

Low cost advantage (Cost leadership):

- A firm enjoys **relative cost advantage** if its total costs are **lower than those of its competitors**
- Cost leadership can help the company in **charging the same price as competitor to maintain its market share** while improving profitability. It can also help the firm to **charge a lower price than its competitors to increase its market share**
- Low cost advantage can arise from access to **low-cost raw materials, innovative process technology, low-cost access to distribution channels or customers** and superior operating management
- Disadvantage of this strategy is that **competitors can find ways to reduce cost and hence the company should continuously find ways to reduce its cost**. Company can do value chain analysis to find ways to reduce costs.

Value-chain approach for assessing competitive advantage:



Internal cost analysis:

- **Identify the firm's value creating processes:** The companies should identify their value creating processes and their contribution to the firm's competitive advantage.
- **Determine the proportion of the total cost of the product or service attributable to each value creating process:** The next step would be to calculate the cost of the various processes. The company should also allocate costs of various support activities to primary activities using suitable basis
- **Identify the cost drivers for each process:** Company identify the factors which drive costs. A change in cost driver leads to change in total cost. Companies are currently using ABC system to gain a better understanding of the resources consumed and costs incurred for certain activity
- **Identify the links between processes:** Value chain analysis consider activities as separate and discrete. However, the individual activities are interdependent and hence the linkages between processes is to be understood. Cost improvement programs in one value chain may lower or increase the cost in other processes.
- **Evaluate the opportunities for achieving relative cost advantage:** Traditionally firms have adopted across the board cost reduction under all heads. However, a forceful reduction in some activities like marketing can impact sales. Value chain analysis involves understanding of various activities and attempts to lower cost and improve efficiency within each value creating process.

Internal differentiation analysis:

- **Identify the firm's value creating processes:** Companies must identify the various activities in its value chain which are undertaken to deliver product/service. Differentiation can come from the way various activities are performed and the way in which value chains is structured.
- **Evaluate differentiation strategies for enhancing customer value:** The companies can implement the following to enhance customer value
  - Superior features in product
  - Effective marketing and distribution channels
  - Excellent customer service
  - Superior brand image
  - Better quality product at competitive prices
- **Determine the best sustainable differentiation strategies:** Company must identify various activity which can enhance differentiation and select the strategy which can create sustainable product/service differentiation

Vertical Linkage Analysis:

- A company **can earn competitive advantage** not only through linkage between various **internal activities but also through linkages between a firm's value chain and that of suppliers or users**
- Vertical linkage analysis **includes all upstream and downstream activities throughout the industry**
- A company might **not carry out all activities in the entire value chain of an industry**. Hence it might not be in a position to obtain information relating to costs or revenues for each process. However, it is necessary to **carry out a vertical linkage analysis to identify the sources of competitive advantage**
- **Example:** A company manufactures cars using various components like chassis, steering wheel, tyres, axles etc. The company does not manufacture all components and assembling is its core competency. However certain parts which are critical are manufactured in-house

Vision, Mission and Objectives:

Mission Statement	✓ Mission statement seeks to answer the question as to **"Why does the company exist"?** ✓ It can include a statement of organisation values and major goals ✓ **Company's mission statement must be customer focussed and not product focussed**
Vision Statement	✓ Vision statement **what the company would like to achieve** ✓ Vision statement must be challenging and generally state an ambitious future
Objective or goal	✓ Objective or goal is a **precise and measurable future state that the company wants to achieve** ✓ Purpose of objective or goal statement is to specify what needs to be done in order to attain the company's mission and vision

Value shop model or Service Value Chain:

- Value shop model aims to **serve companies from service sector**. This model best applies to telecommunication companies but can also be used for insurance companies and banks
- In value shop principle, **no value addition takes place**. It only deals with the problem, figure-out the main area requires its service and finally comes with the solution
- Value shop model is designed to **solve customer problems rather than creating value by producing output from an input of raw materials**
- Value shop model has the **same support activities as Porter model but the primary activities are described differently**
- Management in a value shop focuses on areas like problem and opportunity assessment, resource mobilization, project management, solutions delivery, outcome measurement and learning

Primary Activities	Support Activities
• Problem finding and acquisition • Problem solving • Choosing among solutions • Execution and control/ evaluation	• Infrastructure • Human Resource Management • Technology Development • Procurement

Overview of practical problems/ case studies/ important questions:

- Part I - Introduction to strategic cost management
- Part II - Value Chain Analysis and Value Shop Model
- Part III - Strategic framework for value chain analysis
- Part IV - Vision, Mission and Objectives

Part I – Introduction to Strategic Cost Management

1. **Executional cost driver versus structural cost driver [Category B – November 2007 (exam)]**

"Cost can be managed only at the point of commitment and not at the point of incidence. Therefore, it is necessary to manage cost drivers to manage cost." Explain the statement with reference to structural and executional cost drivers.

Answer:

- A firm **commits costs at the time of designing the product and deciding the method of production**. It also commits cost at the time of deciding the delivery channel (e.g. delivery through dealers or own retail stores).
- Costs are **incurred at the time of actual production and delivery**. Therefore, no significant cost reduction can be achieved at the time when the costs are incurred. Therefore, it is said that costs can be managed at the point of commitment.
- **Cost drivers are factors that drive consumption of resources**. Therefore, management of cost drivers is essential to manage costs.
- Structural cost drivers are those which **can be managed by effecting structural changes**. Examples of structural cost drivers are scale of operation, scope of operation (i.e. degree of vertical integration), complexity, technology and experience or learning. Thus, structural cost drivers arise from the business model adopted by the company.
- Executional cost drivers **can be managed by executive decisions, examples of executional cost drivers are capacity utilization, plant layout efficiency, product configuration and linkages with suppliers and customers**. It is obvious that cost drivers can be managed only at the point of structural and operating decisions, which commit resources to various activities.

Part II - Value Chain Analysis and Value Shop Model

2. Value Chain analysis [Category A – May 2015 (Mock)]

ABC Ltd. is engaged in business of manufacturing branded readymade garments. It has a single manufacturing facility at Ludhiana. Raw material is supplied by various suppliers. Majority of its revenue comes from export to Euro Zone and US. To strengthen its position further in the Global Market, it is planning to enhance quality and provide assurance through long term warranty. For the coming years company has set objective to reduce the quality costs in each of the primary activities in its value chain.

Required

STATE the primary activities as per Porter's Value Chain Analysis in the value chain of ABC Ltd with brief description.

Answer:

Primary activities are the activities that are directly involved in transforming inputs into outputs and delivery and after-sales support to output. Following are the primary activities in the value chain of ABC Ltd.: -

- **Inbound Logistics: These activities are related to the material handling and warehousing**. It also covers transporting raw material (yarn or fabric) from the supplier to the place of processing inside the factory at Ludhiana.
- **Operations:** These activities are directly responsible for the transformation of yarn or fabric into final readymade garments for the delivery to the consumers.
- **Outbound Logistics:** These activities are involved in movement of readymade garments to the point of sales. **Order processing and distribution are major part of these activities**.
- **Marketing and Sales: These activities are performed for demand creation and customer solicitation. Communication, pricing and channel management are major part of these activities**.
- **Service: These activities are performed after selling the goods to the consumers. Installation, repair and parts replacement are some examples of these activities**.

3. Value chain analysis [Category A]

S-Mart was founded in 1990 as a departmental store catering to the entire household requirements (from grocery to clothing) of middle-income groups. The company since has grown leaps and bounds and inaugurated its 100th store in 2017. S-Mart is known for high quality products which are available at discount to the market price at its store. The company claims to give at least 5% discount on listed price across product segments. The sales of company have grown 30% on Y-o-Y basis. The company has highest net profit margin and highest return on equity in the industry.

S-Mart has tie-ups with more than 500 vendors across India who provide high quality products on demand. S-Mart pays all its suppliers in advance and hence enjoys preferential pricing as compared to its competitors. The company procures products using the Just-In-Time (JIT) philosophy which helps it to keep low level of inventories and thereby freeing up significant amount of working capital. The products are directly delivered to the stores by company owned trucks and mini-vans and hence, there is no requirement of warehouses to store products.

The company sells products which are required by households on a day to day basis and is not keen to sell premium products which have higher margin but lower demand. This ensures that inventory is moved out of the stores faster and increases the inventory turnover ratio. The company owns all the stores which it operates under its brand name.

There is no third-party franchisee appointed to operate the stores. Since the products are directly procured from the manufactures and sold to customers, there are no intermediaries in between.

S-Mart invests in superior quality products and high level of customer services than aggressive marketing. The company believes that it can attract more customers by offering quality products at reasonable prices rather than spend huge amount on marketing. However, need based marketing activities are carried out by the company. S-Mart aims to build customer loyalty through high level of customer service at its store.

S-Mart is one of the few companies which has witnessed a low employee turnover in the industry in which it operates. The motivation level of employees are very high which results in excellent performance across all levels. Company rewards its employees generously through employee stock options plan. The company conducts training sessions for its employees periodically to equip them with latest techniques in areas of procurement, sales, marketing and customer service. The result of these efforts is clearly visible in the company's growth.

The company has a solid Information Technology infrastructure for all its activities. The company has leveraged technology across all departments - be it procurement, logistics or sales. It has implemented SAP-R3 which is one of the leading Enterprise Resource Planning system globally. Various reports relating to inventory levels, sales, liquidity position etc. are available on a real time basis to the senior management. Requirement

Map the various activities performed at S-mart to the Porter's Value Chain model.

Answer:

Introduction

Value chain is defined as **"a chain of value-added activities; products pass through the activities in a chain, gaining value at each stage"**. **Value chain focuses on systems, and how business inputs are changed into business outputs purchased by customers**. The entire set of activities that a business undertakes to covert inputs to outputs are interlinked to each other. A business carries out these activities to earn a profit or margin.

A business should undertake only those activities which add value to the end product being delivered to the customer. **A value chain analysis helps business identify those activities which are not adding value (in other words wasteful activities)**. **An example of a wasteful activity could be unnecessary storage of products which increases the inventory and working capital requirement.** Such activities must be removed to ensure that the margin of business improves. **Value Chain Analysis is one way of identifying which activities are best undertaken by a business and which are best outsourced.**

Porter's value chain classifies activities into primary activity and secondary activity.

Primary Activities

Primary activities are those activities that are directly related with creating and delivering a product to the end customers. The following activities are considered as primary activities-

Inbound Logistics

Inbound logistics involves arranging inbound movement of materials or finished goods from suppliers to the manufacturing plants or retail stores. Since S-Mart is not involved in manufacturing, all the activities that it undertakes to deliver the products to its retail stores would form part of Inbound Logistics. The company has its own transport fleet to ensure timely delivery of products to the retail stores. The company also has a JIT system in place which ensures minimum inventory level. A reason why the company uses its own fleet of trucks is to ensure that there are no failures on the supply side. In JIT systems and especially in retail business, it is very important that stock outs are avoided.

Operations

Operations involve those activities which are concerned with conversion of input into outputs in case of manufacturing companies. In retail business, it comprises of those activities which are concerned with running of stores, planning of inventory levels of various products, deciding the layout of various stores etc. The company operates through 100 stores which are owned by itself. The company does not have franchisee or agent model for operation of its stores. The ownership of the stores ensure that the quality standards are maintained across various stores and customer get the best value. Since the stores are owned, the company does not face any risk of closing the stores due to expiry of lease arrangements. The company can also invest to build the best layout for the stores.

Outbound Logistics

These include planning and dispatch, distribution management, transportation, warehousing, and order fulfilment. In case of a retail business, this includes activities carried out to deliver the product to the customer. S-Mart operates through its own stores and there are no outsourcing or franchisee arrangements. The company does not have any warehousing requirement as the product are directly delivered to the retail stores. The customers directly pick up the products from the stores and there is no transport requirement in this case. The company must however ensure that the customer waiting time is low at the time of invoicing and checkout from the store.

Marketing & Sales

Marketing and sales are the means whereby consumers and customers are made aware of the product which is ultimately sold to them. The activities include selling products to the end customers covering activities like product management, price management, promotion and marketing management. S-Mart builds customer loyalty by offering high quality products at affordable pricing. The company does not spend a huge amount on marketing.

Service

In case of manufacturing industry, service generally refers to the after sales service which are required to maintain the value of product and includes activities like installation, repair etc. In case of retail stores, service would encompass a superior experience at the stores and managing return of products by the customers. S-Mart aims to build customer loyalty through high level of customer service at its store.

Secondary Activities

Secondary activities are those activities which support the primary activities in their function. The following are the broad classification of secondary activities:

Procurement

Procurement refers to the processes of acquiring various products and include activities like identifying sources of these products, vendor selection, placing an order, purchase of products etc. The company deals with over 500 vendors across India on advance payment terms to procure high quality products at preferential pricing. This helps the company get better discounts which it can pass it onto the customers. This ensures that the company does not carry the burden of discounts being offered to the customers.

Technology Development

Technology spans across all the primary activities of an organisation. It includes activities like process automation, an Enterprise Resource Planning (ERP) system, inventory management systems etc. The company has implemented SAP R/3 - an ERP package which helps in the management of various functions of procurement, logistics and sales. A robust system is always necessary to ensure that the JIT systems work

effectively. Such systems assist in real-time monitoring of inventory levels and triggering purchase orders when inventory levels are low. The entire flow of products from an order placement till the delivery to customer can be tracked seamlessly.

Human Resource Management

This involves areas of recruiting, managing, training, developing and rewarding people within an organisation. S- Mart has a very low employee turnover and a very high level of employee motivation. The company rewards all its employees generously and conducts periodic training and development programmes for its employees. This ensures that the employees are highly motivated which translates into a consistently high performance.

Infrastructure

This includes not only the physical infrastructure but also all departments of management, finance, legal which are required to keep the company's store operational. All these are important for organisation's performance in primary activities.

4. Value Chain Analysis Versus Value Shop Model [Category A]

Westwood Solar Solutions (WSS) has mastered the art of developing Solar Domestic Water Heater that fulfil customer's needs. WSS's designers and product developers focus on solutions to get rid of everyday hassles and transform these into a pleasant experience. WSS also has a wide service network that spans the length and breadth of India to ensure good care of customers and products, by providing a prompt and pleasant service experience. In the past, WSS had a dominant position in the Indian market. However, over the past four years, it has been found that its profits and its share in the market have come down.

WSS has business Model comprising of following steps:

- Firstly, WSS's highly qualified and skilled experts visit customer's locations to identify and design the appropriate heater as per customer's requirements. WSS's experts are recognized as the best in the industry, and customers agree that they produce the most effective solutions to their complaints.
- At WSS, in the laboratories, the heater design goes through intricate, complex, and dynamic process. Prototypes are developed on the basis of discussions in previous step. Thereafter, these prototypes are tested. Once a final design is decided, such design is passed to the manufacturing division for production.
- Then, WSS manufactures appropriate Solar Water Heater to the desired specification and installs at the customer's location.
- After the heater's installation, WSS renders annual maintenance services for which it is well known in the industry.

WSS's customers pay a total price for design, manufacture and initial installation of the Solar Water Heater and an annual maintenance charge after that. Total prices are quoted before design work begins.

Although customers appreciate the high quality of the solutions provided by WSS's team, however, they are complaining that the overall prices are too high. Customers have said that although other suppliers do not solve their problems as WSS does, they do charge less. Consequently, WSS has lower down its prices to compete in the market. There is a doubt that the manufacturing and installation stages of the business model are not contributing sufficiently to the firm since costs at both stages are going high.

Partners of WSS have considered that this situation should no longer continue and have recommended that a value chain analysis to be conducted as to identify the way forward for WSS. Although majority of partners are in the agreement with the proposed value chain analysis, however senior partner 'W' has stated that value chain analysis is inappropriate idea. She says that she has heard a number of criticisms of the value chain model.

Assuming yourself as management accountant of WSS, answer the following questions:

Required

(i) DISCUSS the benefits that may accrue to WSS from conducting a value chain analysis.
(ii) DISCUSS the criticisms of Porter's value chain model in the context of WSS
(iii) EXPLAIN other form of Value Chain Analysis that may be more suitable for WSS.

Answer:

(i) There are following benefits accruing to WSS through a value chain analysis:

- Value chain analysis is a process by which a firm identifies and analysis 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 thereafter eliminating such non-value adding activities. **The analysis of value chain helps a firm in obtaining cost leadership or improve product differentiation.** For WSS, value chain can provide with more unambiguous picture of the value of the manufacturing function as perceived by customers.
- **This model also helps in analyzing other firms within the same industry**. As WSS observed that other firms in the industry are considered to be more cost effective in terms of manufacturing, it may plan to use the value chain model to examine the reason for the same.
- **The value chain will assist WSS to determine ways to get best approach towards developing higher level competitive performance.** This model assists firms in finding ways to develop higher level of performance either by cost leadership or product differentiation. Right now, WSS is in a situation wherein it is being defeated on price by some of its competitors, however is recognized as the best solutions provider to customer's problems. Through detailed value chain analysis, WSS may be able to ascertain the reason of falling down in such situation and partners may be able to take decision regarding the future vision of the firm.
- Through this analysis, WSS may apply other relevant management techniques as well. **Post value chain analysis, WSS will be in a position to decide whether it is worthwhile to continue the technique of benchmark (processes and performance) against its rivals, to develop an information systems strategy, to carry out a business process re-engineering process or to adopt activity-based management**. Further, WSS may decide to outsource manufacturing and keep focus on design and services by following value chain analysis model. This technique may be appropriate for WSS as by outsourcing manufacturing, WSS may be able to focus on its core area for which it is well-known in the industry.
- **Value Chain analysis will also facilitate the development of performance metrics for WSS.** By developing such metrics WSS may be able to identify which aspects of its business model are not contributing to the overall value and profits of the firm. Although currently WSS has suspicion that manufacturing and installation are the weak parts of its operation, development of transparent and appropriate metrics would enable WSS to recognize where value and profit are being added in the business model.

(ii) Number of criticisms of the value chain developed by Michael Porter have been:

- **This value chain analysis cannot easily be applied to firms belonging to service industries.** This criticism is particularly imperative in the context of WSS which has upward profits from rendering solutions and services rather than that from manufacturing tangibles products. **Many people appreciate that the model is more suitable to manufacturing-based industries, rather than service-based industries**.
- **Often this model is seen as complicated and perhaps could be a source of frustration for the management of a firm**. Although the staff of WSS includes bright and intelligent experts, they may not see the value in-depth analyses of business which is required for a full value chain analysis.
- **This analysis has a linear approach and ignores the concept of value networks.** This criticism is specifically relevant to WSS because its major business resort to the cooperative relationship that the experts have with their customers. If, WSS decides to outsource manufacturing and focus on design and service, this will become even more relevant where relationships are utmost important.
- **Often value chain analysis is perceived as time consuming and expensive as a whole.**

However, if the analysis is to be completed timely, there will be requirement of reliable data such as cost of components in business model. However, in the absence of good cost capturing system, this model could prove to be a costly process. After completion of this process, still there is no guarantee that the process leads to have upward trend in profitability and where it does, it may take some time in realization.

(iii) WSS requires to acknowledge that the nature of its business is turning from manufacturing zone to a solutions provider or professional services firm.

From this point of view, it would be better for WSS to analyze its business using the Professional Services Value Chain/ Value Shop Model. The concept of Value Shop came in to lime light holding the hand of

Charles B. Stabell and Oystein D. Fjeldstad in 1998.**This concept aims to serve firms from service sector. It only deals with problems, figure out the main area requiring service and finally come with the solution. This approach is designed to solve customer's problems rather than creating value by producing output from an input of raw materials**.

A Value Shop mobilizes resources (say: people, knowledge or money) to solve specific problems such as delivering a solution to business problem. This shop model is iterative, involving repeatedly performing a generic set of activities until a solution is reached.

Secondary activities in the Professional Service Value Chain have same support activities as those in the porter's value chain, However the primary activities are described differently to recognize the different nature of a service-oriented business. In value shop, primary activities are performed in a circle within a firm to perform generic set of activities iteratively before reaching a conclusion. Since WSS team communicate with customers to find a solution before testing of developed prototypes, so they will find the vale shop, compatible and effective model to use

Part III – Strategic framework for value chain analysis

5. Porter's five forces model [Category A]

WDG is a family owned business. The family owns 80% of the shares. The remaining 20% is owned by six non- family shareholders. It manufactures Cardboard Boxes for customers which are mainly manufacturers of shoes, cloths, crackers etc. Now, the board is considering to join the Paper Tubes market as well. Paper Tubes, also known as Cardboard Tubes, are cylinder shaped components that are made with Cardboard. Paper Tubes can be used for a wide range of functions. Paper Tubes are usually ordered in bulk by many industries that rely Paper Tubes include food processing, shipping and the postal service, automotive manufacturing, material handling, textile, pulp and paper, packaging, and art etc. The Paper Tubes cost approximately 1% - 3% of the total cost of the customer's finished goods. The information about Paper Tubes is as follows:

(i) The Paper Tubes are made in machines of different size. The lowest cost machine is of Rs. 1,89,000 including GST @ 5% and only one operator is required to run this machine. Two days training program is required to enable untrained person to run such a machine efficiently and effectively. A special paper is used in making Paper Tubes and this paper remains in short supply.

(ii) Presently, five major manufacturers of Paper Tubes have a total market share of 75%, offer product ranges which are similar in size and quality. The market leader currently has 24% share and the four remaining competitors hold on average 12.75% share. The annual market growth is 3% per annum during recent years.

(iii) A current report "Insight on Global Activities of Foreign Based MNCs" released the news that now MNC's are planning to expand their packaging operations in overseas market by installing automated machines to produce Paper Tubes of any size.

(iv) Another company, HEG manufactures a small, however increasing, range of Plastic Tubes which are capable of housing small products such as foils and paper-based products. Currently, these tubes are on an average 15% more costly than the equivalent sized Paper Tubes.

Required

ASSESS whether WDG should join the Paper Tubes market as a performance improvement strategy?

Author's Note:

- The important part of this question is it does not specify Porter's five forces model in question. In many exam questions students may not be sure about which model to follow for case study questions. Conceptual clarity of different concepts will help to answer questions in exam.
- Question talks about entry into new industry and hence we are following Porter's five forces model in this question to analyze the attractiveness of the industry

Answer:

To assess the feasibility of joining Paper Tubes market, Michael Porter's 'five forces model' can be used. **It analyses the competitive environment of an industry. It is an important tool for understanding the competitive structure of a particular industry**. This complete analysis includes five forces: buyer's bargaining power, supplier's bargaining power, the threat of substitute products, the threat of new entrants and the intra industry competition.

While applying this model to the above case, it can be observed that the low cost of the machine along with

the fact that an untrained person will only need two day's training as to be able to operate a machine, will form comparatively low costs of entry to the market. Therefore, WDG may reasonably consider high threat of new entrants.

Customer's (buyer) power could be high since customers buy Paper Tubes in bulk along with the fact that there is insignificant difference between the products of alternative suppliers. Paper Tubes cost approximately 1% - 3% of the total cost of the customer's finished goods also indicates that customer's power is high.

The fact that the special paper from which the tubes are made remain in short supply, signals high threat from suppliers. Hence, **suppliers may raise their prices that would result in reduction of profit.**

Five major players with 75% market share, offer product ranges which are similar in size and quality, besides, the market is a slow growing i.e. annual growth of 3% p.a., **indicate high rivalry among competitors.**

A **little real threat from a substitute product exist since HEG manufactures a narrow range of Plastic Tubes**. This threat might go up if the product range of HEG is expanded or the price of Plastic Tubes goes down sharply.

Major threat from **potential new entrants can be seen**, as foreign-based MNCs are planning to joining this market and it seems that these giant corporations might be able to gain economies of scale from automated machines and large production lines with manufacturing flexibility.

WDG might enter this market **due to low capital investment but this would also lead to other potential entrants.** The easy entry, threat of substitute, the existence of established competitors in the market, the possible entry of a MNCs, and competitors struggling due to slow growth market are putting the potential of WDG into the question to achieve any sort of competitive advantage.

Joining this market might be a good move, if WDG would be able manufacture Paper Tubes at lowest cost within the industry. To assess feasibility, WDG must take into consideration all possible synergies between its existing operations of Card Boxes and the proposed operations of Paper Tubes.

From the available information, joining the market for Paper Tubes does not seem to be attractive. Thus, WDG should go for other alternative performance improvement strategy.

6. Strategy analysis [Category A]

Wireless is a manufacturer of mobile phones. The company operates in a market that is dynamic, extremely competitive and consumer centric. The market is broadly fragmented into those customers who are price conscious looking only for basic features and those who are technology savvy wanting to try out the latest offering. Wireless manufactures phones that cater to both these segments.

Mobile A has the very basic features that a customer requires from a phone. It is marketed to attract the price conscious customers. There are many other manufacturers who have similar product offering for this market. Mobile Z offers the latest technology features and an attractive design. Wireless has invested substantial amount in research and development that has resulted in Mobile Z having many unique features. It is marketed to attract customers willing to try out newer products. The research has also yielded results whereby a large section of the design of Mobile A and Z can be standardized to have a similar components and engineering. This would enable Wireless to enter into agreements with its suppliers to provide components Just in Time based on the production schedule. With this change, the quality of Mobile A is expected to improve, thereby improving its sales offtake manifold.

Online shopping has given customers complete access to the prices of phones offered by different manufacturers. This channel of shopping contributes to almost 70% of the sales. Huge discounts by its rivals has forced Wireless to reduce the prices of Mobile A as well. This has stretched its profit margins. Various cost reduction measures have been initiated to maintain profitability. Mobile Z on the other hand

is currently doing well since it is targeted at a more niche segment of customers. Wireless is able to charge premium price for Mobile Z. The latest news in the industry of personal devices like mobiles, laptops etc. is the use of Artificial Intelligence and Augmented Reality to enhance user experience. The technical staff at Wireless feel that this could be the next new frontier that could really change the way we use our devices, most of which could even go redundant.

Required

(i) IDENTIFY the strategy that Wireless is using for Mobile A and Mobile Z.
(ii) DISCUSS the risks involved in each of these strategies.
(iii) ADVISE Wireless to sustain its current strategy for Mobile A?

Answer:

(i) **Wireless is following the "low cost strategy" for Mobile A and "differentiation strategy" for Mobile Z**. Mobile A is being offered at discounted rates to meet the prices of its competitors. This is being done in order to gain market share from its competitors. To maintain its profitability, Wireless has to find means to keep its manufacturing, distributing and other costs low.

Mobile Z is being perceived by customers as a unique product, with features different from its competitors. This is "differentiation strategy". Differentiation can be achieved from superior product quality, innovation and customer responsiveness.

(ii) **The risks involved in a "low cost strategy" for Mobile A is that any price reduction by Wireless will be followed by an equivalent price reduction by its competitors. This price war will ultimately eliminate players who are unprofitable. This strategy will put margins under pressure. The company has to find ways to its costs low on a sustained basis. The "low cost advantage" will be lost once its competitors find a way to lower their costs as well. The other risk would be to that the quality of the product could be impacted negatively due to lowering of costs.**

The risks in differentiation strategy is that it will work only when customers are not price sensitive. The mobile market that Wireless operates is a competitive market. As long as certain customers are will to pay extra for additional features, Mobile Z will have a competitive advantage. If these customers also become price sensitive, they fail to see the value for paying extra for the additional features, the sales of Mobile Z will start falling. The other risk in this strategy would be in the ability of competitors to replicate the features of Mobile Z. Therefore, Wireless should protect its intellectual property rights in order to prevent its competitors from replicating the design and features of Mobile Z. It only when these risks are contained, that Wireless would be able to maintain its premium price for Mobile Z for its unique features.

An external risk factor for Wireless would also be from the developments in the fields of Artificial Intelligence and Augmented Reality. Wireless has to constantly monitor and assess how these technological developments can impact its business. It must be flexible to adapt to changes as they take place, in order not to become redundant in business.

(iii) **"Low cost advantage" can be maintained by copying designs rather than creating them, attaining economies of scale by high-volume sales, getting discounts on bulk purchases and gaining learning and experience curve benefits.**

Learnings and experience from research for Mobile Z can be leveraged for Mobile A. Standardization of design for Mobile Z and A would improve the quality of the product since the design is based on a product that has premium range of customers. Since these features can improve the sales of Mobile A, costs would benefit from economies of scale due to larger production volumes.

Bulk purchase of components for Mobile A and Z gives Wireless the advantage of negotiating for discounts on purchases. It could also negotiate for favorable delivery terms, like just in time purchasing agreements. This would reduce the inventory holding costs for Wireless.

All this contributes towards lowering the costs of production of Mobile A. This will help Wireless sustain its low-cost advantage

7. Mission statement [Category B]

T has recently been appointed as the new Chief Executive of PV Company which manufactures cosmetics and toiletries. She has spent the first three months meeting with her senior management team, employees and customers of the company to establish how PV is currently perceived by some of its various stakeholders. The discussions with the different groups have revealed that there seems to be a great deal of confusion on what PV Company stands for. It is apparent to T that there are many inconsistencies in the priorities and objectives across the different departments of the company. T has determined that immediate action is needed to establish a clear mission for PV Company.

To start the process, T intends to run a series of events at which the mission will be discussed with different groups of employees. She has asked for your help in preparing for the first workshop session. Specifically, she has asked you to put together a presentation with the aim of helping the various audiences to understand why it would be beneficial for PV Company to have a clear mission.

Required

Discuss the points you would include in the presentation on the benefits of having a clear mission for PV Company

Answer:

- The mission essentially provides a broad statement of the overriding purpose of PV Company in terms of the products and services it provides. **It is also concerned with the scope and boundaries of the company's operations in product/market terms. The mission should, therefore, be used to guide the company's current strategic decision making, articulating what PV Company does and who the organisation is for**; in other words, its raison d'être. **It should reflect the company's core values in line with the values and expectations of the various stakeholders.**
- The development of a mission is an important element in the strategic planning process, in that PV Company's objectives should be set to support the mission. The benefits of this would help to provide a basis for consistent strategic and operational planning. It could assist in translating PV Company's purpose and direction into objectives suitable for assessment and control.
- The mission is an essential element in the definition of what constitutes the strengths and weaknesses of PV Company and could act as a benchmark by which plans are judged against and it should help to ensure consistency in both future decisions and evaluation of possible strategies across the organisation.
- Since a **mission is concerned with why an organisation exists, a key benefit is that it will convey the scope and boundaries of PV Company's activities**. This should help in providing clarity on purpose which currently appears to be problematic with different parts for the company having different priorities and objectives.
- **The mission can be powerful in communicating the intentions of PV Company and inspiring a common vision of the future. It provides everyone with unanimity of company purpose and a sense of shared values**. The ideal is that everyone in the company will buy into the mission which should then provide a common source of direction for all employees, focusing on the company's strengths and competitive advantage.
- It would also help in establishing clarity on PV Company's values. The values incorporated in the mission should relate to the culture and should capture the basic, perhaps often unstated, beliefs of the people who work for PV Company.
- **The mission could be embodied in a mission statement which could be reproduced and used on different media to reinforce the key elements of the mission as a communication vehicle not only for employees but also other stakeholder groups.**

Chapter 2 – Modern Business Environment

Modern Business Environment (MBE):

- MBE has changed drastically and shaped entirely in a different manner and hence it has become a challenge for business managers to understand the business environment and formulate business plans and policies
- Main revolution of the current business environment **is the transition from a seller's market to a buyer's market**

Seller's market to buyer's market

- Today's business environment is that of a **buyer's market**. This result is the trend of **international transitions and macroeconomic, technological**, political and social changes
- Challenge of today's environment is to **satisfy the customer** with exceptional performance of the processes
- MBE is characterized by
  - Globalization of the world economy
  - Fierce competition
  - Global excess capacities in production, services
  - New managerial methods
  - Availability and accessibility of data and knowledge
  - Timely availability of materials and services
  - Ease of global travel and transportation

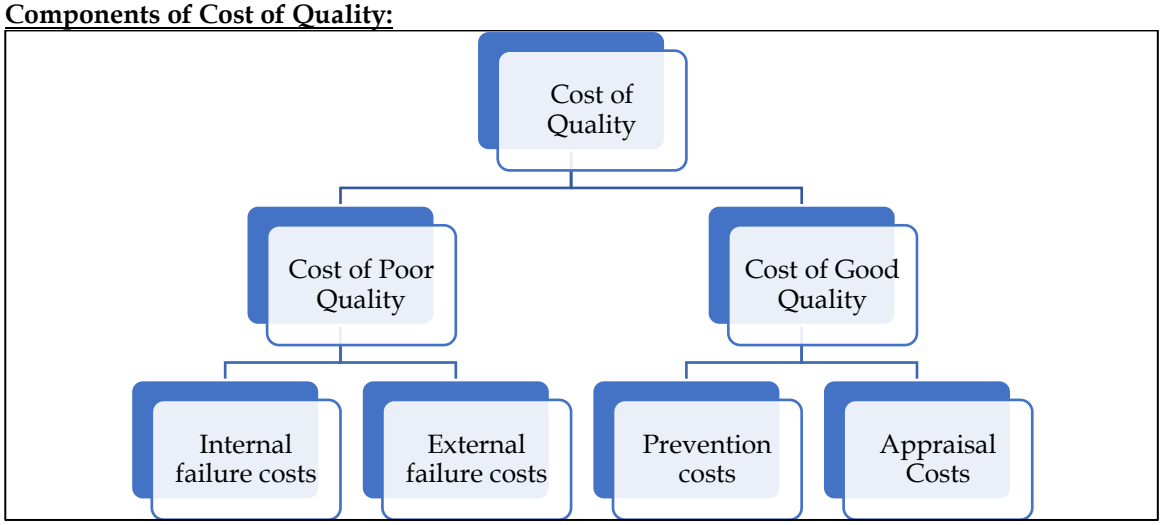
Cost of Quality (COQ)

- Quality is concerned with **conformance to specifications** and ability to satisfy customer expectations and value for money
- **COQ = Cost of control/conformance + Cost of failure to control/non-conformance**

Views regarding Cost of Quality:

- **View 1:** Higher quality means higher cost
- **View 2:** Resultant savings due to improving quality are greater than the cost of improving quality
- **View 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:



Prevention costs	✓ Costs incurred for **preventing the poor quality** of products and services are termed as prevention costs ✓ These are **planned and incurred before actual operation** and associated with the design, implementation and maintenance of the quality management system ✓ **Examples:** Quality Planning, Quality assurance, Supplier evaluation, New Product review, Error Proofing, Capability evaluations, Quality improvement team meetings, Quality improvement projects, Quality education and training

Appraisal costs	✓ Appraisal costs are cost **associated with measuring and monitoring activities related to quality** ✓ Appraisal costs are incurred to **determine the degree of conformance** to quality requirements ✓ **Examples:** Verification, Quality audits, Supplier rating, Checking and testing purchased goods and services, In-process and final inspection/test, Field testing, Product or process audits, calibration of equipment
Internal failure costs	✓ Internal failure costs are **associated with defects found before the customer receives the product or service** ✓ These costs occur when the **product is not as per design quality standards** and they are detected before they are transferred to the customer ✓ **Example:** Waste, Scrap, Rework, Rectification, Failure analysis, Delays, Re-designing, Shortages, Re-testing, Downtime
External failure costs	✓ External failure costs are **occurred to rectify defects discovered by customers** ✓ These costs occur when products or services that fail to reach design quality standards **are not detected until their transfer to the customer** ✓ **Example:** Repairs and servicing, Warranty claims, Complaints, Returns, Losses due to sales reduction,

Optimal COQ:

- **Increase expenditure in prevention and appraisal** will result in **substantial reduction in failure costs**. Because of this relationship, there can be an optimum level at which the **combined cost is at minimum**
- Hence it is **not necessary to get to a zero defect** through a program of continuous improvement **as the combined cost may not be minimum**

Prevention, Appraisal and Failure (PAF) Model:

- PAF Model is the most widely used method for **measuring and classifying quality costs**. Following are its five-steps:
  - Gather some basic information about the **number of failures** in the system
  - Apply **some assumptions** to that data in order to quantify the data
  - Chart the data **based on the four elements** and study it
  - **Allocate resources** to combat the weak-spots
  - Do this **study on regular basis** and evaluate your performance

Total Quality Management (TQM):

- TQM is a management philosophy that **seeks to integrate all organizational functions** (marketing, finance, design, engineering, production, customer service) to focus on meeting customer needs and organizational objectives
- TQM aims **at improving the quality of organizational outputs through continual improvement of internal practices**
- TQM's objectives are to **eradicate waste and increase efficiency**
- 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 focuses on **doing things right the first time** and that defects and waste are eliminated from operations

Six C's of TQM:

Commitment	✓ **Quality improvement** should become a **normal part** of everyone's job ✓ There should be a **clear commitment toward quality** from the top

	✓ Quality improvement **should not be delegated to a single person but the same should form part of everyone's work**. Management should provide necessary training and support for this achievement
Culture	✓ **Training lies at the centre of effecting a change in culture and attitudes** ✓ Everyone must be encouraged to do individual contributions and to make quality a part of everyone's job
Continuous improvement	✓ TQM **is a process and not a programme**. Hence, we **should be committed in the long-term to the never-ending search** for ways to do job better
Co-operation	✓ **Total Employee Involvement (TEI) principle** is of paramount importance ✓ **On-the job experience of employees must be fully utilized** and their cooperation sought in the development of improvement strategies
Customer focus	✓ **TQM should focus on meeting the need of the external customer** as well as **internal customer** ✓ Perfect service with zero defects should be acceptable both at internal or external levels
Control	✓ **Documentation, procedures and awareness** of current best practice are essential if TQM implementation is to take place appropriately ✓ **Some organization over-look needs for control mechanism** in wake of customer focus. **However, procedures should be developed to monitor the extent of improvement and correct the deficiencies if required**

Contribution by Deming to TQM:

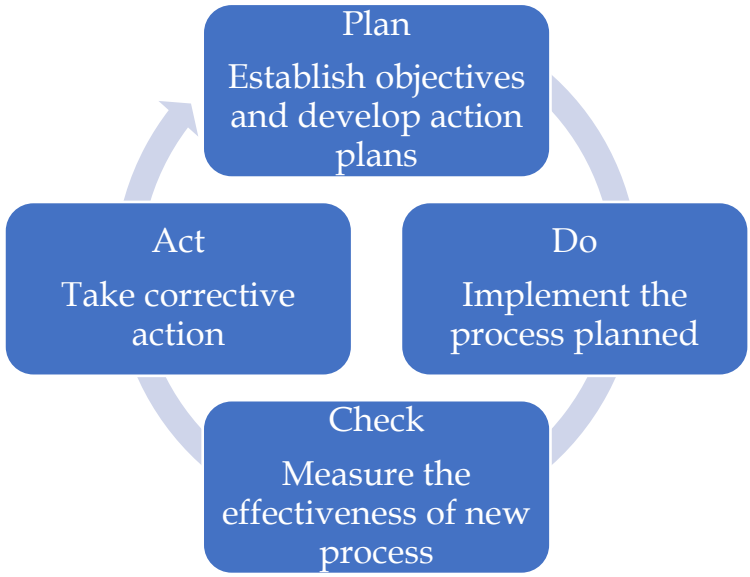
- ❖ William Edwards Deming is **considered as the father of Quality Control**. A number of elements of Deming's philosophy depart from traditional notions of quality
- ❖ **Historically poor quality was blamed on workers**. However, Deming pointed out that only **15 percent of quality problems are actually due to worker error** and the balance 85 percent are caused by processes and systems

Deming's 14 points methodology:

1. **"Create constancy of purpose towards improvement"**. Replace short-term reaction with long-term planning
2. **"Adopt the new philosophy"**. The implication is that management should actually adopt his philosophy rather than merely expect the workforce to do so
3. **"Cease dependence on inspection".** If variation is reduced, there is no need to inspect manufactured items for defects, because there won't be any
4. **"Move towards single supplier for any one item"**. Multiple suppliers mean variation between feedstock
5. **"Improve constantly and forever"**. Constantly strive to reduce variation
6. **"Institute training on the job".** If people are inadequately trained, they will not all work the same way, and this will introduce variation
7. **"Institute leadership"**. Deming makes a distinction between leadership and mere supervision. The latter is quota and target-based
8. **"Driver out fear".** Deming sees management by fear as counter-productive in the long term, because it prevents workers from acting in the organization's best interests
9. **"Break down barriers between departments"**. Another idea central to TQM is the concept of the 'internal customer' that each department serves not the management, but the other department that uses the outputs
10. **"Eliminate slogans".** Another central TQM idea is that not people who make most mistakes – it's the process they are working within. Harassing the workforce without improving the processes they use is counter-productive
11. **"Eliminate management by objectives"**. Deming saw production targets as encouraging the delivery of poor-quality goods
12. **"Remove barriers to pride of workmanship"**. Many of the other problems outlined reduce worker satisfaction
13. **"Institute education and self-improvement"**
14. **"The transformation is everyone's job"**

Plan-Do-Check-Act (PDCA) Cycle:

- PDCA cycle describes the activities a company needs to perform in order to **incorporate continuous improvement** in its operation. This cycle is also known as **"Deming Wheel"**



Criticisms of TQM:

- TQM focuses **extensively on documentation** of process and ill-measurable outcomes
- TQM **emphasizes on quality assurance** rather than improvement
- TQM **emphasizes on internal focus** which is at odds with alleged customer orientation
- TQM **may not be appropriate for service-based industries**, because the standard based approach of 'industry best practice' ignores the culture of the organization

Business Excellence Model:

- **Business Excellence (BE) is a philosophy for developing and strengthening the management systems** and processes of an organization to improve performance and create value for stakeholders
- **Essence of BE is to develop quality management principles that increase the overall efficiency of the operation, minimize waste** in the production of goods and services, and help to increase employee loyalty as a means of maintaining high standards throughout the business **by achieving excellence in everything that an organization does**
- Business excellence models **consider various management thoughts** as core concepts and structures quality management in a manner that can be adapted by any enterprise. Most common business excellence models are
  - EFQM Excellence Model
  - Balridge Criteria for Performance Excellence
  - Singapore BE Framework
  - Japan Quality Award Model
  - Australian Business Excellence Framework

EFQM Excellence Model:

- EFQM Excellence Model **provides an all-round view of the organization** and it can be used to determine how different methods **can fit together and complement each other**
- EFQM Model presents set of three integrated components:
  - **The Fundamental,** concept of excellence
  - **The Criteria**, conceptual framework
  - **The RADAR**, logic assessment framework

Fundamental concepts of Excellence:

- Fundamental concepts are the **basic principles that describe the essential foundation** for any organization to achieve sustainable excellence. Fundamental concepts are
  - Sustaining outstanding results
  - Adding value for customers

- Creating a sustainable future
- Developing organization capability
- Harnessing creativity and innovation
- Leading with vision, inspiration and creativity
- Managing with agility
- Succeeding through the talent of people

Criteria:

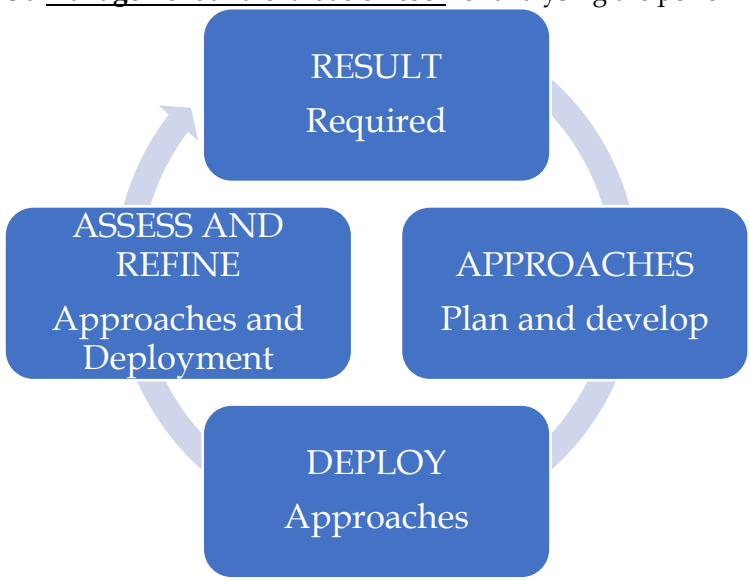
- EFQM criteria model **focuses on what an organization does** and the result it achieves. There are **five Enablers** (what an organization does) and **four Results** (what an organization achieves)

Enablers (What an organization does)	Results
• Leadership • People • Strategy • Partnership & Resources • Processes, products and services	• People results • Customer results • Society results • Business results

Enablers should focus on innovation, learning and creativity to improve results

RADAR (results – approaches – deploy – assess – refine) logic:

- RADAR is a **management and evaluation tool** for analysing the performance of an organization



Balridge criteria for performance excellence:

- This model **forms the foundation for various other business excellence models** adapted around the world. The framework is built round the following seven categories
  - Leadership
  - Strategic Planning
  - Customer and market focus
  - Measurement, analysis and knowledge management
  - Workforce
  - Process management and
  - Business results

Business excellence model and organization culture:

- Business excellence approach focuses on **strengthening the internal function** and communication, looks towards the **cultivation of strong ties with consumers** and can be incorporated into the culture
- **Strong and empathetic leader**, effective communication system, employee empowerment, employee motivation, innovative and creative culture are some of the strategies to make the employee feel connected to the management philosophy of the organization

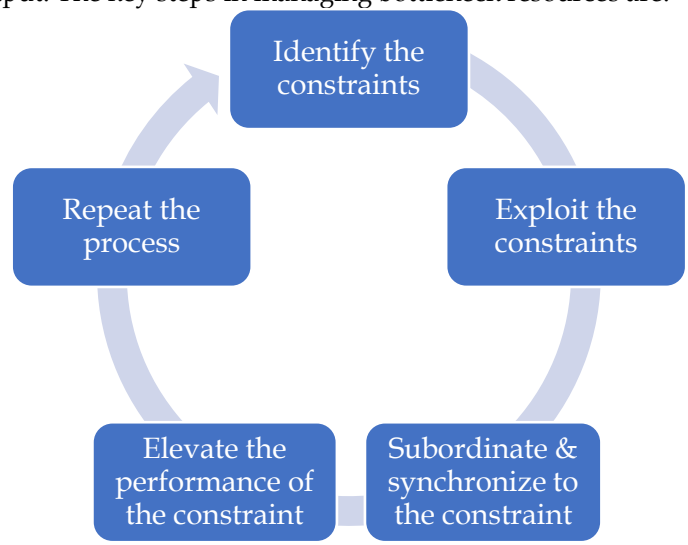
Theory of Constraints (TOC):

- TOC **focuses on revenue and cost management** when faced with bottlenecks. It advocates the use of three measures
- The objective of management can be expressed as **increasing throughput, minimizing investment and decreasing operating expenses**

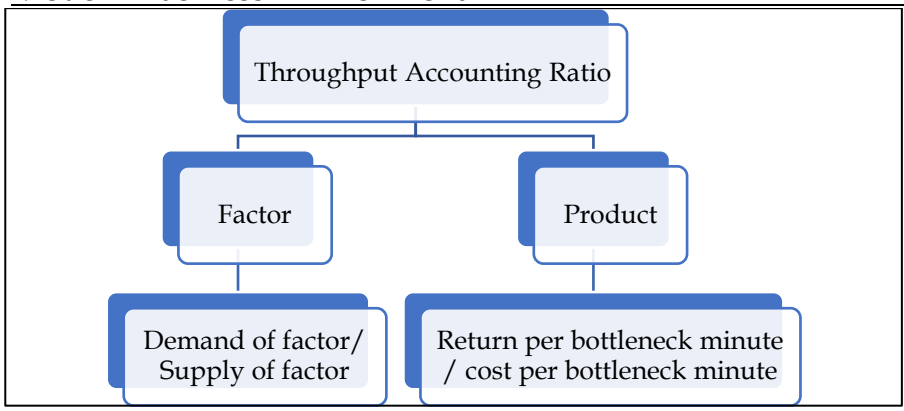
Throughput	•Measures rate of generating money in an organization through sales •Throughput = (Sales - unit level variable expense)/ Time •Direct labour cost is viewed as fixed cost and hence is not included while calculating throughput
Investment	•Money associated with turning materials into througput and do not have to be immediately expensed •Includes assets such as faclities, equipment, fixtures, computers and Research & Development expense
Operating expense	•Money spent in turning investment into throughput and therefore reprsent all other money that an organization needs •Includes direct labour and all operating and maintenance expense

Goldratt's five step method for improving performance:

- TOC describes the **process of identifying** and taking **steps to remove the bottlenecks** that restrict output. The key steps in managing bottleneck resources are:



Throughput Accounting Ratio:



Note:

- **TA ratio of more than 100 percent for an input factor indicates bottleneck resource**
- **TA ratio of more than 100 percent for a product indicates profitable product**

Advantages and disadvantages of TOC:

Advantages	Disadvantages
• Reduction in inventory • More productive machines • Ability to meet shorter lead times • More flexible • Better customer service • Better product mix • Better customer relationship	• Focus on short-term goals • Main emphasis on increasing sales and volume, not quality as opposed to TQM • Might result in loss of overall picture • Focuses on push approach as opposed to pull approach of JIT • Valid only if applied to total supply chain process including management, production, resources and support

Supply Chain Management:

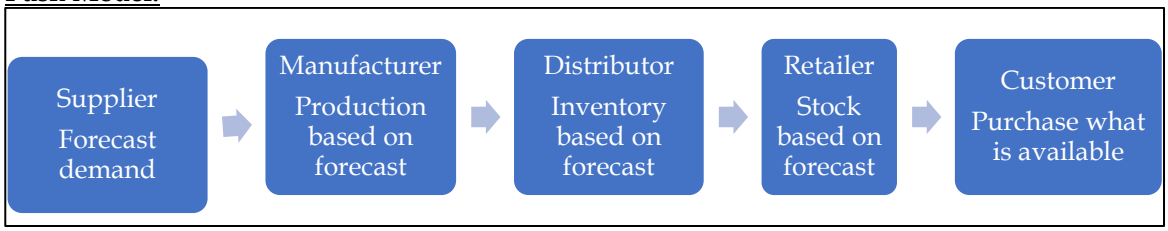
- Supply chain **comprise of vendors that supply raw materials**, producers who convert the material into products, **warehouses that store, distribution centers** that deliver to the retailers and retailers who sell the product to the ultimate user
- Supply chain can be referred as the **entire network of organizations working together to design, produce, deliver and service products**
- Supply chain includes production planning, purchasing, material management, distribution, customer service and forecasting
- The Global Supply Chain Forum (GSCF) defines Supply chain management as the **"integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders".**
- Supply chain management consist of the following eight processes:
  - Customer relationship management
  - Supplier relationship management
  - Customer service management
  - Demand management
  - Order fulfillment
  - Manufacturing flow management
  - Product development and commercialization
  - Returns management

Push versus Pull Supply Chain:

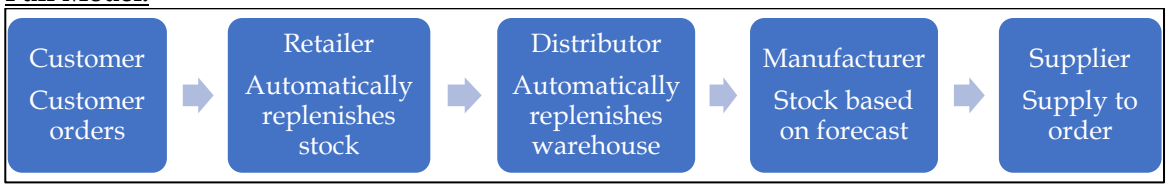
Push Model	Pull Model

Under Push Model **stocks are produced on the basis of anticipated demand**. Demand forecasting can be done via a variety of sophisticated techniques such as operations research or data mining	Under Pull Model **stocks are produced on the basis of actual demand**. This new business model is less product centric and more directly focused on the individual consumer – a more marketing-oriented approach

Push Model:



Pull Model:



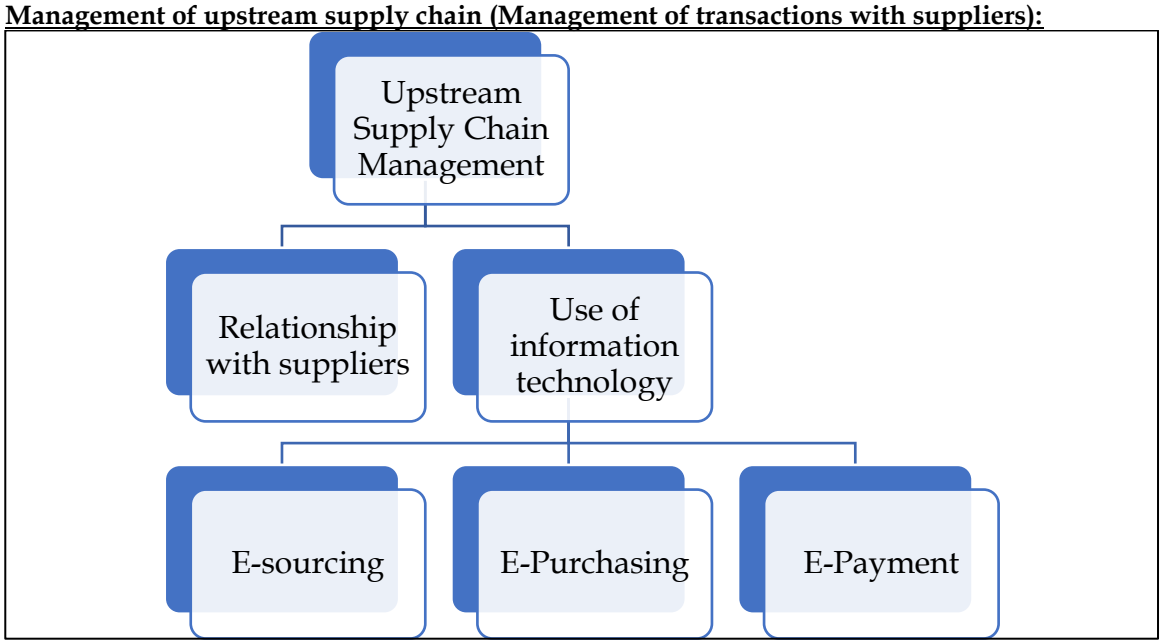
Role of e-commerce in supply chain:

- Supply chain created through e-commerce can benefit both customer and manufacturer. **It facilitates the companies to fulfill customer needs, carry fewer inventories, and send products to market very quickly**

Upstream and downstream supply chain:

Basis	Upstream supply chain	Downstream supply chain
Meaning	When the flow **relates to supplier** it is termed as upstream supply chain	When the flow **is with customers** it is named as downstream supply chain
Material	Returns, Repairs, After-sales service	Products, Parts
Information	Orders, Points of sale data	Capacity, Delivery schedules
Capital/finance	Payments	Invoices, Pricing, Credit terms

Management of upstream supply chain (Management of transactions with suppliers):



Relationship with suppliers:

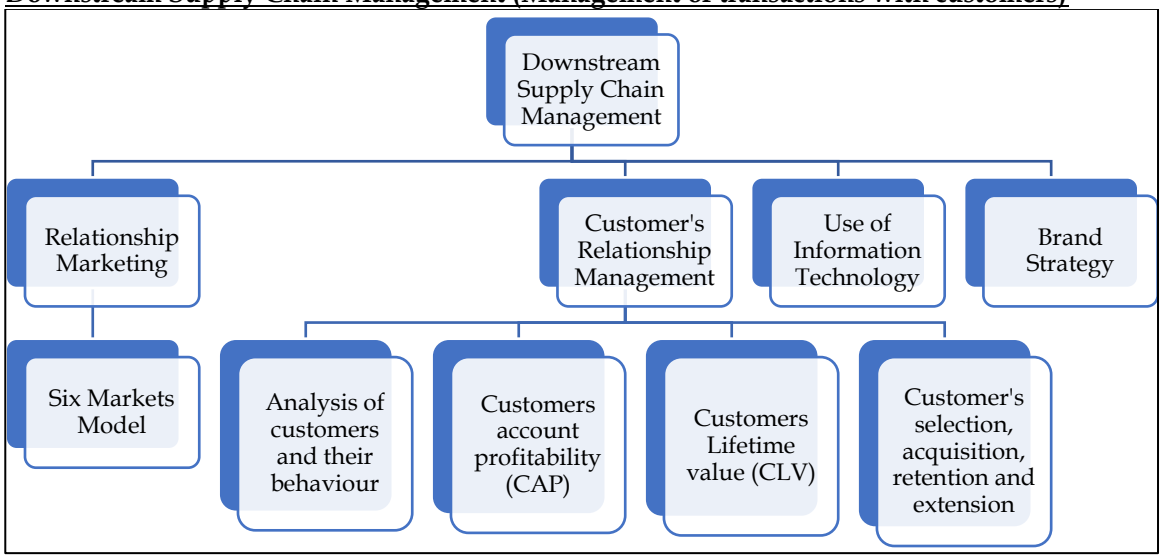
- Supplier Relationship Management (SRM) is undergoing a major transition. There are **lot of factors in choosing a supplier such as innovation, quality, reliability, and costs/price reductions and agility to reduce risk**

- SRM can create greater value for both businesses, something that would be difficult to achieve if operating independently
- The company should adopt a **suitable supplier strategy** to ensure the whole upstream supply chain is managed. The strategy should take into account sources, number of suppliers, cost, quality and speed of delivery, Make or Buy and outsourcing

Use of information technology:

- Main activities of upstream supply chain are **procurement and logistics**. The companies can use information technology for **E-sourcing, E-purchasing and E-payment**
- **E-sourcing:** Organization provides electronic invitation to tenders and requests them to submit their quotations. This can help to find out the best supplier among others
- **E-purchasing:** Usage of technology has resulted in lesser time, lower cost and better result in product selection and ordering. E-Purchasing system include electronic catalogues, recurring requisitions/shopping lists, electronic purchase orders and detailed management information
- **E-Payment:** Payment can also be made in electronic mode (invoicing and fund transfer). E-payment results in faster payment with zero error which is expected in manual form

Downstream Supply Chain Management (Management of transactions with customers)



Relationship Marketing:

- Marketing plays a **pivotal role to successfully handle** the downstream supply chain management
- Relationship marketing helps the **organization to keep existing customer and to attract new customers**
- Companies can use **"Six Market Model"** to identify the markets where company can direct their marketing initiatives

Internal Markets	✓ Internal markets include **internal departments and staff**. Staff have the ability to determine customer oriented corporate culture
Referral Markets	✓ Referral markets are of two categories: **Existing customers** who refer their suppliers to others and **referral sources** such as **consultancy firm** which may refer work to a law firm
Influence Markets	✓ Influence markets represent **entities and individuals, which have the ability to influence** marketing environment of a firm. This may include financial analysts, shareholders, business press, Government and consumer groups
Recruitment's markets	✓ Recruitment markets include **commercial recruitment agencies**, universities and agencies who have access to potential employees for the company
Supplier's markets	✓ Supplier markets refer to **traditional suppliers** as well as organizations with which the firm has some form of **strategic alliance** to gain benefits such as better quality, faster reach among others

Customer's markets	✓ Customer Markets represent all **existing and prospective customers** as well as intermediaries. In today's environment, the way firms provide services affect the market and helps in gaining customers

Customer's relationship management (CRM):

- CRM focuses on **knowing the needs of the customers** and providing them with the best solution
- Customers **under different channels are compiled through CRM**. The staff dealing with customers get a detailed information about customer's personal information, purchase history, buying preferences and concerns

Analysis of customers and their behavior:

- Analysis of customers is necessary based on **geographical location** or **purchasing characteristics**
- Companies should consider safety need, social need, physiological need, status/ego need and self-fulfillment need of existing and future customers

Customers Account Profitability (CAP):

- CAP involves **calculation of the profitability at customer level**. It includes the following five-steps:
  - Analyze the customer base and split it into segments
  - Calculate the annual revenues earned from the customer
  - Calculate the annual costs of serving the segment
  - Identify and retain quality customers
  - Re-engineer/ eliminate the unprofitable segments
- Customer profitability analysis is best conducted with a technique called as **Activity Based Costing**
- Post completion of CAP customers can be categorized into four types:
  - **Platinum customers –** Most profitable
  - **Gold customers –** Profitable
  - **Iron customers –** Low profit but desirable
  - **Lead customers –** Unprofitable and undesirable
- A company would always give the **best service to the first two customers**. It will at the same time try to **convert Iron customers to Platinum or Gold customers**. Finally, these companies will have systems in place to **avoid lead customers** completely
- Major challenge in CAP analysis is **calculation of right cost**. Time spent with each customer is different and therefore the cost is different. Furthermore, there are several non-customer related costs too. If these costs are ignored, then the profitability calculation can be wrong

Customers Lifetime Value (CLV):

- Customers lifetime value is the **present value of net profit** that we derive from a customer over the entire lifetime of relationship with a particular customer
- This is an **essential tool in marketing to focus on more profitable customers** and stop servicing non-profitable customers
- We need to use **ABC technique** to calculate the customer profitability and then project the future revenues and costs. These cash flows are discounted at firm's cost of capital to arrive at CLV

Customer's selection, acquisition, retention and extension:

- **Customer selection:** Type of customer which the company needs to target has to be selected
- **Customer acquisition:** Relationship needs to be developed with new customers. It can use off-line techniques such as advertising, direct mail or on-line techniques such as search engine, online marketing
- **Customer retention:** The company can keep its customer intact by emphasizing on meeting customer needs, ensuring ongoing service quality and using e-techniques
- **Customer extension:** The Company needs to increase the products sold to customers. It can re-sell similar products, cross-sell closely related products and up-sell more expensive products

Use of Information Technology in Downstream Supply Chain Management:

- Organizations are increasingly **linking their sales system to the purchasing system of the customer through Electronic Data Inter-change (EDI)**
- Intelligence gathering is used to monitor the online customer transactions. Use of IT results in quick action, reduction in associated time and cost

Brand Strategy:

- Branding of product **makes a huge difference in its appeal** to customers
- Branding can be usage of logo or specific color or any other means by which product/service is distinguished from others

Service Level Agreements:

- An **agreement between the customer and service provider** is termed as a service-level agreement.
- This can be a legally binding formal or an informal "contract".
- The agreement may be between separate organisation or within different teams of the organisation.
- SLAs commonly include many components, from a definition of services to the termination of agreement.
- To ensure that SLAs are consistently met, agreements are often designed with specific lines of differentiation and the parties involved are required to meet regularly to create an open forum for communication.
- **Providers rewards and penalties are specified. There is always place left for revisiting in most SLA.**

Benefits of supply chain:

- Inventory reduction
- Personnel reduction
- Productivity improvement
- Order management improvement
- Financial cycle improvement
- Information visibility
- New/improved processes
- Customer responsiveness
- Standardization
- Flexibility and globalization of performance

Gain-sharing arrangements:

- Gain sharing is an approach to the review and adjustment of an existing contract, or series of contracts, where **the adjustment provides benefits to both parties**.
- A fundamental **form of gain-sharing is where a supplier agrees to perform its side of the contract with no guarantee of receiving a payment**.
- Instead, any payment received is based upon the benefits that emerge to the customer as a result of the successful completion of the supplier's side of the bargain. **This is clearly a risky stance for the supplier, because it could spend a fortune and walk away with nothing.**
- Alternatively, **if the benefits to the customer are substantial, the supplier could find itself rewarded with a large return**. In this situation, the supplier could almost be described as taking an equity stake in the customer rather than entering into a contract with it.
- There must be no rewards for the suppliers to achieve a higher return through adversarial behaviour or by hiding behind the contract. **Gain-sharing deals are, on the face of it, a win-win situation for suppliers and their customers.**

Outsourcing:

- Outsourcing (also sometimes referred to as "**contracting out") is** a business practice used by companies to **reduce costs or improve efficiency** by shifting tasks, operations, jobs or processes to another party for a span of time.
- Outsourcing is a cost**- saving measure, and practising this can have a significant impact on manufacturing.**
- Outsourcing is not limited to manufacturing. Giving services to customer such as those in a call center, and computer programming jobs are also outsourced by companies seeking ways to reduce costs.
- The component can be purchased for a lower cost than it would be for the company to manufacture that component themselves, and the component may be of higher quality.
- Outsourcing is often an integral **part of downsizing or reengineering.**

Advantages of Outsourcing

- Outsourcing helps **in cost savings**. The lower cost of operation and labour, and Reduction in overhead costs makes it attractive to outsource.
- It frees an **organization from investments in technology, infrastructure and people** that make up the bulk of a back-end process capital expenditure.
- It gives businesses **flexibility in staffing**, manpower management, helps in cost savings.

Disadvantages of Outsourcing

- One of the biggest disadvantages **is the risk of losing sensitive data** and the loss of confidentiality.
- Control of **operations and deliverables of activities outsourced**.
- **Inexperienced worker or improper process** can lead to quality problems.

Overview of practical problems/ case studies/ important questions:

- Part I - Total Quality Management
- Part II - Business Excellence Models
- Part III - Theory of Constraints
- Part IV - Supply Chain Management
- Part V - Gain Sharing Arrangement and Outsourcing

Part I – Total Quality Management

1. Cost classification [Category B]

Classify the following items under appropriate categories of quality costs:

i. Rework
ii. Scrap
iii. Warranty Repairs
iv. Revenue loss
v. Repair to manufacturing equipment
vi. Discount on defective sale
vii. Establishment of quality circles
viii. Packaging inspection

Answer:

Prevention costs	Appraisal Costs	Internal Failure Costs	External Failure Costs
❖ Establishment of quality circles	❖ Packaging Inspection	❖ Rework ❖ Scrap ❖ Repair to manufacturing equipment's	❖ Warranty Repairs ❖ Revenue loss ❖ Discount on defective sale

2. Impact of TQM [Category A – Nov 2014 (RTP)]

7 Star Sports Co. (7SSC) is engaged in the manufacture of cricket bats. Following table shows the budgeted figures for the coming year:

Particulars	Per unit
Selling Price	4,800
Less: Component (1 set)	1,200
Assembling costs	2,000
Delivery cost	800
Contribution	800

Components like willow, rubber grip and handle bar in a set, are bought in and an assembling process carried out to transform them into a single bat. Market is intensely competitive where 7SSC currently holds 30% market share. Annual demand of these bats is 1,00,000 units.

On reviewing previous performance, it is revealed that 3% of the bats supplied to customers were returned for free replacement because of faults. Defective components, which are initially bought in to assembling process, are held responsible for this. These returned bats cannot be repaired and have no scrap

value. Supply of faulty bats to customers could be eliminated by implementing an inspection process immediately before the goods are delivered. This would improve customer perception thus resulting in an increase of 5% in current market share (making in all a total share of 35%).

Required

- Calculate the quality non-conformance cost for the coming year, based on the budgeted figures and sales returns rate.
- Calculate the impact on profitability due to implementation of inspection process for the bats.

Answer:

WN 1: Calculation of quality non-conformance cost

Particulars	Calculation	Amount
No of free replacements	1,00,000 * 30% market share * (3/97)	928
Cost per unit	Component + Assembling + Delivery	4,000
Cost of free replacement		**37,12,000**
Loss of market share due to defective		5%
Loss of potential units		5,000
Contribution lost due to defective	WN 2	35,04,000
Total quality non-conformance cost		**72,16,000**

WN 2: Calculation of contribution lost due to defective

Particulars	Calculation	Amount
Sales	5000 units * 4800	2,40,00,000
Less: Variable cost	5000 units *4000	-2,00,00,000
Less: Relevant cost of faulty bats	5000 units * 3/97 ~ 155 bats * 3,200	-4,96,000
Lost contribution		**35,04,000**

Explanation:

- **It is assumed that the customers are eligible for a second replacement in case the replaced product turns out to be defective.** The company is currently selling 30,000 bats and this would become 97 percent of the total units manufactured by the company. Hence the overall units manufactured will be 30,928 bats (30,000/97%)
- The company has lost a 5 percent market share due to defective products and the same can be saved by implementing an inspection process before delivery of bats. The company had an opportunity loss of 5,000 bats wherein it could have earned Rs.800 per bat. **However, the overall opportunity cost would be lower as there will be production of 155 faulty bats to meet the demand of 5,000 bats. The relevant cost of 155 bats will be Rs.3,200/bat (excluding delivery cost) as the delivery cost won't be incurred on those units**

WN 3: Impact on profitability due to implementation of inspection process

Particulars	Calculation	Amount
Extra contribution from increased market share	WN 2	35,04,000
Savings in delivery cost of faulty bats	928 bats * 800	7,42,400
Total benefit due to inspection		**42,46,400**

3. Quality Costs Classification [Category B]

Classify the following items under appropriate categories of quality costs:

I. Unplanned replacement to customers
II. Correction of a bank statement
III. Design review
IV. Equipment accuracy check

V. Staff training
VI. Reprocessing of a loan application
VII. Product liability
VIII. Product acceptance
IX. Wastage of material
X. Planned maintenance of equipment

Answer:

Prevention Costs	❖ Design review ❖ Staff Training ❖ Planned maintenance of equipment
Appraisal Costs	❖ Equipment accuracy check ❖ Product acceptance
Internal Failure Costs	❖ Correction of a bank statement ❖ Reprocessing of a loan application ❖ Wastage of material
External Failure Costs	❖ Unplanned replacement to customers ❖ Product liability warranty

4. Implementation of inspection process [Category B]

Lovewell Limited is a manufacturing company that produces a wide range of consumer products for home consumption. Among the popular products are its energy efficient and environment friendly LED lamps. The company has a quality control department that monitors the quality of production.

As per the recent cost of poor-quality report, the current rejection rate for LED lamps is 5% of units input. 5,000 units of input go through the process each day. Each unit that is rejected results in a Rs.200 loss to the company. The quality control department has proposed few changes to the inspection process that would enable early detection of defects. This would reduce the overall rejection rate from 5% to 3% of units input. The improved inspection process would cost the company Rs.15,000 each day.

Required

(i) ANALYSE the proposal and suggest if it would be beneficial for the company to implement it.
(ii) After implementation, ANALYSE the maximum rejection rate beyond which the proposal ceases to be beneficial?

Answer:

(i) Analysis of the proposal to make changes to the inspection process:

The company wants to reduce the cost of poor quality on account of rejected items from the process. The current rejection rate is 5% that is proposed to be improved to 3% of units input. The expected benefit to the company can be worked out as follows:

Particulars	Calculation	Amount
Reduction in rejections	5,000 x 2%	100
Cost per unit		200
Savings in rejection cost		**20,000**
Less: Cost of inspection process		15,000
Net cost		**5,000**

ii) Analysis of maximum rejection rate beyond which the proposal ceases to be beneficial

- ❖ The cost of improving controls to the inspection process is Rs.15,000 each day. The number of units of input processed each day is 5,000. The cost of rejection is Rs.200 per unit.
- ❖ It makes sense to implement the improvements to controls only if the benefit is greater than the cost involved. To find out the point where the benefits equal the cost, solve the following equation

Particulars	Amount
Target savings in rejection	15,000
Cost per unit	200
Target reduction in rejections	**75**

Target reduction in rejection rate (75/5,000)	1.5%
Allowed New Rejection Rate (5% - 1.5%)	**3.5%**

Beyond 3.5% rejection rate, the proposal will result in savings to the cost of poor quality that is less than the cost involved of Rs.15,000 each day.

5. Quality report [Category A]

NJ assembles and sells racing bicycles. In an attempt to improve profit, during the latest year NJ reduced the training it provided to its manufacturing staff.

The following actual selling price and cost information is available for the latest year:	
Selling price	1350
Frame cost	820
Other material cost	85
Assembly cost	100
Delivery cost	15
Contribution	330

Annual quality cost information for the latest year	
Inspection costs (manufacturing)	$2,300,000
Staff training costs	$780,000
Total cost of dismantling and reassembling per bike (this includes the collection cost of the faulty bicycle at $20)	$200
Estimated market size (number of bicycles)	2,500,000

Additional information for the latest year

- 3,000 completed bicycles were found to have a faulty frame before delivery to the customer. Each faulty frame had to be replaced and the bicycle had to be reassembled. NJ is unable to recover the cost of faulty frames from the supplier as the supplier has gone into liquidation.
- NJ had to replace 1,500 bicycles that had already been delivered to customers due to a failure of the frame.
- The management team at NJ estimated that its market share fell to 8% from a forecast 8.5% due to adverse consumer reaction as a result of criticism in the bicycle racing press.

Required:

(a) **Prepare** a cost of quality report for NJ for the latest year under appropriate headings.

(b) **Discuss**, using the above information, the relationship between conformance costs and non-conformance costs

Answer:

Statement showing total quality cost		
Particulars	**Calculation**	**Amount**
Prevention costs		
Staff training costs	Given	7,80,000
Appraisal costs		
Inspection costs	Given	23,00,000
Internal Failure Costs		
Replacement of faulty frame (collection cost of 20 will not be incurred)	3,000 * (820 + 180)	30,00,000
External Failure Costs		
Replacement of bicycles	1500 * (820+200+15)	15,52,500
Contribution lost due to lower market share	0.5% * 25,00,000 * 330	41,25,000
Total Quality Cost		**1,17,57,500**

Explanation:

- Faulty frame can be identified before delivery and this would lead to frame cost of Rs.820 per unit

and assembly cost of Rs.180 per unit. The total assembly cost is Rs.200 per unit and the company will not incur collection cost of Rs.20 per unit

- The company has to replace 1,500 bicycles and it would dismantle the cycle. It will incur frame cost of Rs.820 per unit, assembly cost of Rs.200 per unit and delivery cost of Rs.15 per unit. Hence the total cost would be Rs.1035 per unit

Relationship between conformance and non-conformance costs:

- **NJ incurs conformance costs with the aim of removing defects and failure in production.**
- **Conformance costs comprise: i) prevention costs (the cost of ensuring products are not produced that do not conform with quality requirements) and ii) appraisal costs (the cost of assessing if products meet the required quality standard).**
- **Non-conformance costs are incurred as a result of faulty products being produced. Non-conformance costs comprise: i) internal failure costs (the cost incurred when sub-standard products are produced but not delivered to the customer) and ii) external failure costs (the costs incurred when a sub-standard product reaches the customer).**
- **An increase in spend on conformance costs is likely to reduce the amount of cost incurred on non-conformance costs. The view is that the optimal amount to spend on conformance costs is where total quality costs are at a minimum**. However, this is contrary to the TQM philosophy where the aim is zero defect production.
- Staff training costs are prevention costs and a reduction in spend is likely to result in increased non-conformance costs that may lead to a rise in total quality cost. This could ultimately damage NJ's reputation and adversely impact revenues.

6. Cost of Quality [Category B – May 2018]

JK Ltd. Produces and sells a single product. Presently the company is having its quality control system in a small way at an annual external failure and internal failure costs of Rs.4,40,000 and Rs.8,50,000 respectively. As the company is not able to ensure supply of good quality products upto the expectations of its customers and wants to manage competition to retain market share considers an alternative quality control system. It is expected that the implementation of the system annually will lead to a prevention cost of Rs.5,60,000 and an appraisal cost of Rs.70,000. The external and internal failure costs will reduce by Rs.1,00,000 and Rs.4,10,000 respectively in the new system. All other activities and costs will remain unchanged.

Required:

(i) Examine the new quality control proposal and recommend the acceptance or otherwise of the proposal both from financial and non-financial perspectives

(ii) What is your advice to the company, if the company wants to achieve zero defect through a continuous quality improvement programme?

(iii) Suggest a suitable quality control level at a minimum cost

Answer:

(i) Quality cost statement:

Particulars	Existing	Proposed
Prevention cost	0	5,60,000
Appraisal cost	0	70,000
Internal Failure Cost	8,50,000	4,40,000
External failure cost	4,40,000	3,40,000
Total Cost	**12,90,000**	**14,10,000**

Implementation of new system will reduce costs of the non - conformance (internal and external failure) by Rs.5,10,000 (-40%). However, this will also increase costs of conformance by Rs.6,30,000. **There is inverse relationship between the costs of the conformance and the costs of non-conformance**. JK Ltd. should try to avoid costs of nonconformance because both internal and external failure affect customer's satisfaction and organisations profitability. The company should focus on preventing the error such that it ensures that product is of good quality when it reaches the customer at the very first instance. This enhances the customer experience and therefore eliminating the scope for external failures like sales returns and warranty claims. Better quality can yield further sales. Therefore, an increase in spending on

quality measures is justified since it not only yields significant improvements to quality but also brings in more sales orders.

Accordingly, from the financial perspective point of view the new proposal for quality control should not be accepted as it will lead to an additional cost of Rs.1,20,000 (Rs.6,30,000 - Rs.5,10,000). However, from non-financial perspective point of view as stated above the company should accept the new proposal.

(ii) It is possible to increase quality while at the same time reducing both conformance and non-conformance costs if a programme of aiming for zero defect/ and or continuous improvement is followed. **Zero defect advocates continuous improvement.** To implement this elimination of all forms of waste, including reworks, yield losses, unproductive time, over-design, inventory, idle facilities, safety accidents, etc. is necessary.

(iii) To achieve 0% defects, costs of conformance must be high. As a greater proportion of defects are accepted, however, these costs can be reduced. At a level of 0% defects, cost of non-conformance should be nil but these will increase as the accepted level of defects rises. There should therefore be an acceptable level of defects at which the total costs of quality are at a minimum.

7. Decision on inspection [Category A]

EKS Ltd. manufactures a single product, which requires three components. The company purchases one of the components from three suppliers. DE Ltd., PE Ltd. and ZE Ltd. The following information are available:

	DE Limited	PE Limited	ZE Limited
Price quoted by supplier (per hundred units)	Rs.240	Rs.234	Rs.260
% of Defective of total receipts	3%	5%	2%

If the defectives are not detected they are utilized in production causing a damage of Rs.200 per 100 units of the component. Total requirements are 12,000 units of the components.

The company intends to introduce a system of inspection for the components on receipt. The inspection cost is estimated at Rs.26 per 100 units of the components. Such as inspection will be able to detect only 90% of the defective components received. No payment will be made for components found to be defective in inspection.

Required

(i) Advice whether inspection at the point of receipt is justified.

(ii) Which of the three suppliers should be asked to supply

Answer:

(i) A: Statement Showing Computation of Effective Cost before Inspection

Particulars	**DE Limited**	**PE Limited**	**ZE Limited**
Units Supplies (Nos)	12,000	12,000	12,000
Defectives Expected (Nos)	360	600	240
Costs:			
Purchase of Components	28,800	28,080	31,200
Add: Production Damage on Defective Components (@ Rs.200 per 100 components)	720 (360 x 2)	1,200 (600 x 2)	480 (240 x 2)
Total	**29,520**	**29,280**	**31,680**
Good Components (Nos)	11,640	11,400	11,760
Cost per 100 Good Components	**253.61**	**256.84**	**269.39**

B: Statement Showing Computation of Effective Cost after Inspection

Particulars	**DE Limited**	**PE Limited**	**ZE Limited**
Units Supplies (Nos)	12,000	12,000	12,000
Defects Not Detected (Nos)	36	60	24
Defectives Detected (Nos)	324	540	216

Components Paid For	11,676	11,460	11,784
Costs:			
Purchase of Components (components paid x Price per unit)	28,022.40	26,816.40	30,638.40
Add: Inspection Cost	3,120.00	3,120.00	3,120.00
Add: Production Damage on Defective Components (@ Rs.200 per 100 components)	72.00	120.00	48.00
Total	**31,214.40**	**30,056.40**	**33,806.40**
Good Components (Nos.)	11,640	11,400	11,760
Cost per 100 Good Components	**268.16**	**263.65**	**287.47**

Advice Whether Inspection at the Point of Receipt is Justified

- On comparing the cost under situation, A and B shown above, we find that it will not be economical to install a system of inspection.
- **Further we also need to consider that presently many organizations are undergoing Just in Time (JIT) implementation. JIT aims to find a way of working and managing to eliminate wastes in a process. Achievement of this is ensured through eliminating the need to perform incoming inspection**. Inspection does not reduce the number of defects; it does not help in improving quality. In general inspection, does not add value to the product. It simply serves as a means of identifying defects the supplier has failed to recognize subsequent to the manufacturing of the product.
- As a matter of fact, organizations implementing JIT are seeking eventually to eliminate the need for performing incoming inspection activities through a combination of reducing the supplier base, selection through qualification and vendor development. Vendor development and its proper management seeks to assist the supplier who maintains an interest in striving to provide 100% defect-free materials and parts.
- **So, to decision whether inspection at the point of receipt is justified or not will also depend on Qualitative factors as well.**

(ii) On comparing the buying cost of components under different situations, as analysed and advised above, if company decides not to install a system of inspection, supplier DE would be cheaper otherwise supplier PE would be cheaper and company may choose supplier accordingly

8. Cost of quality report [Category A – May 2019 (exam)]:

The CEO of Skytech Limited is concerned with the amounts of resources currently spent on customers warranty claims. Each box of its product is printed with the logo: "Satisfaction guaranteed or your money back". Skytech Limited is having difficulty competing with Softech Limited because it does not have the reputation for high quality that Softech Limited enjoys. Since the warranty claims are so high, the CEO of skytech Limited would like to evaluate what costs are being incurred to ensure the quality of the product. Following information is collected from various departments within the company relating to 2018-19:

Particulars	Amount
Warranty Claims	4,25,000
Employee training costs	1,20,000
Rework	3,00,000
Lost profits from lost customers due to impaired reputation	8,10,000
Cost of rejected units	50,000
Sales return processing	1,75,000
Testing	1,70,000

For the year 2019-20, the CEO is considering spending the following amounts on a new quality programme:

Particulars	Amount
Inspect raw material	1,20,000
Reengineer the production process to improve product quality	7,50,000
Supplier screening and certification	30,000
Preventive maintenance on plant equipment	70,000

Skytech Limited expects the new quality programme to save costs by the following amounts:

Particulars	Amount
Reduction in Lost profits from lost customers due to impaired reputation	8,00,000
Reduction in rework costs	2,50,000
Reduction in warranty costs	3,25,000
Reduction in sales return processing	1,50,000

Required:

i. Prepare a cost of quality report for the year 2018-19 showing the percentage of the total costs of quality incurred in each cost category
ii. Prepare a cost benefit analysis of the new quality programme showing how the quality initiative will affect each cost category
iii. State how the manager trade-offs among four categories of quality costs

Answer:

Part 1:

Cost of quality report for 2018-19

Particulars	Amount	%
Prevention costs:		
Employee Training costs	1,20,000	5.85
Total Prevention costs	**1,20,000**	**5.85**
Appraisal costs:		
Testing	1,70,000	8.29
Total Appraisal Costs	**1,70,000**	**8.29**
Internal Failure Costs:		
Rework	3,00,000	14.63
Cost of rejected units	50,000	2.44
Total Internal Failure Costs	**3,50,000**	**17.07**
External Failure Costs:		
Warranty claims	4,25,000	20.73
Lost profits from lost customers	8,10,000	39.51
Sales return processing	1,75,000	8.54
Total External Failure Costs	**14,10,000**	**68.78**
Total Quality Costs	**20,50,000**	**100.00**

Part 2:

Cost of quality report post implementation of new quality training programme (impact of new system on quality costs)

Particulars	Amount	%
Prevention costs:		
Employee Training costs	1,20,000	8.03
Inspect raw material	1,20,000	8.03
Re-engineer the production process to improve product quality	7,50,000	50.17
Supplier screening and certification	30,000	2.01
Preventive maintenance on plant equipment	70,000	4.68
Total Prevention costs	**10,90,000**	**72.91**
Appraisal costs:		
Testing	1,70,000	11.37
Total Appraisal Costs	**1,70,000**	**11.37**
Internal Failure Costs:		
Rework	50,000	3.34
Cost of rejected units	50,000	3.34
Total Internal Failure Costs	**1,00,000**	**6.69**
External Failure Costs:		
Warranty claims	1,00,000	6.69
Lost profits from lost customers	10,000	0.67
Sales return processing	25,000	1.67
Total External Failure Costs	**1,35,000**	**9.03**

Total Quality Costs	**14,95,000**	**100.00**

Cost-benefit analysis of new quality improvement programme:

Particulars	Amount
Benefits:	
Reduction in internal failure costs (3,50,000 – 1,00,000)	2,50,000
Reduction in external failure costs (14,10,000 – 1,35,000)	12,75,000
Total Benefits	**15,25,000**
Costs:	
Increase in prevention costs (10,90,000 – 1,20,000)	**9,70,000**
Net benefit of new quality programme	**5,55,000**

Part 3:

- **Conformance costs comprise: i) prevention costs (the cost of ensuring products are not produced that do not conform with quality requirements) and ii) appraisal costs (the cost of assessing if products meet the required quality standard).**
- Non-conformance costs are incurred as a result of faulty products being produced. Non-conformance costs comprise: i) internal failure costs (the cost incurred when sub-standard products are produced but not delivered to the customer) and ii) external failure costs (the costs incurred when a sub-standard product reaches the customer).
- **An increase in spend on conformance costs is likely to reduce the amount of cost incurred on non-conformance costs. Therefore, there is a trade-off between various categories of quality costs.** Spending more on quality conformance costs can help an organization in spending on non-conformance costs.

Part II – Business Excellence Models

9. Business excellence model [Category B]

As a guest lecturer at a symposium for Business Excellence where you are giving a lecture on "Sustaining Business Excellence". A manufacturer of a fashion clothing line is one of the participants at the symposium. He has the following query:

"We are an apparel company that manufacture and sell our fashion clothing and accessories directly through 30 stores spread across India. Shortly we are planning to establish similar outlets overseas. Our business is under constant change due to changing customer trends. At the same time, we are the largest company in our industry segment in India, both in terms of market share and profits. We have a satisfied base of customers who are loyal to our brand. Shareholders are also satisfied stakeholders due to good returns provided on their investments. What would be the relevance of Business Excellence model to our company?
Thank you!"

You are required to frame an appropriate response to this query.

Required

(i) EXPLAIN the importance of business excellence to an organization.
(ii) LIST the tool available to achieve and sustain excellence.
(iii) APPLY the fundamentals of EFQM model on the apparel company.
(iv) EXPLAIN the relationship between various criteria of the model in general terms.

Answer:

(i) Business Excellence is a philosophy for developing and strengthening the management systems and processes of an organization to improve performance and create value for stakeholders. Stakeholders in an organization are not limited to shareholders (business) alone. They include also customers, employees (people) and society. What an organization does impact all the stakeholders in different ways, yet they are all interlinked to each other. Customers' needs are of paramount importance to companies. Yet given uncertain conditions, shareholders demand challenging return on their investments. Employees need more from their company than just their pay-check. They want the company to enable to grow their knowledge and experience that can improve their career growth. Society expects companies to operate ethically and for the overall betterment of the society and environment.

For several years' businesses have been operating under challenging circumstances. For example, landline phones have been entirely replaced by mobile phones. Television programs can be watched seamlessly on internet enabled mobile phones. Not just this, today's smartphones have computing capability much more than the computers that were used in Apollo Mission to send the first man to moon! The proliferation of mobile phones has changed not just the telecom industry but also others like communication, banking, e commerce etc. The pace of change is both exhilarating and challenging.

To manage this complex scenario, a company cannot focus on only one aspect of their operations. **Optimize processes, delivery quality to customers, manage employee talents, earn required return on investment while managing to be a socially responsible organization.** In short, the company should achieve excellence in all aspects of its operations. This is business excellence. **Business excellence principles emerged because of development of quality drive into traditional business management.** It is imperative not just to achieve excellence but also to sustain it.

Business excellence models are holistic tools that help companies develop stakeholder focused strategy. Each operation within a company enables a corresponding result. **Business models present a formal, standardized cause effect relationship between different operations (enablers) and their resultant consequences.** If the company want to achieve a different result, it has to do things differently. This can be better analysed through these models. Continuous improvement on various operations will ultimately lead to excellence. More importantly, these models need to be used to sustain and maintain excellence to retain their competitive advantage. They are not to be taken as one-time exercise by the company. Assessments using this model have to be made periodically so that timely action can be taken to achieve the desired result.

(ii) Some of the popular business excellence models are (i) the European Foundation Quality Management (EFQM) model (ii) Baldrige Criteria for Performance Excellence (iii) Singapore BE Framework (iv) Japan Quality Award Model and (iv) Australian Business Excellence Framework.

(iii) The apparel company is a **well-established player in the industry**. It is a growing company that is looking to expand its operations overseas. To achieve business excellence in this environment, the company could adopt the EFQM model, which is a popular model.

The EFQM model was developed by the European Foundation for Quality Management. The model provides an all-round view of the organization and it can be used to determine how different methods fit together and complement each other. It can help the company understand the cause and effect relationships between what their organization does and the results it achieves. Creating an EFQM Management Document gives the organization a holistic overview of its strategic goals, the key approaches it has adopted and the key results it has achieved.

The fundamental concepts for excellence are the basic principles that describe the essential foundation for any organization to achieve sustainable excellence. With respect to the company they can be detailed as below:

(a) Adding value to customers: Companies need to understand their customers, their needs, anticipate their needs and make use of opportunities to fulfil their expectations. In the current case, fashion apparel business is ever changing and dynamic due to the changing trends in customer's tastes. This could differ across locations within India and abroad. In the era of e-commerce, competition would be cut-throat. Before going to "how" it can meet customer's needs, the company should be clear on "what" need of the customer it can satisfy. For example, should the company cater to Indian apparel market, western apparel market, men or women or children apparel market etc. Once the "what" is clear, the company should have mechanisms in place to find out and anticipate customer tastes. Accordingly, it should structure its operations to add value to the customers in terms of quality, availability, support, and experience

(b) Creating a sustainable future: Society and environment (People and Planet of Triple Bottom-line concept) play a major role in ensuring the sustainability of business. A company should have as much positive impact on its surroundings and try to minimize any negative impact on the same. Here, the company should assess the environmental impact of its operations, measures to minimize adverse impacts,

business impact on the society etc. For example, leather is contended to be harmful to the environment since it requires the skin of animals specially cattle hide, needs huge amount of energy and chemicals to process it. This has a negative environmental impact. As regards societal impact, suppliers of cloth to the apparel company should not indulge in labor malpractice like child labor and should adhere to safety standards within its factories. The company should procure cloth only from suppliers who adhere to such standards.

(c) Developing Organizational Capability: Companies need to manage change within the organization and beyond. The company should identify "what it is capable of being great at?" in order to differentiate it from its competitors. For example, the apparel company may have the capability of tracking its inventory at the stores on real time basis. As soon as the inventory falls below a certain level, the stores issues fresh products to stock up. This ensures that there are no stock outs at the retail outlet. This ability to track inventory real time and ability to stock up quickly may be unique to the company that gives it a competitive edge. Another can be the ability to quickly change the apparel production to meet changing trends. Likewise, the company should identify and develop unique capabilities to have a competitive edge in the market.

(d) Harnessing creativity and innovation: Continuous improvement and innovation brings value to the company. The company should promote a working environment that enables and appreciates creativity and innovation. For example, new apparel designs can be promoted to test the market. If found feasible, the company can go for mass production of the same.

(e) Leading with vision, inspiration, and integrity: The tone at the top defines the rest of the company. The leaders and management of the company should have a clear vision of what the company wants to achieve, develop strategy to achieve it, work with integrity and ethics. Leaders shape the future of the organization.

(f) Managing with agility: Agility would be the capability to identify and effectively respond to opportunities and threats. For example, although the apparel company is in an expansionary phase, it should consider the threat, yet opportunity of using ecommerce as a platform to reach out to customers directly. Brick and mortar stores are becoming largely redundant due to online platforms, a threat the company should recognize and act upon.

(g) Succeeding through the talent of people: An organization is only as good as the people who work in it. There should be an atmosphere of teamwork that enable achievement of organizational and personal goals. Performance evaluation, reward and recognition programs, training and talent network are ways to cultivate talent within the organization.

(h) Sustaining outstanding results: Use of EFQM model is not a onetime exercise. Constant and periodic evaluation is required to keep up and sustain excellence.

(iv) The criteria of the model are comprised of 5 enablers and 4 results. Enablers covers what an organization does (its objective) and how it does it (strategy, use of resources to achieve it).

(a) Leadership: A leader defines the organization's culture. They enable the organization to achieve its goals by taking the correct decisions at the correct time. To do this they should have sufficient skill, work as per the company's code of conduct and should be ethical in their dealings.

(b) Strategy: Operations should be planned and directed as per a clearly defined strategy. The company's vision and mission statement with respect to its various stakeholders are the goals that the organization wishes to achieve. Strategy (plan) enables the company to achieve these goals.

(c) People: Excellence is possible only if the people working in the company wish to achieve it. They must be motivated, recognized, and managed to enable them to work towards the company's vision and mission. The work culture should be that this opens up opportunities for personal development as well. This would cultivate a bond with the organization, which enables people working within to strive for excellence.

(d) Partnerships and resources: Effective management of partnerships that the company has with other organizations is critical to success. Partners could be external vendors, suppliers, and service providers. The services of partners enable business to operate smoothly. Resources, both tangible and intangible should be managed optimally. Tangible resources can be financial (cash, bank accounts) and physical assets

(machinery, building, land etc.). Intangible resources would be intellectual property rights, information technology, licenses etc. Proper management of resources enables optimal results.

(e) Processes, Products, and Services: A company exists because of its processes, products, and services. They should be managed and continuously improved to create value to the stakeholders

Results are what the organization achieves following its operations and decisions. As explained before, the stakeholders of the company are investors (business), people (employees), customers and society. In order to track performance, the company has to develop Key Performance Indicators (KPI)s for each of the stakeholder groups. Results should be tracked periodically. Changes to targets and benchmarks should be continuously made to reflect the current objectives that the company wants to achieve. Some of the results that the company can look at are:

(a) Customer results: Are the customers of the company satisfied with the products and service? How does the company fare in terms of brand loyalty? Is the customer base growing to indicate increasing market share?

(b) People results: Does the company have skilled and motivated employees? What is the employee turnover with reasons for the same? Does the company have proper access to hire required talent? Are the employees motivated, trained, recognized, and rewarded for their performance? What is performance measurement system, is it robust and accurate to measure performance?

(c) Society results: Is the company a good corporate citizen. Are the objectives of corporate social responsibility being met? If the organization is a not for profit organization, is it meeting its objectives and goals?

(d) Business results: Is a for profit organization achieving the required return on investment, profitability that the shareholders and other investor demand? Has the company been able to manage financial and other risks properly?

Enablers enable achievement of results. EFQM model documents this flow and symbiosis in a structured way. It highlights the strength and weakness of the enablers. With this information, the company can alter its operations and strategy to achieve desired results. On assessment, there is a flow from results to enablers. If the results have been achieved, enablers continue to operate status quo. If the results fall short of targets, changes have to be made to enablers to improve performance. Therefore, it can be concluded the EFQM model encourages constant self-assessment to achieve excellence. When a company wins an excellence, award based on a business excellence model, it gains in stature within the industry. This recognition could work to its advantage financially and otherwise.

Part III – Theory of Constraints

10. Theory of constraints [Category A – May 2015 (exam)]

Phi Ltd. produces 4 products P, Q, R and S by using three different machines X, Y and Z. Each machine capacity is limited to 6,000 hours per month. The details given below are for July, 2013:

Particulars	P	Q	R	S
Selling Price p.u. (Rs.)	10,000	8,000	6,000	4,000
Variable Cost p.u. (Rs.)	7,000	5,600	4,000	2,800
Machine Hours Required p.u.				
Machine X	20	12	4	2
Machine Y	20	18	6	3
Machine Z	20	6	2	1
Expected Demand (units)	200	200	200	200

Required

(i) Find out the bottleneck activity.

(ii) Allocate the machine hours on the basis of the bottleneck.

(iii) Ascertain the profit expected in the month if the monthly fixed cost amounts to Rs.9,50,000.
(iv) Calculate the unused spare hours of each machine.

Answer:

WN 1: Calculation of throughput accounting ratio (TA Ratio)

Particulars	Demand	Supply	TA Ratio
Machine X	7,600	6,000	126.67
Machine Y	9,400	6,000	156.67
Machine Z	5,800	6,000	96.67

- **Machine Y has to be taken as bottleneck factor as it has the highest TA Ratio.**

WN 2: Statement of ranking based on bottleneck factor (Machine Y):

Particulars	P	Q	R	S
Selling Price	10,000	8,000	6,000	4,000
Less: Variable cost per unit	7,000	5,600	4,000	2,800
Contribution per unit	3,000	2,400	2,000	1,200
No of machine Y hours per unit	20	18	6	3
Contribution/Machine Y hour	150	133.33	333.33	400
Rank	**III**	**IV**	**II**	**I**

WN 3: Statement of allocation:

Product	No of units	Machine X consumed	Machine Y consumed	Machine Z consumed	Total contribution
Product S	200	400	600	200	2,40,000
Product R	200	800	1,200	400	4,00,000
Product P	200	4,000	4,000	4,000	6,00,000
Product Q	11	132	198	66	26,400
Total		**5,332**	**5,998**	**4,666**	**12,66,400**
Less: Fixed cost					**9,50,000**
Profit					**3,16,400**

WN 4: Computation of unused time:

Machine	Total capacity	Utilized capacity	Unused spare hours
X	6,000	5,332	668
Z	6,000	4,666	1,334

11. Theory of constraints [Category B – May 2018 (exam)]

Rohni Steel Company produces three grades of steel – super, good and normal grade. Each of these products (Grades) has high demand in the market and company is able to sell as much as it can produce these products.

The furnace operation is a bottle-neck in the process. The process is running at 100% of capacity. The company wants to improve its profitability. The variable conversion cost is Rs.100 per process hour. The fixed cost is Rs.48,00,000. In addition, the cost accountant was able to determine the following information about the three products (grades):

	Super Grade	Good Grade	Normal Grade
Budgeted units produced	6000	6000	6000
Total Process hours per unit	12	12	10
Furnace hours per unit	6	5	4
Unit Selling Price	3600	3400	3000

Direct material cost per unit	2100	1900	1720

The furnace operation is part of the total process for each of these three products. Thus, furnace hours are the part of process hours.

Required:

i. Determine the unit contribution margin for each product
ii. Give an analysis to determine the relative product profitability, assuming that the furnace is a bottleneck
iii. Management wishes to improve profitability by increasing prices on selected products. At what price would super and good grades need to be offered in order to produce the same relative profitability as normal grade steel?

Answer:

WN 1: Computation of unit contribution margin and statement of ranking

Particulars	**Super Grade**	**Good Grade**	**Normal Grade**
Selling Price	3,600	3,400	3,000
Less: Material cost	2,100	1,900	1,720
Less: Variable processing cost @ 100 per processing hour	1,200	1,200	1,000
Contribution margin per unit	**300**	**300**	**280**
Furnace bottleneck hours per unit	6	5	4
Contribution margin per furnace hour	**50**	**60**	**70**
Ranking	**III**	**II**	**I**

Author's Note:

- The word bottleneck is normally associated with TOC. However, this question has been solved under marginal costing approach by ICAI. Please write your assumption clearly in exam if you are in doubt

Analysis:

The Super and Good Grade steel have the highest contribution margin per unit (Rs.300); however, the normal grade has the highest contribution margin per furnace hour (Rs.70). Thus, using production bottleneck analysis indicates that the Normal Grade is actually more profitable at a Rs.70 contribution margin per furnace hour than Super Grade's Rs.50 or Good Grade's Rs.60 contribution margin per furnace hour. Therefore, the company would want to sell product in the following preference order:

- Normal Grade
- Good Grade
- Super Grade

WN 3: Computation of selling price of super and good grade steel to have same relative product profitability:

Particulars	**Super Grade**	**Good Grade**
Selling Price	**3,720**	**3,450**
Less: Material cost	2,100	1,900
Less: Variable processing cost @ 100 per processing hour	1,200	1,200
Contribution margin per unit (Contribution margin x No of hours)	**420**	**350**
Furnace bottleneck hours per unit	6	5
Contribution margin per furnace hour	**70**	**70**

Note:

- The company wants to earn same contribution margin of Rs.70 per hour and based on that we have reverse worked contribution margin per unit
- Selling price = Contribution margin per unit + Variable processing cost + Material cost

12. Theory of constraints [Category A – May 2018(exam)]

A division of XY company produces two types of products, whose selling price and cost data are as follows:

Particulars	**Product A**	**Product B**
Selling Price	200	280
Material cost per unit	80	100
Variable conversion cost	20	60

Maximum sales potential	75,000	35,000
Production per machine hour	3.125	2.5

Maximum capacity hours are 30,000. Total fixed overheads are Rs.42 lakhs. The stock of work-in-progress and finished goods are negligible because the company uses just-in-time system.

Required:

(i) Determine the optimal product mix using marginal costing

(ii) Calculate the throughput accounting ratio for each product and rank the products for manufacture

(iii) Based on the concept of throughput accounting, compute the product mix to yield maximum profit

WN 1: Statement of ranking as per marginal costing:

Particulars	**A**	**B**
Selling price	200	280
Less: Variable cost	100	160
Contribution per unit	**100**	**120**
Machine hours per unit (1/production per hour)	0.32 (1/3.125)	0.40 (1/2.5)
Contribution per hour	**312.50**	**300**
Rank	**I**	**II**

WN 2: Statement of allocation as per marginal costing:

Product	**Units**	**Hours per unit**	**MH Consumed**
A	75,000	0.32	24,000
B	15,000@	0.40	6,000
Total			**30,000**

@Number of hours post production of A = 30,000 – 24,000 = 6,000; Units of B which can be manufactured = 6,000/0.40 = 15,000 units

WN 3: Computation of Throughput Accounting Ratio (TA Ratio):

Particulars	**Product A**	**Product B**
Contribution per hour (WN 4)	375	450
Operating Cost per hour (66,00,000/30,000 hours)	220	220
TPAR (Contribution per hour/Cost per hour)	1.70	2.05
Rank	**II**	**I**

- Operating costs = All costs other than material costs
- Operating costs = 42,00,000 + (75,000 x 20) + (15,000 x 60) = 66,00,000
- **Variable conversion cost has been calculated on the basis of current production computed in WN 2**

WN 4: Statement of ranking as per throughput accounting approach:

Particulars	**A**	**B**
Selling price	200	280
Less: Material cost	80	120
Throughput Contribution per unit	**120**	**180**
Machine hours per unit (1/production per hour)	0.32	0.40
Throughput Contribution per hour	375	450
Rank	**II**	**I**

WN 5: Statement of allocation as per throughput accounting approach:

Product	**Units**	**Hours per unit**	**MH Consumed**
B	35,000	0.40	14,000
A	50,000@	0.32	16,000
Total			**30,000**

@Number of hours available post manufacturing of B = 30,000 – 14,000 = 16,000 hours; Number of units of Material A can be manufactured = 16,000/0.32 = 50,000 units

13. Throughput Accounting and Pricing Policy [Category A – May 2019 (exam)]:

Pentonic Limited produces two types of products A and B at its manufacturing plant. Both the products are produced using the same materials, machinery and skilled labour. Machine hours available for the year is 4,000 hours. Market research conducted by the company indicates that the selling price of A and B cannot be increased for the next two years.

Information relating to Product A and B are as follows:

Particulars	A	B
Selling price per unit	16,000	4,000
Material cost per unit	7,000	1,200
Machine hours per unit	1.6 hours	0.8 hours
Maximum annual demand	2,000 units	1,600 units
Online booking already accepted for	400 units	1,200 units

Due to poor productivity levels, late order and declining profits over recent years, the chief executive officer (CEO) has suggested the introduction of throughput accounting in the company, together with a Just-in-Time (JIT) system of production.

Total factory costs which include the cost of labour and all factory overheads are Rs.1,42,60,000 each year at the plant.

Required:

I. Using throughput accounting prepare statement to determine the optimum production mix and maximum profit for the next year. Note: Profit to be calculated using throughput return per hour only and not by contribution per unit
II. Calculate the amount of profit lost due to acceptance of online booking of the products
III. Recommend the booking procedure to be followed in order to avoid any loss of profit
IV. It has now been reported that the company intends to customize the pricing of products- A and B. Recommend various ways through which price customization could be done by the company
V. Given that the products – A and B are respectively in the maturity stage and introduction stage of the life cycle. State the most appropriate pricing policy that could be followed by the company for A and B as per their life cycle

Answer:

Part 1:

WN 1: Statement of ranking (Machine hours is the bottleneck):

Particulars	Product A	Product B
Selling Price	16,000	4,000
Less: Material Cost	(7,000)	(1,200)
Throughput Contribution	**9,000**	**2,800**
Machine hours per unit	1.6	0.8
Contribution per hour	**5,625**	**3,500**
Rank	**1**	**2**

WN 2: Statement of allocation:

Product	Units	Hours consumed	Balance hours	Contribution
A (online booking)	400	640	3,360	36,00,000
B (online booking)	1,200	960	2,400	33,60,000
A (Normal demand)	1,500 [2,400/1.6]	2,400	0	1,35,00,000
Total Contribution				**2,04,60,000**
Less: Factory Overheads				(1,42,60,000)
Profit				**62,00,000**

Note: It is assumed that online booking is part of the maximum annual demand.

Part 2: Computation of loss due to online order acceptance:

- If the company has not accepted online bookings then we would start with allocation as per statement of ranking.
- Loss = Profit as per revised statement of allocation – Profit as per WN 2

Profit as per revised statement of allocation:

Product	Units	Hours consumed	Balance hours	Contribution
A	2,000	3,200	800	1,80,00,000
B	1,000	800	0	28,00,000
Total Contribution				**2,08,00,000**
Less: Factory Overheads				(1,42,60,000)
Profit				**65,40,000**

- **Loss due to online order acceptance = 65,40,000 – 62,00,000 = Rs.3,40,000**

Part 3:

- The company should prioritize production of Product A as per statement of ranking. Therefore, it should first open online booking for Product A.
- Online booking for Product B can be opened once company gets orders for 2,000 units of Product A

Part 4:

Price customization: Pricing of a product is some **time customized keeping taste, preference and perceived value of a consumer into consideration**. Price customization is done in various ways:

- **Based on Product Line:** Pricing can be different for a phone having 16GB memory as compared to a phone having 32GB memory
- **Based on customer's past behavior:** Customer with good payment track record can be given more discounts as compared to others
- **Based on demographics:** Different pricing can be based on age and social status. Example: Railway concession can be given for senior citizens and military personnel
- **Based on time differential:** Pricing for a product or service is also done on the basis of time differential i.e. different price for different time period

Part 5:

- **Product A – Maturity stage:** Market price (or) just below market price (or) Going rate pricing
- **Product B – Introduction stage:** The company can either follow penetration or skimming pricing depending on characteristics of the product and market. The question indicates that the selling price cannot be increased for next two years and hence it is better to start with **skimming pricing strategy.**

Part IV – Supply Chain Management

14. Supply Chain Management [Category A]

Sun Electronics manufactures and sells various electronic goods like mobile phones, laptops, televisions, refrigerator etc. The company sells these goods through the 30 stores situated in different parts of the country. The store managers place a request to the centralised team situated in Mumbai on a monthly basis. One store can send only one requisition per month.

The requirements of the stores are forwarded to the production planning team which is responsible for scheduling the manufacturing of these products. Once the goods are manufactured, the goods are sent to a central warehouse in Mumbai and are dispatched to different stores according to the store requirements. The time taken from placing a request from store to the delivery of product to the store takes about 30-40 days on an average. In the process the company procures parts from more than 100 vendors. The company has faced quality related issues with many vendors leading to delay in production.

The average holding period of inventory in Sun Electronics is very high at 45 days as against an industry average of 15 days. Since the order to delivery time at a store is very high, the company has traditionally allowed high inventory holding to reduce the stock outs at store level. The company is under severe pressure to improve its working capital cycle.

A high amount of inventory held at each store also means that the products become obsolete quickly. In case of products like mobile phones, new and upgraded versions are available in the market as early as six months from the date of initial launch of a particular model. A significant portion of inventory of mobile phones becomes obsolete every year. The company generally resorts to a discounted sale to liquidate such obsolete models.

The management at Sun Electronics has identified e-commerce as an opportunity for faster growth, both in terms of revenues and profitability. The company is considering launch of its own e-commerce website to sell all products which are currently being sold in physical stores. Depending upon the success of online sales, the company might choose to optimize and close certain physical stores in the next couple of years.

The management of the company is cognizant of the fact that existing inventory procurement and management system will not fit in the new e-commerce business. E-commerce works on an inventory light model and quick as well as on time delivery of products of the customers. The fact that customers could be from a location other than those where Sun Electronics has physical presence makes the matter complex.

Required

The company is considering implementation of a supply chain management system. Will a supply chain management system be of use to Sun Electronics in light of the e-commerce venture? You are required to EXPLAIN the concept of Supply Chain Management and EVALUATE the applicability of in the current case.

Answer:

Issue

- Sun electronics manufactures and sells various electronic products through its physical stores. The **existing manufacturing system does not take into consider the demand of products in the market**. Store managers are allowed to submit only one order per month. A **high level of inventory can be seen at Sun Electronics as compared to the industry average**. The store managers tend to keep high level of inventories as a safeguard against stock-outs. Whereas, keeping inventory to meet customer requirement is good, high level of inventories due to inefficient processes is not advisable.
- The company also has a **longer working cycle because of a long order to deliver time and excess holding of inventory**. A significant amount of working capital is blocked due to this practice. Technology changes rapidly and the company is expected to roll out latest products in the market. A product like mobile gets outdated very soon and the company has to resort to discounted sales. This results in financial losses to the company.
- The company has identified an opportunity in e-commerce. **E-commerce businesses require leaner models and faster response time. The production must be based on the demand from the customer and not on an ad-hoc basis**. In the following paragraphs, the importance of supply chain management (SCM) and its applicability in the current case is discussed.

Supply Chain Management (SCM)

Supply Chain Management can be defined as the management of flow of products, services and information, which begins from the origin of products and ends at the product's consumption at consumer's end. SCM also involves movement and storage of raw material, work-in-progress and finished goods. In other words, supply chain management involves management of all activities associated with moving goods from the raw materials stage to the end user. An important objective of SCM is to correlate the production and distribution of goods and services with demand of the product.

The following are the various activities which an organisation carries out to meet the customer requirements (Primary activities under value chain model) -

- Inbound Logistics covering procurement and related activities.
- Operations covering conversion of raw materials into finished products
- Outbound Logistics covering movement of products from plants to end users
- Marketing and Sales
- Service

Supply Chain Management **looks each of the above activities as integrated and interrelated to each other.** None of the activities can be looked in silos. In the case of Sun Electronics, there is a restriction on number of orders which a store manager can place. This would lead to excess ordering because of the fear of stock-outs.

The **customer demand is completely ignored and hence the production is not in sync with the market demand**. This could lead to excess production, higher inventory holding and longer working capital cycles. The facts presented in the case indicate the following problems at Sun Electronics:

- Production planning is not based on customer demand & is done on an ad-hoc basis.
- Inventory Holding period is very high (45 days against an industry average of 15 days).
- The working capital cycle is longer.
- The time take to fulfil an order from the store is very high.
- The production is dispatched to a central warehouse for further deliveries to the stores. This could be an inefficient process.
- Liquidation of products at discount for products with low shelf life.

SCM Process and applicability to Sun Electronics: The SCM process is explained below:

- **Plan:** The first step in SCM process is to develop a plan to address the requirements of the customer. **Sun Electronics must shift its focus from ad hoc and predetermined production planning to understanding the requirements of customers**. Production must be planned based on the demand of products. The focus must be on producing what the customer wants.
- **Develop (procure):** In this step, the materials required for production is sourced from various suppliers. **A good relationship with supplier is required to ensure that the parts/materials are received as and when required by the production team.** It is also important that the vendors supply quality material which is not the case in Sun Electronics. The company must select suppliers which are dependable and can deliver quality products in the stipulated time. The company must focus in reducing the lead time required for sourcing materials which will reduce the inventory holding period.
- **Make:** The third step is making or manufacturing the products required by the customer. **This is quite different from the existing practice in Sun Electronics where store managers are allowed to place only one order.** This would mean that the company is not considering the ever-changing demands and tastes of the customers.
- **Deliver:** The fourth stage is to deliver the products manufactured for the customers. This stage is concerned with logistics. The time required to deliver to the store in case of Sun Electronics is very high. **The company must evaluate if the centralised warehouse is causing delay in delivery of products to the stores.**

Logistics is **one of the important components of the entire supply chain process.** Right from procurement of material, movement of raw material in the plants and final delivery of products of customers, logistics play a critical role. **An excellent system must be in place to ensure that the movement of materials and final product are uninterrupted.**

Warehousing also plays an important role in today's business environment. **The company has a centralised warehouse to meet the needs of all its stores. This would not be the most efficient way**. The company must evaluate creation of additional storage facility which would ensure timely delivery of goods to the stores. Newer products can reach the market faster.

Benefits of SCM to Sun Electronics

SCM looks at the entire value chain process as an integrated process. There is a seamless flow of information and products between suppliers and customers. The customer's requirements would be

captured to plan the production. The suppliers would be intimated to supply the materials according the production plan. An effective logistics system ensures that movement of materials is seamless. Sun Electronics can also consider implementing an integrated ERP which would also interact with vendors on real time basis.

The following benefits of SCM can be envisaged for Sun Electronics -

- Better Customer Service as customer is supplied with what he/she wants in the minimum time.
- Better delivery mechanism for goods.
- Improves productivity across various functions and departments.
- Minimises cost (both direct and indirect).
- Reduces the inventory holding time and improves the working capital cycle.
- Enhances inventory management and assists in implementation of JIT systems.
- Assists companies in minimising wastes and reduce costs.
- Improves supplier relationship.

E-Commerce and SCM

The SCM is the backbone of E-commerce industry. **Customers buying products online want deliveries to be faster. Another distinct feature of e-commerce is that buyers could be located in any corner of the country and not just restricted to the cities where Sun Limited has physical presence**. This definitely means that the company must have an effective Supply Chain Management in place which could meet the customer's requirement.

The existing practice of one order per month from each store would not work in the e-commerce space. **Orders can come at any time and from anywhere**. Supply Chain Management would be required for success of e-commerce business.

Customer Orders

The company **must have an effective mechanism to capture customer orders and feed it into the production planning on a real time basis**. An integrated ERP system would be required for this purpose. Any delay in intimating the production team would mean delay in production and delivery which would not be taken positively by the customers. The existing system of one order per month from a store would not fit the purpose. A real time flow of information would mean lower inventory holding.

Procurement

The **material requirements must be communicated to suppliers seamlessly. The company must identify those vendors who can deliver quality materials in the required time frame**. A delay in supplies would delay the production process. A company cannot afford this in e-commerce business. Automatic exchange of information using EDI (Electronic Data Interchange) or Integrated ERP systems would ensure that the vendors receive material requirements in a timely manner.

Production

As discussed earlier, the production must be in accordance with the customer order. This requires a shift in approach of the production team. **Business environments have shifted from "Customer will buy what we produce" to "We have to produce what the customers require".** The company would ideally not produce products to store them and sell later.

Logistics:

Logistics would be the backbone of entire e-commerce set up. Right from sourcing of materials to delivery of products at the customer's door step, logistics would play an important role. If the company has an in-house logistics facility, the logistics team must be trained with the requirement of the new business. If the company has outsourced the logistics, vendors must be briefed about the requirements of the e-commerce. The company might have to tie up with new logistic vendors to avoid any delay in deliveries.

15. Customer lifetime value analysis [Category A]

Cineworld is a movie theater is located in a town with many colleges and universities around it. The town has a substantial student population, most of whom are avid movie goers. Business for Cineworld has been slow in the recent years due to the advent of streaming websites, that show the latest and popular movies online. However, the management of Cineworld continue to feel students would still enjoy the watching

movies on big-screen, along with the facilities and ambience that only a movie theater can offer. Accordingly, they have framed a plan to attract students by offering discounts on movie tickets.

The average time a student spends at the college or university is 4 years, which is the average duration of any course. For a nominal one-time subscription fee, Cineworld plans to offer students discounts on movie tickets for a period of 4 years. By attracting more footfalls, Cineworld targets to cross sell its food & beverages and souvenirs. This would help it sustain a reasonable revenue each year.

Cineworld would attract attention to the plan by initially offering free tickets, food and beverage and gift vouchers. This one-time initial expense, net of the one-time subscription fee collected, would cost Rs.5,000 per student. On subscription to the plan, the viewership and purchases of each student is expected to be as follows:

Particulars	Year 1 and 2	Year 3 and 4
Spend on movie tickets per year	2,000	1,500
Spend on food and beverage per year	4,000	3,000
Spend on souvenirs and accessories per year	2,250	750

Assumptions

1. Only 50% of the subscribers are expected to visit the theatres in years 3 and 4.
2. Across all years, only 75% of the subscribers who visit the theatre are expected to buy food and beverage.
3. Only 25% of the subscribers who visit are expected to buy souvenirs in years 1 and 2, and 10% of them in years 3 and 4.

Given that PVIFA of Rs.1 for 4 years at 10% = 3.169 and PVIFA of Rs.1 for 2 years at 10% = 1.735.

Required

CALCULATE the customer lifetime value per subscriber for the above plan.

Answer:

Customer lifetime value per subscriber can be found by calculating the present value of the revenue that is generated over the period of 4 years. This netted out with the cost incurred to attract subscribers, would give the customer lifetime value per subscriber

Sr. No.	Particulars	Revenue (per year)	PVIFA	PV of Revenue	Probability of Usage	Net Revenue
1	Net cost of attracting students (onetime expense)					5,000
2	Net revenue from movie tickets					
	Years 1-2	2,000	1.735	3,470	100%	3,470
	Years 3-4 (Note 1)	1,500	1.434	2,151	50%	1,076
3	Sale of food and beverages					
	Years 1-2	4,000	1.735	6,940	75%	5,205
	Years 3-4 (Note 2)	3,000	1.434	4,302	37.5%	1,613
4	Sale of souvenirs and accessories					
	Years 1-2	2,250	1.735	3,904	25%	976
	Years 3-4 (Note 3)	750	1.434	1,076	5%	54
5	Total revenues (2+3+4)					12,394
6	**Net revenue subscription plan (5-1)**					**7,394**

- **Note 1:** PVIFA (10%, 4 years) = 3.169 and PVIFA (10%, 2 years) is 1.735. Therefore, PVIF for years 3 and 4 = PVIFA (10%, 4 years) - PVIFA (10%, 2 years) = 3.169 - 1.735 = 1.434.
- **Note 2:** Only 50% of the subscribers are expected to attend in years 3 and 4. Out of those only 75% are expected to buy food and beverage. Therefore, only 38% of the subscribers (75% of 50% subscribers who visit) are expected to buy souvenirs in years 3 and 4.
- **Note 3:** Only 50% of the subscribers are expected to attend in years 3 and 4. Out of those only 10% are expected to buy souvenirs. Therefore, only 5% of the subscribers (10% of 50% subscribers who visit) are expected to buy souvenirs in years 3 and 4

Present value of total revenue generated over the four-year period by a customer is Rs.12,393 while the corresponding expense is Rs.5,000. Therefore, the customer lifetime value per subscriber is Rs.7,393. Cineworld has to multiply this with the expected number of subscribers each year, to find out if this would be a profitable proposition.

Part V – Gain Sharing Arrangement and Outsourcing

16. Outsourcing of finance function [Category B]

TL Company is a large retail women's clothing chain with stores throughout Country K. The company currently has a number of regional offices, each with its own dedicated finance department responsible for the finance and administration functions covering all the stores in its region.

In response to poor sales in the current business climate and disappointing financial results, F, the CEO, has stated that there is a clear need for the company to pay greater attention to the operational cost effectiveness of the various functional departments. F is proposing that the finance function's focus should be on contributing to the strategic decisions of the company as a whole, rather than its current emphasis on finance operations and processing.

However, F doubts that the current structure of the function within TL Company is necessarily the best way forward. She is exploring the possibility of outsourcing some aspects of the finance function to a specialist third party provider.

Required:

Discuss the relative merits and problems for TL Company of outsourcing some aspects of the finance function

Answer:

Outsourcing, in this case, is essentially concerned with giving a third party/external supplier the responsibility to carry out the work of the finance function that would otherwise be an internal activity undertaken by TL Company. Whilst it is true that outsourcing some aspects of the finance function could prove to be a cheaper option than undertaking the function in house, this has to be weighed up against a number of potential drawbacks.

For TL Company there would be the potential for cost reduction by outsourcing some finance activities from the regional offices. This may be achieved through the economies of scale the outsourced company may enjoy by using standardised procedures and leading-edge technology. The services would be provided by the outsourced supplier at a pre-agreed cost meaning that budgetary control should be more accurate. The company may also benefit from the expertise that a specialist provider could bring, particularly if it possesses expertise and specialist knowledge of the retail sector. Outsourcing the administrative and processing activities should free up the time of finance staff to focus on value adding activities.

However, the loss of control that would be an inevitable consequence of outsourcing could prove problematical for TL Company. In particular, because sales patterns and demand may vary from region to region as well as from store to store, the information emanating from an external provider may not necessarily meet with the company's needs.

A further concern for TL Company could be that the outsourcing partner will have access to confidential information. This may be of concern since it is possible that it will be processing financial information for other retail companies which may be TL's direct competitors. There may also be delays in stores obtaining customised information which they may need to respond quickly to changes in demand, inventory levels, etc.

There is no doubt that local knowledge is a major advantage of the current position of the finance function. The accountants based in each of the company's regional offices will have an intimate knowledge and understanding of the needs of the stores within their region. In addition, strong relationships will have been built up between the accountants and the store managers. Nevertheless, F, as CEO, would need to look at how efficiently the finance function is operating for the company as a whole before making a final decision. In this respect she will need to consider how much duplication of effort there is across the company and the extent to which knowledge is being shared in order to ensure that best practice is being employed throughout the company.

In addition, F will need to consider potential control costs and risk, for instance unsatisfactory quality of information, and other aspects of control such as monitoring the outsourced supplier's compliance with the contract details. Also, pursuing penalty payments if service level agreements are not being met, and possible legal action and associated costs if the outsourced supplier does not perform/deliver.

An alternative way forward for TL Company to achieve a reduction in costs could be to consolidate the finance function to run as part of a shared service centre. This would enable TL Company to enjoy substantial cost benefits whilst retaining full control and so minimise some of the control risks associated with outsourcing, as outlined above. It would also release capacity which aligns with F's objective to allow the finance function to concentrate on its role as business partner, supporting the strategic decision making of the company.

17. Gain Sharing Arrangement [Category B - MAY 2020 RTP]:

Raya Health Care Limited is a leading healthcare service provider in Mumbai, it has approximately 450 potential beds, it provides diagnostic and day care speciality facilities also. In diagnostic centres they are using traditional devices for CT Scan and MRI which are not enough as per demand. Patients waited more than weeks for CT and MRI scans, this problem can cause delay in diagnosing illness; waste of time and other resources; not just in radiology but throughout the healthcare system.

Raya has planned to outsource CT scan and MRI services to Livlife, which has worldclass international chain of diagnostic centre. Livlife promise to provide radiologist report within 24 hours. However, finance manager of Raya doubt that it will not be a profitable arrangement. For the satisfaction of Raya, Livlife has entered an agreement to provide its services to Raya with no guarantee of receiving payment. Raya agrees to the following conditions:

- Cost savings generated in first year, the same will be retained by Livlife.
- Cost savings generated in second and third year will be shared between Raya and Livlife at a ratio of 30%:70%.
- Cost savings generated in the fourth year will be passed to Raya.
- Any cost savings generated by an idea proposed exclusively by Raya that does not require capital investment by Livlife will be immediately passed along to Raya.

Required DISCUSS the agreement between Raya and Livlife.

Answer:

The agreement between Raya and Livlife is Gain Sharing Arrangement. **Gain sharing (also known as cost saving sharing) arrangement is an approach to the review and adjustment of an existing contract, or series of contracts, where the adjustment provides benefits to both parties**. A fundamental form of gain-sharing is where a supplier agrees to perform its side of the contract with no guarantee of receiving a payment. Instead, any payment received is based upon the benefits that emerge to the customer as a result of the successful completion of the supplier's side of the bargain.

Livlife and Raya has also entered into such arrangement. **This is clearly a risky stance for the supplier i.e. Livlife, because it could spend a fortune and walk away with nothing. Alternatively, if the benefits to Raya are substantial, Livlife could find itself rewarded with a large return**. Cost savings might be attained from reducing the cost of supplies, implementing new skill and technologies, revised delivery time, improvements in operations etc.

The gain, benefit, or advantage to be shared is not necessarily financial, although financial benefits are expected to occur frequently. The Raya, for instance, will not necessarily take cost savings in the form of a lower contract value but might require a higher specification for medical treatment. However, to assess any financial benefit, both parties have to provide each other with access to relevant cost numbers to determine the basis for the assessment of the benefit and the calculation and sharing of the benefit.

Many contracts involving these arrangements have emphasis on greater openness and shared development and improvement. In the given case gain-sharing deals are, on the face of it, a win-win situation for both Raya and Livlife, interest of both are aligned. Livlife is trying to save costs of Raya while Raya is trying to get world class services.

Chapter 3 – Lean System and Innovation

Lean System:

- Lean system is an **organized method for waste minimization** without sacrificing productivity within a manufacturing system
- Waste is any step or action in a process that is not required to complete a process successfully **(called Non-value adding)**
- Following are the seven types of wastes:
  - **Over-production**
  - **Inventory – Having more inventory than what is required**
  - **Waiting – Waiting includes products waiting on the next production step**
  - **Motion – Movement of people or equipment more than what is required**
  - **Transportation – Moving products that is not actually required to perform process**
  - **Rework from defects**
  - **Over-processing**
- Many large companies are **employing lean manufacturing.** Lean manufacturing involves a shift in traditional thinking, from batch and queue to product-aligned pull production. Following are some of the techniques of lean manufacturing:
  - **Just-in-Time**
  - **Kaizen Costing**
  - **5 S**
  - **Total Productive Maintenance (TPM)**
  - **Cellular Manufacturing/one-piece Flow Production Systems**
  - **Six Sigma (SS)**

Principles and characteristics of Lean Manufacturing:

Principles	Characteristics
• Perfect first-time quality • Waste Minimization • Continuous improvement • Flexibility	• Zero waiting time • Zero inventory • Pull processing • Continuous flow of production • Continuous finding ways of reducing processing time

Just-In-Time (JIT):

- **"Just-in-time (JIT):** System whose objective is to produce or to procure products or components as they **are required by a customer** or for use, rather than for stock. It is a Pull system, which responds to demand, in contrast to a push system, in which stocks act as buffers between the different elements of the system such as purchasing, production and sales".
- **"Just-in-time production:** Production system which is driven **by demand for finished products**, whereby each component on a production line is produced only when needed for the next stage".
- **"Just-in-time purchasing:** Purchasing system in which **material purchases are contracted so that the receipt and usage of material, to the maximum extent possible, coincide**"
- Following are some of the steps in JIT system:

Spare Parts/ Materials from suppliers on **the exact date and at the exact time** when they are needed	**Straight delivery** to the production floor for immediate use in manufactured products	**Visit of engineering staff at supplier sites** to examine supplier's premises
Installation of EDI system that tells suppliers exactly how much of which parts are to be sent	Dropping off **products at the specified machines**	**Shorten the setup times**
Eliminating the need for long production runs/ Streamlined	**Training to employees** how to operate a multitude of different	Several alterations in the **supporting accounting**

flow of parts from machine to machine	machines, perform limited maintenance	**systems**

Features of JIT System:

- Organize production in manufacturing cells, a grouping of all different types of equipment used to make a given product. Materials move from one machine to another where various operations are performed in sequence. **Material-handling cost is reduced.**
- Hire and retain workers who are multi-skilled so that they are capable of performing a variety of operations, including repairs and maintenance tasks. **Thus, labour idle time gets reduced.**
- Apply TQM to eliminate defects. As, there are tight link stages in the production line, and minimum inventories at each stage, defect arising in one stage can hamper the other stages. **JIT creates urgency for eliminating defects as quickly as possible.**
- Place emphasis on reducing set-up time which makes production in smaller batches economical and reducing inventory levels. **Thus, company can respond to customer demand faster.**
- Carefully selected suppliers capable of delivering high quality materials in a timely manner directly at the shop – floor, **reducing the material receipt time.**

Pre-requisites of JIT System:

- Low variety of goods
- Vendor reliability
- Good communication
- Demand stability
- TQM
- Defect free materials
- Preventive maintenance

Impact of JIT System:

- **Waste costs:** Characteristic of the JIT system is its continuous focus on eliminating all waste from a system. **It can reduce waste of material, time, unused assets, obsolete inventory, defective products, rework among others**
- **Overhead costs:** Cost of material handling, facilities, quality inspection are significantly reduced in JIT System. **Furthermore, there is a reduction of space requirement for maintaining inventory and hence all costs related to warehouse is also significantly reduced**
- **Product prices:** When a company achieves a **higher level of product quality, along with its ability to deliver products on the dates required, customers may be willing to pay a premium**. Hence JIT can present an opportunity to increase prices. However, if customers do not pay major importance to timely delivery and quality, then there will be no scope for price increase.

Performance Measurements in JIT System versus Traditional System:

Measure	Traditional system	JIT System
Machine utilization	Machine utilization refers to the rate at which every asset is utilized. **In the traditional system, companies will focus on ensuring maximum capacity utilization.** However, this will lead to higher production and consequently higher inventory	JIT focuses on producing only what is needed. **Hence machine utilization measurement is discarded in JIT System**
Piece rate	**Companies pay a higher piece rate when the efficiency exceeds 100%.** Employees would be motivated to produce more as their earnings is proportionate to units produced	**Concept of Piece rate system is scrapped in JIT System.** JIT focuses on producing what is needed and hence employee performance is measured with factors such as number of suggestions for improving system/quality
Labour efficiency	Traditional system **pays utmost importance on measuring labour efficiency** to ensure maximum production	**JIT system does not focus on how fast an employee works**. It focuses on the quality of the products manufactured. Furthermore, labour efficiency calculation would need

		time-keeping and time-booking techniques which are considered as non-value-added activity

Performance measures of JIT System:

Inventory turnover	✓ Companies installing JIT system should **experience extraordinarily high inventory turnover**
Setup time reduction	✓ **Shortest possible setup times** are crucial for the success of short production runs and so this is a major JIT measurement
Customer complaints	✓ JIT is based on premise that **product quality is superb**. Hence any customer suggestion of a product issue should be greeted with gravest concern and investigated immediately
Scrap	✓ Little waste should be generated by JIT system, which means that **material scrap should be driven down to exceedingly low levels**
Cost of quality	✓ Focus of JIT is **to produce high-quality products** and hence the managers would like to track the full cost of quality. The company should take-up measures to reduce quality cost
Customer service	✓ This has various sub-measures such as **delivering products on the dates prescribed by customer, shipping full orders, not having returns due to poor quality**
Ideas generated	✓ **JIT system works well when employees pitch in with hundreds of suggestions for improvement.** It can be measured as ideas per worker, total number of ideas generated, number of ideas implemented of the proportion of ideas suggested that are implemented

Back-flushing in a JIT System:

- Backflushing requires **no data entry of any kind until a finished product is completed**. At that time the total amount finished is entered into the computer system, which multiplies it by all the components listed in the bill of materials for each item produced.
- This yields a **lengthy list of components that should have been used in the production process and which are subtracted from the beginning inventory balance** to arrive at the amount of inventory that should now be left on hand.
- Given the **large transaction volumes associated with JIT, this is an ideal solution to the problem.**
- Companies should consider the following before implementing a back-flushing system:
  - **Production reporting** – Employees must be trained to report accurate production. In case the reporting is incorrect, it will lead to wrong component types and quantities being deducted from stock
  - **Scrap reporting** – All abnormal scrap must be diligently tracked and recorded; otherwise these materials will fall outside the back-flushing system and will not be charged to inventory
  - **Lot tracing** – Lot tracing is impossible under back-flushing system. It is required when a manufacturer need to keep records of which production lots were used to create a product in case all the items in a lot must be recalled
  - **Inventory accuracy** – Inventory balance may be very high at all times because the transactions are recorded only once in a day, during which time other inventory is sent to production premises. Hence it is not possible to maintain accurate inventory

Kaizen Costing:

- Lean manufacturing is founded on the idea of kaizen**, or continual improvement**. Continuous improvement is the continual **examination and improvement of existing processes** and is very different from approaches such as business process re-engineering (BPR), which seeks to make radical one-off changes to improve an organization's operations and processes.
- This philosophy **implies that small, incremental changes routinely applied and sustained over a long period result in significant improvements**.
- Some of the activities in the kaizen costing methodology include the elimination of waste in the production, assembly, and distribution processes, as well as the elimination of work steps in any of these areas.

- Though these points are also covered in the value engineering phase of target costing, the initial value engineering may not uncover all possible cost savings. **Thus, kaizen costing is really designed to repeat many of the value engineering steps for as long as a product is produced, constantly refining the process and thereby stripping out extra costs.**
- The cost reductions resulting from kaizen costing are much smaller than those achieved with value engineering but are still worth the effort since competitive pressures are likely to force down the price of a product over time, and any **possible cost savings allow a company to still attain its targeted profit margins while continuing to reduce cost.**

Kaizen Costing Principles

- The **system seeks gradual improvements** in the existing situation, at an acceptable cost.
- It **encourages collective decision making** and application of knowledge.
- There are no **limits to the level of improvements** that can be implemented.
- Kaizen involves setting standards and then continually improving these standards to achieve long-term sustainable improvements.
- **The focus is on eliminating waste, improving systems, and improving productivity.**
- Involves all employees and all areas of the business.

5S:

- 5S is the name of a workplace organization method that uses a list of five Japanese words: **seiri, seiton, seiso, seiketsu, and shitsuke**. They can be translated from the Japanese as **"sort", "set in order", "shine", "standardize", and "sustain"**
- It explains how a work space should be organized for **efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order.**

Sort (Seiri)

- Make **work easier by eliminating obstacles** and evaluate necessary items with regard to cost or other factors.
- Reduce chances of being disturbed with unnecessary items.
- Prevent accumulation of unnecessary items.

Set in Order (Seiton)

- **Arrange all necessary items into their most efficient and accessible arrangements so that they can be easily selected for use and make workflow smooth and easy**.
- Ensure first-in-first-out FIFO basis, so that it is easy to find and pick up necessary items.
- Place components according to their uses, with the frequently used components being neared to the work.

Shine (Seiso)

- **Clean your workplace on daily basis completely** or set cleaning frequency.
- Keep workplace safe, easy to work, clean and pleasing to work in.
- In an unfamiliar environment, people must be able to detect any problems within 50 feet.

Standardize (Seiketsu)

- **Standardize the best practices** in the work area.
- Maintain high standards, orderliness, everything in order and according to its standard.
- Every process has a standard.

Sustain (Shitsuke)

- **Not harmful to anyone, training and discipline, to maintain proper order**.
- Also translates as "do without being told".
- Training is goal-oriented process. Its resulting feedback is necessary monthly.

Total Productive Maintenance (TPM):

- Total Productive Maintenance (TPM) is a system **of maintaining and improving the integrity of production and quality systems.**

- TPM helps in keeping all equipment in **top working condition so as to avoid breakdowns and delays in manufacturing processes.**

Four stages of TPM:

- **Preparation Stage:** Establish a suitable environment and conducting programme awareness.
- **Introduction Stage:** Initialization of TPM, information to suppliers, customers, and other stakeholders.
- **Implementation Stage:** This is done with the help of eight activities referred as eight pillars of TPM.
- **Institutionalizing stage:** This is the stage of getting TPM awards.

Foundation and 8 Pillars of TPM (TPM Goals – Zero defect, zero breakdown and zero accident)

Foundation & Pillars	About	Techniques
Foundation: 5S	TPMS stats with 5S. It deals with organizing a **workplace which helps to recognize the uncover problems**	Seiri (Sort), Seiton (Set in order), Seiso (Shine), Seiketsu (standardize), Shitsuke (sustain)
P-1: Autonomous Maintenance	**Operation of equipment without any breakdown and eliminating defects** through active employee participation	Cleaning, Lubricating, Visual Inspection, Tightening of Loosened Bolts
P-2: Focussed improvement (Kaizen)	**Minor improvement** made on continuous basis	Kaizen register, Kaizen summary sheet, Why-why analysis, summary of losses
P-3: Planned Maintenance	Proper maintenance system adopted for **improvement in reliability and maintainability of equipment**	Preventive maintenance, breakdown maintenance, corrective maintenance
P-4: Early management	**Shortening the time required** for product and equipment development	Engineering and re-engineering process
P-5: Quality maintenance	Customer satisfaction through **delivery of highest quality product**	Root cause analysis, customer data analysis
P-6: Education & Training	**Improve knowledge/skills** and enhance morale of employees	Training calendar, Policies for education and training, On-site training
P-7: Office TPM	Application of TPM techniques in administration to **improve productivity and efficiency in functions**	Increased office automation
P-8: Safety, Health and Environment	**Safety of the worker is of utmost importance.** It aims to have zero accidents and zero health damages	Drama, safety slogans, Quizzes, Posters making to create awareness related to safety

Performance measures in TPM:

- Most important approach to the measurement of TPM is **Overall Equipment Effectiveness (OEE)**. Calculation of OEE takes into account the following six losses:
  - Equipment failure/breakdown
  - Set-up/adjustments
  - Idling and minor stoppages
  - Reduce speed
  - Reduce yield and
  - Quality defects and rework
- First two losses are time related, next two losses are related to performance and the last two losses are related to quality
- **OEE = Performance * Availability * Quality**
- **OEE cannot be at 100% and the ideal values for various parameters are: Performance (>95%), Availability (>90%), Quality (>99%)**

Connection between TQM and TPM:

- TQM and TPM **make company more competitive** by reducing costs, improving customer satisfactions and slashing lead times
- **Involvement of workers** in all phases of TQM and TPM is necessary
- Both processes **need fundamental training and education** of participants
- TPM and TQM take **long time to notice sustained tangible benefits**
- **Commitment from top management are necessary** for the success of the implementation

Cellular Manufacturing/one-piece flow production system:

- Cellular manufacturing is a system **where multiple cells are used**. Each cell comprises of one or more machines which accomplish a certain task. **The product moves from one cell to the next with each cell completing part of the manufacturing process**. U-shaped design is given to these cells because this allows the supervisor to move less and have the ability to watch over the entire process
- Goals of cellular manufacturing are to **move as quickly as possible, make a wide variety of similar products and making as little waste as possible**
- A cell is created by consolidating the processes used to create a specific output, such as part or set of instruction. Reduction in steps is done wherever possible. **Flexibility in operations, quick identification of problems, improved communication of employees is some of the benefits of cellular manufacturing**
- It also gives massive gains on implementation in productivity and quality while reducing inventory, lead time, space and hence this is also known as "**the ultimate in lean production"**

Implementation of Cellular Manufacturing:

- First, the parts **to be made must be grouped by similarity** (in design or manufacturing requirements) into families.
- Then a **systematic analysis of each family must be performed**; typically, in the form of production flow analysis (PFA) for manufacturing families, or in the examination of design/product data for design families. There are also a number of mathematical models and algorithms to aid in planning a cellular manufacturing center.
- Once these variables are determined with a given level of uncertainty, optimizations **can be performed to minimize factors such as, "total cost of holding, inter-cell material handling, external transportation, fixed cost for producing each part in each plant, machine and labor salaries**."

Difficulties in creating flow:

- Exceptional elements
- Machine distances
- Bottleneck machine and parts
- Machine location and relocation
- Part routing
- Cell load variation
- Inter and intracellular material transferring
- Cell reconfiguring
- Dynamic part demands and
- Operation and completion times

Benefits and costs of cellular Manufacturing:

- **Scattered processes are merged to form short focused paths in concentrated places**. So constructed, by logic a cell reduces flow time, flow distance, floor space, inventory, handling, scheduling transactions, and scrap and rework (the latter because of quick discovery of nonconformities).
- **Production and quality controls are facilitated**. Cells that are underperforming in either volume or quality can be easily isolated and targeted for improvement.
- There are also a number of benefits for employees working in cellular manufacturing. **The small cell structure improves group cohesiveness and scales the manufacturing process down to a more manageable level for the workers**.
- Workers can **more easily see problems or possible improvements** within their own cells and tend to be more self-motivated to propose changes.

- There are a number of possible limitations to implementing cellular manufacturing. Some argue that cellular manufacturing can lead to a **decrease in production flexibility**. Cells are typically designed to maintain a specific flow volume of parts being produced. **Should the demand or necessary quantity decrease, the cells may have to be realigned to match the new requirements**, which is a costly operation, and one not typically required in other manufacturing setups.

Six Sigma:

- Six Sigma is quality **improvement technique** whose objective 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"**
- Primary focus of Six Sigma is:
  - Customer satisfaction
  - Decision based on data driven facts
  - Management, improvement and processes
  - Proactive management team
  - Collaboration with in the business
  - Goal for perfection
- **Sigma is a statistical team that measures how far a process deviates from the perfection. The higher the sigma number, closer the process is to perfection**
- Six Sigma is 3.4 defects per million or getting things right 99.99966% of the time. The same is explained in the below table:

Sigma Level	Defects per million opportunities (DPMO)	Defective percentage (%)	Percentage yield (%)	Quality/profitability
One	6,91,462	69%	31%	Loss
Two	3,08,538	31%	69%	Non-competitive
Three	66,807	6.7	93.3	Average industries
Four	6,210	0.62	99.38	Above average
Five	233	0.023	99.977	Below maximum productivity
Six	3.4	0.0034	99.99966	Near perfection

Implementation of Six Sigma:

DMAIC Implementation:

- This method is very robust. It is used **to improve existing business process.** This method has five phases
- DMAIC is possible under the following circumstances:
  - Product or process exists
  - **Project is part of on-going continuous improvement process**
  - Only single process needs to be altered
  - Competitor's actions are **stable**
  - Technology is stable
  - Customer's behaviour is **unchanging**
- Five phases of DMAIC is explained below:

Define	•Define the problem, the project goals and customer requirements
Measure	•Measure the process to determine the current performance
Analyze	•Analyze the process to determine the root causes of variation and poor performance (defects)
Improve	•Improve the process by addressing and eliminating the root causes
Control	•Control means maintaining the improved process and future process performance

DMADV Implementation:

- DMADV is aimed at creating a **high-quality product keeping in mind customer requirements at every stage of the product**. This is used to develop new product or processes.
- DMADV is used when a **customer or process is not in existence, project have strategic importance, multiple process needs to be altered, competitor's performance/customer's behaviour is changing**

Define	• Define the project goals and customer deliverables
Measure	• Measure and determine customer needs and specifications
Analyze	• Analyze the process options to meet customer needs
Design	• Design the detailed process to meet customer needs
Verify	• Verify the design performance and ability to meet customer needs

Similarities between DMADV and DMAIC:

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

Difference between DMAIC and DMADV:

DMAIC	DMADV
Review the existing process and fix problems	**Emphasis on the design of the product** and process
More reactive process	**Proactive process**
Increase the capability	**Increase the capacity**

Benefits can be quantified easily	Benefits are more difficult to quantify and tend to be much more long term
Examples of DMAIC: ❖ Reduce the cycle time to process a patent ❖ Reduce the number of errors in sales list ❖ Improve search time for critical information	**Examples of DMADV:** ❖ Add a new service ❖ Create a real-time system ❖ Create a multi-source lead tracking system

Quality-management tools under six sigmas:

- **Control chart** – Monitors variance in process and alerts the business to unexpected variance
- **Histogram** – Helps in prioritizing factors and identify areas which needs utmost attention
- **Pareto diagram** – Revolves around the concept of 80:20 rule
- **Process mapping** – Work-flow diagram which reduce cycle time and defects
- **Root cause analysis** – Root cause is a non-conformance and should be permanently eliminated
- **Statistical process control** – Helps in analysing data, study and monitor process capability and performance
- **Tree Diagram** – Shows key goals, their sub-goals and key tasks
- **Cause and effect diagrams** – Help in identifying the cause for various problems

Limitations of six sigma:

- Focuses on **only quality**
- Does not work well **with intangible results**
- **Substantial infrastructure investment** is required
- Complicated for some tasks
- Not all products need to meet six sigma standards
- Focuses on **specific types of process only**

Lean six sigmas:

- Lean Six Sigma is the **combination of Lean and Six Sigma** which help to achieve greater results that had not been achieved if Lean or Six Sigma would have been used individually.
- It increases the **speed and effectiveness** of any process within any organization.
- By using lean Six Sigma, organisations will be able to Maximize **Profits, Build Better Teams, Minimize Costs, and Satisfy Customers.**

Process Innovation (PI):

- Process Innovation means the implementation **of a new or significantly improved production or delivery method**
- Changes, improvements, increase on product or service capability done by addition in manufacturing or logical system, simple capital replacement or extension, customization, regular **seasonal and other cyclical changes are not considered innovations.**
- Process of innovation could fall into one of these areas:
  - **Production:** Related to processes, equipment and technology to enhance manufacturing or production processes
  - **Delivery:** Delivery process innovations involve tools, techniques and software solutions to help in supply chain and delivery systems
  - **Support services:** Innovations can also be done in support services such as purchasing, maintenance and accounting

Business Process Reengineering (BPR):

- **BPR is defined as 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**
- Four components of BPR are:

Fundamental rethinking	✓ We need to **challenge the very basic assumptions** under which business operate

	✓ We ask question such as why do we do what we do?
Radical redesign	✓ BPR relies on a **fresh-start, clean-slate approach to examining of an organization's basic processes** ✓ The goal is to reinvent what is done and how it is done rather than to tinker with the present system by making marginal, incremental improvements
Dramatic improvements	✓ Fundamental rethinking and radical redesign are aimed towards **making quantum leaps in performance** ✓ BPR is not about improvement in quality, speed of around 10% because improvement of this magnitude can be done by marginal, incremental changes to existing processes ✓ **On the other hand, BPR would focus on major improvement**
End to end business processes	✓ **BPR focuses on end-to-end business processes and not the individual activities that comprise the processes** ✓ Many organizations segment a process into individual activities and allot an activity to specialists. However, while doing this, managers lose focus of the entire processes and focus on improving individual activities. BPR focuses on improving the entire process by re-engineering end to end business process

Principles of successful BPR:

- **Organize around outcomes and not tasks:** Single person should perform all steps in a process; design the job around an objective or outcome rather than a single task
- **Have those who need the results of a process perform the process:** Reengineering can provide customers with more timely service and reduce the overhead needed to coordinate the activities of these units by having customers provide their own service
- **Integrate the processing of information into the work process that produces the information:** The department which receives the information should process the same and integrate into the work-flow. However, this will lead to relaxation of segregation of duties and management should evaluate the risks arising out of the same
- **Treat geographically dispersed resources as though they were centralized:** Decentralized resources typically provide better service to their customers at the expense of creating redundant operations and lost economies of scale. However, companies should operate as a centralized unit while dealing with other parties to get the benefits of economies of scale
- **Link parallel activities instead of integrating their results:** If parallel activities have been created, use communication networks, shared databases and teleconferencing to coordinate activities that must eventually come together
- **Put the decision point where work is performed and build controls into the process:** Organizations often distinguish those who do the work from those who monitor and make decisions about the work. However, organizations can reduce non-value-added management and flatten the organization structure if the organizations use information technology to capture and store data, and expert system to supply knowledge, to enable people to make their own decisions
- **Capture information once and at the source:** Collected and store data in online data-bases for all who need them. This principle is facilitated by information technology

Main stages of BPR:

- **Process identification** – Each task performed being re-engineered is broken down into a series of processes
- **Process rationalization** – Processes which are non-value adding, to be discarded
- **Process redesign** – Remaining processes are redesigned
- **Process reassembly** – Re-engineered processes are implemented in the most efficient manner

Overview of practical problems/ case studies/ important questions:

- Part I – Just in Time
- Part II – Kaizen Costing
- Part III – 5S
- Part IV - TPM
- Part V – Six Sigma
- Part VI – BPR Versus PI

Part I – Just in Time

1. Decision on Just-in-time inventory policy [Category A – May 2014 RTP]

United Video International Company (UVIC) sells package of blank video tapes to its customer. It purchases video tapes from Indian Tape Company (ITC) @ Rs. 140 a package. ITC pays all freight to UVIC. No incoming inspection is necessary because ITC has a superb reputation for delivery of quality merchandise. Annual demand of UVIC is 13,000 packages. UVIC requires 15% annual return on investment. The purchase order lead time is two weeks. The purchase order is passed through Internet and it costs Rs. 2 per order. The relevant insurance, material handling etc Rs. 3.10 per package per year. UVIC has to decide whether or not to shift to JIT purchasing. ITC agrees to deliver 100 packages of video tapes 130 times per year (5 times every two weeks) instead of existing delivery system of 1,000 packages 13 times a year with additional amount of Rs. 0.02 per package. UVIC incurs no stock out under its current purchasing policy. It is estimated UVIC incurs stock out cost on 50 video tape packages under a JIT purchasing policy. In the event of a stock out, UVIC has to rush order tape packages which costs Rs. 4 per package. Comment whether UVIC should implement JIT purchasing system.

Hindustan Tape Company (HTC) also supplies video tapes. It agrees to supply @ Rs. 136 per package under JIT delivery system. If video tape purchased from HTC, relevant carrying cost would be Rs. 3 per package against Rs. 3.10 in case of purchasing from ITC. However, HTC. doesn't enjoy so sterling a reputation for quality. UVIC anticipates following negative aspects of purchasing tapes from HTC.

- To incur additional inspection cost of 5 paisa per package.
- Average stock out of 360 tapes packages per year would occur, largely resulting from late deliveries. HTC cannot rush order at short notice. UVIC anticipates lost contribution margin per package of Rs. 8 from stock out.
- Customer would likely return 2% of all packages due to poor quality of the tape and to handle this return an additional cost of Rs. 25 per package.

Required

Comment whether UVIC places order to HTC.

Answer:

WN 1: Comparative cost statement for multiple alternatives

Particulars	Current policy ITC with no JIT	Revised Policy ITC with JIT	New Supplier HTC with JIT
Material cost	18,20,000 (13,000 packages x 140)	18,20,260 (13,000 packages x 140.02)	17,68,000 (13,000 packages x 136)
Ordering cost	26 (2 x 13 orders)	260 (2 x 130 orders)	260 (2 x 130 orders)
Opportunity /Carrying cost (Note 1)	10,500 (1/2 x 1,000 packages x 140 x 15%)	1,050 (1/2 x 100 packages x 140.02 x 15%)	1,020 (1/2 x 100 packages x 136 x 15%)
Other carrying cost (Note 1)	1,550 (1/2 x 1,000 packages x 3.10)	155 (1/2 x 100 packages x 3.10)	150 (1/2 x 100 packages x 3.00)
Stock-out cost	-	200 (50 packages x 4)	2,880 (360 packages x 8)
Inspection cost	-	-	650 (13,000 x 0.05)
Customer return cost	-	-	6,500 (13,000 x 2% 25.00)
Total cost	**18,32,076**	**18,21,925**	**17,79,460**

Note:

1. Carrying cost is computed on average inventory and the same is taken as quantity per order/2. This is as per the EOQ technique wherein average inventory is taken as half of quantity per order

Conclusion:

- **Implementation of JIT System:** The company should implement JIT system as the relevant cost under JIT system is Rs.18,21,925 versus current relevant cost of Rs.18,32,076

- **Placing of orders with HTC:** The company should place orders with HTC as the relevant cost is lowest when orders are placed with HTC

2. Just-in-time (May 2020 RTP):

Pearson Metal and Motor Works (PM2W) deals in manufacturing of the copper wired electronic motor, which is specifically designed. PM2W is thinking to shift from traditional system to JIT system as part of process innovation.

CEO among the other top bosses at PM2W are hopeful that implementation of JIT will not only improve value in value chain for end consumer, but also improve overall manufacturing cycle efficiency. JIT pre-implementation team was formed to evaluate the probabilities, which collects following actual and estimated data about process;

Activity Category	Traditional Systems (Actual)	JIT System (Estimated)
Inspection	40	30
Storage	80	20
Moving	20	10
Processing	60	40

All data in minutes

Further, PM2W decided to practice single piece flow under JIT. PM2W received an order which is due to manufacture and delivered for 10 such motors. Total available production time to produce what customer demands is 480 minutes out of which it normal practice that 30 minutes will be spent in shutdown and cleaning. CEO is also considering JIT purchase apart from JIT production.

Required

(i) EXPLAIN just in time.

(ii) CALCULATE the 'takt time' and INTERPRET the results.

(iii) ADVISE whether company should shift to JIT.

Answer:

(i) Just in Time:

- Just-in-time (JIT) is a collection of ideas **that streamline a company's production process activities to such an extent that wastage of all kind viz., of time, material and labour systematically driven out** of the process with single piece flow after considering takt time.
- In JIT, production facility is required to be integrated with vendor system for signal (Kanban) based automatic supply which depends upon demand based consumption. **Under JIT system of inventory storage cost is at lowest level due to direct issue of material to production department as and when required** and resultantly less/no material lying over in store or production floor.
- **Prerequisite of JIT system is integration with vendor**, if vendor is not integrated properly or less reliable, then situation of stock out can arise and which can result into loss of contribution.
- **Multitasking by employee** is another key feature of JIT, group of employees should be made based upon product instead based upon function. Hence, functional allocations of cost become less appropriate.
- Overall, JIT enhance the quality into the product by eliminating the waste and continuous improvement of productivity.

(ii) Takt Time:

- **Takt Time is the maximum available time to meet the demands of the customer**; this will help to decide the speed of/ at manufacturing facility.
- **Takt time is the average time between the start of production of one unit and the start of production of the next unit, when these production starts are set to match the rate of customer demand.**

$$\textbf{Takt Time} = \frac{\textbf{Available Production Time}}{\textbf{Total Quantity Required}}$$

Here,

Available Production Time is 'total available time for production' – 'planned downtime i.e. spent in shutdown and cleaning' i.e. 450 minutes = 480 minutes – 30 minutes.

$$\textbf{Takt Time} = \frac{\textbf{450 minutes}}{\textbf{10 units}} = \textbf{45 Minutes}$$

Note - Heijunka can be applied in order to reduce variation between 'Takt times' over the production.

Interpretation

- Customer's demand is 10 units, to calculate the takt time, divide the available production time (in minutes) by the total quantity required. The takt time would be 45 minutes.
- This means that process must be set up to produce one unit for every 45 minutes throughout the time available. **As order volume increases or decreases, takt time may be adjusted so that production and demand are synchronized.**

(iii) Advise on Shifting to JIT

- To evaluate how much of the old cycle time was spent in inventory, we need to know how **organizations assess the efficiency of their manufacturing processes**. One commonly used measure is **process cycle efficiency** and to calculate the same every process is breakdown into combination of activities such as value-added activities, non-value added activities and non-value added activities but strategic activities. **In order to generate highest value to customer, only value added activities are included in process**. But those non-value added activities, which are strategic in nature, also need to be part of process. Therefore, it may be possible that entire process is not efficient.
- To measure efficiency of process, managers keep track of the relation between 'times taken by value added activities' in comparison 'total cycle time'. Such relation/ratio is processing cycle efficiency.

$$\textbf{Process Cycle Efficiency} = \frac{\textbf{Value Added Time}}{\textbf{Cycle Time}}$$

- **Processing time is considered as value added time**; whereas time spend on inspection, storage and moving is non-value-added time and included in cycle time. The higher the percentage, less the time (and costs) needs to be spent on non- value-added activities such as moving and storing etc.

Computation of Processing Cycle Efficiency:

Sr.No.	Activity Category	Traditional System (Actual)	JIT System (Estimated)
A	Inspection	40	30
B	Storage	80	20
C	Moving	20	10
D	Processing	60	40
E	**Value added time (D)**	**60**	**40**
F	**Cycle Time (A) + (B) + (C) + (D)**	**200**	**100**
G	**Process Cycle Efficiency (E)/(F) x 100**	**30%**	**40%**

- Of the 200 minutes required for manufacturing cycle under PM2W's traditional system, only 60 minutes were spent on actual processing. The other 140 minutes were spent on non- value-added activities, such as inspection, storage, and moving.
- **The process cycle efficiency formula shows that processing time equaled to 30% of total cycle time. The cycle time is reduced substantially in the JIT system from 200 minutes to 100 minutes. In addition to this, the amount of time that used up in inventory i.e. non-value-added activities is also reduced. Therefore, process cycle efficiency has been increased from 30% to 40%.**
- This significant improvement in efficiency over the previous system comes from the implementation of JIT system. Therefore, it is advantageous to shift to JIT system.

3. Just in Time and Target Costing (Nov 2019 Exam):

Pixel Limited is a toy manufacturing company. It sells toys through its own retail outlets. It purchases materials needed to manufacture toys from a number of different suppliers. Recently, due to the entity of few reputed foreign brands in the toy market and particularly in the segment in which Pixel Ltd. is doing business, it is facing a threat to operate profitably.

Each toy requires 4 kg. of materials at Rs. 19 per kg. and 5% of all materials supplied by the suppliers are found to be substandard. Labour hour requirement for each toy is 0.4 hour at Rs. 120 per hour.

Market research has determined that the selling price will be Rs. 240 per toy. The company requires a profit margin of 15% of the selling price. Expected demand for toy in the coming year will be 50,000 toys. Sales and variable overhead per unit for the four quarters of the year will be as follows:

Particulars	Q1	Q2	Q3 (Festive Season)	Q4 (Festive Season)
Sales (units)	7,500	9,000	15,500	18,000
Variable overheads per unit	22	22	24	25

Total fixed overheads are expected to be Rs. 6,25,000 for each quarter.

The production manager has decided to produce 12,500 units in each quarter. Inventory holding costs will be Rs. 18 per unit of average inventory per quarter. Inventory holding costs are not included in above. Normal production capacity per quarter is 15,000 toys. The company can produce further up to 6,000 units per quarter by resorting to overtime working. Overtime wages will be at 150% of normal wage rate. Assume zero opening inventory

Required

- CALCULATE the cost gap that exists between the total cost per toy as per the production plan and the target cost per toy.
- DISCUSS how just-in-time purchasing and just-in-time production will remove the cost gap calculated in (i) above. Show calculations in support of your answer.
- EXPLAIN, how implementation of JIT production method can be a major source of competitive advantage and success of the company

Answer:

WN 1: Computation of cost gap that exists between total cost per toy as per the production plan and target cost per toy:

Note 1: Computation of target cost:

Particulars	Amount
Selling Price per unit	240
Less: Target profit of 15% (15% x 240)	-36
Target cost per unit	**204**

Note 2: Computation of Actual Cost:

Particulars	Calculation	Amount
Material cost	$4 \; x \; 19 \; x \; \left(\frac{100}{95}\right)$	80
Labour cost	0.4 x 120	48
Inventory carrying cost (Note 3)	$\frac{3,42,000}{50,000}$	6.84
Variable overheads cost (Note 3)	$\frac{11,62,500}{50,000}$	23.25
Fixed overheads	$\frac{6,25,000 \text{ x } 4}{50,000}$	50
Target cost per unit		**208.09**

Note 3: Computation of variable overheads and inventory carrying cost:

Particulars	Q1	Q2	Q3	Q4	Total
Opening stock	0	5,000	8,500	5,500	
Add: Production	12,500	12,500	12,500	12,500	
Less: Sales	(7,500)	(9,000)	(15,500)	(18,000)	
Closing stock	5,000	8,500	5,500	0	
Average stock (Opening + Closing)/2	2,500	6,750	7,000	2,750	
Inventory carrying cost (Average stock x 18)	45,000	1,21,500	1,26,000	49,500	3,42,000
Variable overheads cost (Production x VOH per unit)	2,75,000	2,75,000	3,00,000	3,12,500	11,62,500

Note 4: Cost gap between target and actual cost:

Particulars	Amount
Target cost per unit	204
Actual cost per unit	208.09
Cost gap between target and actual cost	**4.09**

WN 2: Benefits of just-in-time purchasing and just-in-time production in removing the cost gap:

- Just in Time Purchasing and Just in Time Production is aimed at eliminating inventory holding of raw material and finished goods respectively. Components are purchased only when there is a requirement in the production process. Similarly, finished goods are produced only when there is a demand for them. **This type of production is called "produce to order". Hence, there is neither any opening inventory nor any closing inventory, thereby no inventory holding cost.**

Note 1: Production plan under Just in Time System:

Particulars	Q1	Q2	Q3	Q4
Normal Production	7,500	9,000	15,000	15,000
Overtime production	-	-	500	3,000

Note 2: Computation of cost per unit with JIT:

Particulars	Calculation	Amount
Material cost	$4\ x\ 19\ x\ \left(\frac{100}{95}\right)$	80
Labour cost	0.4 x 120	48
Variable overheads (Note 3)	$\frac{11,85,000}{50,000}$	23.70
Overtime cost (Note 3)	$\frac{84,000}{50,000}$	1.68
Fixed overheads	$\frac{6,25,000 \text{ x } 4}{50,000}$	50
Target cost per unit		**203.38**

Note 3: Computation of overtime cost and Variable Overheads:

Particulars	Q1	Q2	Q3	Q4	Total
Total Production	7,500	9,000	15,500	18,000	
Variable overheads per unit	22	22	24	25	
Total variable overheads	1,65,000	1,98,000	3,72,000	4,50,000	11,85,000
Overtime production	-	-	500	3,000	
Overtime premium per unit	-	-	24	24	
Total overtime cost	-	-	12,000	72,000	84,000

- The cost of production per toy under the JIT system is Rs.203.38 per toy as compared to the target cost of Rs.204 per toy and save Rs. 0.62 per toy.
- The savings primarily comes from eliminating the inventory holding cost of Rs.3,42,000 per annum. This is slightly offset by the additional cost of Rs.84,000 per annum that has to be paid towards overtime labor charges and Rs.22,500 towards additional variable overheads. However, by switching to the JIT system, Pixel Ltd. could reduce its production cost below the target cost per toy.

Competitive advantage due to JIT System:

JIT system aims at:

- Meeting customer demand in a timely manner.
- Providing high quality products and
- Providing products at the lowest possible price.

The main features of the JIT production system are:

- **Material handling cost is reduced**: Materials move from one machine to another in an organized sequence. The production process is grouped into to manufacturing cells. These can be managed with minimal labor. This reduces material handling costs as also any pile up of inventory in the

form of work-in-progress. In JIT procurement process, the raw material is received only when needed. Due to significant reduction in inventory, inventory holding costs, normal wastage cost and spoilage can be avoided. Optimum arrangement of cells can lead to lesser floor space requirement, thereby reducing factory rental and overhead cost.

- **Multi-skilled labor:** Hire and retain multi-skilled workers who are capable of performing a variety in operations including repairs and maintenance. Therefore, a worker is not confined to only one process in the production process. He can contribute towards other processes as well. This reduces the workforce requirement and labor idle time. The company can have a more efficient workforce, with lesser number of workers. There is potential to reduce labor cost on account of this.
- **Minimizing defects rework and scrap:** Each stage of the production process is tightly linked in a sequential manner. Defective output from one stage will stop the work at the next stage. Due to this, workers can identify and correct errors or defects instantaneously. JIT creates urgency for eliminating defects as quickly as possible since the downstream work also stops due to error in any workstation. Production process efficiency improves and reduces rework or scrap. The overall quality of production improves. There are other benefits to streamlining production process: lesser need for inspection of final output and lesser sales returns due to defects. This would contribute to the product's brand value.
- **Reduced set-up time:** Streamlined production process under JIT reduces set-up time at the workstations. When the production process has to change to make the product per the customers' demands, set-up time is incurred at the workstation. By streamlining operations, JIT system aims at reducing the set-up time, so that production can continue with the least possible interruption. This brings flexibility in the operations since the company can quickly change the production requirement, to make products to meet the customer's demand. Quick turnover improves productivity of the machine, thereby increasing the production capacity. Lesser time is spent on set-up which is not a value adding activity.
- **Reduces lead time for receiving materials** since the suppliers of raw material are capable of delivering high quality materials in a timely manner directly at the shop. Proper selection of such suppliers is imperative for the JIT system to be successful. If this can be achieved, then it is beneficial for the company since inventory holding of material is eliminated along with receiving better quality of raw material in a timely manner.
- **Eliminating inventory holding, scrap, material wastage, flexibility in operations by reducing set-up time, better response time to customer's demands, better skilled workforce, better quality of production, lower workforce requirement, lower floor space requirement all of these contribute towards lowering working capital requirements. These contribute to a company's competitive edge and success.**

4. Impact of implementation of JIT System [Category A]

A manufacturer is considering implementing Just in time inventory system for some of its raw material purchases. As per the current inventory policy, raw materials required for 1 month's production and finished goods equivalent to the level of 1 week's production are kept in stock. This is done to ensure that the company can cater to sudden spurt in consumers' demand. However, the carrying cost of inventory has been increasing recently. Hence, the consideration to move to a more robust just in time purchasing system that can reduce the inventory carrying cost. Details relevant to raw material inventory are given below:

Average inventory of raw material held by the company throughout the year is Rs.1 crore. Procurement of raw material for the year is Rs.12 crore. By moving to just in time procurement system, the company aims at eliminating holding this stock completely in its warehouse. Instead, suppliers of these materials are ready to provide the goods as per its production requirements on an immediate basis. Suppliers will now be responsible for quality check of raw material such that the raw material can be used in the assembly line as soon as it is delivered at the company's factory shop floor.

Increased quality check service done by the suppliers as well as to compensate them for the risk of holding the inventory to provide just in time service, the company is willing to pay a higher price to procure raw material. Therefore, procurement cost will increase by 30%, total procurement cost will be Rs.15.6 crore per year. Consequently, quality check and material handling cost for the company would reduce by Rs.1 crore

per year. Similarly, insurance cost on raw material inventory of Rs.20 lakh per year need not be incurred any longer.

Raw material is stored in a warehouse that costs the company rent of Rs.3 crore per annum. On changing to Just in time procurement, this warehouse space would no longer be required.

Production is 150,000 per year. The company plans to maintain its finished goods inventory equivalent to 1 week's production. Despite this, in order to have a complete cost benefit analysis, the management is also factoring the possibility of production stoppages due to unavailability of raw material from the suppliers. This could happen due to of delay in delivery or non-conformance of goods to the standard required. Labor works in one 8-hour shift per day and will remain idle if there is no material to work on. Due to stoppage of production for the above reason, it is possible to have stockout of 3,000 units in a year. Stockout represents lost sales opportunity due to unavailability of finished goods, the customer walks away without purchasing any product from the company. Therefore, in order to reduce this opportunity cost and to make up for the lost production hours, labor can work overtime that would cost the company Rs.10 lakh per annum. This is the maximum capacity in terms of hours that the labor can work. With this overtime, stockout can reduce to 2,000 units.

Currently, sale price of phone is Rs.5,000 per unit, variable production cost is Rs.2,000 per unit while variable selling, general and administration (SG&A) cost is Rs.750 per unit. Raw material procurement cost is currently Rs.800 per unit, that will increase by 30% to Rs.1,040 per unit under Just in time inventory system.

On an average, the long-term return on investment for the company is 15% per annum.

Required

(i) CALCULATE the benefit or loss if the company decides to move from current system to Just in Time procurement system.

(ii) RECOMMEND factors that the management needs to consider before implementing the just in time procurement system.

Answer:

(i)

Implementing Just in time procurement system will benefit the company by Rs.11,27,000 per year as explained below:

Particulars	**Current Purchasing Policy**	**JIT Procurement System**
Raw material procurement cost per year	12,00,00,000	15,60,00,000
Carrying cost of holding inventory (No longer required in JIT)	15,00,000	
Quality check and material handling cost (No longer required in JIT)	1,00,00,000	-
Insurance Cost on raw material inventory (No longer required in JIT)	20,00,000	-
Warehouse rental for storing raw material (No longer required in JIT)	3,00,00,000	-
Overtime Charges under JIT to reduce Stockouts (note1)	-	10,00,000
Stockout Cost (note 2)	-	40,20,000
Total Relevant Cost	**16,35,00,000**	**16,10,20,000**

Note: The company will save on carrying cost of holding inventory. The company is currently holding inventory of Rs.1,00,00,000 and the company will have savings of 15 percent on this.

Therefore, moving to just in time procurement system results in savings of Rs.24,80,000 per year for the company. If reinvested, long term return on investment for the company at 15% would yield a return of Rs.3,72,000 per year. Therefore, total benefit for the company would be Rs.28,52,000 per year.

Note 1: Should overtime cost be incurred to reduce Stockouts?

- Contribution per unit = Sale price - Variable production cost - Variable selling, distribution cost per unit; Variable production cost under the just in time system = Rs.2,000+ Rs. (1,040-800) = Rs.2,240 per unit; Contribution per unit = Rs.5,000 - Rs.2,240-Rs.750 per unit = Rs.2,010 per unit.
- Overtime cost can reduce stockouts from 3,000 units to 2,000 units that is customers' demand of 1,000 units more can be met.
- Contribution earned from selling these 1,000 units = 1,000 × Rs.2,010 per unit = Rs.20,10,000.
- Therefore, the contribution earned of Rs.20,10,000 is more than the related overtime cost of Rs.10,00,000. Therefore, it is profitable to incur the overtime cost.

Note 2: Stockout Costs

Out of the total shortfall of 3,000 units, by spending on overtime 1,000 units of demand can be met. Therefore, actual stockout units is only 2,000 units. As explained above, contribution per unit is Rs.2,010 per unit. Therefore, stockout cost = 2,000 units × Rs.2,010 per unit = Rs.40,20,000.

(ii) The company plans to eliminate its raw material inventory altogether. Raw material will be delivered as per production schedule directly at the factory shop floor, from when production will begin. The management should therefore carefully consider the following points:

- **The entire production process has to be detailed and integrated sequentially**. This is essential to know because it should be known in advance when in the subassembly process is each raw material is required and in what quantity.
- Since production is dependent on delivery and quality of raw material, heavy reliance is being placed on suppliers. **They should be able to guarantee timely delivery of raw material of the appropriate quality. The company is paying a premium of 30% of original cost, that is Rs.240 per unit (Rs.1,040 - Rs.800 per unit) in order to ensure the same.** Each unit gives a contribution of Rs. 2,010 per unit, which is 40.2% of the sale price per unit. Lost sales opportunities due to unavailability of raw material or non-conformance of the material can result in substantial losses to the company. While, portion of this has been factored while doing the cost benefit analysis of implementing Just-in-time systems, it needs careful consideration and monitoring even after implementation. Therefore, to hedge its loss, the management and suppliers should agree on penalties or costs the supplier should incur should there be any delay or non-conformance in quality of materials beyond certain thresholds.
- **Accurate prediction of sales trends** is important to determine the production schedule and finished goods planning.
- **Continuous monitoring of the system** even after implementation is essential to ensure smooth operations. Management commitment and leadership support is essential for its successful implementation and working.

Part II – Kaizen Costing

5. Target Costing versus Kaizen Costing [Category C]

M. India Ltd. (MIL) is an automobile manufacturer in India and a subsidiary of Japanese automobile and motorcycle manufacturer Leon. It manufactures and sells a complete range of cars from the entry level to the hatchback to sedans and has a present market share of 22% of the Indian passenger car markets. MIL uses a system of standard costing to set its budgets. Budgets are set semi-annually by the Finance department after the approval of the Board of Directors at MIL. The Finance department prepares variance reports each month for review in the Board of Directors meeting, where actual performance is compared with the budgeted figures. Mr. Suzuki, group CEO of the Leon is of the opinion that Kaizen costing method should be implemented as a system of planning and control in the MIL.

Required

Recommend key changes vital to MIL's planning and control system to support the adoption of 'Kaizen Costing Concepts'.

Answer:

Kaizen Costing **emphasizes on small but continuous improvement**. Targets once set at the beginning of the year or activities are updated continuously to reflect the improvement that has already been achieved and that are yet to be achieved. The suggestive changes which are required to be adopted Kaizen Costing concepts in MIL are as follows:

- **Standard Cost Control System to Cost Reduction System:** Traditionally Standard Costing system assumes stability in the current manufacturing process and standards **are set keeping the normal manufacturing process into account thus the whole effort is on to meet performance cost standard**. On the other hand, Kaizen Costing **believes in continuous improvements** in manufacturing processes and hence, the goal is to achieve cost reduction target. The first change required is the standard setting methodology i.e. from earlier **Cost Control System to Cost Reduction System.**
- **Reduction in the periodicity of setting Standards and Variance Analysis:** Under the existing planning and control system followed by the MIL, standards are set semi-annually and based on these standards monthly variance reports are generated for analysis. **But under Kaizen Costing system cost reduction targets are set for small periods say for a week or a month.** So, the period covered under a standard should be reduced from semi-annually to monthly and the current practice of generating variance reports may be continued or may be reduced to a week.
- **Participation of Executives or Workers in standard setting:** Under the Kaizen Costing system **participation of workers or executives who are actually involved in the manufacturing process are highly appreciated while setting standards**. So, the current system of setting budgets and standards by the Finance department with the mere consent of Board of Directors required to be changed.

Part III – 5S

6. Case Study on 5S [Category A]

Y & E Chartered Accountants offers a wide range of specialized, multi-disciplinary professional services that meet the immediate as well as the long-term business needs of clients. One of partner 'E' was upset with office documentation. 'E' argued that a document management solution is needed to maximize efficiency within the firm. The senior partner 'Y' has recently attended a seminar on lean system and heard the '5S'. He said that old files hide the key files from the eye and forces staff to ask which to use. Accordingly, he desires to implement '5S'.'

Required

ADVISE on implementation of '5S' in Y & E.

Answer:

Office processes often have huge amounts of paperwork and this not only makes processes slower but also allows errors to be introduced. 5S is a method of both cleaning out the working area and maintaining the cleanliness to improve process quality. The 5S process is based on:

Sort (Seiri)

This is sorting and removal of unnecessary files, papers, books and documents in the work area. **Sorting is designed to make the work area neat, organized and arranged so that relevant items can be found easily**. If an item is not relevant for the work, then it should not be in the work area.

Set in Order (Seiton)

Set in order means systematic arrangement of things i.e. arrange all necessary items into most efficient and accessible arrangement so that they can be easily be identified for use. It is advisable to have proper indexing of files and proper documentation i.e. proper index should be made and pasted on each file about its contents and in that pattern of contents, documents should be kept inside the files so that specific document can easily be traced and withdrawn on time. Even inside cupboard, paper of indexing about files with its name should be pasted so that specific file can easily be traced. Same can be done w.r.t. folders in computer, right file should be saved in right folder with identifiable name so that anyone can easily find any file. Frequent use items should be close by and infrequent use items can be further away in a central area. All storage areas should be clearly labeled to allow items to be put in the correct place, e.g. where did I leave the office stamp again?

Shine (Seiso)

After sorting and simplifying, it is necessary to keep the work area clean and safe. Shining is also an inspection process for the area, i.e. is everything in good condition. It is desirable to involve employees for 15-20 minutes each day to clean the work area so that they can have the habit of cleanness. In the same way, unimportant files either in desktop or any driver should be permanently deleted.

Standardize (Seiketsu)

A clean and tidy work area allows the process to be standardized and examined for quality or process improvements. Best practices are documented and rolled out across the work area, standards and process measures are established and displayed in the work area.

For example, red file can be standardized for very important files (can be required anytime), green file for important files and yellow file for unimportant files.

Sustain (Shitsuke)

It means to maintain discipline; this can only be achieved by auditing work areas and processes to make sure that the 5S standards are maintained. It is worthwhile to apply 5S standards continuously i.e. daily basis and check for any upgradation if needed, so that firm can have good management in terms of documentation, cleanness, time saving of partners as well as clients.

Overall, 5S in offices streamlines the work (low to reduce errors as well as improving process times) and employee satisfaction.

7. Case study on 5S [Category A - MAY 2020 RTP]:

Gold-Star Limited deals in manufacturing of traditional cycles. Recently apart from manufacturing old style cycles, GSL starts assembly of electronic cycles.

Since GSL didn't expand the factory area, post starting assembly of electronic cycles; hence production floor largely remains over-occupied with all sort of material, jigs, and tools; some of them are frequently useful, some are often and other are less often; even some are quite rare.

Workers usually complaint that all categories of jigs and tools are not available, tools which are available also of those belongs to those product design which are outdated (majority of such product are not further manufactured by GSL) accessible. Although floor manager is of opinion instead saying tools are not available, it can be said they are not accessible; because workers pick the tool from tool kit or tool board; but not place it back after use; hence it become difficult to locate such tool later or identify worker; with whom these may available.

On name of maintenance department, there are only two staff members, who are responsible for ensuring that every machine or equipment must be in running order and effective. Due to shortage of staff in maintenance department, requests for repairs of plant or machines are not handled within reasonable time frame and same will result in sharp deterioration of utility/ effectiveness of such plant or machine. Even in some of circumstances, replacements become/ remain only alternative.

GSL has reasonable standardise operating procedure for manufacturing of cycles business, but scenario is worse in case of assembly of electronic cycles. Since GSL is recently entered into assembly of electronic cycles, hence KPIs are not established for all factors which are part of assembly process including critical success factors.

At GSL, the attrition rate at senior management positions is quite high and no formal hierarchy tree is established, which result in drastic shifts in workplace culture (due to frequently changing role & responsibility).

Regarding safety of man and material, GSL is on front foot, taking all reasonable care; which is essential for purpose of eliminating any possibility of workplace accident. But assembly line of electronic cycles witness an incident recently, where one of model "x2" during assembly caught fire because wires set of "x-2" come into exposure of sparking from the light point near to such assembly line. Such fire causes burn of some of other material too, which are lying near to such assembly line.

Post such incident, CEO call for meeting with all the top tier executives, majorly including production and operation manager, safety staff, maintenance staff and store manager apart from management accountant. During the meeting while production and operation manager highlights some of problem areas, management accountant quoted 5S as solutions to problems faced by GSL.

CEO asked Management Accountant to be ready with report and presentation on 5S, which can highlight the operational aspect of 5S.

Required

You are deputy to management accountant and asked by him to prepare a case, in form of report; in favour of implementing/ APPLYING 5S at GSL and EXPLAINING the expected benefit from implementation of 5S.

Answer:

Addressed to;
Office of CEO,
Gold Star Limited (GSL).
Dated – 07th Jan 2020

Report on operational aspect of 5S and expected advantage

- **5S is usually considered as essential component of lean manufacturing, and foundation of eight pillars of TPM**. The 5S refer to five Japanese words- seiri (sort), seiton (set in order), seiso (shine), seiketsu (standardize), and shitsuke (sustain).
- They define a system for workplace organization and standardization. Sort means to separate needed and unneeded materials and to remove latter. Set in Order means to arrange materials and equipment so that they are easy to find and use. Shine means to conduct a clean-up campaign. Standardize means to formalize procedures and practices to ensure that all steps are performed correctly. Finally, sustain means to form habit of always following first four Ss through training, communication etc.
- **Note - Later 6th S was also introduced and i.e. safety.**

S1 – Sorting:

In order to over-come the problem of 'idle laying over material' all across production floor area, sorting of material is need to be done in following categories:

- **Not needed at all – to be moved to red tag area.**
- **Needed but not now – need to be moved to store with yellow tag.**
- **Needed but not here – to be moved to red tag area.**
- **Needed but not so much quantity.**

For purpose of doing sorting GSL need to be answered following questions:

- What is required?
- How much required?
- When it is required?
- Where it is required?

Sorted material depending upon category can be separated and made ready for movement/ shift, in order to segregate the sorted material; visual aid technique can be used by attaching coloured tags to each category of material (called visual sorting). Following two categories of tag can be used:

- **Red tag – A card containing detailed information of 'unwanted things' with a given time limit for further action to be taken.**
- **Yellow tag – A card containing detailed information of 'needed things', but not now with a given time limit for further action to be taken – usually kept in store.**

Sorting can help GSL to identify:

- Obsolete material; parts (jigs/tooling) not required as the design has become obsolete.
- Defective material; part can't be used as it is.
- Scrap material.
- Material which not in place – kept at wrong place.
- Unnecessary/extra/not useful material.

Sorting can also help GSL in reduction of material lying vacant on production floor, by segregating them into different categories and ensure that rarely used material either removed or tagged in red tape

area. If material were sorted than 'loss of material' which was lying vacant near to assembly line during fire incident could be saved.

S2 – Set in Order:

Systemic arrangement by ensuring 'place for everything and everything in its place'**. Purpose is to save search time and eliminate motion waste**, through visual management; with search-free and count free arrangement.

Colour can be best visual aid – RYGB

R – Red – Critical
Y – Yellow – Reorder
G – Green – Design
B – Blue - Excess

Note – Mapping of RYGB to feature is purely illustrative.

In order to implement systematic arrangement, GSL need to consider and answer;

- Analyse status.
- Decide – Which things will belong where?
- Decide – How they should be put away?
- Get everybody to follow rules through indexing, labelling etc.

Expected benefits of set in order to GSL

- **Faster retrieval** of things results in elimination of search time.
- Opportunity to **correct the abnormalities** faster as visibility improve by system itself.
- **Space saving** by systematic arrangement.
- **Efficiency of work** improves as things are available when they are actually needed.

Thus, S can solve the specifically problem of non-accessibility of tools.

S3 – Shine:

Ensure there must be cleanliness 'in and of' everything. Obviously, if there less number of items, then there is less to clean.

- Cleaning should be with meaning.
- Cleaning is inspection (from all aspects – front, rear, left right, top and bottom).

Shine will help GSL to keep things in order with regular cleaning and upkeep, so that maintenance become 'preventive function' rather corrective and any incident, likewise fire occurrence on assembly-line; must be avoided. **This will ensure larger utility out of Machine and Plants which will increase replacement cycle and save investment by lowering down maintenance and replacement cost**.

S4 – Standardization:

Establishing the 'standards' and make 'operating procedure' to create consistency and ensure that all steps are performed correctly. There are;

- Fix responsibilities for implementing & evaluating system.
- Integrate these responsibilities into routine work.
- Check how well the system is working and sustaining itself.

In order to ensure TPM all 5S are essential, but standardisation is key, GSL is facing large set of problem in assembly of electronic cycles and reason being absence of SOPs. Hence, by establishing the standardised process GSL can identify Critical Success Factors (CSFs) and benchmark the Key Performance Indicator (KPIs) against each CSFs.

S5 – Sustain

In order to sustain with the established standard, it is required to do;

- Daily monitoring
- **Improving ownership** by allocating areas

- **Using 'red tag campaign'**
- Communicating visually through fixed point photography
- Structured communication
- Continuous training of all employees
- Periodic audits at all level
- **Motivating staff** through recognition

Since 5S is not a onetime exercise, it is continuous process, hence, it is essential to sustain the practices followed during earlier 5Ss. GSL witness the high attrition rate at top management level, hence, it is important that GSL must inculcate practice of 5S in the system and work culture and sustain them on continuous basis, irrespective of attrition.

Sixth S is 'safety' which was added later on, in order to ensure safety while performing all the remaining 5S.

Further details can be tabled on requisition basis.
Closure of Report

Management Accountant
(For Management Accounting Division)
Gold Star Limited

Part IV – TPM

8. Calculation of OEE [Category A]

Gold Coast Company Ltd. manufactures spare parts. It works in two shifts of 8 hours for 6 days in a week. Lunch break is 45 mins and other miscellaneous breaks add up to 25 minutes. The following details are collected for the last 4 weeks by the TPM team for one of their important equipment

- Hours for Planned Preventive Maintenance = 15 minutes per shift
- For Breakdown Maintenance = 6 hours total
- Set up Changes = 15 hours total
- Power Failure = 4 hours total
- Standard Cycle Time per piece = 3 minutes
- No of Parts Produced per shift = 120
- Parts Accepted per shift = 115

CALCULATE 'OEE'.

Answer:

Calculation of Shifts

Days per week	…(A)	6
Shifts per day	…(B)	2
Total Working Shifts per week	… (C = A × B)	12
Total Weeks	…(D)	4
Total Shifts	… (E = C × D)	48

Calculation of Loss of Time per shift

Breakdown Maintenance (in mins)		360
Set up Changes (in mins)		900
Power Failure (in mins)		240
Total	**…(A)**	**1,500**
Loss of Minutes per shift	… (A/ 48)	31.25
Add: Lunch Breaks per shift		45

Add: Other Breaks	25
Add: Preventive Maintenance	15
Total Time Loss (in Minutes) per shift	**116.25**

Availability ratio	$\frac{\text{Time worked}}{\text{Total Time}} \text{x } 100$	$\frac{480 \text{ mins} - 116.25 \text{ min}}{480 \text{ mins}} \text{x } 100$	75.78%
Performance ratio	$\frac{\text{Standard Time}}{\text{Actual Time}} \text{x } 100$	$\frac{120 \text{ units x } 3 \text{ mins}}{363.75 \text{ mins}} \text{x } 100$	98.96%
Quality ratio	$\frac{\text{Good units}}{\text{Total units}} \text{x } 100$	$\frac{115 \text{ parts}}{120 \text{ parts}} \text{x } 100$	95.83%
OEE		**75.78% x 98.96% x 95.83%**	**71.86%**

9. Calculation of OEE [Category A – Nov 2018 (exam)]

Hindustan Limited supplies the following information relating to a vital equipment used in its production activity for April, 2018

Total time worked during the month	210 hours
Total production during the month	2800 units
No of units accepted out of total production	2520 units
Standard time for actual production of the month	180 hours
Time lost during the month	28 hours

Required:

(i) State an appropriate approach to measure the total productive maintenance performance of the equipment

(ii) Quantify the total productive maintenance performance of the above-mentioned equipment by using the approach states in (i) above

(iii) Comment on the effectiveness of maintenance of the equipment

Answer:

(i) The most important approach to the measurement of TPM performance is known as Overall Equipment Effectiveness (OEE) measure. The calculation of OEE measure requires the identification of "six big losses"

1) Equipment Failure/ Breakdown
2) Set-up/ Adjustments
3) Idling and Minor Stoppages
4) Reduced Speed
5) Reduced Yield and
6) Quality Defects and Rework

The first two losses refer to time losses and are used to calculate the availability of equipment. The third and fourth losses are speed losses that determine performance efficiency of equipment. The last two losses are regarded as quality losses.

Performance × Availability × Quality = OEE %

OEE may be applied to any individual assets or to a process. It is unlikely that any manufacturing process can run at 100% OEE.

(ii) Computation of OEE:

Availability ratio	$\frac{\text{Time worked}}{\text{Total Time}} \text{x } 100$	$\frac{210 \text{ hours}}{210 \text{ hours} + 28 \text{ hours}} \text{x } 100$	88.24%
Performance ratio	$\frac{\text{Standard Time}}{\text{Actual Time}} \text{x } 100$	$\frac{180 \text{ hours}}{210 \text{ hours}} \text{x } 100$	85.71%
Quality ratio	$\frac{\text{Good units}}{\text{Total units}} \text{x } 100$	$\frac{2{,}520 \text{ units}}{2{,}800 \text{ units}} \text{x } 100$	90.00%
OEE		**88.24% x 85.71% x 90.00%**	**68.06%**

(iii) Comment

World Class OEE is 85% or greater, Hindustan Ltd.'s OEE is somewhere around 68%. It just means that company got some opportunities for improvement. Hindustan Ltd. may improve OEE by collecting information related to all downtime and losses on equipment, analyzing such information through graphs and charts, making improvement decisions thereon like autonomous maintenance, preventive maintenance, reduction in set up time etc. and implementing the same.

10. Case study on TPM [Category B]

Super Refineries Limited is a leading oil refining company operating in India. The company has three plants - one each situated in North, South and West. The company has a refining capacity of 30 million barrels. The company currently enjoys a 40% share of the domestic market. The plants run on all 365 days in a year and operate at 100% of the capacity. The company currently does not have any maintenance schedule in place for its plant and machinery. Any repair requirement of plant and machinery is carried out on ad-hoc basis.

The company has implemented Total Quality Management (TQM) to ensure that the company rolls out top quality products. The company did not receive any complaints from its customers regarding poor quality of products or products not meeting the specifications. The entire production team is quite excited with superior quality of products.

However, in the last three months, about 30% of the dispatches to customers were delayed. This comes at a time when the entire plant had to be shut for maintenance activity due to breakdown in the machineries for a week. The company also witnessed 20% rejection of the final products. The customers claimed that the products did not meet the specification agreed by them with the company. The Director of Refineries is worried about the worsening situation of production at plants. Another concern for the director is the increase in number of accidents and loss of productive time due to this.

The chairman of the company convened an urgent meeting of the Board of Directors to understand the impact and reasons of the situation at production plants. A key issue highlighted by plant supervisors is that the scheduled maintenance activity for plants was never carried out. The underlying assumption for not carrying out such maintenance activity was - "Since the plant is running smoothly, there is no requirement of preventive maintenance activity. Such activities cost a lot in terms of money and also cause loss of productive time which could otherwise be used for production". The maintenance departments and production department functioned in silos with almost no co-ordination amongst themselves. The most critical parts of the plant were not maintained for a long time.

The chairman called you after the meeting and asked you to help him understand the current issue at the plant. "We had Total Quality Management (TQM) in place at all our plants. I understand from the production director that TQM is working as intended. Why are we facing the breakdown problem inspite of having a TQM in place"- said the Chairman?

Required

The Chairman has asked you to quickly prepare a note highlighting the following points -

- What could be the likely losses arising due to breakdown of machinery due to non-maintenance?
- What kind of maintenance programme could address the issue being faced by the company?
- EXPLAIN the key features of such programme.
- COMPARE the programme identified above and TQM.
- What are the various types of maintenance practices that the company can implement?

Answer:

Issue:

Super Refineries Limited **has implemented a Total Quality Management and is known for producing top quality products**. The company enjoys 40% market share in the domestic market. The plants operate at 100% capacity and on all days of the year. **This indicates that the company does not carry out preventive and corrective maintenance**. The company has not received any complaints with respect to quality from its customers. This can be attributed a solid TQM in place.

However, in the last three months, **the company has faced delays in supplies and customer rejections**. The delay in supplies could be attributed to the breakdown in the machineries. The production could have been of an inferior quality if the production managers would have rushed to meet the production deadlines due to loss of production time owing to breakdown.

The discussions at the board meeting indicate that the company has not prioritized preventive maintenance. Maintenance is being carried out on an ad-hoc basis with a proper preventive maintenance schedule. The company is concerned about costs of maintenance and hence no preventive maintenance was carried out. Further, there is no co-ordination between the production team and maintenance team.

Losses Arising Due to Breakdown

The following are the losses which can be associated with the breakdown of machinery at Super Refineries Limited -

- **Equipment failure leading to unexpected loss of time** - The production at plants was interrupted and the supplies to customers were delay in case of Super Refinery Limited.
- **Idle waits and stoppages due to ad hoc maintenance requirements**. Since the interruption is unplanned, the productive labour time is wasted.
- **Production of inferior quality products causes financial losses**. The company would also incur additional costs to remake the product without any additional revenues.
- **The company would also incur losses in terms of additional set up costs**. Every time a machine breaks down, a significant amount of time would be wasted in setting up the production processes again.

Total Productive Maintenance (TPM)

Based on the facts of the case, it is very clear that the company has not prioritised maintenance. The company can use TPM philosophy to address the issue.

TPM is a maintenance philosophy aimed at **eliminating production losses due to faulty equipment**. The objective of TPM is to keep equipments (plant, machinery etc) in such a position to produce expected quality products at the maximum capacity with no unscheduled stops. This also includes attaining:

- **Zero breakdowns.**
- **Zero downtimes.**
- **Zero failures attributed to poor condition of equipment.**
- **No loss of efficiency or production capacity due to the equipment.**

The concept was initially applied to equipment i.e., plant and machinery. Of late, the concept has also been extended to processes and employees. TPM focusses in keeping equipment and employees in top working condition to avoid any breakdowns and delays in manufacturing process.

Traditionally, **maintenance work has been considered as a responsibility of the Maintenance Team which is different from the production team**. Total Productive Maintenance seeks to involve workers in all departments and levels in ensuring the effective operations of the plant. When both the teams work in alignment, learnings can be shared with each other. The production team also takes ownership of maintenance requirement. **A sole focus on higher production without taking care of maintenance requirement can hamper the long-term production requirements, as could be seen in the case of Super Refinery Limited.**

Features

- **Traditional maintenance is centred in the maintenance department. However, TPM seeks to involve workers at all departments and levels. There is a great amount of co-ordination between the production and maintenance team in TPM.**
- **Autonomous maintenance** focusses on training operators to be able to take care of minor maintenance tasks. This relieves specialised maintenance staff to focus on critical issues.
- TPM focusses on **achieving and sustaining zero loses** with respect to minor stops, measurement and adjustments, defects, and unavoidable downtimes.
- **Planned Maintenance** is aimed to have trouble free machines and equipment producing defect free products for total customer satisfaction. The approach here is proactive maintenance instead

of reactive maintenance. Super Refinery limited had a reactive approach to maintenance where maintenance was carried out on an ad hoc basis.

- TPM emphasises on **training of workers across all levels and departments**. The ultimate objective is to have a factory full of skilled workers.

The issues faced by Super Refinery Limited due to unplanned shutdowns can be addressed using a Total Productive Maintenance philosophy.
The following are the Eight Pillars or Principles of TPM -

- Autonomous Maintenance
- Focused Improvement
- Planned Maintenance
- Early Equipment Management
- Quality Maintenance
- Education and Training
- Office TPM
- Safety, Health and Environment

TQM and TPM

Total Quality Management (TQM) and Total Productive Maintenance are often used interchangeably. However, TQM and TPM are considered as two different approaches. TQM attempts to increase the quality of goods, services and concomitant customer satisfaction by raising awareness of quality concerns across the organisation. In other words, TQM focuses on the quality of the product, while TPM focuses on the equipment used to produce the products. By preventing equipment break-down, improving the quality of the equipment and by standardising the equipment, the quality of the products increases. TQM and TPM can both result in an increase of quality. However, the approach of each is different. TPM can be seen as a way to help achieving the goal of TQM.

Super Refinery Limited has implemented TQM and is delivering high quality products to its customers. TQM focusses on the end product being supplied to the customer. In the process of producing high quality and volumes of products, the maintenance aspect of plant and machinery was ignored by all. This led to breakdowns and unplanned shutdown of the plant and machineries. The TPM philosophy would focus on the equipment which support production of high-quality products under TQM.

Types of Maintenance under TPM

The following are the types of Maintenance Programmes which Super Refineries Limited can implement-

Breakdown Maintenance

No maintenance is carried out unless the equipment actually fails. This is the approach taken by Super Refineries Limited currently. This type of maintenance is used when the equipment failure does not impact the operations and production significantly and the only cost incurred is the cost of repair. This is not advisable in case of Super Refineries as breakdown of machineries have led to significant delays in deliveries and poor quality of production.

Preventive Maintenance

It is a daily maintenance (cleaning, inspection, oiling and re-tightening), designed to retain the healthy condition of equipment and prevent failure through the prevention of deterioration, periodic inspection or equipment condition diagnosis, to measure deterioration. This can be compared with a routine and periodic maintenance activity of a vehicle.

Corrective Maintenance

Corrective maintenance focusses on making machines easier to clean and maintain. There could be reconfiguration of certain parts of the machines (say, a lubricating pipe) to ensure that the maintenance staff can carry out maintenance effectively and easily.

Maintenance Prevention

Through the analysis of maintenance data, the maintenance technicians can work with the designers of our machines to create machines that are more reliable. Maintenance and repairs that are required can be made as simple and as easy as possible to reduce time, save money and improve safety.

Autonomous Maintenance

In case of autonomous maintenance, minor and day to day repairs are carried out by the operators of plant themselves instead of waiting for technicians. Activities like lubricating, bolt tightening etc. are done along with minor repairs by the floor workers or operators. Maintenance team is called only when sophisticated and highly technical maintenance work is required. You may change the tires of your car on your own but to repair a puncture or wheel alignment, you visit a technician.

Conclusion

Super Refinery Limited should implement a TPM which would complement and support the TQM philosophy. This would also address the issue of the production team and maintenance team not working in co-ordination. Down time for maintenance should not be considered as a cost or unproductive activity. This should be an integral part of the overall manufacturing plan. This would ensure that emergency and unplanned downtime are kept to a minimum.

Part V – Six Sigma

11. Six Sigma [Category B – May 2019 (mock)]

DFS India Ltd. manufactures electronic components for washing machines in an assembly line. Recent market survey reports indicate erosion of its clientele. Feedback taken from customers suggest that the company's products were not of good quality. DFS is concerned because its competitors have been able to achieve zero defect performance in terms of nil sale returns on account of quality and nil subsequent warranty cost. Therefore, the competitors enjoy huge customer loyalty. To satisfy its customers, the company DFS wants to improve its product quality. Consequently, it has decided to undertake Six Sigma study of its operations. Below is the additional information given about DFS's operations:

Yearly sales of electronic components are 25,000 units at Rs.20,000 each. Of these, 1% sales are returned due to quality issues. These are scrapped and a replacement is made by the company. In addition, each product is under warranty for one year after sale. If a claim is accepted under warranty, service and replacement of parts is done free of cost. Current yearly warranty claims (these are separate from sales returns), which is also representative of the average yearly warranty claims, amount to Rs.30,00,000 per annum.

Quality control check and inspection is carried out directly at the assembly line. There is no quality check done at any other point in the entire work flow. Total time spent on inspection is 2,000 hours in a year which costs the company Rs.10,00,000 per annum. Inspection leads to 10% rejection i.e. 2,525 units. These units require only one cycle of rework, after which they are ready for sale. Rate of rework in the units rejected on inspection at the assembly line is 5 units in 1 hour. Cost of rework is Rs.6,250 per hour. The variable cost of electronic component is Rs.12,500.

The Six Sigma team as part of its study found that rework on products was mainly due to the following reasons:
(1) Assembly line workers, including new hires, learnt on the job as to how to assemble the input material to produce the final electronic component. This led to many errors due to lack of proper standardized training. Therefore, on account of these errors, the entire electronic component has to assembled again.
(2) Sub-standard quality of raw material is detected on inspection only at the assembly line. By this time, the defective material is already fitted into the final electronic component. Therefore, entire component has to be reworked upon to replace the defective raw material input.
(3) Machines are outdated and are not entirely suitable for the current production methodology.

Proposed solutions to tackle these issues are as follows:
(1) Provide training to assembly line workers to train them on the production methodology. This training is expected to standardize work flow, thereby reducing errors. Such training programs will be held regularly to update the workers on new methodologies. These programs can also serve as employee feedback sessions about the actual working conditions at the assembly line. This two-way communication can improve and streamline the production process. Brainstorming can help detect or give heads up about

potential problems in the production process. Total training hours in a year are expected to be 5,000 hours, costing Rs.1,000 each hour.

(2) Currently poor quality of raw material input is detected only on inspection at the assembly line. This results in wastage of resources in terms of material, time and capacity. In addition to the existing inspection at the assembly line, a new functional area for quality planning and improvement is proposed to be set up. At the time of procurement, the department will determine the appropriate quality of raw material input, ensure that suppliers supply material as per these requirements as well as suggest alternatives that can help improve product quality. By ensuring quality of raw materials at the beginning of the production process, wastage of resources is reduced, if not can be eliminated. Cost of setting up such a facility will be Rs.1,50,00,000. In addition to this facility, inspection will continue at the assembly line. This ensures complete quality check during the entire production cycle. At the same time, due to the introduction of this new functionality for quality control, the pressure on resources for inspection at the assembly line would reduce.

(3) Current machines should be replaced entirely with new machines. Old machines can be sold for negligible amount as scrap. New machines would cost Rs.3,60,00,000 having a life of three years.

Implementation of the above three solutions can have the following impact:

- Rework of products can be entirely eliminated.
- Sale returns will reduce from 1% to 0% due to better quality of products.
- Yearly warranty claims will reduce from Rs.30,00,000 to nil per annum.
- With the introduction of the new facility, time required for inspection at the assembly line would reduce from 2,000 hours to 1,200 hours. Cost of inspection to do quality check at the assembly line would reduce from Rs.10,00,000 per annum to Rs.600,000 per annum.
- Due to better quality, DFS can build better reputation with the customers which can further yield additional sales of 5,000 units per year.

Required

You are the management accountant at DFS. As part of the Six Sigma project implementation team, you are requested to EVALUATE proposals suggested by the Six Sigma team. The team has used the DMAIC technique to assess quality improvements.

Answer:

DMAIC technique analyses operational problems by assessing them in the following phases (1) Define; (2) Measure; (3) Analyze; (4) Improve and (5) Control.

(1) **Define the problem, project goals and customer requirements:** Poor quality leading to erosion of clientele. **Customers feedback indicates that product quality requires improvement**. Dissatisfaction is reflected in the form of sale returns and warranty claims. Competitors have no sale returns on account of poor quality as well as no warranty claims on its products. Hence, in an environment where 100% quality can be achieved, **DFS is facing quality issues**. This is the problem to be addressed. Failure to do so would result in loss of clientele, leading to a possibility of going out of business. The goal of the project is to identify what is the sigma level at which the company is operating and to suggest improvements to the production process it achieve 6σ level of operations.

(2) **Measure current performance:** Indicators of poor quality to find out what is the sigma level of the current operations? Current performance focusing on quality can be determined based on the cost incurred in the following phases:

(a) **Sale returns:** Sale returns are 1% of total sales. Gross sales are 25,000 units per annum at selling price of Rs.20,000 each, therefore having a value of Rs.50,00,00,000. Sales returns @1% amount to Rs.50,00,000 that represent the return of 250 units per annum. The cost of poor quality on account of these sale returns is the variable cost of the product Rs. 12,500 per unit. This is an avoidable cost amounting to Rs.31,25,000 per annum that is 0.63% of sales (Rs.31,25,000/Rs. 50,00,00,000).

(b) **Warranty claims:** Warranty is an undertaking given by the company to repair the electronic component free of cost if defect occurs within a specific period of time. Hence, when the customer files a claim that is accepted by the company, it means that there has been an issue with the quality of the product. This is a liability / cost that should ideally be kept minimum, if not nil like DFS's competitors. Warranty for the product is for one year from the date of sale. **Warranty claims this year is Rs.30,00,000, which is given to be representative of the**

average yearly warranty cost. Therefore, currently this cost amount to 0.60% of sales (Rs.30,00,000/ Rs.50,00,00,000). Summarizing sale returns and warranty claims alone represent 1.23% of current sales. Considering the current percentage of deficiency, the **company is operating between 3σ and 4σ level**. The rest of the industry is able to achieve 6 σ level of operations. At zero defective production, there are no sale returns on account of quality and no warranty claim costs. Therefore, is **tremendous scope for improvement in DFS's operations**.

(3) **Analyze:** What is the cause of poor quality? What is the cost of resources focused on quality? Six sigma team studied the production process in detail. Replicating the issues detailed in the given problem:

(a) **Problem 1:** Assembly line workers, including new hires, learnt on the job as to how to assemble the input material to produce the final electronic component. This led to many errors due to lack of proper standardized training. Therefore, on account of these errors, the entire electronic component has to assembled again.

(b) **Problem 2:** Sub-standard quality of raw material is detected on inspection only at the assembly line. **Inspection leads to 10% rejection of units. By this time, the defective material is already fitted into the final electronic component.** Therefore, to entire component has to be reworked upon to replace the defective raw material input.

(c) **Problem 3:** Machines are outdated and are not entirely suitable for the current production methodology.

The above factors result in rework on products, an internal failure cost, that lead to wastage of material, resources and capacity. Two costs incurred to focus on quality are cost of inspection and cost of rework, 2,525 units are reworked upon. Time required to rework 2,525 units per year = 2,525 units / 5 units per hour = 505 hours per year. Cost of rework is given to be Rs.6,250 per hour. Therefore, total cost of rework per year = Rs.31,56,250. Inspection cost for 2,000 hours at the assembly line is given to be Rs.10,00,000 per annum. Therefore, total cost of resources currently incurred for quality = Rs.41,56,250 per annum.

(4) **Improve: Reduce errors and improve quality of the product**

While cost of resources currently incurred for quality is only 0.83% of sales (Rs.41,56,250/Rs.50,00,00,000), a detailed analysis brings forth many qualitative aspects that DFS needs to be address. If its competitors are able to achieve excellence in quality, so must DFS, in order to remain in business. Therefore, following are the proposals that can provide solutions to the problems referred to above:

(a) **Solution to Problem 1:** Periodic training sessions to educate new hires and update workers in the assembly line on the latest techniques in production. Standardized and informed working will lead to lower errors and thereby improving product quality. Cost per year = 5,000 hours yearly training × Rs.1,000 per hour = Rs.50,00,000.

(b) **Solution to Problem 2:** Delay in detection of poor-quality input can be resolved by streamlining the work flow. New function for quality planning and improvement, at the beginning of the process helps in early detection, without wastage of resources. Cost per year for introducing this functionality = Rs.1,50,00,000.

(c) **Solution to Problem 3:** Replace old machines with newer ones. Machine upgrade will align the resource with the production requirements. This reduce chances of errors in the production process. Cost of procurement: Rs.3,60,00,000 has a life of 3 years. Therefore, annual depreciation is Rs.1,20,00,000.

(d) Consequences of implementing these proposals, as given in the problem, can result in the following improvements:

(i) Rework of products can be entirely eliminated.

(ii) Sale returns will reduce from 1% to 0% due to better quality of products.

(iii) Yearly Warranty claims will reduce from Rs.30,00,000 to nil per annum.

(iv) With the introduction of the new facility, time required for inspection at the assembly line would reduce from 2,000 hours to 1,200 hours. Cost of inspection at the assembly line would reduce from Rs.10,00,000 per annum to Rs.6,00,000 per annum.

(v) Due to better quality, DFS can build better reputation with the customers which can further yield additional sales of 5,000 units per year.

When the company is capable to achieve points (i), (ii) and (iii) milestones, it would have achieved 6 σ operational level. The cost of quality report summarizes the above discussion:

Cost of Quality Report

Cost of Quality Component	Before Improvements		After Improvements	
	Current Cost Rs.	% of Sales	Projected Cost Rs.	% of Sales
Preventive Cost				
Training (5,000 hrs. × Rs.1,000 per hour)	×××	×××	50,00,000	0.83%
Quality Planning and Improvement	×××	×××	1,50,00,000	2.50%
Appraisal Cost				
Inspection Cost	10,00,000	0.20%	6,00,000	0.10%
Internal Failure Cost				
Rework	31,56,250	0.63%	×××	0.00%
External Failure Cost				
Sale Returns	31,25,000	0.63%	×××	0.00%
Warranty Claims	30,00,000	0.60%	×××	0.00%
Total Cost of Quality	**1,02,81,250**	**2.06%**	**2,06,00,000**	**3.43%**
Yearly Sales	50,00,00,000		60,00,00,000	
Total Cost of Quality / Sales (%)	**2.06%**		**3.43%**	

(e) Cost of quality is 2.06% of sales of which 1.23% alone is external failure cost. This has an impact on the customer experience and can erode customer base. By implementing the six-sigma team's proposal, this external failure cost on account of sale returns and warranty costs, can completely eliminated. Internal failure cost can also be eliminated. The increase in cost of quality proposed to be made would be a preventive cost to avoid failure of quality. The company should focus on preventing the error such that it ensures that product is of good quality when it reaches the customer at the very first instance. This enhances the customer experience and therefore eliminating the scope for external failures like sales returns and warranty claims. Better quality can yield further sales of 5,000 units per year. Therefore, an increase in spending on quality measures is justified since it not only yields significant improvements to quality but also brings in more sales orders.

Improvement to the financial position of the firm is summarized below:

Particulars	Amount (Rs.)
Improved Contribution Margin (Ref. note 1)	3,75,00,000
Elimination of Goods Replacement	31,25,000
Elimination of Warranty Claims	30,00,000
Elimination of Rework	31,56,250

Savings in Inspection Cost	4,00,000
Total Benefit …(A)	**4,71,81,250**
Additional Costs Incurred	
Training	50,00,000
Quality Planning and Improvement	1,50,00,000
Increase in Fixed Cost (Yearly Depreciation of Upgraded Machines)	1,20,00,000
Total Additional Cost …(B)	**3,20,00,000**
Net Benefit …(A) - (B)	1,51,81,250

Note 1: Incremental Contribution:

Sales have increased by 5,000 units. Selling Price is Rs.20,000 per unit while variable cost is Rs.12,500 per unit. Contribution is Rs.7,500 per unit.

Conclusion:

Six Sigma team's proposals are focused on preventing the error from occurring. Consequently, quality improves, sale improves and thereby can yield a net benefit of Rs.1,51,81,250 per year to the company.

(5) Control: Maintain quality at 6σ level and keep the production facilities updated.

(i) **Training sessions with workers** can serve as two-way communication platform to detect other problems that can be resolved in more timely manner. Inputs received can also be used to improve the production work flow as well.

(ii) **New function of quality planning and improvement** can help the company be better informed about the latest production methodologies.

(iii) **Updated machines are better equipped to handled changes** in the production process since they are built with the latest technology. DFS should do a continuous assessment of the state of its machines and upgrade them when necessary.

Part VI – BPR Versus PI

12. Business Process Re-engineering [Category A]

ANI is a government-owned bank. The Bank has over 2,500 branches in country 'A' spread over all states/ union territories including specialized branches. These branches are controlled through 27 Zonal Offices and 4 NBG Offices. As a government owned bank, it has usually been the first preference for customers while choosing a bank. In the last six years, the Government has permitted a number of foreign banks to operate within the country in order to solve the problem of foreign exchange shortage and open up foreign trade as an instrument to promote economic development. These foreign banks offer diverse range of services such as direct access to executive management, a single point of contact to coordinate all banking needs, appointment banking to save time, free online banking services 24/7, free unlimited ATM access etc. In contrast, ANI has very elementary information systems, covering only for internal transaction handling and accounting activities. Customers have to visit banks to carry out transactions like- checking bank balance, cash deposit and withdrawals, transferring money from one account to another in operational hours. Often customers complain about the amount of time as the employees and clerical staff of the bank can attend only few customers at a time. Customer service evaluation has never been undertaken by ANI. Other processes, new account applications, are complex, requiring completion of many documents' formalities. Board of Directors were worried from growing popularity of new style banks. The Board of Directors of ANI has recently held meeting to discuss the shortfalls in its current services and the need to reengineer the ANI's business processes.

Required

ADVISE how Business Process Reengineering (BPR) can be used to improve ANI's current processes.

Answer:

BPR is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvement in critical contemporary measures of performance, such as cost, quality, service and speed. In other words, BPR is concerned with the result of the process (i.e., with those activities that add value

to the process). To implement BPR, firstly, each business process of ANI needs to be divided into a series of processes. Then each business process requires to be documented and analysed to find out whether it is essential, whether it provides support to other valuable processes and whether it is adding value. Any process which does not add value or does not provide essential support to the value adding activities must be removed. Those processes that remain require to be re-engineered/re-structured so that can be as efficient as possible. For ANI, new technology should be introduced to improve these processes. However, ANI must ensure that the statutory compliances regarding these processes are not undermined.

ANI is facing a hyper-competitive marketplace where customers expect a superior experience. BPR activities would help ANI in understanding those processes which ANI's customers value the most and remove those that are not valued. **Foreign banks are offering diverse range of services such as direct access to executive management, a single point of contact to coordinate all banking needs, appointment banking to save time, free online banking services 24/7, free unlimited ATM access etc. Clearly these are valuable business processes valued by the customer**. ANI should incorporate all these facilities in their banking processes to enhance customer satisfaction and service level.

Opening of new accounts in ANI is complex processes since it requires multiple forms to be complied with. Through BPR, ANI would analyse the whole process and identify the need for only one form that contain all of the necessary customer information. Further, it is also possible to initiate opening of new account through the development of an online application form on ANI's website. Online entry would remove the possibility of forms being lost or incorrect, again enhancing customer satisfaction since customers need not to visit ANI's branch to open account. There should also be online processing authentications/ validations as to ensure that data fields are correctly filled by customers that would result in error reduction. This would also remove unnecessary staff activities in checking and re-processing forms.

It is likely that BPR may increase costs in short-term as investment in technology. **However, this would also reduce substantial levels of manual activities and processes thereby providing speedy services to customers.** In long term, this would result in high levels of efficiency, profitability and better levels of customer satisfaction and retention.

13. Business Process Re-engineering [Category A]

History

ANA is one of Country 'I''s top footwear companies and other equipment. Since its foundation in 1988, ANA has been one of the all-inclusive footwear brands that is committed to nurturing the youth across the world through sports to contribute to society. Over more than three decades, the company inherits its values and provides own products while capturing the changes in the social environment. Its state-of-the-art production facilities are located strategically across the Country 'I' and produces all kinds of footwear. ANA is best known for its high ethical standards towards its workers, suppliers and the environment and voluntarily publish CSR report every year.

Organizational Structure and Footwear Market

ANA is organized into conventional functional departments such as procurement on order basis, sales, and finance, most of which have their non-reliable excel sheet-based systems for planning and reporting. Consequently, it often fails to generate accurate, timely and consistent information to monitor its own performance, thus, company faces failures in achieving the performance and delivery targets set by its retail customers.

In Country 'I', footwear market is competitive and seasonal. Retailers, who are ANA's customers, for footwear, they have two main demands, they want –

(i) footwear at lower prices to pass it on to consumers. (ii) suppliers to meet performance and delivery targets relating to lead times and quality.

In order to comply with the retailer's demands, ANA's competitors have discontinued all their own manufacturing facilities and outsourced all production to suppliers, who have much larger production lines and lower costs. To reduce the shipment cost over long distances, competitors have invested in advanced procurement software to consolidate orders so that each 40-foot shipping container gets fully loaded. Purchase invoice processing is also automated via the integration of information systems into the

supplier's software.

Proposal of Outsourcing
In order to mitigate costs, it has been proposed to outsource the manufacture of footwear, to a Chinese Supplier 3,750 km away. A comparison of the average cost of manufacturing and the cost of outsourcing footwear is given below–

Particulars	Manufacturing	Outsourcing
Average manufacturing cost per pair	BND 625	
Purchase cost per pair		CNY 28

Notes
1. Country 'I''s home currency is the BND.
2. Exchange Rate 1CNY = 18 BND.
3. In addition to the purchase cost from the supplier, ANA will be subject to pay for shipping costs at the rate of BND 40,000 for each large, standard sized shipping container, regardless of the number of units in it. Each container contains 5,000 pairs when fully loaded.
4. Custom tariffs are expected to change soon, footwear imports into ANI's home country might be subject to 10% basic custom duty (plus 10% social welfare surcharge on duty) on the assessable value of imports excluding shipping costs.

Therefore, to implement the proposal, restructuring of functional departments into multidisciplinary teams are needed to serve major buyer accounts. Each team is required to perform all activities, related to the buyer account management from order taking (sales order) to procurement to arranging shipping and after sales services. Team members dealing with buyers will work in ANA's corporate office, while those like QC etc. managing quality and supplier audits, will work at the manufacturing site of Chinese Supplier. Teams will be given greater independence to selling prices to reflect market conditions or setting a price based on the value of the product in the perception of the customer. Many support staff will work as helper roles, or be offered new jobs opportunities overseas after the restructuring.

Expert Advise
Prof. WD, Performance Management Consultant has advised ANA that the proposal has features of re-engineered processes and can be defined as business process re-engineering (BPR). Prof. advised, for evaluating the proposal, ANA should consider software development for full front-end order entry, purchasing, and inventory management solution which may be required along with ethical aspect of the proposed changes.

Required
(i) ADVISE on information system which would be required for the reengineering.
(ii) ASSESS the likely impact of reengineering on the ANA's high ethical standards and accordingly on business performance.
(iii) EVALUATE how the BPR proposal can improve ANA's performance in relation to retail customers.
Answer:
(i) Advise on Information System
Combining several jobs into one, permitting workers to make more decision themselves, defining different versions of processes for simple cases vs complex ones, minimizing situations when one person check someone else's work, and reorganizing jobs to give individuals more understanding and more responsibility are characteristics of reengineered processes.

In ANA, **outlays can be saved by rearranging staff into multidisciplinary teams, for example, reducing number of excess staff at different stages – cutting, preparation, finish etc**. These savings can be utilized in additional costs such as investment in new information systems. Hammer and Champy stress the use of information technology as a catalyst for major changes. BPR organizes work around customer processes rather than functional hierarchies.

Presently, ANA's departments have their own excel sheet-based systems for planning and reporting which is unreliable and inconsistent. **They are inadequate to provide the accurate, timely and consistent data which ANA needs to meet its own performance and delivery targets. There must a shared database that**

should be accessible by all parts of the functional teams. This should have real time updation, so that employees in different time zones can use updated data. The database should include financial data and nonfinancial data, like cost information, data related to lead times and quality. Information systems must be featured with all required reports like performance report, budget report etc.

In addition, **ANA is required to invest in special system as advised by Prof. WD for full front-end order entry, purchasing, and inventory management solution to minimize shipping costs by ensuring that the shipping containers get fully loaded** and to integrate with supplier's information systems to automate purchase invoicing. Overall, ANA must analyze that whether the benefits due to information technology are worthy.

(ii) Assessment of Likely Impact of Re-engineering on Ethical Standards

Workers

ANA is famous for its high ethical standards towards workers and staff. Because of adopting BPR proposal, **manufacturing staff are likely to be unemployed**. Competitors, have already shutdown their factories, these workers may not be able to find analogous jobs.

Employees who continue in work may become disappointed if they think the application of BPR to all products. **This may reduce productivity, increase staff turnover or difficulties in recruiting new staff. In addition, they may also be demotivated if they are appointed in unfamiliar roles, or may not be willing to learn new skills.**

Some of staff members may be motivated by the opportunity to perform new types of work, learn new skills or work outside India. This maybe enhance their individual performance.

Suppliers

Any association with non-ethical practices, for example, **if the Chinese supplier is indulged in using non-acceptable working practices, could seriously spoil ANA's reputation for high ethical standards**. This could undermine financial performance because customers may not buy its products, or possible investors might refuse from providing capital. Staff members located at the manufacturing site is responsible for supplier audits, which may assist to mitigate this risk.

Environment

ANA should consider the environmental impact of importing goods from long distances. The environmental related credentials of the Chinese Supplier are not known. Since, ANA voluntarily publishes a corporate sustainability report, any distortion in its performance on environmental issues might undermine the financial performance.

(iii) Evaluation of BPR Proposal in relation to Retailer's Demand

Lower Prices

In order to sell footwear at lower prices, there is proposal to reduce costs by outsourcing production to supplier. The current average production cost of manufacturing is BND 625.00 per unit. The cost of purchase from an external supplier is BND 512, which is BND 504 (CNY18 × BND28) purchase cost, plus BND 8 (BND 40,000/ 5,000) shipping cost. **This 18.08% (113/ 625) saving is a substantial improvement in financial performance, but not a dramatic one. It may be noted that BPR is a methodology that should be applied only when radical or dramatic change is required**. Further, exchange rate movements may also slash the cost saving significantly. In the near future, expected changes to international trade tariffs will increase the unit cost to CNY31.08 (CNY28.00 × 111%) i.e. 567.44 in BND and reduce the cost saving to just 9.20% (57.56/ 625).

Meeting Performance Targets

Lead times

Current lead times for customer orders are not ascertainable. **Since the proposed Chinese Supplier is 3,750 km away, consignment will take several weeks to be imported by sea. This may increase lead times substantially,** although may be set off by faster production times in supplier's plant. As ANA's sales are seasonal, retailers may order in advance, decreasing the long lead times. In order to decrease shipping costs, shipping containers must be full, meaning that deliveries must be in larger quantities.

Quality

ANA is already known for manufacturing high quality footwears. **The quality of the new supplier's footwear needs to be checked. Any distortion in the quality of footwear will deteriorate its reputation and decrease long-term business performance since only few customers would order**. Quality standards checking is more difficult while using outside suppliers, especially at long distance, than manufacturing in ANA's own factory. In BPR, work is done where it makes most sense to do so. In this aspect, having employees responsible for quality checking and supplier audits (working at the manufacturing site, abroad) will assist ANA in sustaining the best supplier relationship management

Chapter 4 – Cost Management Techniques

Cost Control:

- Cost Control implies **regulation of cost** by **executive action**. For this purpose, the executives **are provided with some yard stick** such as **standards or budgets** with which the actual costs and performances are compared to ascertain the degree of achievement made.
- Cost Control involves **continuous comparisons of actual with the standards** or budgets to regulate the former.
- Cost Control is **possible only when an organization has an effective Cost Accounting System** to provide relevant information.
- **Costs should be categorized into controllable and non-controllable.** The organizations are divided into responsibility centres. Every executive is made responsible for the performance of the centre under his control

Cost Reduction:

- Cost Reduction is the achievement of **real and permanent reduction** in unit cost of products manufactured. It, therefore, **continuously attempts to achieve genuine savings in cost** of production distributing, selling and administration.
- It **does not accept a standard or budget**. It rather challenges the standards/budgets continuously to make improvement in them.
- It **attempts to excavate, the potential savings buried in the standards** by continuous and planned efforts.
- Cost Control relax that dynamic approach, it usually dealt with variances leaving the standards intact.

Cost reduction versus cost control:

Cost Reduction	Cost Control
Cost reduction is the achievement of real and permanent reduction in the unit cost of products manufactured	Cost control involves a comparison of actual with standards or budgets to regulate the actual costs
Realistic savings in cost	There could be temporary savings in cost
Product's utility, quality and characteristics are retained	Quality maintenance is not a guarantee
It is not concerned with maintenance of performance according to standards	The process involves setting up a target, investing variances and taking remedial measures to correct them
Continuous process of critical examination includes analysis and challenge of standards	Control is achieved through compliance with standards. Standards by themselves are not examined
Fully dynamic approach	Less dynamic than cost reduction
Universally applicable to all areas of business. Does not depend upon standards, though target amounts may be set.	Limited applicability to those items of cost for which standards can be set
Emphasis here is partly on present costs and largely on future costs	Emphasis on present and past behavior of costs
The function of cost reduction is to find out substitute ways and new means like waste reduction, expense reduction and increased production	Cost control does competitive analysis of actual results with established standards
Cost reduction is a corrective measure	Cost control is a preventive measure

Focus areas for cost reduction:

Area	Explanation
Product Design	❖ Product design being the **first step in manufacturing of a product** and the impact of the proper design can be seen in the entire manufacturing chain ❖ **Efficient designing for a new product or improving the design** for an existing product can help the company in reducing the cost in multiple ways such as:

	○ **Cheaper substitute, higher yield and less quantity** and varieties of materials, cause cost reduction ○ Reduced time of operation and **increased productivity** ○ **Standardization and simplification** in variety increases productivity and reduces costs ❖ **Example: Tata Motors had made an ambitious plan of manufacturing a car at Rs.1,00,000**. The company made this plan due to its product design wherein they had focused on cutting unnecessary parts such as simplicity of the interiors, simple exterior such as one wiper, removal of left side mirror, using plastic exterior parts among others.
Organisation	❖ Proper assignment of task and delegation of responsibility to avoid **overlapping** ❖ Removal of **doubts and fiction** ❖ **Encouragement to employees** for cost reduction
Factory layout equipment	❖ Proper factory layout and utilization of the existing equipment to determine whether there is any scope for cost reduction by elimination of **wastage of men, materials and maximum utilization of available facilities**
Production plan programme and method	❖ Production control ensures **proper planning of work by installing and efficient procedure** and programme ordering correct machine and proper utilization of materials, manpower and resources ❖ Production control to be analyzed to ensure the following: ○ **Wastage of manpower** is kept to **minimum** ○ Scope for **reducing idle capacit**y ○ **Efficient control of stores** and maintenance services ○ **Reduction of labour wastage and increased productivity** by eliminating faulty production method

Tools and techniques of cost control and cost reduction:

- ❖ Value analysis
- ❖ Inventory management (Just in Time, EOQ)
- ❖ Business Process Re-engineering
- ❖ Target costing
- ❖ Kaizen costing

Target Costing:

- ❖ Target costing can be defined as **"a structured approach to determining the cost at which a proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated selling price"**
- ❖ Target costing is almost the exact opposite of cost plus margin modeling where a company produces a product with no cost structure in mind. Once the product is built they add a profit margin on top to arrive at the final price

Steps in Target costing:

- ❖ **Setting of target selling price**: The setting of target selling price of a product which customers are prepared to pay, depend on many factors like design specifications of the product, competitive conditions, customer's demand for increased functionality and higher quality projected production volume, sales forecasts etc. A concern can set its target selling price after taking into account all of the aforesaid factors.
- ❖ **Determination of target costs**: Target profit margin may be established after taking into account long-term profit objectives and projected volume of sales. On deducing target profit margin from target selling price, target cost is determined.
- ❖ **Estimate the actual cost of the product**: Actual cost of the product may be determined after taking into account the design specifications, material cost and other costs required to produce the product.
- ❖ **Comparison of estimated cost with actual cost**: In case the estimated cost of the product is higher than that of the target cost of the product then the concern should resort to cost reduction methods involving the use of Value Engineering / Value Analysis tools.

Advantages of Target Costing:

- Proactive approach to cost management.
- **It reinforces top-to-bottom commitment to process and product innovation**, and is aimed at identifying issues to be resolved, in order to achieve some competitive advantage.
- **Target costing starts with customer's study or market study**. It helps to create a company's competitive future with market-driven management for designing and manufacturing products that meet the price required for market success.
- It uses **management control systems to support and reinforce manufacturing strategies**; and to identify market opportunities that can be converted into real savings to achieve the best value rather than simply the lowest cost.
- Target costing ensures proper planning well ahead of actual production and marketing.
- Implementation of Target Costing enhances employee awareness and empowerment.
- Foster partnership with suppliers.
- Minimize non-value-added activities.
- Encourages selection of lowest cost value added activities.
- Reduced time to market.
- Target Costing takes a market – driven approach towards cost, in which value is defined not only by what customers demand but also by what they are willing to pay for

Main features of Target Costing System:

- Target costing is viewed **as an integral part of the design and introduction of new products**
- For any given product, a target selling price is determined using various sales forecasting techniques . Critical to setting the target selling price are the design specifications (reflecting certain levels of functionality and quality) of the new product
- **Integral to setting the target selling price is the establishment of target production volumes, given the relationship between price and volume**. The expected targets volumes are also critical to computing unit costs, especially with respect to capacity-related costs (such as tooling costs), as product costs are dependent upon the production levels over the life cycle of the product
- Establishing Cost Reduction Targets
- It should be noted that a fair degree of judgement is needed where the allowable cost and the target cost differ. As the ideal is to produce at the allowable cost, it is important that the difference is not too great. Once the product-level target cost is set, however, it generally cannot be changed, and the challenge for those involved is to meet this target.

Components of Target Costing System:

- **Value Analysis is a planned, scientific approach to cost reduction which reviews the material composition of a product and production design so that modifications and improvements can be made which do not reduce the value of the product to the customer or to the user.**
- Value Engineering is the application of value analysis to new products. **Value engineering relates closely to target costing as it is cost avoidance or cost reduction before production** . Value analysis is cost avoidance or cost reduction of a product already in production; both adopt the same approach i.e. a complete audit of the product
- The company can perform value analysis/value engineering by answering the following questions:
    - Can we eliminate functions from the production process?
    - Can we eliminate some durability or reliability?
    - Can we minimize the design?
    - Can we design the product better for the manufacturing process?
    - Can we substitute steps?
    - Can we combine steps?
    - Can we take supplier's assistance?
    - Is there a better way?

Kaizen costing Versus value engineering:

- **The initial value engineering may not uncover all possible cost savings. Thus, Kaizen Costing is designed to repeat many of the value engineering steps for as long as a product is produced, constantly refining the process and thereby stripping out extra costs**
- The **cost reductions resulting from kaizen costing are much smaller than those achieved with value engineering** but are still worth the effort since competitive pressures are likely to force down the price of a product over time, and any possible cost savings allow a company to still attain its targeted profit margins while continuing to reduce cost.

Problems with Target Costing:

- The **development process can be lengthened** to a considerable extent since the design team may require a number of design iterations before it can devise a sufficiently low-cost product that meets the target cost and margin criteria
- A **large amount of mandatory cost cutting can result in finger-pointing in various parts of the company**; especially if employees in one area feel they are being called on to provide a disproportionately large part of the savings
- **Representatives from number of departments on the design team can sometimes make it more difficult to reach a consensus** on the proper design because there are too many opinions regarding design issues
- Effective implementation and use requires the development of detailed cost data
- Use of target costing **may reduce the quality of products** due to the use of cheap components which may be of inferior quality
- For every problem area outlined have the dominant solution is retaining strong control over the design teams, which calls for a good team leader

Management Accountant's Role in Target Costing Environment:

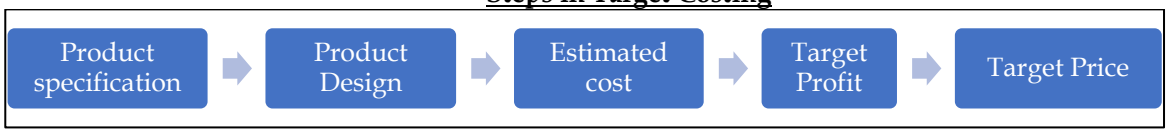
- The management accountant should be able to provide for the other members of the design team a running **series of cost estimates based on initial designs sketch**, activities based costing reviews of production processes, and "best guess" costing information from suppliers based on estimated production volumes.
- The management accountant should also be responsible **for any capital budgeting requests generated by the design team since he or she has the knowledge of the capital budgeting process**, how to fill out the required forms, and precisely what types of equipment are needed for the anticipated product design
- The management accountant should **work with the design team to help it understand the nature of various costs** (such as cost allocations based on an activity-based costing system), as well as the cost-benefit trade-offs of using different design or cost operations in the new product
- Management accountant is responsible **for tracking the gap between the current cost of a product design and the target cost that is the design team's goal**, providing an itemization of where cost savings have already been achieved and where there has not been a sufficient degree of progress
- Management accountant **must continue to compare a product's actual cost to the target cost** after the design is completed, and for as long as the company sells the product

Impact of Target Costing on Profitability:

- Target costing **can have a startlingly large positive impact on profitability**, depending on the commitment of management to its use, the constant involvement of management accountants in all stages of a product's life cycle, and the type of strategy a company follows
- Target costing improves profitability in two ways:
    - It places a **detailed continuing emphasis on product costs** throughout the lifecycle of every product
    - It **improves profitability through precise targeting of the correct prices at which the company feels it can field a profitable product** in the marketplace that will sell in a robust manner

Target Costing versus Traditional Costing

Steps in Target Costing



Steps in Traditional Costing

Target Costing data flow:

- **Data can be obtained from central accounting data base** carefully stocked form such a variety of sources as accounts payable, billing, bills of materials and inventory records
- In initial stages of product design, **the cost accountant must make the best possible guesses regarding the cost of proposed designs**
- The cost accountant **may include the best estimate an additional estimate of the highest possible cost** that will be encountered
- Data can also be obtained **from competitor's information** collected by the marketing staff or an outside research agency
- Sometimes information is compiled by a combined effort of the marketing and engineering staffs through a process called **reverse engineering**
- Engineering staff also compiles their own cost data relating to different designs/components.
- **The final database available to the cost accounting member of a design team contains information regarding the previous quality, cost and on-time delivery performance of all key suppliers, as well as the production capacity of each one**.

Most useful situations for target costing: Target costing is most useful in situations where the majority of product costs are locked in during the product design phase. This is the case with manufactured products but few services. Some companies, which seem to benefit most from target costing, are those, which maintain the following criteria

- **Assembly-oriented industries**, as opposed to repetitive-process industries that produce homogeneous products
- Involved heavily with the **diversification of the product lines**;
- **Use technologies of factory automation, including computer-aided design**, flexible manufacturing systems, office automation, and computer-aided manufacturing
- Have experienced **shorter product life cycles** where the pay-back for factory automation typically must be achieved in less than eight years
- **Must develop systems for reducing costs** during the planning, design and development phases of a product's life cycle
- Are **implementing management methods such as just-in-time, value engineering**

Target costing control points:

- **Identification of Principal Control Point:** Experience shows that there always comes a point, **where the cost of maintaining the design team exceeds the savings gardened from additional iterations**. It is also necessary that most products should be launched within a reasonably short time or they will miss the appropriate market, where they will beat the delivery of competing products to the market
- **Point of Go/No Go Decision:** If **target costing is not reached, management retains power to abandon the design project**. There comes a point, when actual performance is very close to expected performance in matter of cost incurrence
- **Milestone can be in terms of Timer or Points:** A milestone can be in terms of time, say one month. It can also be on the points in design process, at which specific activities are completed

Implementing a target costing system:

- **Create a project charter:** The **target costing effort should begin with a document, approved by senior management** that describes its goals and what it is authorized to do. This document,

known as the project charter, is essentially a subset of the corporate mission statement and related goals as they pertain to the target costing initiative

- **Obtain a management sponsor:** The next step is to obtain the strongest possible support from a management sponsor. This should be an individual who is well positioned near the top of the corporate hierarchy
- **Obtain a budget:** The target costing program requires funds to ensure that one or more well-staffed design teams can complete target costing tasks
- **Assign a strong team member:** The best way to ensure that the team functions properly is to assign to the effort a strong team manager skilled in dealing with management, the use of project tools, and working with a diverse group of people
- **Enroll full-time participants:** A target costing team member puts the greatest effort into the program when he or she is focused only on target costing. Thus, it is essential that as many members of the team as possible be devoted to it full-time rather than also trying to fulfill other commitment elsewhere in the company at the same time
- **Use Project Management Tools:** Target costing can be a highly complex effort especially for high-cost products with many features and components. To ensure that the project stays on track, the team should use all available project management tools, such as Microsoft Project (for tracking the completion of specific tasks), a company database containing various types of costing information, and a variety of product design tools

Life Cycle Costing:

- Life Cycle Costing involves **identifying the costs and revenue over a product's life i.e. from inception to decline**
- Life cycle costing **aims to maximize the profit generated from a product** over its total life cycle

Product Life Cycle:

- **Stage I – Introduction Stage:** Stage one is where the new product is launched in the market. As the product is novel, there is minimal awareness and acceptance of it. Competition is almost negligible and profits are non- existent
- **Stage II: Growth Stage:** Sales begin to expand rapidly because of greater customer awareness. Competitors enter the market often in large numbers. As a result of competition, profit starts declining near the end of the growth stage
- **Stage III: Maturity Stage:** During the stage of maturity sales continue to increase, but at a decreasing rate. When sales level off, profits of both producers and middlemen decline. The main reason is intense price competition; some firms extend their product lines with new models. This stage poses difficult challenges
- **Stage IV: Decline Stage:** Decline in sales volume characterizes this last stage of the product life cycle. The need or demand for product disappears. Availability of better and less costly substitutes in the market accounts for the arrival of this stage.

Characteristics and strategies of 4 Stages:

	Introduction	Growth	Maturity	Decline
Characteristics				
Objectives	Create product awareness and trial	Maximize market share	Maximize profits while defending market share	Reduce expenditures & milk the brand
Sales	Low sales	Rapidly rising	Peak sales	Declining sales
Costs per customer	High cost per customer	Average cost per customer	Low cost per customer	Low cost per customer
Profits	Negative	Rising profits	High profits	Declining profits
Customers	Innovators	Early adopters	Middle majority	Laggards
Competitors	Few	Growing number	Steady number beginning to decline	Declining number
Strategies				

Product	Offer basic product	Offer product extensions, service and warranty	Diversify brands and models	Phase out weak items
Price	Cost plus profit	Price to penetrate market	Price to match or beat competitors	Price cutting
Advertising	Build product awareness amongst early adopters & dealers	Build awareness & interest in mass market	Stress on brand differences and benefits	Reduce level to keep hard core loyalty
Distribution	Build selective distribution	Build intensive distribution	Build more intensive distribution	Go selective; phase out unprofitable outlets
Sales promotion	Use heavy sales promotion to entice trial	Reduce to take advantage of heavy consumer demand	Increase to encourage brand switching	Reduce to minimal level

Characteristics of Product Life Cycle:

- The products have finite lives and pass through the cycle of development, introduction, growth, maturity, decline and deletion at varying speeds.
- **Product cost, revenue and profit patterns tend to follow predictable courses through the product life cycle**
- Profit per unit varies as products move through their life cycles.
- Each stage of the product life-cycle poses different threats and opportunities that give rise to different strategic actions.
- **Products require different functional emphasis in each stage-such as an R&D emphasis in the development stage and a cost control emphasis in the decline stage**.
- Finding new uses or new users or getting the present users to increase their consumption may extend the life of the product.

Benefits of Product Life Cycle Costing:

- The product life cycle costing **results in earlier actions to generate revenue or to lower costs** than otherwise might be considered.
- Better decisions should follow **from a more accurate and realistic assessment of revenues and costs,** at least within a particular life cycle stage.
- Product life cycle thinking **can promote long-term rewarding** in contrast to short-term profitability rewarding.
- It provides an **overall framework for considering total incremental costs over the entire life span of a product**, which in turn facilitates analysis of parts of the whole where cost effectiveness might be improved.
- It is an approach used **to provide a long-term picture of product line profitability** , feedback on the effectiveness of life cycle planning and cost data to clarify the economic impact of alternatives chosen in the design, engineering phase etc.
- Product life cycle costing **traces research and design and development costs etc., incurred to individual products over their entire life cycles**, so that the total magnitude of these costs for each individual product can be reported and compared with product revenues generated in later periods

Uses of Product Life Cycle:

- As a **Planning tool**, it characterizes the marketing challenges in each stage and poses major alternative strategies, i.e. application of kaizen.
- As a **Control tool**, the PLC concept allows the company to measure product performance against similar products launched in the past.
- As a **Forecasting tool**, it is less useful because sales histories exhibit diverse patterns and the stages vary in duration.

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 or 70:30 rule**. The management can use it in a number of different circumstances **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:

- **Prioritize problems, goals and objectives** to identify root causes
- Select and define **key quality improvement programs**.
- Select **key customer relations and service programs**.
- Select **key employee relations improvement programs**.
- Select and define **key performance improvement programs**.
- Allocate physical, financial and human resources

Application of Pareto Analysis:

- **Pricing of a product:** In the case of a firm having multiple products, **20% of the products may account for 80% of the revenues**. Pareto Analysis can help in focusing management's attention to 20 percent of the products and the pricing decision for balance 80% of its products can be delegated to lower levels of management
- **Customer profitability analysis:** Instead of analyzing products, customers can be analyzed for their relative profitability to the organization. Again here it has been observed that **20% of the customers would contribute to 80 percent of the profits and hence Pareto analysis can help in finding the target customers and focusing on them**
- **ABC analysis – Stock control:** Pareto Analysis can also be used in stock control wherein it has been observed that only a few goods in stock make up for most of the value
- **Application in Activity Based costing:** 20% of the organization cost drivers are responsible for 80% of the total cost. Companies can focus on major cost drivers for better cost management
- **Quality control:** Pareto analysis seeks to discover from an analysis of defect report or customer complaints which "vital few" causes are responsible for most of the reported problems. By concentrating once efforts on rectifying the vital 20%, one can have the greatest immediate impact on product quality. The purpose of the analysis is to direct management attention to the area where the best returns can be achieved by solving most of quality problems, perhaps just with a single action.

ENVIRONMENTAL MANAGEMENT ACCOUNTING (EMA)

What is EMA?

- EMA is the process of **collection and analysis** of the information relating to **environmental cost** for **internal decision making**
- EMA is an attempt to **integrate best management accounting** thinking with **best environmental management practice**
- EMA **identifies and estimates** the costs of **environment-related activities** and seeks to **control these costs**
- EMA aims to make a **better use** of or to **modify sources of information** and management accounting techniques and to **evaluate sustainability and/or environmental efficiency** of a company

Example No.1:

A small town wants to build an electricity-generating plant. The area gets a lot of wind and has plenty of coal under the ground; the town is locked in a debate over which energy source should be used. Half of the town feels that a wind-energy power plant is the way to go and the other half feels that a coal-burning power plant is the best option. Even though the town is split over the debate, they all want to come to the best decision and take into account all of the direct cost of the project as well as the indirect cost to the environment and people's health. As a management accountant you are required to help the town in deciding the type of plant?

- The town is required to use the concept of **environmental full cost accounting** to decide on the type of plant

- **Environmental full cost accounting** can be defined as a method of accounting that recognizes the **direct and indirect economic, environmental, health and social costs** of a project or action
- Environmental full cost accounting considers more than just the basic direct costs associated with a project, such as the costs of building supplies, production and distribution
- Environmental full cost accounting **also factors in indirect costs, including externalities**. Externalities are side-effects or costs of an activity that affect otherwise uninvolved parties. **For example, a coal-burning power plant will emit greenhouse gases that could impose health costs on society. And, the noise that comes from wind power generation could cause sleep disturbances, anxiety and stress in susceptible individuals.** These indirect costs are important considerations for a community to examine during the decision making process. The town can decide on the type of plant with the help of environmental full cost

Areas of application of EMA:

- Product Pricing
- Budgeting
- Investment appraisal
- Calculating costs and
- Savings of Environmental Projects or setting quantified performance targets

Classification of Environmental Costs:

US Environmental Protection Agency Classification:	
Conventional costs	**Raw materials and energy costs** having environmental relevance
Hidden costs	Costs which have been accounted for but then **lose their identity in general overheads**
Contingent costs	Costs to be incurred at a **future date** Example: Clean-up cost
Relationship cost	**Intangible costs.** For example the costs of preparing environmental reports
United Nations Division for Sustainable Development classification:	
Costs incurred to protect environment	Example: Measures taken to **control pollution**
Costs of wasted material, capital and labour	Example: **Inefficiencies** in the production process
Practical classification:	
Internal costs	Internal costs have **direct impact on the income statement** of a company
External costs	External costs are **imposed on society at large**, but not borne by the company that generates the cost in the first instance. However recently **Governments are using taxes, subsidies and regulations** to covert external costs into internal costs
Hansen and Mendoza classification:	
Environmental prevention costs	Cost associated with **preventing adverse environmental impact** Example: Evaluating and picking pollution control equipment, Creating environmental policies, Environmentally driven R&D, Site and feasibility studies, Investment in protective equipment, carrying out environmental studies
Environmental appraisal Costs	Costs incurred to **determine whether products, process and activities are in compliance** with environmental standards, policies and laws. Example: Monitoring, testing, inspection and reporting, Improved systems and checks in order to prevent fines/penalties, regulatory compliances, performing contamination tests, audit of environmental activities, verifying supplier environmental performance
Environmental Internal Failure Costs	Costs incurred from activities **that have been produced but not discharged** into the environment Example: Recycling scrap, Disposing toxic material, Back end costs such as decommissioning costs on project completion, maintaining pollution equipment

Environmental External Failure Costs	Costs incurred on activities **performed after discharging waste into environment**. These costs impact organization's reputation and natural resources Example: Cleaning up contaminated soil, restoring land to its natural state

Environmental perspective under balanced scorecard:

Objective	Measures
Minimize hazardous materials	Types and quantities (total and per-unit) Percentage of total materials cost Productivity measures (output/input)
Minimize energy requirements	Types and quantities (total and per-unit) Productivity measures (output/input)
Minimize release of residues	Pounds of toxic waste produced Cubic metres of effluents Tons of greenhouse gases produced Percentage reduction of packaging materials
Maximize opportunities to recycle	Pounds of materials recycled Number of different components Percentage of units manufactured Energy produced from recycled materials

Identification of Environmental Costs:

- Environmental management accounts require an intense review of general ledger as **environmental costs such as materials, utilities, waste disposal among others can be hidden in general overheads** of the company
- **Allocation of environmental costs to the processes or products** which give rise to them is important for organizations in **making well-informed business decisions**
- Some of the decisions done with help of EMA are:
  - Different pricing of products as a result of re-calculated costs
  - Re-evaluation of profit margins of products
  - Phasing out certain products when the change is dramatic
  - Re-designing processes or products in order to reduce environmental costs
  - Improving house-keeping and monitoring of environmental performance
  - Calculation of NPV/IRR for investment decision

Techniques for identification and allocation of environmental costs:

Technique	Explanation
Input-output analysis	❖ Technique records material inflows and balances with outflow on the principle that **what comes in must go out** ❖ **Example:** 100 kg of input has led to 80 kg of output. The company must now find what has happened to the balance 20 kg of input. **The difference could have been sold as scrap or got wasted. These will enable calculation of environmental costs**
Flow cost accounting	❖ Technique records material flows as well as material losses incurred at various stages of production ❖ Flow cost accounting makes material flows transparent by using various data such as quantities, costs and values ❖ **Material flows are divided into three categories, material, system and delivery and disposal** ❖ Material costs refer to the **material cost used in various processes** ❖ System costs refer to the **in-house handling costs incurred by the company** for the purpose of maintaining and supporting material throughput. Example: Personnel costs or depreciation ❖ Delivery and disposal costs refer to the **costs of flows leaving the company**. Example: Transport costs or cost of disposing waste
Life cycle costing	❖ Lifecycle costing **considers the costs and revenues of a product over its whole life** rather than one accounting period

	❖ The company can use **TQM approach** in order to reduce life-cycle environmental cost ❖ TQM can help in **zero complaints, zero spills, zero pollution, zero waste and zero accidents**
Activity based costing	❖ ABC allocates **internal costs to cost centres** and cost drivers on the basis of activities that give rise to the costs ❖ Environmental accounting focuses on distinguishing between environment-related costs and **environmental driven costs** which tend to be hidden on general overheads ❖ Environment driven costs are **removed from general overheads** and traced to products or services using **some suitable allocation basis**. Some of the allocation keys used are: o Volume of emissions or waste o Toxicity of emission and waste treated o Environmental impact added (volume x input per unit of volume) volume of emission treated and o Relative costs of treating different kinds of emission

Controlling Environmental Costs:

Waste	❖ **'Mass balance' approach** can be used to determine how much material is wasted in production, whereby the weight of materials bought is compared to the product yield. ❖ In addition to these monetary costs to the organization, **waste has environmental costs in terms of lost land resources** (because waste has been buried) and the generation of greenhouse gases in the form of methane. ❖ Costs of **unused raw materials and disposal; taxes for landfill; fines for compliance failures such as pollution** are considered as environmental cost associated with waste.
Water	❖ Organization should identify **where water is used and how consumption of the same can be decreased**
Energy	❖ Environmental management accounts **may help to identify inefficiencies and wasteful practices** and therefore would help in energy cost reduction
Transport and travel	❖ EMA techniques can be **used to identify savings in terms of travel and transport** of goods and materials
Consumables and raw materials	❖ Directly attributable costs and discussions with management can help in reducing these costs

Reasons for controlling environmental cost:

- ❖ **Reducing carbon footprint**: Carbon footprint measures the total greenhouse gas emissions caused directly and indirectly by a person, organization, event or product. Controlling environmental cost can help in reducing carbon footprint
- ❖ **Scope for cost reduction**: Environmental costs are becoming huge for companies in highly industrialized sectors and reducing them can help in cost reduction
- ❖ **Regulatory requirement:** There are huge penalties for companies found guilty of breaching environmental regulations and are also liable for criminal prosecution as per the regulatory laws

Role of EMA in Product/Process Related Decision Making:

- ❖ **Correct costing of products is a pre-condition for making sound business decisions**. Accurate product pricing is needed for strategic decisions regarding volume and choice of products to be produced
- ❖ EMA can **help in different pricing of products as a result of re-calculated costs, re-evaluation of profit margins of products, phasing out certain products, re-designing processes** or products and improving housekeeping and monitoring of environmental performance

Advantages of EMA:

- **Improving revenue:** The company can increase the sales by producing products which meets the environmental concerns. These products can also be sold at a premium
- **Cost reductions:** Paying close attention to the usage of resources can lead to reduction in cost

Disadvantages of EMA:

- **Increase in costs:** Cost of complying with legal and regulatory requirements, and additional costs to improve the environmental image of the organization may result in increase in some costs
- **Costs of failure:** Significant costs may be incurred if there is poor environmental management. Thus, the cost of clean-up and fines on violation of any government environmental policy may be huge

Overview of practical problems/ case studies/ important questions:

- Part I – Cost Control and Cost Reduction
- Part II – Target Costing
- Part III – Life Cycle Costing
- Part IV – Pareto Analysis
- Part V – Environmental Management Accounting

Part I – Cost Control and Cost Reduction

1. Calculation of cost reduction [Category B (May 2017 (exam)]

Even Forward Ltd. is manufacturing and selling two products: Splash and Flash at selling price of Rs. 3 and Rs.4 respectively. The following sales strategy has been outlined for the year: ―

- Sales planned for year will be Rs.7.20 lakhs in the case of Splash and Rs.3.50 lakhs in the case of Flash.
- To meet competition, the selling price of Splash will be reduced by 20% and that of Flash by 12 ½ % .
- Break- even is planned at 60%of the total sale of each product.
- Profit for the year to be achieved is planned as Rs. 69,120 in the case of Splash and Rs. 17,500 in the case of Flash. This would be possible by launching a cost reduction programme and reducing the present annual fixed expenses of Rs.1,35,000 allocated as Rs.1,08,000 to Splash and Rs.27,000 to Flash.

You are required to present the proposal in financial terms giving clearly the following information:

- Number of units to be sold of Splash and Flash to break-even as well as the total number of units of Splash and Flash to be sold during the year.
- Reduction in fixed expenses product-wise that is envisaged by the Cost Reduction Programme.

Answer:

Particulars	**Splash**	**Flash**
Sales (A)	7,20,000	3,50,000
Selling price per unit (B)	2.40 (80% of Rs.3)	3.50 (87.5% of Rs.4)
Sales units (A/B)	**3,00,000**	**1,00,000**
BEP (%)	60%	60%
BEP units	**1,80,000**	**60,000**
MOS Units (Total units – BEP Units)	**1,20,000**	**40,000**
Profit	69,120	17,500
Contribution per unit (Profit/MOS)	**0.576**	**0.4375**
Target Fixed cost (CPU x BEP units) (C)	1,03,680	26,250
Existing fixed cost (D)	1,08,000	27,000
Reduction in fixed cost (D – C)	**4,320**	**750**

Part II – Target Costing

2. Impact of value engineering on total costs [Category A]

Kala Ltd manufactures many products. To compute manufacturing cost, it uses a costing system with one direct cost category (direct materials) and three indirect cost categories-

(a) Batch-related Set-up, production Order, and Materials-handling costs, all of which vary with the number of batches.
(b) Manufacturing operations costs that vary with machine hours.
(c) Costs of Engineering changes that vary with the number of engineering changes made.

In response to competitive pressures at the end of year 1, product designers at the company employed value Engineering techniques to reduce manufacturing costs. Actual information of Year 1 and Year 2 follow:-

Particular	Actual results for Year 1	Actual results for Year 2
Total setup, production-order, and material-handling costs	Rs. 72,00,000	Rs. 75,00,000
Total number of batches	900	1,000
Total manufacturing operations costs	Rs. 1,21,00,000	Rs. 1,25,00,000
Total number of machine hours worked	220,000	250,000
Total costs of engineering changes	Rs. 26,40,000	Rs. 20,00,000
Total number of engineering changes made	220	200

The company wants to evaluate whether value engineering has succeeded in reducing the target manufacturing cost per unit of one of its main product, KL-69, by 12%. Actual results for 2000 and 2001 for Kl-69 are:-

Particulars	Actual results for year 1	Actual result for Year 2
Units of KL- 69 produced	3,500	4,000
Direct materials costs per unit ofKL-69	Rs. 1,200	Rs. 1,100
Total No. of batches required to produce KL-69	70	80
Total machine-hours required to produce LK-69	21,000	22,000
Number of engineering changes made	14	10

Required:

1. Calculate the manufacturing cost per unit of Kl-69 for Year1 and Year2.
2. Did the company achieve the target manufacturing cost per unit for KL- 69? Show you calculation

Students are advised to go through concept of Activity based cost in Chapter 10 before attempting this question

WN 1: Computation of cost driver rate

Activity	Total cost	Cost driver name	Cost driver quantity	Cost driver rate
Setup cost				
Year 1	72,00,000	Number of batches	900	8,000
Year 2	75,00,000	Number of batches	1,000	7,500
Manufacturing operations				
Year 1	1,21,00,000	Machine hours	2,20,000	55
Year 2	1,25,00,000	Machine hours	2,50,000	50
Engineering changes				
Year 1	26,40,000	Engineering changes	220	12,000
Year 2	20,00,000	Engineering changes	200	10,000

WN 2: Computation of cost per unit for year 1 and year 2:

Particulars	Year 1	Year 2
Direct material cost	42,00,000 (3,500 x 1,200)	44,00,000 (4,000 x 1,100)
Set-up cost	5,60,000 (70 x 8,000)	6,00,000 (80 x 7,500)

Manufacturing operations cost	11,55,000 (55 x 21,000)	11,00,000 (50 x 22,000)
Engineering changes cost	1,68,000 (12,000 x 14)	1,00,000 (10,000 x 10)
Total cost	**60,83,000**	**62,00,000**
Number of units	3,500	4,000
Cost per unit	**1,738**	**1,550**

Comments:

- The cost per unit in year 1 is Rs.1,738 per unit and the company has targeted reduction of 12% for year 2
- Target cost for year 2 would be equal to 1,529.44 (Rs.1,738 – 12%). The actual cost is Rs.1,550 and hence the company could not meet the target cost

3. Target labour time for achieving desired profit [Category A]

NEC Ltd., forms a Committee consisting of its Production, Marketing, and Finance Directors to prepare a budget for the next year. The Committee submits a draft budget as detailed below:

Particulars	**Amount**
Sales price per unit	50
Variable costs per unit:	
Direct Materials	9
Direct Labour	9
Variable overhead (3 hrs × Re. 2.00)	6
Contribution per unit	26
Budgeted Contribution	6,50,000
Budgeted Fixed costs	5,00,000
Budgeted Profit	1,50,000

The Management is not happy with the budgeted profit as it is almost equal to the previous year's profit. Therefore, it asks the Committee to prepare a budget to earn at least a profit of Rs.3,00,000. To achieve the target profit, the Committee reports back with the following suggestions:

- The unit selling price should be raised to Rs.55.
- The sales volume should be increased by 5,000 units.
- To attain the above said increase in sales, the company should spend Rs.40,000 for advertising.
- The production time per unit should be reduced.
- To win the acceptance of the workers in this regard the hourly rate should be increased by Rs.3 besides an annual group bonus of Rs.30,000.
- There is no change in the amount and rates of other expenses. The company has sufficient production capacity.
- As the implementation of the above proposal needs the acceptance of the work force to increase the speed of work and to reduce the production time per unit, the Board wants to know the extent of reduction in per unit production time.

Required

(i) CALCULATE the target production time per unit and the time to be reduced per unit.
(ii) IDENTIFY the other problems that may arise in production due to decrease in unit production time and also suggest the remedial measures to be taken.
(iii) STATE the most suitable situation for the adoption of Target Costing

Answer:

WN 1: Statement showing target production time per unit:

Particulars	**Amount**
Target sales (55 x 30,000 units#)	16,50,000
Less: Target Profit	(3,00,000)

Target cost	**13,50,000**
Less: Fixed cost (5,00,000 + 40,000 + 30,000)	(5,70,000)
Target variable cost (A)	**7,80,000**
Number of units (B)	**30,000**
Target variable cost per unit	**26**
Less: Direct Material	(9)
Variable OH and Direct labour cost per unit	**17**
Hourly rate per labour for VOH and labour cost (3 + 2 + 3)	8
Time per unit (17/8)	**2.125 hours**
Time to be reduced per unit (3 – 2.125 hours)	**0.875 hours**

#Current sales volume (25,000 units) + 5,000 units

(ii) Problems:

- The target-costing method is **applicable particularly for repetitive manufacturing**. It should however be recognised that some products often bear a high degree of repetition and that there often are considerable repetitions where reduction targets could come into play as a framework for improving design.
- **Working under pressure to finish new design assignments in a short time** may take development resources away from efforts to optimise or re-engineer production processes.
- If approaching product design as an activity to be optimised independently there is a risk that target costing may not succeed to satisfactorily addressing overall performance, so in short **decrease in unit production time may lead to unwanted pressure on design and its implementation stage.**

Remedial Measures:

- As a remedial action **organisation should retain strong control over the design teams headed by a good team leader**. This person must have an exceptional knowledge of the design process, good interpersonal skills, and a commitment to staying within both time and cost budgets for a design project.
- If the **time is too short even an organisation may reject a project for the time being**. Later, it can be tried out with new cost reduction methods or less expensive materials to achieve target cost and control overall production activities

(iii) Most suitable situations for target costing:

- Target costing is most useful in situations **where the majority of product costs are locked in during the product design phase**. This is the case for most manufactured products, but few services.
- In the services area, such as consulting, the bulk of all activities can be reconfigured for cost reduction during the "production" phase, which is when services are being provided directly to the customer.
- In the services environment, the "design team" is still present but is more commonly concerned with streamlining the activities conducted by the employees providing the service, which can continue to be enhanced at any time, not just when the initial services process is being laid out

4. Case study on Target Costing [Category A]

Kaveri Ltd. (KL) is a manufacturer of bikes in India and it sells them in India and outside India. KL has just launched the World's smallest and most affordable bike called 'Zingaroo'. The bike is mounted with all-aluminium, single cylinder, air cooled, 99.2 cc engine. The engine makes just over 8 bhp power and 8 Nm of torque, but it stakes claim to be the fuel-efficient bike, with a claimed figure of 88 kmpl. It has been creating competition for two wheelers as none of the Indian companies as well as foreign companies, offer a bike for such a competitive price within the reach of middle class family.

KL has adopted target costing technique in manufacturing this bike. For KL, maintaining target-price was difficult. During the designing and production process of bike, input costs increased frequently. However, KL designed various components especially for bike to maintain the target price. Though, one curiosity how this can be done in the future when input costs are bound to increase further.

Many environmentalists have opposed the manufacture of this bike, because they believe that mass production of small bike (about 2.5 lakh bike every year) will create heavy pollution. Many people believe that this small bike is not up to the safety standards due to lightweight and use of aluminium and plastic frames. The design of this bike is entirely different from that of other bikes. This also causes a doubt that the existing bike mechanics would be able to repair or not. Durability of bike is another issue in the Indian environment. Further, performance of 'Zingaroo' more or less depends upon the condition of roads and traffic system.

After the launch of 'Zingaroo', many other national and international automobile companies are also planning to manufacture small bike which will create tough competition in near future.

Required

Now you being a strategic performance analyst of KL, answer the following questions:

(i) IDENTIFY strategy which KL has adopted for 'Zingaroo' bike?

(ii) After adopting target costing, IDENTIFY issues and challenges faced by KL and suggest the remedial action to be taken to solve these issues?

Answer:

Strategy adopted by KL:

- KL has adopted Low Cost Strategy for "Zingaroo" bike since the main purpose of manufacturing this bike was to make it cheapest and affordable.

Issues and challenges faced by KL:

Maintaining of Target Price

'Zingaroo' bike is one of the world's cheapest and smallest bike. Maintaining target-price proved to be a big challenge for the KL since input cost of bike are bound to increase further in future. **The initial value engineering may not uncover all possible cost savings. Thus, Kaizen Costing may be designed to repeat many of the value engineering steps for as long as a bike is produced, constantly refining the process and thereby stripping out extra costs.**

Environmental Issues

Many environmentalists have opposed the manufacture of bike as they believe that mass production of **small bikes will create heavy pollution** since automobile pollution is already a big problem for a country like India. For this issue, 'Zingaroo' bike can be prepared based on BS emission norms. These norms restrict the pollution created by any motor vehicle.

Safety Issues

Since 'Zingaroo' bike is made of aluminium and plastic frames so this may also create safety issues for the customers. **For such issues, KL should meet safety standards.** Further, KL should make people aware that 'Safety is Primary'/ 'Drive Safely'.

Servicing/ Repairing Facilities

The design of 'Zingaroo' bike is entirely different from that of other bikes. This causes a doubt that **the existing bike mechanics would be able to repair or not.** For such problem, creation of a good network of service center can be a solution i.e. repair center should be established on required places.

Durability

Durability of 'Zingaroo' bike is another issue in the Indian environment. **The performance of bike more or less depends upon the condition of roads and traffic system**. For such issues, tyre quality and hydraulic brake system should be compatible to the roads and traffic system.

Global Competition

After the launch of 'Zingaroo', **many other national and international automobile companies are also planning to manufacture a small bike, which will be a big challenge for the KL in the near future**. To face such competition, it may adopt Kaizen Costing technique. The cost reductions resulting from Kaizen Costing are much smaller than those achieved with Value Engineering but are still worth the effort since competitive pressures are likely to force down the price of 'Zingaroo' over time, and any

possible cost savings allow KL to still attain its targeted profit margins while continuing to reduce cost.

5. Target costing and value chain [Category B]

PBB is a toy manufacturer and retailer. PBB sells toys to consumers through its large network of retail outlets in its home country and via the company's website. PBB purchases the materials and components that it needs to manufacture toys from a number of different suppliers. All of the purchases are delivered to PBB's raw material store at its factory and are held there until they are needed for production. Finished toys are transported from the factory to PBB's retail outlets by PBB's fleet of vehicles. The vehicles follow the same schedule each week irrespective of the load they are carrying. Finished toys that are destined for sale via the company's website are transported to PBB's distribution centre. PBB has recently won the contract to manufacture and sell a new toy. The new toy, Toy Z, is a doll based on a character from a very popular international children's film. PBB is free to set the selling price of Toy Z as it sees fit, but must pay a royalty fee of 15% of the selling price to the film company. PBB intends to sell Toy Z through its network of retail outlets. PBB plans to adopt a target costing approach for Toy Z. Market research has determined that the selling price will be $25 per Toy Z. PBB requires a profit margin of 25% of the selling price of Toy Z.

The forecast costs per Toy Z are:

Component A	2.15
Component B	1.75
Other materials	see note below for additional information
Labour (0.4 hours at $15 per hour)	6.00
Product-specific production overhead cost	1.89
Product-specific selling and distribution cost	2.38

Note: Each Toy Z requires 0.6kg of 'other materials'. These 'other materials' are purchased from a supplier at a cost of $4 per kg and 4% of all materials purchased are found to be substandard.

Required:

(a) **Calculate** the cost gap that exists between the forecast total cost per unit and the target cost per unit of Toy Z.

(b) **Discuss** how PBB could reduce costs in THREE primary activities in its value chain.

Answer:

(a)

WN 1: Computation of forecast cost per unit:

Particulars	Amount
Component A	2.15
Component B	1.75
Materials (0.6/0.96 x 4)	2.50
Labour (0.4 hours at $15 per hour)	6.00
Production overhead cost	1.89
Distribution and sales cost	2.38
Royalty fee (25 x 15%)	3.75
Forecast cost	**20.42**

WN 2: Computation of target cost:

Particulars	Amount
Sales Price	25.00
25% profit margin	6.25
Target cost	**18.75**

Cost gap = Forecast cost – Target cost = 20.42 – 18.75 = $ 1.67

(b)

Inbound logistics

The receipt and storage of components and materials from suppliers are Inbound Logistics activities in PBB's value chain. PBB currently purchases components and materials from a number of suppliers and stores these in a raw materials store. **Switching to a just-in-time (JIT) system of purchasing could potentially save significant storage costs**. The JIT supplier must take the responsibility for the quality of

products supplied, This could also potentially provide a source of savings as substandard items are removed. However, this should be contrasted with the premium PBB may expect to pay to a supplier that is willing to establish the close relationship required for JIT purchasing to work.

Outbound logistics

Scheduled deliveries of toys to retail outlets are outbound logistics activities at PBB. **The scheduled transportation of toys each week is potentially an inefficient method of providing products to retail outlets**. The scheduled deliveries do not take into consideration toy requirements at retail outlets thus PBB is potentially delivering to retail outlets that do not require toys and incurring excessive transportation costs. **An ERP system is likely to deliver longer term efficiencies at PBB.**

Marketing and sales

At PBB, this includes the sale of Toy Z through its network of retail outlets. **Cost could potentially be reduced by offering the toy for sale via the PBB website**. As well as cost savings this could potentially deliver higher revenues. The internet sales channel could potentially attract international customers to the merchandise from the international hit children's film.

Part III – Life Cycle Costing

6. Suitability of Life Cycle Costing [Category B]

Meena is a news reporter and feature writer for an economic daily. Her assignment is to develop a feature article on 'Product Life-cycle Costing', including interviews with the Chief Financial Officers (CFO) and operating managers. Meena has been given a liberal budget for travel so as to research into company's history, operations, and market analysis for the firm she selects for the article. Meena has asked you to recommend industries and firms that would be good candidates for the article. What would you advice? Explain your recommendations.

Answer:

The product life cycle span the time from the initial R & D on a product to when customer service and support is no longer offered for that product. Life Cycle Costing technique is particularly important when:

- **High percentage of total life-cycle costs are incurred** before production begins and revenue are earned over several years and
- **High fraction of the life cycle costs are locked in at the R & D and design stages.**

Meena should identify those industries and then companies belonging to those industries where above mentioned feature are prevalent. **For example, Automobile and Pharmaceutical Industries companies like Tata Motors Ltd., Ranbaxy Laboratories Ltd., and Dabur India Ltd. will be good candidates for study on product life cycle costing.**

7. Product life-cycle profit statement [Category A – November 2018 RTP]

P & G International Ltd. (PGIL) has developed a new product 'α'which is about to be launched into the market. Company has spent Rs. 30,00,000 on R&D of product ' α '. It has also bought a machine to produce the product 'α ' costing Rs. 11,25,000 with a capacity of producing 1,100 units per week. Machine has no residual value. The company has decided to charge price that will change with the cumulative numbers of units sold:

Cumulative Sales (Units)	Selling Price Per Unit
0 to 2200	750
2201 to 7700	600
7701 to 15950	525
15951 to 59950	450
59951 and above	300

Based on these selling prices it is expected that sales demand will be as shown below:

Weeks	Sales Demand Per Week (units)
1-10	220
11-20	550
21-30	825
31-70	1,100

71-80	880
81-90	660
91-100	440
101-110	220
Thereafter	Nil

Unit variable costs are expected to be as follows:

	Rs. Per unit
First 2,200 units	375
Next 13,750 units	300
Next 22,000 units	225
Next 22,000 units	188
Thereafter	225

PGIL uses just-in-time production system. Following is the total contribution statement of the product ' α ' for its Introduction and Growth phase:

	Introduction	Growth	
Weeks	1-10	11-30	
Number of units produced and sold	2,200	5,500	8,250
Selling price per unit	750	600	525
Variable cost per unit	375	300	300
Contribution per unit	375	300	225
Total contribution	8,25,000	16,50,000	18,56,250

- Prepare the total contribution statement for each of the remaining two phases of the product's life cycle.
- Discuss Pricing Strategy of the product 'α'
- Find possible reasons for the changes in cost during the life cycle of the product 'α'

Answer:

WN 1: Total contribution statement for remaining two phases:

	Maturity		Decline
Weeks	31-50	51-70	71-110
Number of units produced and sold	22,000	22,000	22,000
Selling price per unit	450	450	300
Variable cost per unit	225	188	225
Contribution per unit	225	262	75
Total contribution	**49,50,000**	**57,64,000**	**16,50,000**

WN 2: Pricing strategy for Product α:

- **PGIL is following the skimming price strategy that's why it has planned to launch the product α initially with high price tag.**
- A skimming strategy may be recommended when a firm has incurred large sums of money on research and development for a new product.
- In the problem, PGIL has incurred a huge amount on research and development. Also, it is very difficult to start with a low price and then raise the price. Raising a low price may annoy potential customers.
- **Price of the product α is decreasing gradually stage by stage. This is happening because PGIL wants to tap the mass market by lowering the price**

WN 3: Possible Reasons for the changes in cost during the life cycle of the product:

Product life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their entire life cycle. Possible reasons for the changes in cost during the life cycle of the product are as follows:

- PGIL is expecting reduction in unit cost of the product α over **the life of product as a consequence of economies of scale and learning / experience curves.**
- Learning effect may be the possible reason for reduction in per unit cost if the process is labour intensive. When a new product or process is started, performance of worker is not at its best and learning phenomenon takes place. As the experience is gained, the performance of worker

improves, time taken per unit reduces and thus his productivity goes up. The amount of improvement or experience gained is reflected in a decrease in cost.

- Till the stage of maturity, PGIL is in the expansion mode. The PGIL may be able to take advantages of quantity discount offered by suppliers or may negotiate the price with suppliers.
- Product α has the least variable cost Rs.188 in last phase of maturity stage; this is because a product which is in the mature stage may require less marketing support than a product which is in the growth stage so, there is a saving of marketing cost per unit.
- Again the cost per unit of the product α jumps to Rs.225 in decline stage. As soon as the product reaches its decline stage, the need or demand for the product disappear and quantity discount may not be available. Even PGIL may have to incur heavy marketing expenses for stock clearance.

8. Product Life Cycle [Category A]

PQ manufactures and sells consumer electronics. It is constantly working to design the latest gadgets and "must-haves" which are unique in the market place at the time they are launched. The management of PQ are aware of the short product life cycles in this competitive market and consequently use a market skimming pricing strategy at the introduction stage.

Explain the changes that are likely to occur in the following items at the three later stages in the product life cycle of a typical PQ product.

- Selling price
- Production costs
- Selling and marketing costs

Answer:

Selling price changes

- It is likely that throughout the growth, maturity & decline phases there will be a gradual reduction in the selling price of the product, but the reasons for the reductions are different for each phase.
- **In the growth phase, PQ will be aware that their competitors may have purchased the product during its introduction phase and may have reverse engineered it and perhaps produced a competitive product**. Therefore PQ will be keen to try and keep the competition from entering the market by making the item less profitable. Secondly, in order for PQ's product to be demanded by a greater number of consumers the price will have to be reduced.
- **In the maturity phase, the price will be reduced further to encourage further sales while a replacement product is being finalised** and introduced to the market so that PQ continues to receive cash inflows to support its continued product development.
- **In the decline phase, PQ will reduce the price still further as by now its replacement will have been introduced to the market** and PQ is therefore attempting to clear its inventory of any remaining units of the old product.

Production cost changes

- **During the growth phase** it is likely that there will be reductions in the unit production costs due **to economies of scale and the application of the learning and experience curve** to the greater volumes until a post learning position is achieved.
- **In the maturity phase there is unlikely to be significant further reductions in unit production costs.**
- In the decline phase, PQ will wish to minimise its expenditure so that it can derive as much profit as possible from the final sales of the product, but **its production costs may increase due to possible machine breakdowns and inefficiencies.**

Selling and marketing cost changes

- **During the growth phase it is likely that there will be significant selling and marketing cost** as the product is sold to a more general audience compared to the introduction phase when sales were made to a smaller targeted group of consumers.
- **In the maturity phase, selling and marketing costs can be reduced as the product is established and is selling itself by word of mouth and reputation.**
- In the decline phase, selling and marketing costs will be cut since production will cease during this period.

9. Case study on life cycle costing [Category A – November 2018 (exam)]

JFE, is following Life Cycle Costing. Its four products P4, P3, P2 and P1 are in the market respectively in Introduction, Growth, Maturity, and Decline stages (phases). The Management wants to analyse the

marketing challenges faced by the products to take strategical measures to stabilise the products in the market. For this purpose, the Board directed the Secretary to get a product-wise report from the marketing chief of each product. The chiefs were asked to give one characteristic possessed by the product because of which the product is being classified in the respective stage and two strategical measures to be taken to overcome the market challenges faced at that stage (phase). The Secretary received the report from all the chiefs and handed them over to the computer operator to get it printed in a tabulated form. But the operator, without understanding the significance of the products, phases, characteristics, and strategies, mixed all the twelve items [(1 + 2) × 4] and got it printed as a list as given below:

(1) Over capacity in the industry.
(2) The company can continue to offer the product to our loyal customers at a reduced price.
(3) Few competitors produce basic version of our product.
(4) Product features may be improved or enhanced to differentiate our product from that of the competitors.
(5) Attracting customers by raising awareness about our product through promotion activities.
(6) High volume of business and increase in competition.
(7) Use the present product as replacement product for launching another new product successfully in the market.
(8) Value-based pricing strategies may be considered.
(9) Profits start declining and at times become negative.
(10) Maintain control over product quality to assure customer satisfaction.
(11) Strengthening or expanding channel and supply chain relationships.
(12) Prices may have to be reduced to attract the price-sensitive customers.

The items are required to be tabulated as in the format given below:

Required

(i) Complete the table given below by entering the twelve items under appropriate category columns. You need not rewrite the items. Write the serial numbers of the items only in columns (3) and (4).

Products (1)	Phases (stages) (2)	Characteristics (3)	Strategies (4)
P4	Introduction		
P3	Growth		
P2	Maturity		
P1	Decline		

(ii) List down the importance (any four) of Product Life Cycle Costing.
(iii) State the benefits (any four) of Product Life-Cycle Costing.

Answer:

(i) Statement Showing Product Life Cycle Characteristics and Strategies

Products (1)	**Phases (Stages) (2)**	**Characteristics (3)**	**Strategies (4)**
P4	Introduction	(3)	(5), (11)
P3	Growth	(6)	(10), (8)
P2	Maturity	(1)	(4), (12)
P1	Decline	(9)	(2), (7)

(ii) Importance of Product Life Cycle (PLC) Costing

- **As a Planning tool**, it characterizes the marketing challenges in each stage and poses major alternative strategies, i.e. application of Kaizen.
- **As a Control tool**, the PLC concept allows the company to measure product performance against similar products launched in the past.
- **As a Forecasting tool**, it is very important because sales histories exhibit diverse patterns and the stages vary in duration.
- It leads to **appropriate strategy formulation** depending on the stages of the product life cycle.

(iii) Benefits of Product Life Cycle Costing:

The benefits of product life cycle costing are summarized as follows:

- The product life cycle costing **results in earlier actions to generate revenue or to lower costs than otherwise might be considered**. There are a number of factors that need to the managed in order to maximize return on a product.

- **Better decisions** should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.
- Product life cycle **thinking can promote long-term rewarding in contrast to short-term profitability rewarding.**
- It provides an overall framework **for considering total incremental costs over the entire life span of a product,** which in turn facilitates analysis of parts of the whole where cost effectiveness might be improved.
- It is an **approach used to provide a long-term picture of product line profitability**, feedback on the effectiveness of life cycle planning and cost data to clarify the economic impact of alternatives chosen in the design, engineering phase etc.
- It is **also considered as a way to enhance the control of manufacturing costs**. The thrust of product life cycle costing is on the distribution of costs among categories changes over the life of the product, as does the potential profitability of a product. Hence it is important to track and measure costs during each stage of a product's life cycle.
- **Product life cycle costing traces research and design and development costs etc., incurred to individual products over their entire life cycles**, so that the total magnitude of these costs for each individual product can be reported and compared with product revenues generated in later periods.

Part IV – Pareto Analysis

10. Pareto analysis [Category B – May 2017 (exam)]

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 types	No of items
Cracks (due to mishandling of raw material)	10
Improper shapes	8
Incomplete	8
Surface scratches	53
Other (due to bad quality raw material)	5

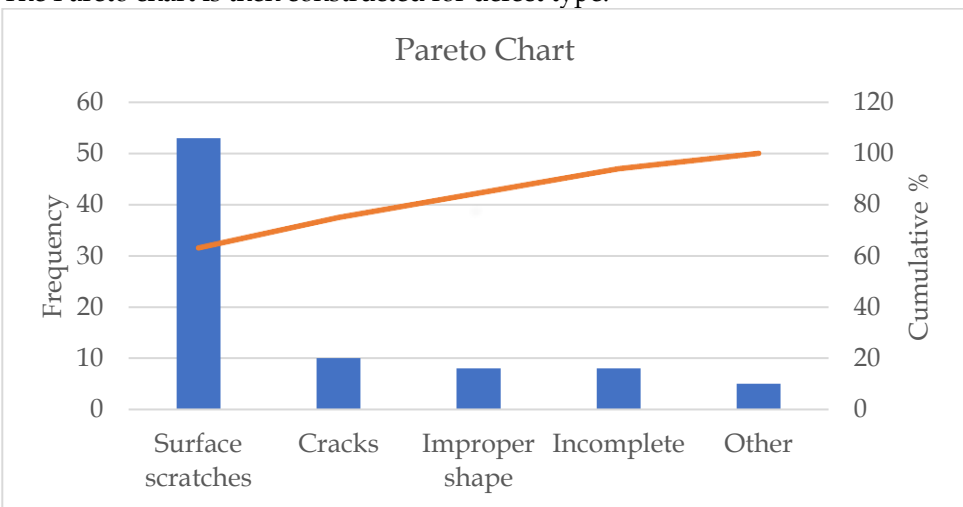
Construct a Pareto chart

Answer:

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	63.0952	63.0952
Cracks	10	11.9048	75.0000
Improper shape	8	9.5238	84.5238
Incomplete	8	9.5238	94.0476
Other	5	5.9524	100.00

The Pareto chart is then constructed for defect type.



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.

11. Pareto Analysis (Category A – May 2019 (exam):

The information given below pertains to ABC Enterprises, a specialized car garage door installation company. ABC Enterprises use to get multiple service calls from the customers with variety of requirements. They may have to Install, Replace, Adjust or Lubricate some part or other to make the door functional. They work with 5 parts as given in the table, namely Door, Motor, Track, Trimmer and T -Lock.

S.No	Parts	Type of Service				Total
		Install	Replace	Adjust	Lube	
1	Door	2	5	1	0	8
2	Motor	3	2	16	9	30
3	Track	5	0	6	6	17
4	Trimmer	14	6	0	0	20
5	T-Lock	5	0	1	0	6
6	Miscellaneous	0	2	1	1	4
	Total	**29**	**15**	**25**	**16**	**85**

Required

(i) Using the above data, carry out a Pareto Analysis (80/20 rule) of Total Parts.

(ii) Using the same data carry out the second level Pareto Analysis on the type of services with respect to Motors only.

(iii) Give your RECOMMENDATIONS on the basis of your calculations in (i) and (ii) above. (Do calculations to two decimals only)

(iv) STATE the business situations in which you recommend to apply Pareto Analysis.

Answer:

(i) Statement showing Pareto Analysis of total parts:

Parts	No. of items	% of total items	Cumulative Total
Motor	30	35.29	35.29%
Trimmer	20	23.53	58.82%
Track	17	20.00	78.82%
Door	8	9.41	88.23%
T-Lock	6	7.06	95.29%
Miscellaneous	4	4.71	100.00%

(ii) Statement showing Pareto Analysis of Type of Service (Motor):

Parts	No. of items	% of total items	Cumulative Total
Adjust	16	53.33	53.33%
Lube	9	30.00	83.33%
Install	3	10.00	93.33%

(iii) **Pareto Analysis is a rule that recommends focus on most important aspects of the decision making in order to simplify the process of decision making**. The very purpose of this analysis is to direct attention and efforts of management to the product area where best returns can be achieved by taking appropriate actions.

Pareto Analysis is based on the 80/20 rule which implies that 20% of the products account for 80% of the revenue. But this is not the fixed percentage rule. In general business sense, it means that a few of the products, goods or customers may make up most of the value for the firm.

The present case stands in a difference to 80/20 rule. Because the company installs doors, they sometimes have multiple service calls to install each door piece by piece. **They may have to install, replace, adjust, or lubricate some part to get the door working properly**. They work with five main parts: door, motor, track, trimmer and tlock. **The service calls with reference to motors are heavy and accounted for as much as 35.29% of the number of calls attended. Motor together with trimmer accounted for 58.82%. So, these two parts are to be considered as key parts and ABC enterprises must be ever ready to cater to all provisional requirements for attending these classes without any inordinate delay**. Any delay in service

these calls is likely to damage its service rendering reputation within a very short span of time. Further, the second level Pareto Analysis on motors has revealed a particular reference to the service problems related to motors. **Adjustments and Lubrication issues cover up 83.33% of the total service problems exclusively connected to Motors.** So, ABC Enterprise must direct its best efforts and develop specific expertise to solve these problems in the best interest of the customers

(iv) Applicability of Pareto Analysis:

Pricing of a Product: In the case of a firm dealing with multi products, it would not be possible for it to analyse cost-profit- price -volume relationships for all of them. Pareto Analysis is used for analysing the firm's estimated sales revenues from various products and it might indicate that approximately 80% of its total sales revenue is earned from about 20% of its products.

Customer Profitability Analysis: Instead of analysing products, customers can be analysed for their relative profitability to the organisation. There will always be some customers who are less profitable than others, just as some products are less profitable than others. Such an analysis is useful tool for evaluation of the portfolio of customer profile and decision making such as whether to continue serving a same customer group, what is the extent of promotion expenses to be incurred.

ABC Analysis- Stock Control: In practice, approximately 20% of the total quantity of stock may account for about 80% of its value. The outcome of such analysis is that by concentrating on small proportion of stock items that jointly accounts for 80% of the total value, a firm may well be able to control most of monetary investment in stocks.

Application in Activity Based Costing: In Activity Based Costing it is often said that 20% of an organisation cost drivers are responsible for 80% of the total cost. By analysing, monitoring and controlling those cost drivers that cause most cost, a better control and understanding of overheads will be obtained.

Quality Control: Pareto analysis seeks to discover from an analysis of defect report or customer complaints which "vital few" causes are responsible for most of the reported problems. Often, 80% of reported problems can usually be traced to 20% of the various underlying causes. By concentrating one's efforts on rectifying the vital 20%, one can have the greatest immediate impact on product quality.

Part V – Environmental Management Accounting

12. Case Study on Environmental Management Accounting [Category A]

Shandaar Bangle Ltd (SBL) have been recognized as a manufacturers and exporters of high quality Bangles, designed and manufactured using optimum quality raw material, sourced from trustworthy vendors of the market.

Manufacturing Process

The process of manufacture of glass bangles is highly skilled labour oriented one comprising of the following main operations:

Glass Melting Phase – Parison Making Phase – Spiral/Coil Making Phase

In first phase, glass batch materials like sand, soda ash, lime stone feldspar, borax etc. with other additives and colouring materials in a suitable proportion are mixed manually and fed into the pot places in pot furnace. The raw material is melted in the furnace at a temperature of about 1300 – 1400 (°C) to obtain molten glass.

In second phase, molten glass is drawn from the pot of the furnace with the help of the iron pipe and formed into gob to gather required quantity of glass for formation into parisons on iron plates. The parisons of different colours are joined together and reheated in an auxiliary furnace to obtain required designs.

In third phase, the reheated parison is then transferred to 'Belan Furnace' from which the glass is further drawn into spiral/ coil of bangles on the spindle counted and rotated manually at uniform rate of revaluation synchronizing with the manually at the other end of the furnace. Spiral are then taken out from the spindle and cut with the help of a pencil cutter to separate out the single pieces of bangles from spiral. These cut or un-joined bangles are then sent for joining of end, finishing cutting & polishing, decoration etc. The finished products are then neatly packed for sale.

Environmental Impact

But unfortunately, these processes have environmental impact at all stages of the process, including emissions of airborne pollution in the form of ashes, gases, noise and vibration.

Conditions of the Workplace
Due to limitations of maintaining appropriate temperature for melting and moulding of the glass, furnaces are kept burning. Therefore, workers have to work with such working conditions continuously without proper leisure time. The above-mentioned factors become more harmful while working in immense heat and sound which is normally higher than permissible levels.

Health Impact
A recent study has revealed adverse impact of pollution over workers and people who are living in nearby area.

Management Initiatives
The management of company is worried about environmental impact and health impact and has taken certain initiatives in taking care of environment like- batch house cyclonic dust collector, noise absorbing device, natural gas fired furnace, better refractory materials, training for waste minimization, treatment of solid waste, research and development activities aimed at reducing pollution level, planting trees, treatment of nitrogen oxide and other harmful gases.

Required
Management desires to adopt environmental management accounting as a part of strategic decision making process.

- EXPLAIN the requirement to have environmental management accounting and IDENTIFY the SBL's environmental prevention, appraisal, and failure costs.
- ANALYZE the appropriateness of SBL incorporating the following in implementing Environmental Management Accounting:
  - Activity Based Costing
  - Life Cycle Costing
  - Input Output Analysis
- EXPLAIN the need of non-financial consideration in decision making and suggest safety measures that can be taken into consideration for workers.

Answer:
Environmental management accounting (EMA) is the generation and analysis of both financial and non-financial information in order to support internal environmental management processes i.e. identification, prioritization, quantification and recording of environmental cost into business decision.
By adopting EMA, SBL will have following benefits:

- Product Pricing.
- Budgeting.
- Investment Appraisal.
- Calculating Investing Options.
- Designing, Calculating Costs, Savings and Benefits of Environment Projects.
- Setting Quantified Performance Targets.
- Assessment of Annual Environmental Costs.
- Environmental Performance Evaluation, Indicators and Benchmarking.
- External Reporting- Disclosure of Environmental Expenditures, Investments and Liabilities.

Environmental Costs of SBL

- **Environmental Prevention Cost:** These costs are basically incurred in relation to activities undertaken to prevent the production of waste that could harm the environment. Company's efforts to minimize the effect of its activities on the environment like installing batch house cyclonic dust collector, natural gas fired furnace, better refractory materials, training for waste minimization, research and development activities, noise absorbing device and planting trees can be classified as Environmental Preventive Cost.
- **Environmental Appraisal Costs:** It means costs incurred in relation to activities undertaken to determine whether product processes and other activities within firm are complying with environment standards. SBL may perform 'Contamination Test' to observe the environment compatibility of its processes can be categorized under environmental appraisal cost.

- **Environmental Failure Cost:** It means cost incurred in relation to activities dealing with pollution arising from the activities of entity includes costs related to treatment harmful gases and treatment of solid waste.

Appropriateness of Techniques for Identification and Allocation

Activity Based Costing

This costing technique would help the SBL to separate environmental costs from the general overheads and allocate them to glass bangles by identifying appropriate drivers of these environmental cost. Possible environment activities for environmental costs and their drivers are:

Activity	Cost Drivers
Planting of trees	Number of trees planted
Treatment of nitrogen oxide	Volume of nitrogen oxide treated
Solid waste removal	Volume of such waste
Research and development activities	Man hours worked

Life Cycle Costing

By using this costing in EMA, SBL would be able to identify, record and control the environmental costs relating to various stages in the life of glass bangles. At each of following stage environmental cost would be incurred:

- In raw material stage, some natural product would be purchased.
- In manufacturing stage, emission and treatment of nitrogen oxide & other gases and treatment of solid waste.
- In marketing and distribution stage, environmental cost relating to transportation of glass bangles to various customers.

Input /Output Analysis

- Here detail analysis of input and output of a system is done for the purpose of assessment of ecological wellbeing of entity's products, processes and other activities. This technique is based on the fact that whatever goes into the system has to come out of it.
- **In case of SBL, it can evaluate the volume of sand, soda ash, lime stone feldspar, borax etc. and the resulting volume of output i.e. glass bangles. Through such evaluation, the SBL would be able to allocate and analyses environmental cost attributable to input and output of glass bangles.**

Non-Financial Considerations

- Entities generally give emphasis on financial measures such as earnings and accounting returns but little emphasis on drivers of value such as customer and employee satisfaction, innovation and quality. Due to which mostly companies could not continue in long term. So for the purpose of achieving long-term organizational strategies, non-financial consideration should be taken into account. Without this it may be that company achieve short term goal but would be difficult to achieve long term goal.
- **In SBL, it can be clearly seen that there is great impact on health of workers. By creating a safe and healthy environment for employees, SBL can improve productivity, business performance, staff morale and employee engagement. Further, SBL will also be able to reduce – accidents/ work related ill health/ sick pay costs as well as insurance costs. A healthy workforce can demonstrate corporate responsibility.**
- If SBL look after employees, business is likely to have a more positive public image.
- To create safe and healthy environment following measures can be taken into consideration:
  - Safety monitoring system.
  - Workers must be trained.
  - Recruitment of more workers.
  - First aid kit should be available.
  - Protective glasses, clothes, gloves should be provided.
  - Regular health check-up camps and awareness programs.

13. Profitability statement under Environmental Management Accounting [Category A – Nov 2018 (exam)]

A fertilizer company produces Grade A and Grade B fertilizers. One kilogram of Grade A fertilizer sells for Rs.280 per kilogram and one kilogram of Grade B fertilizer sells for Rs.400 per kilogram.

The products pass through three cost centers CC1, CC2 and CC3 during the manufacturing process. Total direct material cost per kilogram of fertilizer produced is Rs.300 and direct labor cost per kilogram of fertilizer produced is Rs.200. Allocation between the cost centres is given below:

Particulars	**CC1**	**CC2**	**CC3**
Cost of Direct Material (Per Kg. of fertilizer produced)	90	120	90
Cost of Direct Labour (Per Kg. of fertilizer produced)	60	80	60
Cost allocation to Grade A	30%	50%	30%
Cost allocation to Grade B	70%	50%	70%

All of expenses (considered to be overheads) per kilogram of fertilizer produced is Rs.150. This is allocated equally between Grade A and Grade B fertilizer. Pricing decisions for the fertilizers is made based on the above cost allocation.

The management accountant of the company has recently come across the concept of environmental management accounting. Pricing of products should also factor in the environmental cost generated by each product. An analysis of the overhead expenses revealed that the total cost of Rs.150 per kilogram of fertilizer produced, includes incinerator costs of Rs.90 per kilogram of fertilizer produced. The incinerator is used to dispose the solid waste produced during the manufacturing process. Below is the cost center and product wise information of solid waste produced

Particulars	**CC1**	**CC2**	**CC3**
Grade A	2	3	1
Grade B	2	2	5

Based in the impact that each product has on the environment, the management would like to revise the cost allocation to products based taking into account the incinerator cost that each product generates. The remaining overhead expenses of Rs.60 per kilogram of fertilizer produced can be allocated equally.

Required

(i) CALCULATE product wise profitability based on the original cost allocation. RECALCULATE the product wise profitability based on activity based costing methodology (environmental management accounting).

(ii) ANALYZE difference in product profitability as per both the methods.

(iii) RECOMMEND key takeaways for the company to undertake the above analysis of overhead costs and pricing as per environmental management accounting.

Author's Note: Students are advised to refer Activity Based Costing in Chapter 10 before going through this question

Answer:

WN 1: Product Wise Profitability as per Original Allocation Methodology

(Figures in Rs. per kilogram of fertilizer produced)

Particulars	**Grade A**	**Grade B**	**Total**
Selling Price	280	400	680
Direct Material (Table 1)	114	186	300
Direct Labour (Table 1)	76	124	200
Overheads (allocated equally)	75	75	150
Total expenses	**265**	**385**	**650**
Profit	**15**	**15**	**30**
Profitability	**5.36%**	**3.75%**	**X**

Table 1 Allocation of Direct Materials and Labour as per Cost Centre and Product

Particulars	**CC1**			**CC2**			**CC3**			**Total for company**		
	A	**B**	**CC TOTAL**	**A**	**B**	**CC TOTAL**	**A**	**B**	**CC TOTAL**	**GR.A**	**GR.B**	**TOTAL**
Direct Material	27	63	90	60	60	120	27	63	90	114	186	300

Direct Labour	18	42	60	40	40	80	18	42	60	76	124	200

Product Wise Profitability (activity based costing using environmental management accounting) requires the following steps:

- Overhead expenses of Rs. 150 per kilogram of fertilizer produced be first bifurcated into incinerator costs and other overhead costs.
- Incinerator costs of Rs. 90 per kilogram of fertilizer needs to be allocated first to the cost centres. This is done based on the waste generated at each cost centre. The individual cost allocated to each cost centre is again allocated to products based on the waste generated at each cost centre by each product. Refer part a of table 2 for detailed calculations.
- As mentioned in the problem, other overhead costs are allocated to each product at each cost centre level equally. Refer part b of table 2 for detailed calculations.
- The above allocations to each product at a cost centre level is then summed up to get the product wise overhead cost allocation. Refer part c of table 2 for detailed calculations.

Accordingly, the Revised Product Profitability would be as follows:

(Figures in Rs. per kilogram of fertilizer produced)

Particulars	**Grade A**	**Grade B**	**Total**
Selling Price	280	400	680
Direct Material (Table 1)	114	186	300
Direct Labour (Table 1)	76	124	200
Overheads (refer Table 2)	66	84	150
Profit	**24**	**6**	**30**
Profitability	**8.57%**	**1.50%**	**X**

Table 2 Allocation of Overhead Expenses to each Cost Centre and Product

(Figures in Rs. per kilogram of fertilizer produced)

Product Waste Produced (in tonnes per annum)	**CC1**	**CC2**	**CC3**	**Total**
Grade A	2	3	1	6
Grade B	2	2	5	9
Total waste (in tonnes)	4	5	6	15
Incinerator Cost Allocated to Cost Centres (based on waste generated)	24	30	36	90
Other Overhead Expenses	20	20	20	60
Total Cost Centre Wise Overhead Cost	**44**	**50**	**56**	**150**
Part A: Allocation of Incinerator Cost from Cost Centre to each product (based on waste produced at each cost centre by each product)				
Product	**CC1**	**CC2**	**CC3**	**Total**
Grade A	12	18	6	36
Grade B	12	12	30	54
Total Incinerator Cost	**24**	**30**	**36**	**90**
Part B: Allocation of Other Overhead Cost from Cost Centre to each product				
Product	**CC1**	**CC2**	**CC3**	**Total**
Grade A	10	10	10	30
Grade B	10	10	10	30
Total Overhead Cost	**20**	**20**	**20**	**60**
Part C: Total Overhead Cost (Cost Centre and Product Wise i.e. part a + b)				
Product	**CC1**	**CC2**	**CC3**	**Total**
Grade A	22	28	16	66
Grade B	22	22	40	84
Total overhead cost	**44**	**50**	**56**	**150**

Summarizing Product Profitability as per both methods:

Product	**(Profit in Rs. per kg of fertilizer produced)**		**Profit %**	
Grade A	15	24	5.36%	8.57%
Grade B	15	6	3.75%	1.50%

(ii) As summarized above, originally the profit generated from Grade A and Grade B products, was Rs.15 per kilogram. Grade A was the more profitable product giving return of 5.36% compared to Grade B's return of 3.75%. This has been calculated by allocating overheads equally to Grade A and B.

During the year, 15 tons of waste is produced during the manufacturing process. Grade B fertilizer produces more waste that accounts for 60% of the waste. Therefore, Grade B should bear higher amount of the incinerator cost compared to Grade A. Allocation based on this premise, dramatically changes the profitability of the products. As calculated above, Grade A fertilizer, due to lower incinerator cost allocation, generates a profit of Rs.24 per kilogram of fertilizer. Grade B's profits accordingly are lower, since the product generates more waste and has to bear a larger share of clean-up expenses. Profitability of Grade A increases to 8.57% while Grade B falls dramatically to 1.50%

(iii) The company can draw a number of conclusions from this analysis of overhead costs as per environmental management accounting. This analysis has helped the company reach the conclusion that Grade B fertilizer produces more waste. The company could adopt either of the following approaches:

(a) **To maintain the same level of profitability, the company can increase the price of Grade B by another Rs.9 per kilogram.** This is a 2.25% increase in the sale price of Grade B fertilizer. Depending on the market for this grade of fertilizer, the company has to decide whether to increase the price of the product. While a price increase may be possible if the company has a strong market hold, it might be difficult if competition in the market is high. or

(b) The other approach, **a more sustainable approach that is the aim of environmental management accounting, would be to reduce the waste produced in the manufacturing process**. This analysis, has quantified the waste generated in the process. Better manufacturing techniques, could save the company incinerator costs, that would yield better profits for the company.

14. Environmental Management Accounting (Category B – May 2019 (exam):

(a) Following three independent situations pertaining to environmental management and sustainability are provided to you:

Situation 1:

Recagon Limited is a chemical company which uses chloro-fluorocarbons (CFC) in the production of chemical. As awareness of the environmental damage caused by CFC spread, Recagon Limited stopped using CFC in its production processes and analyzed and redesigned its product range much before the legislation controlling use of CFC introduced by the Government

Situation 2:

Energy drink manufacturer ABC Limited was ordered to pay Rs.25,00,000 in fines and costs for breaking recycling laws. It was penalized for not informing the appropriate authority that it was a producer of packaging waste, and for not recovering and recycling their packaging

Situation 3:

Electrical Limited has achieved a 25% reduction of energy consumption through its "Go Renewable" initiative. For the company a 25% reduction represents a cost saving of about Rs.30,00,000

Required [Read the above three situations and Answer any 2 items from (i), (ii) and (iii) below]

i. Discuss why Recagon Limited stopped using CFC and redesigned its product range much before legislation introduced by the Government (5 Marks)
ii. Evaluate the risk exposure of ABC Limited associated with the order to pay a fine to the Government (5 Marks)
iii. Explain how focussing on environmental sustainability provides opportunity to Electrical Limited for reducing costs (5 Marks)

Answer:

Part 1:

- Ever increasing and demanding environmental regulation is forcing companies to change their practices. **In many countries, numerous pieces of legislation cover areas such as air quality, climate change, hazardous substances, packaging, waste, and water quality.**
- The trend is very much in the **direction of increased and more stringent legislation**. Environment sustainability is not an issue that can be avoided by any organisation.
- Organisations need to consider **how environmental regulation will impact their operations** and the cost of doing business.
- By stopping the use of CFC much before the legislation, Wasco Limited gained advantages over its rivals. **Wasco's actions were integral to its own strategic success, and instrumental in driving through the subsequent legislation from which the company later benefited.**

Part 2:

- **Organizations increasingly have to demonstrate that they are managing all of their risks systematically and responsibly**. This includes environmental risks- risks that are a result of impacts of the organization on the environment. By assessing the environmental risks associated with their activities, processes, product, and services, organizations can identify their potential legal and business exposure. **Non-compliances can cause enormous financial impacts, such as fines, penalties, legal costs, and damages.**
- Thus, Cool Ltd is exposed to environmental risks.

Part 3:

- **Focusing on environmental sustainability will often provide opportunities for reducing costs**. For example, reducing carbon impacts often also saves energy costs. Similarly, programmes for reducing wastes improve environmental performance and reduce operating costs.
- **Reducing environmental impacts can also reduce or eliminate associated tax, levies, and other compliance costs.**
- Focusing on environmental sustainability thereby making investments in developing clean technologies and more energy-efficient products and processes will not only save the organization money, but could also be patented and/ or sold to other organizations, providing an additional source of income. **KOA Limited may have carbon credit for efficiency in reducing energy and sell on the open market, thereby actually generating revenue**

Chapter 5 – Cost Management for Specific Sector

Power Sector:

- Thermal Power Plants are one of the main sources of electricity in India. The **variation in the thermal power stations is due to the different fuel sources** (coal, natural gas, naptha, etc.). Apart from thermal power plants, **there are other types of energy resources being used to generate electricity**.
- The various types of energy sources include **hydro- electricity, solar power, wind power, nuclear power, etc.**

Key Risks in the Sector

Highly Capital Intensive	✓ Power sector is a highly capital intensive business with long gestation periods before commencement of revenue streams (construction periods of 7-8 years) and an even longer operating period (over 25 years).
Coal Supply Position	✓ More than 50 percent of India's generation capacity is coal based. ✓ The shortage of coal is so acute that most of the power generation companies are looking at imported coal as a viable alternative to domestic coal.
Electricity Distribution – A Complex Network	✓ Electricity is generated at power plants and moves through a complex system, sometimes called the grid, of electricity substations, transformers, and power lines that connect electricity producers and consumers. ✓ Most local grids are interconnected for reliability and commercial purposes, forming larger, more dependable networks that enhance the coordination and planning of electricity supply.

Features of Power Sector

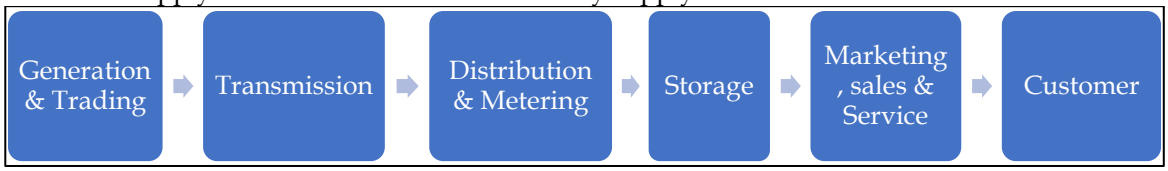
- Limited number of suppliers of electricity.
- Tariff determination is **based upon the rationality to determine the cost incurred at various points of operation**.
- Stakeholders **are existing and future consumers**, industries, government, regulators, and investors.
- **Continuous growing demand** of electricity.
- Flexible Cost allocation.
- **Distribution loss and inefficiency gaps** between generation and consumption of electricity.
- In-disciplined consumer.
- **Continuous network between generators**, transmitters, distributors, and consumers.
- Mostly **public sector undertakings** closely regulated by government.
- **Energy subsidies** having direct impact on national treasury affecting long term growth potential of the economy.

Application of Cost Management Techniques in Power Sector

- For determining prices and regulating tariffs.
- Developing a flexible cost allocation.
- Distribution loss and inefficiency gap analysis.
- Multi-dimensional costing calculations.
- Powerful analysis and reporting.

Value Chain Analysis

- This involves ensuring value creation in all the activities both inbound and outbound activities undertaken by the power company starting from electricity generation to the point of supply or distribution of the electricity supply.



Agriculture Sector:

Features

Fragmented Structure of the Industry	✓ The structure of the agriculture sector is seen to be unorganized and fragmented in nature and thus lack of effective regulation in the given sector is also seen as one of the reasons why farmers seem to be exploited and have been operating at very low margins.
Lack of understanding of costs and prices by the farmers	✓ Lack of prioritization of the cost management among farmers because of lack of knowledge with regards to the same.
Understanding the potential to work collaboratively	✓ The farmers need to be open to innovation in cost management and contracting techniques. Though there is scope for cost reduction in order to bring about improvement in the profit margins for the farmers, it is seen that generally the profits tend to get transferred to the customers and the only point of negotiation is in the contract pricing with the retailers which the farmers fail to reach.
Target cost Management	✓ The target costing technique involves determining the cost by subtracting the required margin from the anticipated price for the agricultural produce. However, the anticipated price for the agricultural products fluctuates making the process of cost management using the target cost management system ineffective in the case of the agricultural sector.
Imbalance of power distribution	✓ With the fragmentation and the unorganized nature of the farmers operating in the agricultural sector, the power of bargaining seems to lie in the hands of the wholesalers purchasing the produce from the farmers resulting in overall low margins for farmers in comparisons to the margins earned by the wholesalers and the retailers operating in the said sector.

Cost Management

- Cost Management focuses upon all the activities internal and external to the value chain process in order to help in cost reduction and cost control
- In relation to the agricultural sector, the Activity Based Costing technique is being increasingly accepted for the purpose of cost management. Activity Based Costing as the name suggests provides a better manner in which the indirect costs associated with the processes carried out in the agricultural sector can be carried out in an efficient manner.
- Benefits of using ABC for cost management in the agricultural sector are as follows:
  - Adjustable costing technique
  - Faster and more accurate
  - Enables carrying out a more detailed cost analysis

Minimum Support Price (MSP)

- In India, Minimum Support Price (MSP) was introduced by the Government of India to protect farmers against sharp dip of agricultural prices, which was usually observed during the harvest seasons.
- The harvest seasons are associated with huge supply, which overshadows the demand, and hence, in most cases the commodity prices hit the bottom. This forces the farmers, in necessity of money for repayment of debts, in selling their produce at losses or very little profits.
- Thus, the government fixes the MSP, as a part of government food grain procurement. Selling at MSP ensures profit margins for farmers and avoids distress selling situations.

IT Sector:

- Complexity of the operating structure and the difficulty seen in the implementation of the cost allocation models, it is seen that in order to manage the IT costs, most organizations tend to develop centralized IT departments acting as cost centers for the purpose of managing the IT budgets as well as allocation of costs associated with along with the charging back of expenses that are incurred by the business units.

IT Organization's Engagement Model:

- The question that needs to be addressed under the same is that whether the IT organization should be organized as a cost center to the organization or whether it should be seen as a strategic partner to the business.
- With more and more organizations whether large or small in nature, opting for third party allocation or opting for cloud computing services it can be seen that the internal IT departments are fighting hard for remaining relevant for the organization.
- In order to stay relevant, what the IT department needs is a better visibility towards the IT needs of the organization. In order to do the same, organizations operating in the given sector can adopt what is referred as to the 4D framework.

4D IT Cost Optimization Framework

Defining Organization Vision	✓ Any amount of spending carried out in relation to the Information Technology requirements of the organization needs to be aligned to the organizational vision and long term objectives. ✓ Business owners should have a sense of ownership and thereby control the IT costs in an effective manner. ✓ The additional visibility through the model needs to determine the appropriate method of cost allocation in relation to the IT cost burden. Thus, the allocation model that is chosen needs to be both flexible and at the same time avoid being too complex in nature. ✓ The organization can either opt for a simple method of dividing the entire IT cost by the number of hours consumed by each department or a more complex but accurate method of ABC costing could be used for allocation of the costs based upon the associated cost drivers associated with each set of activities.
Documentation of the current state	✓ Documentation of the current state of the IT department implemented within the organization in order to identify gaps and potential weaknesses identified in relation to the current state for the purpose of identification of the appropriate pain points as well as identification of areas for potential automation.
Delineation of target business architecture	✓ Once the current state of the IT architecture has been documented, the next step is developing a target business architecture for the purpose of addressing the gaps and limitations identified and laying down the foundation with regards to the formation of the crux of the IT cost management framework.
Decision: Build v/s Buy	✓ The last step understands whether the framework built is bought or custom built internally. ✓ The answer to the question involves a great amount of brainstorming and research taking into consideration the view point of all the strategic stakeholders involved.

Chapter 6 – Decision Making

CVP Analysis:

- CVP analysis **involves analysing the interrelationships among revenues, costs, levels of activity, and profits**
- CVP analysis is useful for numerous decisions related to production, pricing, marketing, cost structure, and many more
- CVP Analysis can be analysed under the following scenarios:
  - **Activity based CVP Analysis**
  - **CVP Analysis under conditions of uncertainty**
  - **CVP Analysis in service and non-profit organizations**
  - **CVP Analysis in Just in Time environment**

Marginal Costing:

- Marginal costing is a technique of decision-making which involves
  - Ascertainment of total costs
  - Classification of **costs into fixed and variable** and
  - Use of such information for analysis and decision making
- Marginal costing is also known as **CVP (cost volume profit) analysis** as it seeks to measure the impact of change in volume on company's cost and profits

Types of costs:

- Variable cost is that portion of cost which **varies proportionately with volume**. **Variable cost per unit remains constant** and any change in variable cost is to be interpreted as change in variable cost per unit
- Fixed costs are costs which are assumed to **remain constant for a given period of time** irrespective of the change in output. **Fixed cost per unit is inversely proportional to volume**. Any change in fixed cost has to be interpreted as change in total fixed cost.
- Semi-variable costs are those costs **that exhibit characteristics of fixed and variable costs**. Semi-variable costs can be split into variable cost and fixed cost using the following formula:
  - **Variable cost per unit = Change in cost / Change in units**
  - **Total fixed cost = Total cost – total variable cost**

Format of marginal cost statement:

Particulars	Per Unit	Total
Sales	XXX	XXX
Less: Variable Costs	(XXX)	(XXX)
Contribution	**XXX**	**XXX**
Less: Fixed Costs		(XXX)
Profit		**XXX**

Note:

1. The profit of the company does not vary proportionately with the change in sales on account of fixed costs. Hence therefore **change in contribution = change in profit**.
2. The cost does not vary proportionately with volume because of existence of fixed costs. Hence **change in total cost = change in variable cost**

Profit-Volume Ratio (PVR):

- PVR measures the extent of change in contribution/profit on account of change in sales. Net profit ratio keeps on changing for different sale amounts whereas PVR is constant.
- PVR is the true indicator of the profitability of the product

PVR = Contribution / sales	**PVR = Change in contribution / Change in sales**
PVR = Contribution per unit / SP	**PVR = Change in profit / change in sales**

Break-even point (BEP):

- BEP refers to the sales level at which the company earns no profit and no loss. This can be either expressed in units or rupees.
- **If expressed in units it is called BEP and if expressed in rupees it is called Break even sales.**
- Moreover at BEP, contribution = fixed cost and sales = total cost

BEP in units = Fixed cost / Contribution per unit	**BEP in Rs. = Fixed cost / PVR**
BEP in Rupees = BEP in units * Selling Price	

Margin of safety (MOS):

- MOS is the difference between the actual sales and break even sales. It is the extent of allowable drop in sales before the company starts incurring losses
- MOS can be expressed in rupees or in units or as a percentage of total sales

MOS in units = Profit / Contribution per unit	**MOS in Rs. = Profit/ PVR**
MOS in Rupees = MOS in units * Selling Price	
Sales in rupees = BEP in rupees + MOS in rupees	

Sales to achieve desired profit and profit at desired sales level:

1. Sales to earn desired profit = $\frac{\text{Target Profit + Total fixed cost}}{\text{PVR/Contribution per unit}}$
2. Profit at sales level = (Sales * PVR) – Total fixed cost

Note: For BEP, MOS, Sales, the answer would be in rupees if the denominator is PVR and the answer would be in units if the denominator is contribution per unit

Break-even point for multiple products:

- BEP is computed using fixed cost and PVR/Contribution per unit. However in case of multiple products there will be multiple PVR/Contribution per unit
- **BEP for multiple products (in units) = TFC/Contribution per set. It would be assumed that one set would contain the product mix as given in the question**
- **BEP for multiple products (in rupees) = TFC/Composite PVR. Composite PVR would be calculated as overall contribution/overall sales**

Steps for solving multiple break-even point problems:

- Multiple BEP arises in a situation wherein a question has **multiple fixed cost/contribution per unit**.
- Multiple fixed cost may arise if the cost increases beyond a specified limit. For example, fixed cost will be Rs.1,00,000 if the units produced are less than 10,000 units and the same will become Rs.1,50,000 if the units increase beyond 10,000 units

Step 1: Identify class intervals

A new class interval will emerge whenever there is a change in fixed cost or variable cost per unit or selling price for the additional units. In the above example a class interval will arise for 0 to 10,000 units and more than 10,000 units. **For better understanding of this concept please refer problem no.11.**

Class Interval	Selling Price	VC/unit	Cont./unit	Total fixed cost

Step 2: Calculate BEP using the following format:

Class Interval (CI)	Fixed cost of CI	FC recovery till previous CI	FC to be recovered	Contribution per unit	Units to be sold	Final BEP
Step 1	Step 1	Contribution earned till previous CI	Col 2 – Col 3	Step 1	Col 4 / Col 5	

Indifference point:

1. In case of two different alternatives indifference point refers to a level wherein the two alternative decisions would provide the same result
2. For level below the indifference point, the alternative with lower fixed cost is preferable and for level above the indifference point, the alternative with higher fixed cost is preferable
3. Indifference point = Difference in Fixed costs / Difference in VC per unit or difference in VCR or difference in PVR

Shut-down point:

1. In case of adverse economic conditions a company might have to make a decision on whether to continue their business or temporarily shut the business unless the demand revives
2. Shut-down point (in units) = (Normal Fixed costs – (FC during shutdown + Add. FC for shutdown)) / Contribution per unit
3. Shut-down point (in Rs.) = Same Numerator / PVR
4. If the **expected sales volume is less than the shutdown point then the company** should close their business or else continue producing

Limiting factor:

1. Limiting factor is one which acts as a bottleneck and limits the company's ability to serve the demand of the external market
2. Limiting factor is a situation where in the demand for the limiting factor is always greater than the supply for the limiting factor

Steps for solving Limiting factor problems:

1. Identify the limiting factor – Limiting factor is one whose demand is more than supply
2. Calculate the contribution per unit of limiting factor and rank the products with maximum contribution being top ranked product

Particulars	**Product A**	**Product B**	**Product C**
Selling Price	XXX	XXX	XXX
Less: Variable cost	(XXX)	(XXX)	(XXX)
Contribution per unit (A)	**XXX**	**XXX**	**XXX**
No. of limiting factors required per unit (B)	XXX	XXX	XXX
Contribution per unit of limiting factor (A/B)	**XXX**	**XXX**	**XXX**
Rank	**XXX**	**XXX**	**XXX**

3. Use the following format for allocation of resources:

Product	No. of units	Units of limiting factor per unit	Limiting factor consumed	Total contribution

Concept: Make or Buy Decisions and Subcontracting decisions

1. A company on account of capacity constraints would not be able to meet the full demands of the external customers. Hence it becomes imminent for the companies to go for either subcontracting or buying the products from outside.
2. **Make or buy decision:** The Company should compare the purchase cost of a product with the variable costs of production and not the total costs of manufacture. If the variable cost of production is more than the purchase cost then the company should buy the product or else make it in house. This is because fixed cost is irrelevant
3. **Subcontracting decision:** We should compare the variable cost of production with the subcontracting cost and make the decision on the subcontracting. If the variable cost of production is more than the subcontracting cost then the company should subcontract the part or else make it in house
4. In order to solve these type of problems prepare statement of comparative cost showing manufacturing cost and purchase cost. (Only the relevant costs should be mentioned in these statements)

Limiting factor in subcontracting decision or make vs. buy decision:

- In case we have subcontracting option with limiting factor scenario, then it is certain that the company will meet the entire demand
- However, we are not certain whether we will manufacture the product or purchase the product and meet the external demand
- **Hence statement of ranking is prepared on the basis of savings per unit to identify products which are to be manufactured**

Particulars	A	B	C	D
Variable Manufacturing cost				
Less: Purchase cost				
Saving in manufacturing (A)				
Units of limiting factor per unit (B)				
Saving per unit of limiting factor (A/B)				
Ranking				

Short run decision making:

- Short run decision making involves act of choosing one course of action among various feasible alternatives
- Short-term decisions sometimes are referred to as tactical, or relevant decisions because they involve choosing between alternatives with an immediate or limited time frame
- Short term decisions are small-scale actions that serve a larger purpose
- Companies need to identify relevant cost for tactical decision-making

Relevant cost:

- Relevant means pertinent to the decision at hand.
- **Relevant costs are those expected future costs that are essential but differ for alternative courses of action**
- Relevant cost is a future cost that would arise as a direct consequence of the decision under review

Rules of relevance:

- **Opportunity cost** refers to the value of sacrifice made or benefit of opportunity foregone by selecting one particular alternative in preference to the other alternative. **All opportunity costs are considered to be relevant costs.**
- **All variable costs are generally considered to be relevant** unless the costs do not vary between alternative courses of action.
- **All fixed costs are generally considered to be irrelevant** unless the costs vary between alternative courses of action.
- Sunk or historical costs are irrelevant

Committed fixed cost versus discretionary fixed cost:

- Committed fixed costs are those that arise from the possession of asset and are normally unaffected by any short-term changes in volume of production. Example: Rent of factory, Insurance. **Committed fixed costs are otherwise known as unavoidable fixed costs.**
- Discretionary fixed costs are incurred as result of management discretion/decision. Example: Advertising. **Discretionary fixed costs are otherwise known as avoidable fixed costs.**

Opportunity costs:

- The opportunity cost of the value of opportunity foregone is taken into consideration when alternatives are compared.
- Opportunity Cost is the value of the next best alternative. In other words, it is the opportunity cost lost by diversion of an input factor from one use to another. It is the measure of the benefit of opportunity foregone.

Notional Cost:

- As per CIMA terminology 'Cost used in product evaluation, decision making and performance measurement to **reflect the use of resources that have no actual (observable) cost'**

Avoidable costs:

- Avoidable costs are cost that can be skipped if the decision on activity in consideration will not been taken up.
- **As per CIMA terminology avoidable costs are the 'Specific cost of an activity or sector of a business that would be avoided if the activity or sector did not exist'**

Historical costs:

- Cost that has been already incurred in the past is called historical cost.

Sunk costs:

- Costs which do not change under given circumstance and do not play any role in decision making process are known as sunk costs.
- These are the costs which have been incurred by a decision made in past and cannot be changed by any decision made in the future

Out of pocket cost:

- This is that portion of costs which involves payments to outsiders i.e. it gives rise to cash expenditure as opposed to such costs as depreciation, which do not involve any cash expenditure

Shut-down cost:

- When an organization suspends its manufacturing, certain fixed expenses can be avoided and certain extra fixed expenses may be incurred depending upon the nature of the industry.
- By closing down the manufacturing, the organization will save variable cost of production as well as some discretionary fixed costs. This particular discretionary cost is known as shut-down cost

Engineered cost:

- Engineered costs results from a defined mathematical relationship with the cost object and resources consumed to produce an output. Example: Raw material, labour and machine hours

Inventoriable costs:

- Costs that are considered as part of merchandise and considered as asset when these are incurred and these costs become cost of goods sold when the final output is sold.
- In other words inventoriable costs are cost of purchase plus cost expended to make final product in saleable condition

Period costs:

- Period costs are all costs other than cost of goods sold and treated as expense in income statement.

Differential cost, Incremental cost and Incremental revenue:

- Differential cost (which may be incremental or decremental cost) is the difference in total cost that will arise from the selection of one alternative instead of another. It involves the estimation of the impact of decision alternatives on costs and revenues.
- The two basic concepts which go together with this type of cost analysis are incremental revenue and incremental costs.
- Incremental revenue is the change in the total income resulting from a decision.
- Incremental costs represent a change in the total costs resulting from a decision
- Concept of incremental/differential cost techniques can be used for the following decisions:
    - Whether to process a further product or not
    - Dropping or adding a product line
    - Making the best use of investment made
    - Acceptance of an additional order from a special customer at lower than existing price
    - Opening of new sales territory and branch
    - Make or buy decisions
    - Submitting tenders
    - Lease or buy decisions
    - Equipment replacement decisions

Non-financial considerations:

- With increase in competition, **dynamic market changes and changing needs of customers, non-financial information have gained relevance in the decision-making process.**
- Information of an organization like number of employees, employee morale, customer satisfaction that cannot be expressed in monetary terms is termed non -financial in nature.
- Non- financial information is long term focused and ensures profitability and sustainability in long term for an organization thereby evaluating the internal performance of the company.
- Non- Financial information which a company should focus that would turn out to be advantageous while making decisions for a company are:
  - **Quality**
  - **Employee satisfaction**
  - **Customer satisfaction**
  - **Corporate social responsibility**
  - **Environmental factors**
  - **Intellectual Property**
  - **Intangible assets**
  - **Competitor's movements**
  - **Brand name**

Ethics: Ethics are moral principles that guide the conduct of individuals. Following are the guidelines for Ethical conduct:

- **Identify an ethical decision by using personal ethical standards of honesty and fairness.**
- Identify the **consequences of the decision** and its effect on others.
- **Consider obligations and responsibilities** to those that will be affected by decision.
- Make a decision that is ethical and fair to those affected by it.

Decision-making model: Following are the steps for tactical decision-making

- **Step 1:** Define the problem
- **Step 2:** Identify alternatives, eliminating unfeasible alternatives
- **Step 3:** Identify costs & benefits of each alternative
- **Step 4:** Examine total relevant costs, benefits of each alternative
- **Step 5:** Assess non-financial factors and ethical issues
- **Step 6:** Select alternative with greatest overall benefit

Application of CVP Analysis:

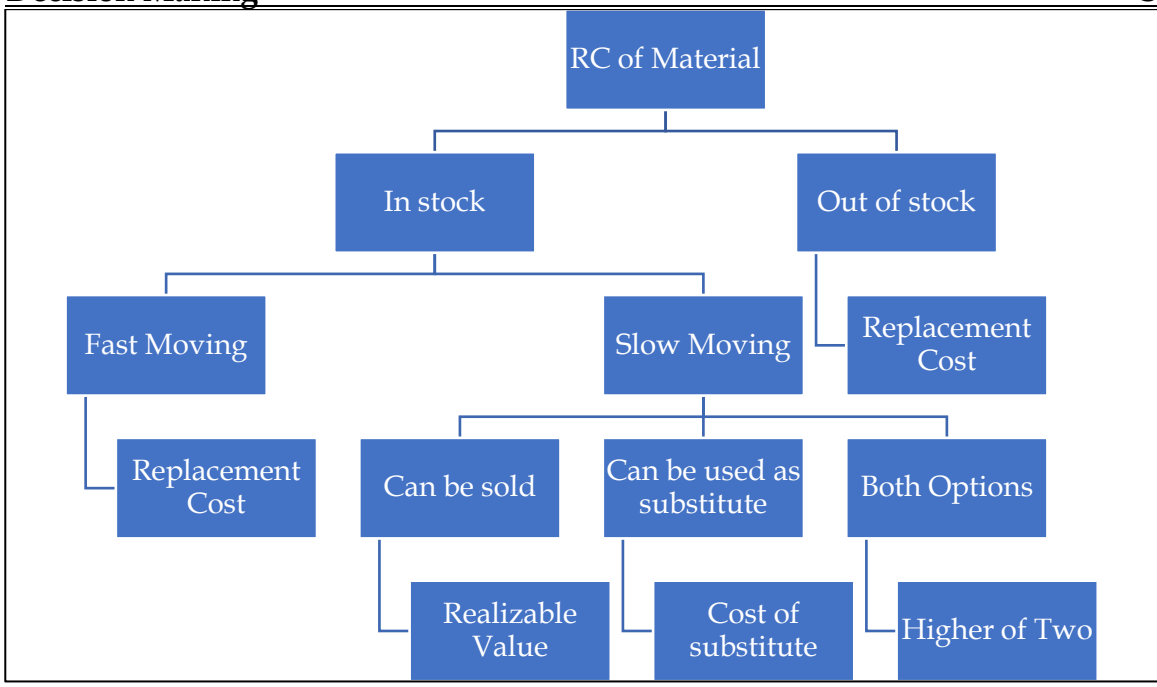
Outsourcing Decisions	
Meaning	Outsourcing decision is also known as "make or buy" decision. It involves a decision of whether to continue 'making' a product versus 'buying' it from an external firm
Incremental analysis	Outsourcing decision requires incremental analysis . The incremental amounts are based on the difference in the cost of buying a product or service compared to the cost of producing the item or providing the service in house.
Opportunity costs	Opportunity costs are the costs forgone as a result of selecting a different alternative. They are always incremental. For example, if a company decides to outsource, it is able to lease its factory space that the product being outsourced no longer will occupy
Outsourcing Decisions- Accept or Reject?	If incremental cost savings + opportunity costs < incremental costs, reject the outsourcing, unless qualitative factors fiercely impact the decision
Qualitative factors	**While considering the decision to Outsourcing the management should consider qualitative aspects like quality of goods, reliability of suppliers, impact on the customers and suppliers**
Sell or further process decisions	
Meaning	Sell or process further refers to a decision-making situation where an executive has to decide either to sell a component/ product/ raw material as it is or alternatively process it further by incurring additional expenses

Decision	On further processing the component/product/raw material may not only be improved or reconditioned but will mostly fetch a higher sale value as well. Here if the differential sales value is more than the further processing cost, then it is beneficial to process the product further otherwise sell it without further processing
Qualitative factors	**Resource availability such as the readiness of employees to work extra hours to further process the products and availability of materials required for the processing**
Minimum Pricing Decisions	
Meaning	The minimum pricing approach is a useful method in situations where there is a lot of intense competition, surplus production capacity, clearance of old inventories, getting special orders and/or improving market share of the product
Rule	The minimum price should be set at the incremental costs of manufacturing, plus opportunity costs
Keep or drop decisions	
Meaning	Operating decision that management must make is whether to keep or drop unprofitable segments, such as product lines, services, divisions, departments, stores, or outlets
Incremental revenue	Incremental revenue is the difference in revenue between the original sales revenue and the new revenue that is expected to result due to dropping a segment.
Incremental cost savings	Variable costs associated with a segment to be dropped are incremental cost savings that cause profit to increase.
Opportunity costs	They often arise due to rental of production space that will become vacant if the decision is made to drop a product
Decision – keep or drop?	If incremental cost savings > incremental revenue lost, the segment should be dropped, unless qualitative characteristics fiercely impact the decision
Qualitative factors	**Considerations of employees that will be terminated if the product is dropped, the effect a lay off might have on employees that are not terminated, effects of suppliers from which the materials needed for the product will no longer be purchased, and the effect of customers who previously purchased the product being dropped**
Special order decisions	
Meaning	Special order decisions focus on whether a special priced order should be accepted or rejected. These orders often can be attractive, especially when the firm is operating below its maximum productive capacity
Incremental analysis	Special order decisions are based on incremental analysis. Incremental analysis enables managers to emphasis on the relevant areas of a decision
Decision –Accept or Reject?	If incremental revenue < incremental cost, reject the special order, unless qualitative characteristics fiercely impact the decision.
Product Mix Decisions	
Meaning	Many times the management has to take a decision whether to produce one product or another instead. Generally, decision is made on the basis of contribution of each product. Other things being the same the product which yields the highest contribution is best one to produce. But, if there is shortage or limited supply of certain other resources which may act as a key factor like for example, the machine hours, then the contribution is linked with such a key factor for taking a decision

Relevant Cost:

- Relevant cost is one which varies between alternative course of action
- All fixed costs are generally considered irrelevant and all variable costs are generally considered relevant

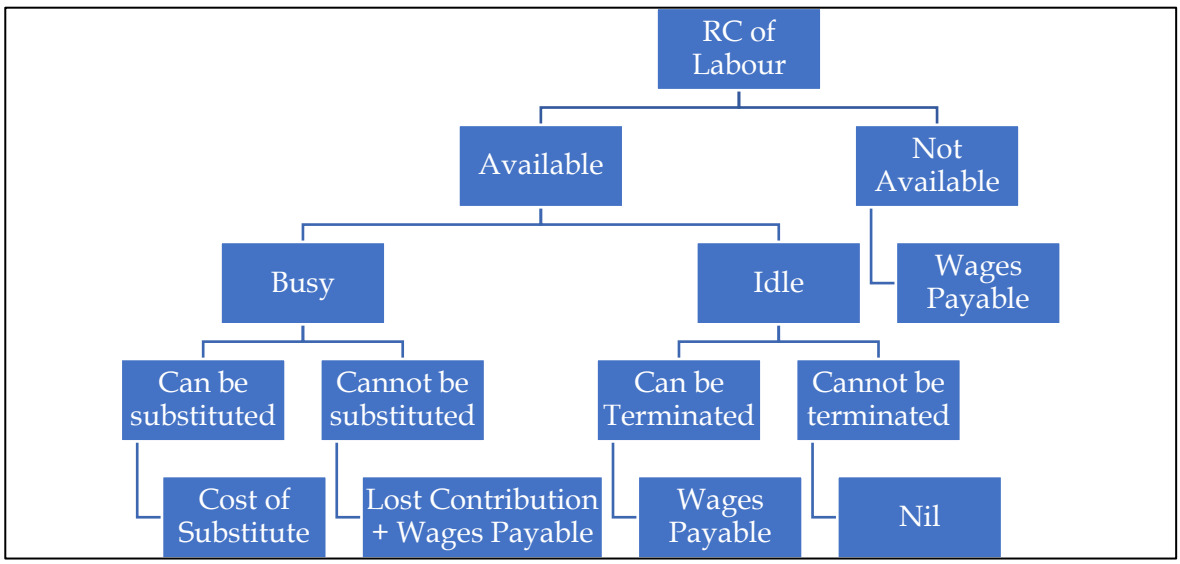
Relevant Cost of Material:



Note:

- In case of relevant cost of material, we check for following two questions
  - Is the material in stock?
  - Is it fast-moving or slow-moving item?
- Relevant cost for in stock material and fast-moving item is replacement cost. Like this we can find relevant cost for other scenarios

Relevant Cost of Labour:



Overview of practical problems/ case studies/ important questions:

- Part I – Basics of Marginal Costing
- Part II – Activity based CVP Analysis
- Part III – CVP Analysis under conditions of uncertainty
- Part IV – CVP Analysis in service and non-profit organisations
- Part V – Cost Classification
- Part VI - Relevant Costing
- Part VII – Indifference Point and Shut-down Point
- Part VIII – Limiting factor
- Part IX – Make or Buy Decisions

- Part X – Differential selling prices and product mix
- Part XI – Special orders
- Part XII – Evaluation of multiple alternatives
- Part XIII – Further Processing Decisions
- Part XIV – Dropping a product line
- Part XV – Ethics and non-financial considerations in decision making

Part I – Basics of Marginal Costing

1. Marginal costing -basics [Category B]

The following information is given by Z Limited:

Margin of Safety	Rs.1,87,500
Total cost	Rs.1,93,750
Margin of safety	75%

Compute profit, PVR, BEP sales in rupees and fixed cost

Answer:

Total Sales	$\frac{\text{MOS in Rupees}}{\text{MOS in \%}}$	$\frac{1,87,500}{75\%}$	Rs.2,50,000
Profit	Total Sales – Total cost	2,50,000 – 1,93,750	Rs.56,250
PVR	$\frac{\text{Profit}}{\text{MOS in rupees}} \times 100$	$\frac{56,250}{1,87,500} \times 100$	30%
BEP in rupees	Total sales – MOS Sales	2,50,000 – 1,87,500	Rs.62,500
Fixed cost	BEP in rupees x PVR	62,500 x 30%	Rs.18,750

2. BEP of multiple products [Category A – May 2012 (exam)]

XY Ltd. makes two products X and Y, whose respective fixed costs are F1 and F2. You are given that the unit contribution of Y is one-fifth less than the unit contribution of X, that the total of F1 and F2 is Rs. 1,50,000, that the BEP of X is 1,800 units (for BEP of X F2 is not considered) and that 3,000 units is the indifference point between X and Y.(i.e. X and Y make equal profits at 3,000 unit volume, considering their respective fixed costs). There is no inventory buildup as whatever is produced is sold.

- Find out the values F1 and F2 and unit contributions of X and Y.
- Calculate the break-even point of the company if the proposed sales mix is 2:3 and the products operate at 40% and 25% PVR. (For BEP consider the fixed cost for the company as a whole)

Note: Students are requested to learn concept of indifference point (part 5) before solving this question

- Let us assume C1 and C2 to be the contribution of Product X and Y respectively
- Contribution of Product Y (C2) is 1/5th less than the contribution of X (C1). **Hence C2 = 0.8C1 (Equation 1)**
- BEP of X = (Fixed cost of X/Contribution of X); 1,800 units = F1/C1; **F1 = 1800C1 (Equation 2)**
- **F1 + F2 = 1,50,000 (Equation 3)**

Indifference Point	$\frac{\text{Change in Fixed cost}}{\text{Change in contribution per unit}}$	$\frac{F1 - F2}{C1 - C2} = 3,000$ units
		F1 – F2 = 3,000 (C1 – C2)
Substituting C2 as 0.8C1 from equation 1		F1 -F2 = 3,000 (C1 – 0.8C1)
Equation 4		**F1 – F2 = 600C1**

- **Equation 3:** F1 + F2 = 1,50,000
- **Equation 4:** F1 – F2 = 600C1
- Combining two equations we get; 2F1 = 1,50,000 + 600C1
- Substituting F1 = 1800C1 of equation 2; 2(1800C1) = 1,50,000 + 600C1
- 3,000C1 = 1,50,000; C1 = Rs.50 per unit

Solution for Part 1:

C1 (Contribution of X)		Rs.50 per unit
C2 (Contribution of Y)	80% of Rs.50	Rs.40 per unit
F1 (Fixed cost of X)	1,800 x 50	Rs.90,000
F2 (Fixed cost of Y)	1,50,000 – 90,000	Rs.60,000

Part 2: Computation of Break-even Point:

- Proposed sales mix is 2:3 and the product mix can either be assumed for units or for sales value

Sales mix assumed for units sold:

- Let us assume one set contains 2 units of product X and 3 units of product Y
- Contribution per set = (2 x 50) + (3 x40) = 220

BEP in sets	$\frac{\text{Fixed cost}}{\text{Contribution per set}}$	$\frac{1,50,000}{220}$	682 sets
BEP in units			
Product X	682 sets x 2		1,364 units
Product Y	682 sets x 3		2,046 units
BEP in rupees			
Product X	1,364 units x (50/40%)		1,70,500
Product Y	2,046 units x (40/25%)		3,27,360
Total BEP in rupees			**4,97,860**

Sales mix assumed for value of sales:

- Composite PVR= [(2 x 40%) + (3 x25%)]/ (3+2) = 31%

Break-even sales	$\frac{\text{Fixed cost}}{\text{Composite PVR}}$	$\frac{1,50,000}{31\%}$	4,83,871
BEP in rupees			
Product X	4,83,871 x (2/5)		1,93,548
Product Y	4,83,871 x (3/5)		2,90,323
BEP in units			
Product X	1,93,548/125		1,548 units
Product Y	2,90,323/160		1,815 units

Author's Note:
This is a good problem to understand BEP for multiple products. We need to check whether the mix is in rupees or units sold and accordingly compute composite PVR/Contribution per set.

3. Calculation of Break-even point [Category A]

A Limited makes and sells a single product. The company's trading results for the year are

Particulars	**Year 2007 (in '000s)**
Sales	3,000
Direct Materials	900
Direct Labour	600
Overheads	900
Profits	600

For the year 2008, the following are expected:

- Reduction in the selling price by 10%
- Increase in the quantity sold by 50%
- Inflation of direct material cost by 8%
- Price inflation in variable overhead by 6%
- Reduction of fixed overhead expenses by 25%

It is also known that

- In 2006, overhead expenditure totaled to Rs.8,00,000
- Total overhead cost inflation for 2007 has been 5% more than 2006
- Production and sales volumes have been 25% higher in 2007 than in 2006

The high-low method is being used by the company to estimate the overhead expenditure. You are required to:

- Prepare a statement showing the estimated trading results for 2008
- Calculate the break-even point for 2007 and 2008
- Comment on the BEP and profits for the years 2007 & 2008
- Calculate the sales to be made in 2008 to maintain the same net profit ratio

- Calculate the percentage increase in sale price to maintain same net profit ratio
- Calculate the sales to be made in 2008 to maintain the same net profit

Answer:

WN 1: Statement showing estimated trading results for 2008

Let us assume 100 units are sold in 2007 and hence the quantity sold in 2008 would be 150 units

(in'000s)

Particulars	Year 2007			Year 2008		
	Quantity	Rate	Amount	Quantity	Rate	Amount
Sales	100	30.00	3,000	150	27.00	4,050
Direct material	100	9.00	900	150	9.72	1,458
Direct Labour	100	6.00	600	150	6.00	900
Variable Overhead (WN 2)	100	3.00	300	150	3.18	477
Contribution	**100**	**12.00**	**1,200**	**150**	**8.10**	**1,215**
Less: Fixed overheads (WN 2)			600			450
Profit			**600**			**765**

Note:

- **Any change in variable costs will be considered as change in variable cost per unit. Hence increase in direct material and variable overheads has been added to the per unit rate**
- **Any change in fixed costs will be considered as change in total cost and hence fall of 25 percent has been applied on total cost**

WN 2: Computation of variable and fixed overheads:

Year	Total overheads (in '000s)	No of units
2006 (unadjusted)	800	80 (Note 1)
2006 (adjusted)	840 (Note 2)	80
2007	900	100

Note 1:

- Production and sales volumes were 25 percent higher than that of 2006. Hence 2007 production will be equal to 125 percent of 2006 volumes
- Volumes of 2007 (100 units) = 125 percent of 2006 volumes
- 2006 volumes = 100/125% = 80 units

Note 2:

- Total overheads of 2006 was Rs.8,00,000 whereas the same for 2007 is Rs.9,00,000. Part of increase in 2007 is due to inflation and the balance is due to higher production
- In order to compute the variable OH per unit, we need to compute the overheads adjusted for inflation and the same would amount to Rs.8,40,000

VOH per unit	$\frac{\text{Change in total cost}}{\text{Change in units}}$	$\frac{900-840}{100-80}$	Rs.3 per unit
Fixed Overheads	Total cost – Total variable cost	900 – (100 x 3)	Rs.600

WN 3: Computation of break-even point for 2007 and 2008:

Particulars	2007	2008
Sales	3,000	4,050
Contribution	1,200	1,215
PVR (Contribution/Sales) x 100	**40%**	**30%**
Fixed cost	600	450
Break-even point [Fixed cost/PVR]	**1,500**	**1,500**

Comments:

Both Fixed Cost and P/V ratio have declined by 25% equally. So BEP sales remains the same. The contribution is only Rs.1,215 in 2008 though quantity is increased by 50%. This is due to increase in production cost and decrease in selling price. This is more than made up by decrease in fixed cost so that overall profit has increased by 27.5%

WN 4: Calculation of sales to be made in 2008 to maintain the same net profit ratio:

- The company has earned profit margin of 20 percent in 2007 and wants to maintain the same margin in 2008

- Let us assume the total sales of 2008 as X and hence the profit for 2008 would be 0.2X

Particulars	Amount
Sales	X
Less: Variable cost	0.7X
Contribution	0.3X
Less: Fixed cost	450
Profit	0.3X – 450

- Profit of company: 0.2X = 0.3X – 450; X = 4,500

WN 5: Computation of percentage increase in selling price to maintain the same net profit ratio:

- The company plans to change the selling price and hence the overall quantity sold would remain same. Consequently, the overall variable cost would continue to be 2,835

Particulars	Amount
Sales	X
Less: Variable cost	(2,835)
Contribution	X – 2,835
Less: Fixed cost	450
Profit	X – 3,285

- Profit of company: 0.2X = X – 3,285; X = 4,106.25

% increase in SP	$\frac{\text{Increase in Sales}}{\text{Old Sales}}$ x 100	$\frac{4{,}106.25 - 4{,}050}{4{,}050} \; x \; 100$	1.39%

WN 6: Calculation of sales to be made in 2008 to maintain the same net profit:

- The company has earned profit 600 in 2007 and wants to maintain the same profit in 2008
- Let us assume the total sales of 2008 as X

Particulars	Amount
Sales	X
Less: Variable cost	0.7X
Contribution	0.3X
Less: Fixed cost	450
Profit	0.3X – 450

- Profit of company: 600 = 0.3X – 450; X = 3,500

4. Breakeven point with differential variable costs [Category A – May 2014 (exam)]

A pharmaceutical company produces formulations having a shelf life of one year. The company has an opening stock of 30,000 boxes on 1st January, 2005 and expected to produce 1, 30,000 boxes as was in the just ended year of 2004. Expected sale would be 1, 50,000 boxes. Costing department has worked out escalation in cost by 25% on variable cost and 10% on fixed cost. Fixed cost for the year 2004 is Rs.40 per unit. New price announced for 2005 is Rs.100 per box. Variable cost on opening stock is Rs.40 per box. You are required to compute breakeven volume for the year 2005.

Answer:

WN 1: Identification of class interval:

- Class interval is one which will have either change in selling price, variable cost per unit or total fixed cost.
- In this question variable cost for first 30,000 boxes would be Rs.40 per box (last year cost) and the cost for additional units would be Rs.50 per box (current year cost)

Class Interval	Selling Price	Variable cost per unit	Contribution per unit	Total Fixed Cost
0 to 30,000	100	40	60	57,20,000 (Note 1)
30,001 to 1,60,000	100	50	50	57,20,000

Note 1:

- Fixed cost of last year = 1,30,000 units x Rs.40 per unit = Rs.52,00,000
- Fixed cost increases by 10 percent in current year and hence the overall fixed cost would become Rs.57,20,000
- Fixed cost will be incurred in current year even if production is zero

WN 2: Computation of Break-even point:

Class Interval (CI)	Fixed cost of CI	FC recovery till previous CI	FC to be recovered	Contribution per unit	Units to be sold	Final BEP
0 to 30,000	57,20,000	0	57,20,000	60	95,333	Loss
30,001 to 1,60,000	57,20,000	18,00,000	39,20,000	50	78,400	**1,08,400**

Note:

- Column 1 (Class Interval), Column 2 (Fixed cost of CI) and Column 5 (Contribution per unit) is copied from WN 1
- FC recovery till previous CI is basically the contribution earned till previous CI
  - For first CI– No units are sold before this CI and hence the same is zero
  - For second CI – 30,000 units are sold and contribution on the same is Rs.18,00,000 (30,000 units x Rs.60 per unit)
- FC to be recovered = Column 2 – Column 3; this basically indicates how much additional FC needs to be recovered to break-even
- Units to be sold = Column 4/Column 5
- **Final BEP:** We need to check whether the company can sell the specified number of units in the class interval
  - For example, first class interval is of 30,000 units and the company needs to sell 95,333 units. This is not possible and hence this is loss making scenario
  - In second class interval we need to sell 78,400 units and the class interval is of 1,30,000 units. This is possible and hence BEP is 1,08,400 units (30,000 units sold in first CI + 78,400 units sold now)

5. Impact of semi-variable cost on decision making [Category A]

Souvenir Ltd. manufactures medals for winners of athletic events and other contests. Its manufacturing plant has the capacity to produce 10,000 medals each month. The company has current production and sales level of 7,500 medals per month. The current domestic market price of the medal is Rs.150. The cost data for the month of March, 2013 is as under:

Particulars	Amount
Variable Costs (that vary with units produced):	
Direct Materials	2,62,500
Direct Manufacturing Labour	3,00,000
Variable Costs (that vary with number of batches):	
Set-ups; Materials Handling; Quality Control (150 batches × Rs. 500 per batch)	75,000
Fixed Costs:	
Manufacturing Costs	2,75,000
Marketing Costs	1,75,000

Souvenir Ltd. has received a special one-time-only order for 2,500 medals at Rs.100 per medal. Souvenir Ltd. makes medals for its existing customers in batch size of 50 medals (150 batches x 50 medals per batch = 7,500 medals). The special order for 2,500 medals requires Souvenir Ltd. to manufacture the medals in 25 batches of 100 each.

Required

- Should Souvenir Ltd. accept the special order? Why? Explain briefly.
- Suppose the plant capacity was 9,000 medals instead of 10,000 medals each month. The special order must be taken either in full or rejected totally. Should Souvenir Ltd. accept the special order? Why? Explain briefly.
- Identify the indifferent level of idle capacity which will lead to acceptance of the special order

WN 1: Analysis of special order when the manufacturing capacity is 10,000 medals:

- The company has manufacturing capacity of 10,000 medals and the sales level is of 7,500 medals. Therefore, the company has idle capacity of 2,500 medals
- The company has received the special order for 2,500 medals and has adequate capacity for the same. Hence there is no opportunity cost for the special order

Particulars	Calculation	Amount
Sales	2,500 medals x 100	2,50,000
Less: Direct material	(2,62,500/7,500) x 2,500	(87,500)
Less: Direct Labour	(3,00,000/7,500) x 2,500	(1,00,000)
Less: Variable batch cost	25 batches x 500	(12,500)
Profit from special order		**50,000**

Note:

1) The company should go ahead with acceptance of special order as it earns profit of Rs.50,000 from special order
2) Fixed cost will not be considered as the same is not a relevant cost

WN 2: Analysis of special order when the manufacturing capacity is 9,000 medals:

- The company has manufacturing capacity of 9,000 medals and the sales level is of 7,500 medals. Therefore, the company has idle capacity of 1,500 medals
- The company has received the special order for 2,500 medals and hence has to reject external demand to accept this special order

Computation of opportunity cost:

Particulars	7,500 medals	6,500 medals
Sales	11,25,000	9,75,000
Less: Direct material	(2,62,500)	(2,27,500)
Less: Direct Labour	(3,00,000)	(2,60,000)
Less: Variable batch cost	(75,000)	(65,000)
Less: Fixed manufacturing cost	(2,75,000)	(2,75,000)
Less: Fixed Marketing cost	(1,75,000)	(1,75,000)
Profit	**37,500**	**(27,500)**

- Opportunity cost = Profit from 7,500 medals – Profit from 6,500 medals
- Opportunity cost = Rs.37,500 – (-27,500) = Rs.37,500 + Rs.27,500 = Rs.65,000
- The company earns Rs.50,000 from special order whereas it has an opportunity cost of Rs.65,000 and hence it should not accept the special order

WN 3: Computation of indifferent level of idle capacity:

- The company will not accept the special order if the idle capacity is 1,500 medals. This was because we had opportunity cost of Rs.65,000 with loss of sales of 1,000 medals
- We should find the number of units at which the opportunity cost would be Rs.50,000. Opportunity cost would be Rs.50,000 if the loss from existing operations would be Rs.12,500 (Rs.37,500 – Rs.50,000)

Let us assume X to be units sold
Total Sales – Total cost = -12,500
Total sales = 150X
Total cost = $35X + 40X + \left(\frac{X}{50}\right) 500 + 2,75,000 + 1,75,000$
$150\ X - (35X + 40X + \left(\frac{X}{50}\right) 500 + 2,75,000 + 1,75,000) = -12,500$
$65X - 2,75,000 - 1,75,000 = -12,500;\ 65X = 4,37,500;\ X = 6,731$

Computation of units sold to achieve desired profit:

- 6,731 units falls in 135th lot of 50 units and hence final answer can lie in 135th lot and 136th lot *(same lot and one lot above)*

Particulars	135th lot	136th lot
Revenues	150X	150X
Less: Variable cost	75X	75X
Less: Batch cost	67,500 (500 x 135)	68,000 (500 x 136)
Less: Fixed cost	4,50,000	4,50,000

Loss	75X – 5,17,500 = -12,500	75X – 5,18,000 = -12,500
Number of units (X)	6,733 units	6,740 units
Final answer	**6,733 units**	**6,740 units is not possible as 136th lot is for 6,751 to 6,800**

Conclusion:

- The opportunity cost would be Rs.50,000 if the company is able to sell only 6,733 units. Hence acceptable loss in units sold would be 767 units (7,500 – 6,733)
- Indifferent level of idle capacity = Order quantity – acceptable loss
- Indifferent level of idle capacity = 2,500 units – 767 units = 1,733 units

Part II – Activity based CVP Analysis

6. BEP in batches [Category A – May 2016 RTP]

Electro Life Ltd. is a leading Home Appliances manufacturer. The company uses just-in- time manufacturing process, thereby having no inventory. Manufacturing is done in batch size of 100 units which cannot be altered without significant cost implications. Although the products are manufactured in batches of 100 units, they are sold as single units at the market price. Due to fierce competition in the market, the company is forced to follow market price of each product. The following table provides the financial results of its four unique products:

	Alpha	**Beta**	**Gamma**	**Theta**	
Sales (units)	2,00,000	2,60,000	1,60,000	3,00,000	**Total**
	(Rs.)	(Rs.)	(Rs.)	(Rs.)	(Rs.)
Revenue	26,00,000	45,20,000	42,40,000	32,00,000	145,60,000
Less: Material Cost	6,00,000	18,20,000	18,80,000	10,00,000	53,00,000
Less: Labour Cost	8,00,000	20,80,000	12,80,000	12,00,000	53,60,000
Less: Overheads	8,00,000	7,80,000	3,20,000	12,00,000	31,00,000
Profit / (Loss)	4,00,000	(1,60,000)	7,60,000	(2,00,000)	8,00,000

Since, company is concerned about loss in manufacturing and selling of two products so, it has approached you to clear picture on its products and costs. You have conducted a detailed investigation whose findings are below:

The overhead absorption rate of Rs. 2 per machine hour has been used to allocate overheads into the above product costs. Further analysis of the overhead cost shows that some of it is caused by the number of machine hours used, some is caused by the number of batches produced and some are product specific fixed overheads that would be avoided if the product were discontinued. Other general fixed overhead costs would be avoided only by the closure of the factory. Numeric details are summarized below:

	Rs.	Rs.
Machine hour related…….....……..6,20,000		
Batch related ……4,60,000		
Product specific fixed overhead:		
Alpha…….....10,00,000		
Beta……..…… 1,00,000		
Gamma…… 2,00,000		
Theta……...1,00,000 ……..	14,00,000	
General fixed overheads……. …….	6,20,000	
		31,00,000

The other information is as follows:-

	Alpha	**Beta**	**Gamma**	**Theta**	**Total**
Machine Hours	4,00,000	3,90,000	1,60,000	6,00,000	15,50,000

Labour Hours	1,00,000	2,60,000	1,60,000	1,50,000	6,70,000

Required

(i) Prepare a profitability statement that is more useful for decision making than the profit statement prepared by Electro Life Ltd.

(ii) Calculate the break-even volume in batches and also in approximate units for Product 'Alpha'.

Answer:

WN 1: Statement of Profitability of Electro Life Limited:

Particulars	**Alpha**	**Beta**	**Gamma**	**Theta**	**Total**
Revenues	26,00,000	45,20,000	42,40,000	32,00,000	1,45,60,000
Less: Material cost	(6,00,000)	(18,20,000)	(18,80,000)	(10,00,000)	(53,00,000)
Less: Labour cost	(8,00,000)	(20,80,000)	(12,80,000)	(12,00,000)	(53,60,000)
Less: Overheads					
Machine hour related (apportioned in the ratio (400:390:160:600) of machine hours)	(1,60,000)	(1,56,000)	(64,000)	(2,40,000)	(6,20,000)
Batch related (apportioned in the ratio of (20:26:16:30) no of batches)	(1,00,000)	(1,30,000)	(80,000)	(1,50,000)	(4,60,000)
Contribution	**9,40,000**	**3,34,000**	**9,36,000**	**6,10,000**	**28,20,000**
Less: Product specific fixed overheads	(10,00,000)	(1,00,000)	(2,00,000)	(1,00,000)	(14,00,000)
Gross Profit	**(60,000)**	**2,34,000**	**7,36,000**	**5,10,000**	**14,20,000**
Less: General fixed overheads					(6,20,000)
Profit					**8,00,000**

WN 2: Computation of break-even point of Alpha:

Let us assume X to be units sold

At Break-even point, total sales would be equal to total cost
Total sales = 13X
Manufacturing cost per batch = 16,60,000/2,000 = 830
Total cost = $830(\frac{X}{100})$ + 10,00,000
Total sales = Total cost $13X = 830(\frac{X}{100})$ + 10,00,000 4.7X = 10,00,000; X = 2,12,766 units

Computation of final BEP:

- 2,12,766 units falls in 2128th lot of 100 units and hence final BEP can lie in 2128th lot and 2129th lot *(same lot and one lot above)*

Particulars	**2128th lot**	**2129th lot**
Revenues	13X	13X
Less: Variable cost (No of lots x 830)	17,66,240	17,67,070
Less: Fixed cost	10,00,000	10,00,000
Profit	13X – 27,66,240 = 0	13X – 27,67,070 = 0
Final BEP	**2,12,788 (or) 2,128 batches**	**2,12,852 (or) 2,129 batches**

Note:

- There are no variable product costs in this question and all cost will vary with batches as company will only produce products in batch size of 100 units.

Part III – CVP Analysis under conditions of uncertainty

7. CVP and Uncertainty [Category B]

The selling price of a product for the next accounting period is 110, and the variable cost is estimated to be 70 per unit. The budgeted fixed costs for the period are 1,63,500. Estimated sales for the period are 5,000 units, and it is assumed that the probability distribution for the estimated sales quantity is normal with a standard deviation of 125 units. The selling price, variable cost and total fixed cost are assumed to be certain.

- What is the probability of profits being greater than 40,000?

- What is the probability of profits being less than 30,000?

Answer:

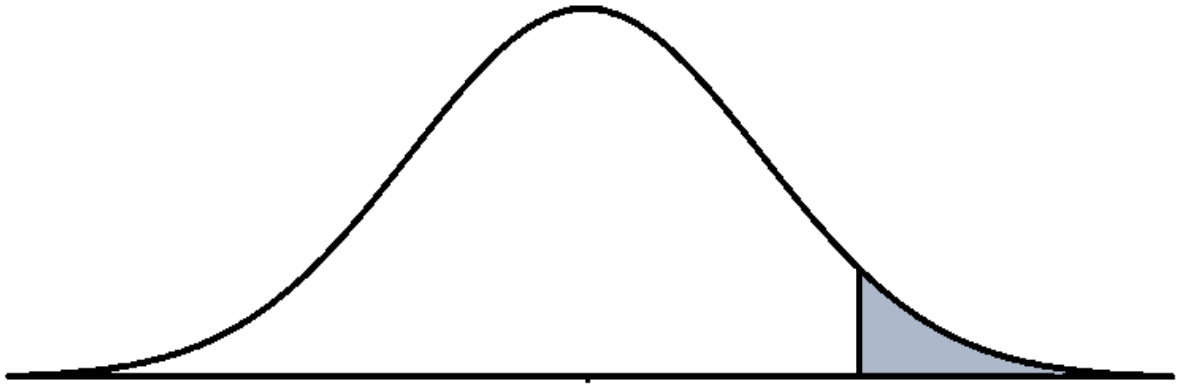
WN 1: Computation of expected profit and standard deviation in profits:

Particulars	**Amount**
Selling Price	110
Less: Variable cost per unit	(70)
Contribution per unit	40
Number of units	5,000
Total contribution	**2,00,000**
Less: Fixed cost	1,63,500
Expected Profit	**36,500**
Standard deviation (125 units x Rs.40)	**5,000**

WN 2: Computation or probability:

Probability of profits being greater than Rs.40,000:

Z	$\frac{\text{Target Profit} - \text{Expected Profit}}{\text{SD}}$	$\frac{40,000 - 36,500}{5,000}$	0.70

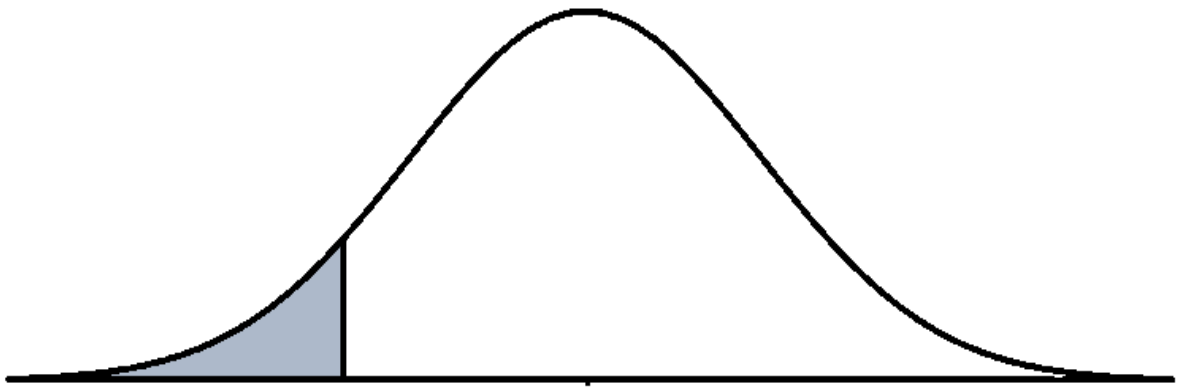


-Z **0** **+Z** **0.7**

- Z of 0.70 corresponds to probability of 0.7580 or 75.80%. Computed Z values are to the left-side of the area and we are required to find the area to the right of binominal curve. This is because we are required to find out the probability of profits greater than Rs.40,000
- **Probability of profits greater than Rs.40,000 = 100% - 75.80% = 24.20%**

Probability of profits being less than Rs.30,000:

Z	$\frac{\text{Target Profit} - \text{Expedted Profit}}{\text{SD}}$	$\frac{30,000 - 36,500}{5,000}$	-1.30



-1.30 **-Z** **0** **+Z**

- Z of -1.30 corresponds to probability of 0.0918 or 9.18%. Computed Z values are to the left-side of the area and we are required to find the area to the left of binominal curve. This is because we are required to find out the probability of profits less than Rs.30,000
- **Probability of profits less than Rs.30,000 = 9.18%**

Part IV – CVP Analysis in service and non-profit organisations

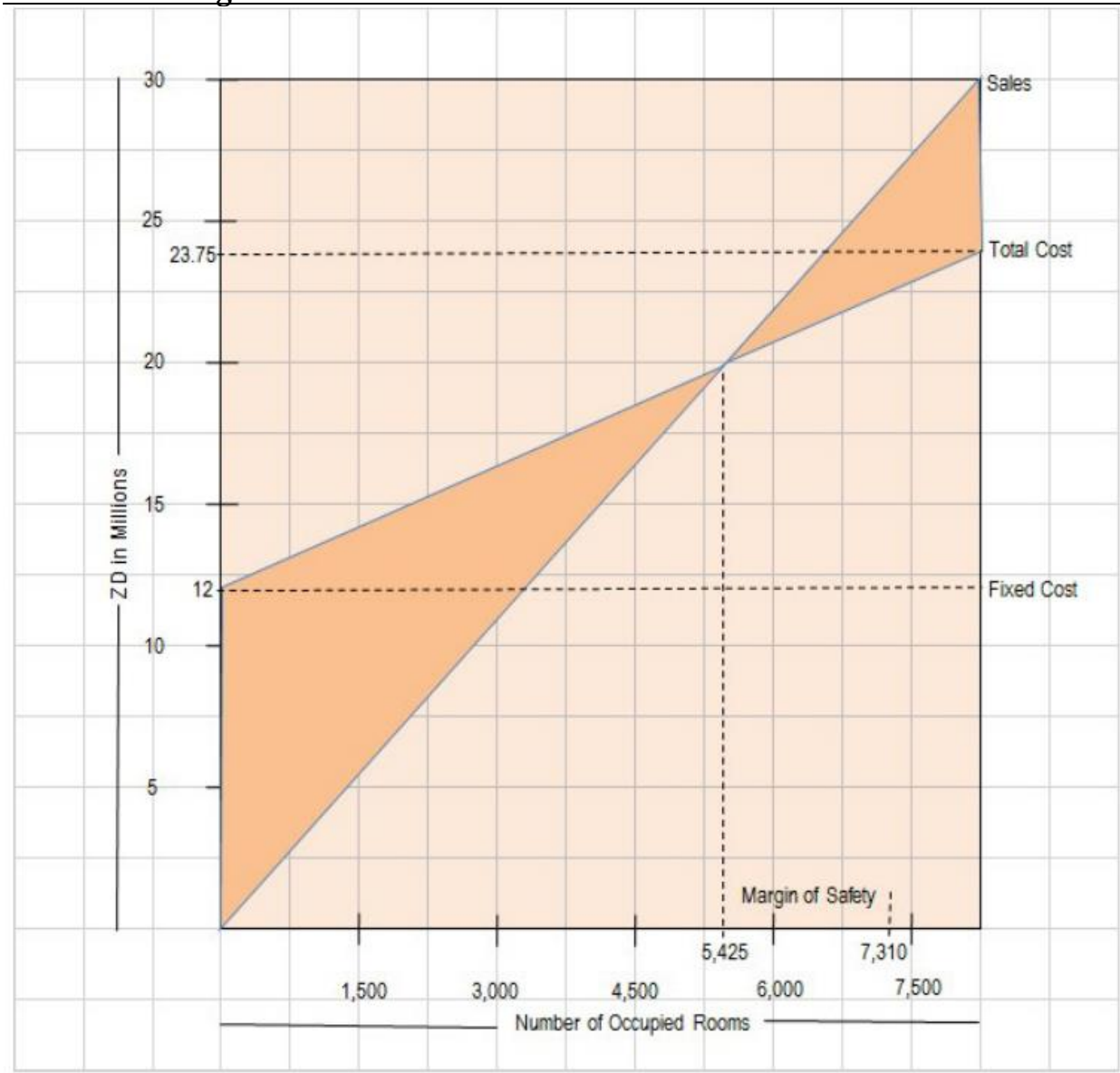
8. CVP Analysis: (Category A – November 2019 RTP)

Hotel Nikko, Zeeland, an affordable leisure hotel resort is an ideal retreat to escape, unwind and enjoy peace of mind. Set amid expansive tropical greenery in the enclave of Zeeland, Hotel Nikko is designed for pleasure, where services reign supreme and Italianstyle architecture of its 25 classic rooms harmonize with nature. Hotel Nikko, Zeeland is a beachfront resort that features a good choice of swim-up pool bar, gym, and variety of restaurants. A wide array of water sport activities like surfing, sailing, jet skiing etc. are available from beach operators at walking distance. The hotel is synonymous with enjoyment and value for money, with a large choice of very attractive "All Inclusive" packages.

Nikko charges guests ZD 2,700 per room per night, irrespective of single or double occupancy. The variable cost is ZD 900 per occupied room per night. The Nikko is available throughout 365 days a year and has a 75% budgeted occupancy rate. Fixed costs are budgeted at ZD 9 million and are incurred evenly during the year

During the second quarter (Q2) of the year, usually the room occupancy rates remains substantially below the levels expected at other quarters of the year. Nikko is expecting to sell 900 occupied room nights during Q2. Management is considering strategy to improve profitability, including closing the Nikko for the duration of Q2 or adopting one possible option as follows –

There is scope to extend the Nikko by creating enough space to run a Rustic Chic, Italian Style restaurant to serve its guests. The annual revenues, costs and sales volumes for the combined operations are given in the following graph–



Note Zeeland's home currency is the ZD.

Required

ANALYZE the profit improvement plan.

Answer:

Computation of Present Profit of Hotel Nikko:

Particulars	Calculation	Amount
Total Room days	25 rooms x 365 days x 75%	6,844
Total contribution	6,844 x 1,800 (2,700 – 900)	1,23,19,200
Fixed Cost		(90,00,000)
Profit		**33,19,200**

Impact of shut-down of Nikko during Q2:

- Loss of Contribution {900 Room Days × (ZD 2,700 - ZD900)} = ZD 16,20,000
- **Nikko should not close its hotel during Q2. The fixed costs will still be incurred and hotel closure would result in lost contribution of ZD16,20,000**. This in turn would decrease annual profits by ZD16,20,000. In addition, Nikko could lose guests at other quarters of the year, particularly their regular business customers, who may perceive the Nikko as being nonreliable

Proposal of opening an Italian Restaurant:

- Opening a restaurant will increase the fixed costs of the Nikko from ZD 9 million p.a. to ZD 12 million p.a. **Thus, annual increment of ZD 3 million**

- Average Revenue per occupied room will rise from ZD 2,700 to ZD 3,636.36 (ZD 30 Million / 8,250 rooms#) **because increasing guest expenditure in Italian restaurant**.
- The total cost predicted at a level of 8,250 occupied rooms is ZD 23.75 million **which means the variable costs must be ZD 11.75 million (ZD 23.75 million – ZD 12 million fixed costs)**. This is a variable cost per occupied room of ZD 1,424.24 which is an increase of ZD 524.24
- New Break-even point = 1,20,00,000/(3,636.36 – 1,424.24) = 5,425 room nights. BEP has gone up from 5,000 to 5,425 room nights. However, budgeted occupancy is now 7,310 occupied room nights which is 80.11% occupancy (7,310/ 9,125). **This provides a margin of safety of 1,885 occupied room nights or 25.79%.**

Single line in X-axis would represent 750 room days. Hence the overall rooms would represent 8,250 room days

Profit with restaurant:

Particulars	Calculation	Amount
Total Room days		7,310
Total contribution	7,310 x 2,212.12 (3636.12 – 1424.24)	1,61,70,597
Fixed Cost		(1,20,00,000)
Profit		41,70,597

At 7,310 occupied room nights, Nikko's budgeted profit would be ZD 41,70,597 which is more than present budgeted profit by ZD 8,51,397. So, it is better for Nikko to go for opening an Italian Restaurant

Part V – Cost Classification

9. Relevant/Irrelevant costs [Category B]

Proposal A is being evaluated against Proposal B. Fill up column IV of the following table:

I	II	III	IV
Sl. No.	Type of Cost	Classification	Condition under which the classification happens
(i)	Variable cost per unit	Irrelevant	
(ii)	Unavoidable fixed costs	Relevant	
(iii)	Out of pocket costs in future	Relevant	
(iv)	Sunk cost	Irrelevant	

Answer:

(i) Variable cost that will not differ between two options/ variable cost has already been incurred in the past
(ii) Fixed cost that is not committed and differ between the options
(iii) Additional future cost/ differs between alternatives
(iv) Costs already have been incurred and it will not affect any current or future action

Part VI – Relevant Costing

10. Relevant costing – Comprehensive Problem [Category B]

Intervero Ltd., a small engineering company, operates a job order costing system. It has been invited to tender for a comparatively large job which is outside the range of its normal activities and, since there is surplus capacity, the management is keen to quote as low a price as possible. It is decided that the opportunity should be treated in isolation without any regard to the possibility of its leading to further work of a similar nature (although such a possibility does exist). A low price will not have repercussions on Intervero's regular work. The estimating department has spent 100 hours on work in connection with the quotation and they have incurred travelling expense of Rs.550 in connection with a visit to the prospective customers' factory. The following cost estimates has been prepared on the basis of their study.

Inquiry 205 H 81
Cost Estimate

	(Rs.)
Direct material and components:	
2,000 units of A at Rs.25 per unit	50,000
200 units of B at Rs.10 per unit	2,000
Other material and components to be bought is	
(specified)	12,500
Direct labour:	
700 hrs. of skilled labour at Rs.3.50 per hour	2,450
1,500 hrs. of unskilled labour at Rs.2 per hour	3,000
Overhead:	
Department P- 200 hrs. at Rs.25 per hour	5,000
Department Q- 400 hrs. at Rs.20 per hour	8,000
Estimating Department:	
100 hours at Rs.5 per hour	500
Travelling expenses	550
Planning Department:	
300 hours at Rs.5 per hour	1,500
	85,500

The following information has been brought together:

Material A: This is a regular stock item. The stock holding is more than sufficient for this job. The material currently held has an average cost of Rs.25 per unit but the current replacement cost is Rs.20 per unit.

Material B: A stock of 4,000 units of B is currently held in the stores. This material is slow moving and the stock is the residue of a batch bought seven years ago at a cost of Rs.10 per unit. B currently costs Rs.24 per unit but the resale value is only Rs.18 per unit. A foreman has pointed out that B could be used as a substitute for another type of regularly used raw material which costs Rs.20 per unit.

Direct Labour: The work force is paid on a time basis. The company has adopted no redundancy policies which mean that skilled workers are frequently moved to jobs which do not make proper use of their skills. The wages included in the cost estimate are for the mix of labour which the job ideally requires. It seems likely, if the job is obtained, that most of the 2,200 hours of direct labour will be performed by skilled staff receiving Rs.3.50 per hour.

Overhead: Department P: It is a department of Intervero Ltd. that is working at full capacity. The department is treated as a profit center and it uses a transfer price of Rs.25 per hour for charging out its processing time to other departments. This charge is calculated as follows:

Estimated variable cost per machine hour	10
Fixed departmental overhead	8
Departmental profit	7
	25

Department P's facilities are frequently hired out to other firms and a charge of Rs.30 per hour is made. There is a steady demand from outside customers for the use of these facilities.

Overhead: Department Q: Department Q uses a transfer price of Rs.20 for charging out machine processing time to other Departments. This charge is calculated as follows:

Estimated variable cost per machine hour	8
Fixed departmental overhead	9
Departmental profit	3
	20

Estimating department: This department charges out its time to specific jobs using a rate of Rs.5/- per hour. The average wage rate within the department is Rs.2.50 per hour but the higher rate is justified as being necessary to cover departmental overheads and the work done on unsuccessful quotations.

Planning department: This department also uses a charging out rate which is intended to cover all departmental costs. The offer received for the above contract is Rs.70, 000.

You are required to restate the cost estimate by using an opportunity cost approach. Make any assumptions that you deem to be necessary and briefly justify each of the figures that you give.

Answer:

Relevant cost estimate for Inquiry 205 H 81

Particulars	**Reference**	**Amount**
Material A	Note 1	40,000
Material B	Note 2	4,000
Other items (to be incurred)		12,500
Direct labour	Note 3	-
Department P	Note 4	6,000
Department Q	Note 5	3,200
Estimating department	Note 6	-
Travelling expenses	Note 6	-
Planning department	Note 6	-
Total relevant cost		**65,700**

Notes:

1. Material A is in stock and is a fast-moving item. Hence the relevant cost is the replacement cost (Rs.20 * 2,000 units)
2. Material B is in stock and is a slow-moving item. It can either be sold for Rs.18 per unit or used as a substitute to save Rs.20/unit. Relevant cost in this case is higher of two options and hence the total relevant cost is Rs.4,000 (Rs.20 * 200 units)
3. Direct labour can move from job to job and hence they are idle. The company has adopted no redundancy policy and hence they cannot be terminated. The relevant cost therefore is zero
4. Department P is a profit-centre and has outside demand. The relevant cost of using Department P's facilities for captive consumption is the lost revenue and the same amounts to Rs.6,000 (200 hours * Rs.30/hour)
5. Department Q does not have outside demand and the relevant cost of using Department Q's facilities for captive consumption is variable cost. The total relevant cost is Rs.3,200 (400 hours * Rs.8/hour)
6. Estimating department expenses, Planning department expenses and travelling expenses have already been incurred and hence are sunk costs. All sunk costs are irrelevant costs.

11. Relevant costing – Comprehensive problem [Category B]

Ranka Builders has been offered a contract by Excel Limited to build for its five special guest houses for use by top management. Each guest house will be an independent one. The contract will be for a period of one year and the offer price is Rs.1 Crores. In addition, Excel Limited will also provide 2 grounds of land, free of cost for the purpose of construction. The chief accountant of Ranka builders has prepared an estimate on the basis of which he has advised that the contract should not be accepted at the price offered. His estimated was as follows:

Particulars	Amount (in lacs)
Land (3 Grounds at Rs.20 lakhs each)	60
Drawings and design	7
Registration	10
Materials: Cement and sand	6
Bricks and Tiles	4
Steel	10

Others (including interior decoration)	10
Labour – Skilled	12
Unskilled	8
Supervisor's salary	5
General overheads	12
Depreciation	6
Total cost	150

The accountant also provides the following information:
Land: The total requirement of land is 3 grounds costing Rs.20 lakhs per ground. Excel Limited will provide 2 grounds free of cost.
Drawings and Design: These have already been prepared and 50% of the cost has already been paid

Materials:

- Cement and sand are already in stock and are in regular use. If used for this contract, they have to be replaced at a cost of Rs.8 lakhs
- Bricks and tiles represent purchases made several months before for a different contract. They could be sold readily for a net of Rs.5 lakhs after meeting all further expenses
- Others: Materials worth Rs.2 lakhs relating to interior decoration are in stock for which there is no alternative use is expected in the near future. However they can be sold for Rs.1 lakh.

Labour:

- Skilled workers will be transferred to this project from another project. The project manager claimed that if the men were returned to him, he could have earned the company an additional Rs.2 lakhs in terms of profits.
- The supervisor undertakes various tasks in the sites and his pay and continuity of employment will not be affected by the new contract. If the contract is taken, he will devote half of his time.

Overheads:

- The equipment that would be used on the contract was bought one year before for Rs.30 lakhs and is expected to last for five years. It can also be used on other contracts and the current replacement price will be Rs.32 lakhs and in a year's time it will be Rs.25 lakhs
- The general overhead include both specific and absorbed overheads. If the contract is not undertaken, Rs.4 lakhs of the same can be avoided

Ranka Builders has also on hand another project, which would not be executed if the contract from Excel Limited were to be accepted. The estimated profit on that project is Rs.10 lakhs. In the light of the information given above, you are required to indicate with reasons whether the contract from Excel Limited, should be accepted or not.

Answer:

Relevant cost statement of Ranka Builders for contract offered by Excel Limited:

Particulars	Reference	Amount (in lacs)
Land cost	Note 1	20
Drawings and design	Note 2	0
Registration	To be incurred	10
Cement and sand	Note 3	8
Brick and tiles	Note 4	5
Steel	To be incurred	10
Others	Note 5	9
Skilled labour	Note 6	14
Unskilled labour	To be incurred	8
Supervisor's salary	Note 7	0
General Overheads	Note 8	4

Particulars	Reference	Amount (in lacs)
Depreciation	Note 9	7
Opportunity cost	Note 10	10
Total relevant cost		**105**

Conclusion: The contract is not to be taken up as the revenues of Rs.100 lacs is lower than relevant cost

Notes:

1. The company needs 3 grounds of land for the contract. 2 grounds of land is given free of cost and hence the relevant cost is the cost of only 1 ground of Rs.20 lacs
2. Drawings and design is a sunk cost as the same has already been incurred. Non-payment of the same does not change the nature of the cost
3. Cement and sand is in stock and is a fast-moving item. The relevant cost for cement and sand is therefore replacement cost (Rs.8 lacs)
4. Bricks and tiles is in stock and is a slow-moving item. The relevant cost for bricks and tiles is therefore realizable value (Rs.5 lacs)
5. Other include interior decoration expense of Rs.2 lacs and other items of Rs.8 lacs. Relevant cost of interior decoration items is Rs.1 lacs (Resale value) and the relevant cost of others would therefore be Rs.9 lacs (Rs.1 lacs + Rs.8 lacs)
6. Skilled workers are available, busy and cannot be substitute. The relevant cost of labour will therefore be lost contribution + wages payable. Relevant cost = Rs.2 lacs + Rs.12 lacs = Rs.14 lacs
7. Supervisor will continue to be there in the company even if the contract is not taken up and hence the relevant cost of the supervisor is zero
8. General overheads are irrelevant in nature. However it includes specific overheads of Rs.4 lacs which would be considered as relevant
9. Relevant cost for the equipment which is regularly used is the difference in replacement cost. Relevant cost = Rs.32 lacs – Rs.25 lacs = Rs.7 lacs
10. The company will incur an opportunity cost of Rs.10 lacs by taking up this contract as they would lose the profit on the other contract

12. Calculation of minimum price to be charged [Category A]

Aayla runs the Planetarium Station in New Delhi, India. The strength of the station lies in its live interactions and programs for visitors, students and amateur astronomers. The station is always active with programs for school and college students and for amateur astronomers. One of the station's key attractions is a big screen IMAX theatre. IMAX is a 70 mm motion picture film format which shows images of far greater size and resolution than traditional film systems. The IMAX cinema projection standards were developed in Canada in the late 1960s. Unlike traditional projectors, the film is run horizontally so that the image width is greater than the width of the film.

The average IMAX show at the station attracts 120 visitors (50 children and 70 adults) at a ticket price of Rs.160 for children and Rs.200 for adults. Aayla estimates that the running costs per IMAX show are Rs.10,000. In addition, fixed costs of Rs.7,500 are allocated to each show based on annual estimate of the number of IMAX shows.

The Hobart School has approached Aayla about scheduling an extra show for its class VIII students. One hundred students and five teachers are expected to join the special show on the 'Planets & Solar System', a feature that is currently showing. The school has asked Aayla for a price quote. The special show will take place at 08:30 AM when the IMAX is not usually open.

Required

RECOMMEND the minimum amount that Aayla should charge.

Answer:

The incremental cost associated with the IMAX show appears to be Rs.10,000 i.e. cost of running the show. **The allocated fixed cost per show is not relevant because the total amount of fixed costs for the year will not change as a result of the special show**. Further, the stated ticket prices are not relevant because the show will take place at 08:30 AM when the IMAX is not usually open – thus, the students will not be

displacing any regular visitors. Based on the financial data provided, the minimum price quote appears to be Rs.10,000.

Aayla should consider the following factors:

- Does the station have a souvenir shop and/or cafeteria? If so, many students are likely to buy food and/or souvenir items, thereby increasing the station's contribution. In turn, this would reduce the minimum price quote.
- **What is the impact on future revenue?** After seeing the show, many students may return with their parents, thereby increasing future revenue.
- Are there costs linked with the special showing that are not included in the Rs.10,000 variable cost number? For example, will the station have to pay an overtime premium.

Aayla should also consider the educational mission of the Planetarium Station. Such shows directly contribute to this mission, the station, and, hopefully, the betterment of the students. The special shows may be an excellent way to expose some students to earth science –these students may have never gone through the Planetarium Station if it were not for the school excursion.

Overall, the "best" price to charge is unclear and requires some judgment as Aayla needs to balance an array of financial and non-financial factors

13. Relevant Costing – Price Fixation: (Category B – November 2019 RTP)

N2 Co. is the manufacturer and supplier of firefighting and safety equipment for industrial use and follows the international quality standards and uses the high-grade raw material. It is a fast-growing brand that protects millions of people across the India, every single day. N2 has been offered a bid on a prospective export contract for 20,000 commercial fire extinguishers with following specification from USA buyer and the delivery terms is FOB. "two-gallon cylinder holding 10 pounds of multi-purpose dry chemical at 380 PSI"

N2 is exporting first time. The price computation per fire extinguisher is as follows:

Particulars	Amount	Amount
Direct Material		
Circle part cost	620	
Necking part	30	
Bottom part	50	
Fire extinguisher Powder	590	
Heat process	50	
Nozzle	60	
Meter	20	
Pipe	50	
Nitrogen	30	1,500
Direct Labor (2 hrs. × Rs.40)		80
Leakage Testing		50
Variable Overheads (including packing)		214
Export Clearance Charges on FOB term		36
Fixed Overhead		100
Total		1,980
Add: Markup @ 10%		198
Price		2,178
USD to INR		67
Price in USD		32.51

After quotation of USD 32.51, the buyer is negotiating the price and ready to pay only USD 28.50.

Required

ADVISE whether it is worth accepting at USD 28.50 considering other factors

Answer:

Statement Showing Benefit from Prospective Export Contract

Particulars	Amount

Direct Material	1,500
Direct Labor (2 hrs. × Rs.40)	80
Leakage Testing	50
Variable Overheads (including packing)	214
Export Clearance Charges on FOB term	36
Total Relevant Cost	1,880
USD to INR	67
Relevant cost	**$28.06**
Price offered by customer	$28.50
Benefit per extinguisher	**$0.44**
No. of extinguishers	20,000
Total Benefit	**$8,800**

Advise

From financial perspective, it will be profitable for N2 to accept the contract because of gain of $8,800 (Rs.5,89,600) along with export incentives of drawback. Besides this, following consideration should also be taken into consideration while exporting fire extinguishers:

Statutory Compliances

- **Before exporting to a foreign country or even agreeing to sell to a new customer in a foreign country, N2 should be aware of foreign laws that might affect the sale**.
- Export documentation is important as it plays a significant role in regulating the flow and movement of goods in international markets. Thus, N2 should consider about the documentation and inspection compliances part of new buyer.
- It may include third party audit, commercial invoice and packaging list requirements, certificate requirements like- no child labour certificate, inspection certificate, reach compliance certificate etc. If any compliance requirement is not met, what will be the consequences? There may be stiff penalty has to be paid owing to non-compliance or failure to accurately comply with the export obligation.

Buyer Creditworthiness

- **It is necessary that before shipment the exporter to carry out its own credit check on the importer to determine creditworthiness. Thus, N2 should make a proper assessment of the creditworthiness of the foreign buyer and spend sufficient time in cross checking the credit worthiness of his counterpart to avoid any kind of unforeseen situation in future**. Such information can be easily availed through contracts or through ECGC.
- Private agencies also provide information on paid service basis. However, this risk can be covered by asking for LC payment terms or 100% advance or opting for post shipment insurance for goods being exported.

Industry Analysis

- **Industry analysis involves such things as assessing the competition in the industry; the interplay of supply and demand in the industry; how the industry holds up against other industries that are emerging and providing competitions;** the likely future of the industry, especially in light of technological developments; how credit works in the industry; and the exact extent of the impact that external factors have on the industry.
- For N2, it is worthwhile to know the current and future demand of fire extinguisher and factors influencing the growth of global fire extinguisher market. **N2 can perform industry analysis through three main ways i.e. the Competitive Forces Model (also known as Porter's 5 Forces); the broad factors analysis, also known as PEST analysis; and SWOT Analysis. It may also arrange industry report from trusted sources.**

Additional Terms

- **Ensure that the all terms are clear and suit the business purpose. For instance, delivery terms should provide date of shipment or means of determining the date**. Therefore, N2 should evaluate whether shipment date is attainable or not. If the target shipment date could not be met,

what will be the charges? Further, N2 must also check whether the foreign bank charges are subject to beneficiary account. If yes, then the same must be considered in the quotation.

Overall, N2 should accept the proposed contract only after due and careful consideration of above factors

Part VII – Indifference Point and Shut-down Point

14. Indifference point – Basic [Category A]

X is a multiple product manufacturer. One product line consists of motors and the company produces three different models. X is currently considering a proposal from a supplier who wants to sell the company blades for motor line. The company currently produces all the blades it requires. In order to meet the customer's needs, X currently produces three different blades for each motor model (for different blades). The supplier would charge Rs.25 per blade, regardless of blade type. For the next year X has projected the costs of its own blade production as follows (based on projected volume of 10,000 units)

Direct Material	Rs.75,000
Direct Labour	Rs.65,000
Variable overhead	Rs.55,000
Fixed Overhead	
Factory supervision	Rs.35,000
Other fixed costs	Rs.65,000
Total production costs	Rs.2,95,000

Assume (1) the equipment utilized to produce the blades has no alternative use and no market value, (2) the space occupied by blade production will remain idle if the company purchases rather than makes the blades, (3) factory supervision costs reflect the salary of a production supervisor who would be dismissed from the firm if blade production ceased.

i. Determine the level of production where X would be indifferent between buying and producing the blades. If the future volume were predicted to decrease, would that influence the decision?

ii. For this part only, assume that the space presently occupied by blade production could be leased to another firm for Rs.45, 000 per year. How could this affect make or buy decision?

Answer:

WN 1: Computation of variable cost per unit and total fixed cost for make and buy option

Particulars	Cost of Make	Cost of Buy
Variable costs:		
Direct Material	75,000	-
Direct Labour	65,000	-
Variable Overheads	55,000	-
Purchase cost	-	2,50,000
Total variable cost	**1,95,000**	**2,50,000**
Number of units	10,000	10,000
Variable cost per unit	**19.50**	**25.00**
Fixed costs:		
Factory supervision	35,000	0
Other fixed costs (Note 1)	65,000	65,000
Total Fixed costs	**1,00,000**	**65,000**

Note:

1) Other fixed costs of Rs.65,000 is considered to be unavoidable and hence would be incurred both while making and buying the product

WN 2: Computation of indifference point between make and buy option:

Indifference Point	$\frac{\text{Change in Fixed Cost}}{\text{Change in Variable Cost per unit}}$	$\frac{1,00,000 - 65,000}{25 - 19.50}$	6,364 units

- The company would be indifference between make and buy option at volume of 6,364 units. For any volume below indifference point (6,364 units), we would prefer an alternative having lower fixed cost (buy option). Similarly, for any volume above indifference point, we would prefer an alternative having higher fixed cost (make option)

- **In this case we should opt for make decision for expected volume of 10,000 blades. However future volumes are predicted to decrease and in case the volumes fall below 6,364 blades then we can opt for buy decision**

WN 3: Computation of variable cost per unit and total fixed cost for Part II

Particulars	Cost of Make	Cost of Buy
Variable cost per unit	**19.50**	**25.00**
Fixed costs:		
Factory supervision	35,000	0
Other fixed costs	65,000	65,000
Rent cost (opportunity cost) (Note 1)	45,000	0
Total Fixed costs	**1,45,000**	**65,000**

Note:

1) **Rent cost will be taken as an opportunity cost as we lose the opportunity of renting property when we go for make option. Alternatively, this can be taken as income in case of buy option as we will let out the property. However, we should provide either the treatment of opportunity cost or income. Providing both treatments would lead to double-counting**

WN 4: Computation of indifference point between make and buy option:

Indifference Point	$\frac{\text{Change in Fixed Cost}}{\text{Change in Variable Cost per unit}}$	$\frac{1,45,000 - 65,000}{25 - 19.50}$	14,545 units

- **We should opt for buy alternative (lower fixed cost) as the expected volume is lower than indifference point.**

15. Indifference point [Category B]

The following are the cost data for three different alternative ways of processing work

Particulars	Manual	Semi-automatic	Fully-automatic
Monthly fixed costs			
Occupancy	15,000	15,000	15,000
Maintenance contract	-	5,000	10,000
Equipment lease	-	25,000	1,00,000
Variable costs			
Supplies	40	80	20
Labour	200	60	20

- Calculate the cost indifference points and interpret your results
- If the present case load is 600 cases and it is expected to go up to 850 cases in near future, which method is most appropriate on cost considerations?

Answer:

WN 1: Cost indifference Point

Particulars	A and B	A and C	B and C
Differential fixed cost	Rs.30,000 (45,000 – 15,000)	Rs.1,10,000 (1,25,000- 15,000)	Rs.80,000 (1,25,000 – 45,000)
Different variable cost	Rs.100 (240-140)	Rs.200 (240 – 40)	Rs.100 (140 – 40)
Cost indifference point (Differential fixed cost/Differential variable cost)	300 cases	550 cases	800 cases

Note:

- Indifference point can be always computed between two alternatives. Hence we have computed indifference point between A and B, A and C & B and C

Interpretation of Results

At activity level below the indifference points, the alternative with lower fixed costs and higher variable costs should be used. At activity level above the indifference point alternative with higher fixed costs and lower variable costs should be used.

No of cases	Alternative to be chosen
Cases less than 300	Alternative 'A'
300 to less than 800	Alternative 'B'
Greater than 800	Alternative 'C'

(ii) Present case load is 600. Therefore, alternative B is suitable. As the number of cases is expected to go upto 850 cases, alternative C is most appropriate.

16. Shutdown point [Category B]

A paint manufacturing company manufacture 2, 00,000 per annum medium sized tins of spray lac paints when working at normal capacity. It incurs the following costs of manufacturing per unit:

Direct Material	7.80
Direct Labour	2.10
Variable overheads	2.50
Fixed overheads	4.00
Products costs per unit	16.40

The selling price is Rs.21 per unit and variable and administrative expenses are 60 paise per ton. During the next quarter only 10,000 units can be produced and sold. Management plans to shut down the plant estimating that the fixed manufacturing cost can be reduced to Rs.74, 000 for the quarter. When the plant is operating, the fixed overheads are incurred at a uniform rate throughout the year. Additional costs of plant shutdown for the quarter are estimated at Rs.14, 000.

a) Express your opinion as to whether the plant should be shut down during the quarter and
b) Calculate the shutdown point for the quarter in terms of number of tins

Answer:

WN 1: Computation shut-down point:

Shut-down Point	$\frac{\text{FC during operation} - \text{FC during shutdown} - \text{Additional FC to resume operations}}{\text{Contribution per unit}}$
Shut-down Point	$\frac{[(50{,}000 \text{ x } 4) - 74{,}000 - 14{,}000]}{(21 - 12.40 - 0.60)}$
Shut-down point	$\frac{1{,}12{,}000}{8}$
Shut-down point	14,000 tins

Note:

- Fixed cost during operation for a year = 2,00,000 tins x 4/tin = Rs.8,00,000; Fixed cost for a quarter = Rs.8,00,000/4 = Rs.2,00,000

Conclusion:

- The company is expected to operate at 10,000 units in the next quarter. This is lower than shut-down point and hence from a financial point of view the company should shut-down its plant
- However, before deciding on shut-down it should also consider qualitative factors.
- **Qualitative factors related to shut-down decision often include considerations of employees that will be terminated if the operations are shut-down, effects of suppliers from which the materials will no longer be purchased, and the effect of customers who previously purchased the product**

Part VIII – Limiting Factor

17. Limiting Factor – Basic [Category A]

Division Z is a profit center which produces four products A, B, C and D. Each product is sold in the external market also. Data for the period is:

	A	B	C	D
Market price per unit (Rs.)	150	146	140	130
Variable cost of pdn. Per unit	130	100	90	85
Labour hours required per unit	3	4	2	3
Maximum demand	2800	2500	2300	1600

- Identify the production pattern if the available labour hours are a) 20000 hours and b) 30,000 hours

- Assume there is no restriction on maximum demand, identify the opportunity cost of producing Product A, B, C or D if labour availability is 20,000 hours

Answer:

WN 1: Identification of limiting factor:

Product	Demand	Hours per unit	Hours required
A	2,800	3	8,400
B	2,500	4	10,000
C	2,300	2	4,600
D	1,600	3	4,800
			27,800

Note:

- **Labour will be a limiting factor if the availability of labour hours is less than 27,800**

WN 2: Statement of ranking:

Product	**A**	**B**	**C**	**D**
Selling Price	150	146	140	130
Less: Variable cost	(130)	(100)	(90)	(85)
Contribution per unit	20	46	50	45
Labour hours per unit	3	4	2	3
Contribution per labour hour	6.67	11.50	25.00	15.00
Ranking	**IV**	**III**	**I**	**II**

WN 3: Production pattern if labour hours availability is limited to 20,000 hours:

Product	Demand	Hours per unit	Hours consumed
C	2,300	2	4,600
D	1,600	3	4,800
B	2,500	4	10,000
A	200 (600/3)	3	600
Total			**20,000**

Note:

- We prioritize production of rank 1 product and post meeting its full demand we move to rank 2. We should keep moving forward till allocation of entire 20,000 hours is complete
- Product A's production would be limited to 200 units. This is because there are only 600 balance hours and hence production would be only 200 units (600 hours/3 hours per unit)

WN 4: Production pattern if labour hours availability is limited to 30,000 hours:

- The company has adequate capacity to produce all four products. Hence production would be equal to 2,800 units of A, 2,500 units of B, 2,300 units of C and 1,600 units of D

WN 5: Computation of opportunity cost:

Product	**A**	**B**	**C**	**D**
Labour availability	20,000	20,000	20,000	20,000
Labour hours per unit	3	4	2	3
Maximum possible production	6,666	5,000	10,000	6,666
Contribution per unit	20	46	50	45
Total contribution	1,33,320	2,30,000	5,00,000	2,99,970
Opportunity cost	**5,00,000**	**5,00,000**	**2,99,970**	**5,00,000**

- Opportunity cost is the cost of the next best available alternative. For Product A, B and D the next best available alternative is Product C and hence it has opportunity cost of Rs.5,00,000
- The next best available alternative for Product C is Product D and hence the opportunity cost for the same is Rs.2,99,970

18. Limiting factor & specific fixed costs [Category A – November 2015 (exam)]

Four products P, Q, R and S are produced by profit center Division A. Each product is sold in the external market also. Data for the period are as follows:

Particulars	P	Q	R	S
Market price	70	69	56	46
Variable cost	66	59	36	37
Labour hours per unit	3	2	2	3
Specific fixed costs per 10,000 units of product	2,500	12,600	15,000	18,000

Product S can be transferred to Division B but the maximum quantity that might be required for transfer is 20,000 units of S. The specific fixed costs given above are avoidable if a product is not made. They are incurred for every 10,000 units.

The maximum sales (units) in the external market are:

- Product P = 30,000 units
- Product Q = 31,000 units
- Product R = 28,000 units
- Product S = 18,000 units

Division B can purchase the same product at a slightly cheaper price of Rs. 45 per unit instead of receiving transfers of product S from Division A without any extra transport/inspection costs. B can also take partial supplies from A. The total labour hours available in Division A is 1, 92,000 hours.

- What is A's optimal product mix and the corresponding contribution net of specific fixed costs?
- How many units should A transfer to B and at what price?
- Is it in the company's interest to transfer 20,000 units of S to B?

Answer:

WN 1: Statement of ranking:

Particulars	**P**	**Q**	**R**	**S**
Selling price	70	69	56	46
Less: Variable cost	66	59	36	37
Contribution per unit	4	10	20	9
Labour hours per unit	3	2	2	3
Contribution per Labour Hour	1.33	5	10	3
Ranking	**IV**	**II**	**I**	**III**
Specific Fixed Cost	0.25	1.26	1.5	1.8
Contribution net of specific fixed cost	3.75	8.74	18.5	7.2
Labour hours per unit	3	2	2	3
Contribution per Labour Hour	1.25	4.37	9.25	2.4
Ranking	**IV**	**II**	**I**	**III**

- In this question we have specific fixed cost which increases with every lot of production. In this type of problem, we will have to do ranking based on normal contribution and ranking based on contribution net of specific fixed cost
- We need to follow two different statement of allocation based on two different types of ranking. Here the ranking has remained same and hence we will prepare only one statement of allocation

WN 2: Statement of allocation:

Product	**Units**	**Hrs/unit**	**LH consumed**	**Contribution**	**Fixed cost**	**Profit**
R	20,000	2	40,000	4,00,000	30,000	3,70,000
R	8,000	2	16,000	1,60,000	15,000	1,45,000
Q	30,000	2	60,000	3,00,000	37,800	2,62,200
~~Q~~	~~1,000~~	~~2~~	~~2,000~~	~~10,000~~	~~12,600~~	~~-2,600~~
S	10,000	3	30,000	90,000	18,000	72,000
S	8,000	3	24,000	72,000	18,000	54,000
P	7,333	3	22,000	29,332	2,500	26,832
Total			**1,92,000**	**10,51,332**	**1,21,300**	**9,30,032**

- Statement of allocation will be carried out as per the ranking identified in WN 1. However, we should do allocation of product in two stages:
- Allocation in multiples of 10,000 units and

- **Balance units – This would be done to check whether contribution from extra units recovers the specific fixed cost arising out of that allocation. In this question we will not produce 31,000 units of Q and restrict to 30,000 units of Q. This is because contribution from extra 1,000 units does not recover specific fixed cost of Rs.12,600**

WN 3: Statement of ranking with transfer possibility of 20,000 units:

Note: Students are requested to refer to this part post understanding of transfer pricing (Chapter 9)

Particulars	P	Q	R	S	S (Internal)
Selling price	70	69	56	46	45
Less: Variable cost	66	59	36	37	37
Contribution per unit	4	10	20	9	8
Labour hours per unit	3	2	2	3	3
Contribution per Labour Hour	1.33	5	10	3	2.67
Ranking	**V**	**II**	**I**	**III**	**IV**
Specific Fixed Cost	0.25	1.26	1.5	1.8	1.8
Contribution net of specific fixed cost	3.75	8.74	18.5	7.2	6.2
Labour hours per unit	3	2	2	3	3
Contribution per Labour Hour	1.25	4.37	9.25	2.4	2.07
Ranking	**V**	**II**	**I**	**III**	**IV**

- In case of internal transfer, the company will save Rs.8 per unit as they were earlier purchasing the product at Rs.45 per unit and now will manufacture at Rs.37 per unit

Statement of allocation:

Product	Units	Hrs/unit	LH consumed	Contribution	Fixed cost	Profit
R	20,000	2	40,000	4,00,000	30,000	3,70,000
R	8,000	2	16,000	1,60,000	15,000	1,45,000
Q	30,000	2	60,000	3,00,000	37,800	2,62,200
~~Q~~	~~1,000~~	~~2~~	~~2,000~~	~~10,000~~	~~12,600~~	~~-2,600~~
S	10,000	3	30,000	90,000	18,000	72,000
S	8,000	3	24,000	72,000	18,000	54,000
S(internal)	7,333	3	22,000	58,664	18,000	40,664
Total			**1,92,000**	**10,80,664**	**1,36,800**	**9,43,864**

- The company should transfer 7,333 units of S as per the statement of allocation. The transfer price for the same is calculated below:

Particulars	Calculation	Amount
Variable manufacturing cost	7,333 x 37	2,71,321
Specific Fixed cost	1 lot of Rs.18,000	18,000
Loss of net contribution of Product P	WN 2	26,832
Total relevant cost		**3,16,153**
Number of units		7,333
Transfer price per unit	**(3,16,153/7,333)**	**43.11**

WN 4: Analysis of transfer of 20,000 units of Product S:

- The company is able to manufacture 27,333 units of Product S and now plans to transfer 20,000 units of Product S. Therefore, company would be able to sell only 7,333 units externally and balance 20,000 units would be transferred to internal division

Particulars	Calculation	Amount
Variable manufacturing cost	20,000 x 37	7,40,000
Specific Fixed cost	2 lots of Rs.18,000	36,000
Loss of net contribution of P	WN 2	26,832
Loss of contribution of S	12,667 x 9	1,14,003

Savings in specific fixed cost of S for external sales	Note 1	(18,000)
Total relevant cost for manufacture		**8,98,835**
Total relevant cost for purchase	20,000 x 45	9,00,000
Net savings in manufacturing		**1,165**

Note:

1) The company was earlier manufacturing two lots of 10,000 units for external sales. Now it will manufacture only one lot for external sales and hence it would save Rs.18,000 of specific fixed cost

Conclusion:

- The company should go ahead with transfer of entire 20,000 units as the relevant cost of manufacturing is lower than relevant cost of purchasing the product

19. Multiple limiting factors [Category A – November 2014 (exam)]

A company is producing three products X, Y & Z. Relevant information is given below:

Product	X	Y	Z
Raw material per unit (kg)	20	12	30
Machine hours per unit (hours)	3	5	4
Selling price per unit (Rs.)	500	400	800
Maximum limit of production Unit	1,500	1,500	750

Only 9,200 hours are available for production at a cost of Rs.20 per hour and maximum 50,000 kgs. Of material @ Rs. 20 per kg., can be obtained. (Only product mix quantities are to be shown, calculation of total profit at that product mix not required to be shown)

On the basis of the above information determine the product-mix to give the highest profit if at least two products are produced.

Answer:

WN 1: Identification of limiting factor:

- The company will need 70,500 KG of Raw material and 15,000 machine hours to meet the demand given in the question. However, the available machine hours and raw material is lower than requirement and hence both are limiting factors
- In this problem we have 2 limiting factors and there are 3 products. Following approach can be used if there are 'n' limiting factors and 'n+1' products

WN 2: Identification of alternatives:

- **Alternative 1:** Meet maximum demand of X and split the balance resources between Machine Y and Machine Z
- **Alternative 2:** Meet maximum demand of Y and split the balance resources between Machine X and Machine Z
- **Alternative 3**: Meet maximum demand of Z and split the balance resources between Machine X and Machine Y

WN 3: Analysis of Alternative 1:

a) Resources used for meeting maximum demand of X:

Particulars	**Raw Material**	**Machine hours**
Availability	50,000	9,200
Less: Utilized for X (1,500 units)	(30,000)	(4,500)
Balance for Y and Z	**20,000**	**4,700**

b) Balance production of Y and Z:

Raw material constraint: 12Y + 30 Z = 20,000
Machine hours constraint: 5Y + 4Z = 4,700
Solving two equations we get, Y = 598 units and Z = 427 units

c) Possible combination:

X = 1,500 units; Y = 598 units and Z = 427 units

WN 4: Analysis of Alternative 2:

a) Resources used for meeting maximum demand of Y:

Particulars	Raw Material	Machine hours
Availability	50,000	9,200
Less: Utilized for Y (1,500 units)	(18,000)	(7,500)
Balance for X and Z	**32,000**	**1,700**

b) Balance production of X and Z:

Raw material constraint: 20X + 30 Z = 32,000
Machine hours constraint: 3X + 4Z = 1,700
Solving two equations we get, X = -7,700 and Y = 6,200

- Production of X cannot be negative and hence the above combination of X and Y is not feasible. In this case the balance resources can either be fully utilized for X or for Y

c) Usage of balance resources fully for X or Z:

Particulars	Product X	Product Z
Available Raw material	32,000	1,700
Raw material per unit	20	30
Maximum possible production (A)	**1,600**	**1,067**
Available Machine hours	1,700	1,700
Machine hours per unit	3	4
Maximum possible production (B)	**567**	**425**
Final feasible production (Lower of A and B)	**567**	**425**

- We compute the maximum possible production based on various constraints. Final feasible production would be the minimum of various maximum possible production. This is because we need adequate resources of all resources to manufacture the product

d) Possible combination:

Combination 1: Y = 1,500 units and X = 567 units
Combination 2: Y = 1,500 units and Z = 425 units

WN 5: Analysis of Alternative 3:

a) Resources used for meeting maximum demand of Z:

Particulars	Raw Material	Machine hours
Availability	50,000	9,200
Less: Utilized for Z (750 units)	(22,500)	(3,000)
Balance for X and Y	**27,500**	**6,200**

b) Balance production of X and Y:

Raw material constraint: 20X + 12Y = 27,500
Machine hours constraint: 3X + 5Y = 6,200
Solving two equations we get, X = 986 units and Y = 648 units

c) Possible combination:

X = 986 units; Y = 648 units and Z = 750 units

WN 6: Computation of contribution per unit:

Particulars	X	Y	Z
Selling Price	500	400	800
Less: Material cost @ Rs.20 per KG	(400)	(240)	(600)
Less: Machine cost @ Rs.20 per hour	(60)	(100)	(80)
Contribution per unit	**40**	**60**	**120**

WN 6: Selection of best alternative:

Combination	Calculation	Total Contribution
X = 1,500 units; Y = 598 units and Z = 427 units	1,500(40) + 598(60) + 427(120)	1,47,120
Y = 1,500 units and X = 567 units	567 (40) + 1,500(60)	1,12,680
Y = 1,500 units and Z = 425 units	1,500(40) + 425(120)	1,41,000
X = 986 units; Y = 648 units and Z = 750 units	**986(40) + 648(60) + 750(120)**	**1,68,320**

The company should go ahead with 986 units of X, 648 units of Y and 750 units of Z to earn maximum contribution of Rs.1,68,320

20. Limiting factor [Category A – May 2015 (exam)]

Apex Limited manufactures two products, P and Q, using the same production facility. The following information is available for a production period:

Particulars	Product P	Product Q
Demand (units)	2,20,000	1,75,000
Contribution (Rs./ unit)	10	12
Machine hours required per 100 units	15	25

P and Q can be produced only in batches of 100 units, and whatever is produced has to be sold or discarded. Inventory build-up is not possible from one production period to another. The total fixed costs for each level of production and directly attributable to P and Q are given below:

Level of output	Fixed cost of Product P	Fixed cost of Product Q
Upto 1,00,000 units	6,00,000	5,50,000
1,00,001 to 2,00,000 units	13,50,000	12,20,000
2,00,001 to 3,00,000 units (maximum possible level)	18,70,000	15,50,000

75,000 machine hours are available in the production period.

Required

- Calculate the quantities of P and Q in the best product mix to achieve the maximum Profit and compute the maximum profit.
- What will be the opportunity cost of meeting P's demand fully?

Answer:

WN 1: Statement of ranking:

Particulars	Product P	Product Q
Contribution per unit	10	12
Machine hours per unit	0.15	0.25
Contribution per machine hour	66.67	48
Rank	**I**	**II**

WN 2: Statement of allocation:

Product	Units	Hrs/unit	MH consumed	Contribution	Fixed cost	Profit
P	1,00,000	0.15	15,000	10,00,000	6,00,000	4,00,000
P	1,00,000	0.15	15,000	10,00,000	7,50,000	2,50,000
~~P~~	~~20,000~~	~~0.15~~	~~3,000~~	~~2,00,000~~	~~5,20,000~~	~~-3,20,000~~
Q	1,00,000	0.25	25,000	12,00,000	5,50,000	6,50,000
Q	75,000	0.25	18,750	9,00,000	6,70,000	2,30,000
Total			**73,750**	**41,00,000**	**25,70,000**	**15,30,000**

- Statement of allocation will be carried out as per the ranking identified in WN 1. However, while doing allocation we should check whether the contribution recovers the extra fixed cost arising at each stage
- **The company will not manufacture 20,000 units of P as the contribution of Rs.2,00,000 will not recover fixed cost of Rs.5,20,000.**
- The company should produce 2,00,000 units of P and 1,75,000 units of Q to earn maximum profit of Rs.15,30,000

WN 3: Computation of opportunity cost of meeting P's demand fully:

Product	Units	Hrs/unit	MH consumed	Contribution	Fixed cost	Profit
P	2,20,000	0.15	33,000	22,00,000	18,70,000	3,30,000
Q	1,00,000	0.25	25,000	12,00,000	5,50,000	6,50,000
Q	68,000	0.25	17,000	8,16,000	6,70,000	1,46,000
Total			**75,000**	**42,16,000**	**30,90,000**	**11,26,000**

- The overall profits reduce from Rs.15,30,000 to Rs.11,26,000 once the entire demand of P is met
- **Opportunity cost of meeting P's demand fully = 15,30,000 – 11,26,000 = Rs.4,04,000**

21. Limiting factor [Category A – Nov 2016 (exam)]

Jaya-Surya Ltd. (JSL) manufactures and sells two products 'Jaya' and 'Surya'. Both Jaya and Surya use a regular machine while Surya uses another high-precision machine as well. The following information is available for the next quarter.

	Jaya	Surya
Selling Price per unit (Rs.)	1,500	2,000
Variable Manufacturing Cost per unit (Rs.)	900	1,600
Variable Marketing Cost per unit (Rs.)	250	150
Budgeted Allocation of Fixed Overhead Costs (Rs.)	18,00,000	85,00,000
Regular Machine Hours per unit	2.0	1.0

Further information is available as follows:

- JSL faces a capacity constraint of 60,000 hours on the regular machine for the next quarter and there is no constraint on the high precision machine for the next quarter.
- Out of Rs.85, 00,000 budgeted allocation of fixed overhead costs to product Surya, Rs. 60, 00,000 is payable for hiring the high precision machine. This cost is charged entirely to product Surya. The hiring agreement can be cancelled at any time without penalties.
- All other overhead costs are fixed and cannot be changed.
- A minimum quantity of 12,500 units per quarter of Jaya must be produced to fulfill a commitment to a customer.
- Any quantity of any product can be sold at the given prices.

Required:

- Calculate the product mix of Jaya and Surya which would maximize the relevant operating profit of JSL in the next quarter.
- JSL can double the quarterly capacity of regular machine at a cost of Rs. 28, 00,000. Calculate the new product mix and the amount by which the relevant operating profit will increase.

Answer:

- Statement of ranking is not required as there are two products and the company incur product specific fixed cost for Surya
- We can look at the following two alternatives:
  - Alternative 1 – Meet minimum demand of Jaya and use balance for Product Jaya
  - Alternative 2 – Meet Minimum demand of Jaya and use balance for Product Surya

Particulars	60,000 hours		1,20,000 hours	
	Alternative 1	**Alternative 2**	**Alternative 1**	**Alternative 2**
Units produced				
Jaya	30,000	12,500	60,000	12,500
Surya	0	35,000	0	95,000
Contribution per unit				
Jaya	350	350	350	350
Surya	250	250	250	250
Total contribution				
Jaya	1,05,00,000	43,75,000	2,10,00,000	43,75,000
Surya	0	87,50,000	0	2,37,50,000
Total contribution	**1,05,00,000**	**1,31,25,000**	**2,10,00,000**	**2,81,25,000**
Less: Fixed cost	43,00,000	1,03,00,000	71,00,000	1,31,00,000

Profit	**62,00,000**	28,25,000	1,39,00,000	**1,50,25,000**

Note:

- The company incurs fixed cost of Rs.18 lacs for Product Jaya and Rs.85 lacs for Product Surya. Out of the fixed costs, only Rs.60 lacs are avoidable fixed cost for Product Surya
- The company would incur Rs.43 lacs (18 lacs + 85 lacs – 60 lacs) if Product Jaya is made and it will incur Rs.103 lacs (18 lacs + 85 lacs) for Product Surya
- The fixed cost will increase by Rs.28 lacs if the company doubles capacity to 1,20,000 hours

Selection of alternative:

- **The company will manufacture 30,000 units of Jaya when capacity is 60,000 hours**
- **The company will manufacture 12,500 units of Jaya and 95,000 units of Surya if the manufacturing capacity is doubled to 1,20,000 hours**

22. Optimum product Mix [Category B – May 2018 (exam)]

Nova Limited manufactures two products 'Super' and 'Bright'. The selling price and cost data are as under:

Particulars	Super	Bright
Selling Price per unit	384	525
Direct material per unit	158	240
Direct labour @ Rs.40 per hour		
Department A	60	80
Department B	-	100
Department C	80	-
Variable overhead per unit	32	45

The company operates a single shift of 8 hours/day for 300 days in a year and the number of workers in each department are as under:

Department A	78 workers
Department B	54 workers
Department C	48 workers

The employees cannot be increased nor can they be transferred from one department to another.

Required:

Calculate the number of units of each product that can be manufactured to yield maximum profit

WN 1: Identification of alternatives:

- Demand of Product Super and Product Bright is not given and hence it is assumed that there is unlimited demand
- There is limitation on availability of labour in Department A, B and C and hence all three departments are limiting factors
- Following alternatives are available in this question:
  - Alt 1 – Prioritize production of Product Super and use balance resources for Product Bright
  - Alt 2 – Prioritize production of Product Super and use balance resources for Product Bright

WN 2: Evaluation of Alternative 1:

Dept	Available capacity	Hrs/unit of Super	Max Production	Hrs Utilized	Balance resource	Hrs/unit of Bright	Maximum Production
A	1,87,200	1.5	1,24,800	86,400	1,00,800	2	**50,400**
B	1,29,600	NA	NA	0	1,29,600	2.5	51,840
C	1,15,200	2	**57,600**	1,15,200	0	NA	NA

- The company would be able to manufacture 57,600 units of Super and 50,400 units of Bright.
- Contribution per unit of Super = 384 – 158 – 60 – 80 – 32 = 54
- Contribution per unit of Bright = 525 – 240 – 80 – 100 – 45 = 60
- **Total contribution of Alternative 1 = (57,600 x 54) + (50,400 x 60) = Rs.61,34,400**

WN 3: Evaluation of Alternative 2:

Dept	Available capacity	Hrs/unit of Bright	Max Production	Hrs Utilized	Balance resource	Hrs/unit of Super	Maximum Production

A	1,87,200	2	93,600	1,03,680	83,520	1.5	**55,680**
B	1,29,600	2.5	**51,840**	1,29,600	0	NA	NA
C	1,15,200	NA	NA	0	1,15,200	2	57,600

- The company would be able to manufacture 51,840 units of Bright and 55,680 units of Super.
- **Total contribution of Alternative 2 = (55,680 x 54) + (51,840 x 60) = Rs.61,17,120**

Conclusion: The company should go ahead with manufacturing 57,600 units of Super and 50,400 units of Bright to earn maximum contribution of Rs.61,34,400

Part IX – Make or Buy Decisions

23. Basic Make or Buy decision [Category A]

B Limited produces and sells bicycles. It also manufactures the chains for its bicycles. It expects to produce and sell 24,000 bicycles during 1996-97. It is considering an offer from an outside vendor to supply number of chains at Rs.12 per chain.

The accountant of B Limited reports the following costs of producing 24,000 chains:

Cost	Cost per Unit (Rs.)	Total Cost (Rs.)
Direct Material	5.00	1,20,000
Direct Labour	4.00	96,000
Variable manufacturing overhead	2.00	48,000
Inspection setup etc.	1.00	24,000
Machine rent	1.00	24,000
Allocated fixed overhead	1.25	30,000
	14.25	3,42,000

The following additional information is available:

I. Inspection, setup etc. varies with the number of batches in which the chains are produced. Currently chains are being produced in the batch size of 2,000 units

II. Direct labour represents wages to four workers who are exclusively engaged in the manufacturing of chains. These workers are in permanent capacity and cannot be retrenched

III. If B Limited procures all its chains from outside vendor, it will not require the machine which it has hired for manufacturing chains.

Required:

i. Assume that if B Ltd. Purchases chains from outside vendor, the facility (including workers) where the chains are currently manufactured will remain idle. Should B Ltd. accept the offer from outside vendor at the anticipated production and sale volume of 24,000 units?

ii. Whether your decision in (i) will change if facilities can be used to upgrade the bicycle, which will result in incremental revenue of Rs.22 per bicycle. The variable cost for upgrading would be Rs.18 per and tooling cost tooling cost would be Rs.16,000

iii. Assume that facilities will be as stated in (ii) above. Further assume that with better planning B Ltd. will be able to manufacture chains in the batch size of 4,000 units (instead of 2,000 units) if it decides to procure chains inside

WN 1: Computation of relevant cost of Make and Buy for Part 1:

Particulars	**Manufacture**	**Purchase**
Direct Material	1,20,000	0
Direct Labour	0	0
Variable Manufacturing Overheads	48,000	0
Inspection set-up	24,000	0
Machine rent	24,000	0
Allocated fixed Fixed Overheads	0	0
Purchase cost	0	2,88,000
Total cost	**2,16,000**	**2,88,000**

- Direct labour is irrelevant cost as the labour is in permanent capacity and cannot be terminated
- Allocated fixed overheads is irrelevant as it would remain same for both alternative

- The company should go ahead with make option as the relevant cost of manufacture is lower than relevant cost of purchase

WN 2: Computation of relevant for make and buy for Part 2:

Particulars	Manufacture	Purchase
Cost as per WN 1	2,16,000	2,88,000
Profit from upgradation (4 x 24,000 – 16,000)	0	(80,000)
Total cost	**2,16,000**	**2,08,000**

- The company can go for upgradation of bicycle if it purchases chain from outside. It would earn Rs.4 per unit and incur fixed cost of Rs.16.000
- Profit of Rs.80,000 on upgradation can be considered either as benefit of Alternative 2 or an opportunity cost of Alternative 1
- **The company should go ahead with Purchase option as the relevant cost of purchase is lower than that of Make**

WN 3: Computation of relevant for make and buy for Part 23:

Particulars	Manufacture	Purchase
Cost as per WN 2	2,16,000	2,08,000
Les: Savings in inspection cost	(12,000)	0
Total cost	**2,04,000**	**2,08,000**

- Inspection is currently carried out in batch size of 2,000 units. Hence there will be 12 batches and cost per batch is Rs.2,000. The company revises batch size to 4,000 units and hence it will need only 6 batches. Revised inspection cost would be 6 batches x Rs.2,000 = Rs.12,000. Savings in inspection cost = Rs.24,000 – Rs.12,000 = Rs.12,000
- **The company should go ahead with Make option as the relevant cost of make is lower than that of Purchase**

24. Make or Buy decision [Category A]

DBA, manufactures and sells 25,000 table fans annually. One of the components required for fans is purchased from an outside supplier at a price of Rs.190 per unit. Annually it is purchasing 25,000 components for its usage. The Production Manager is of the opinion that if all the components are produced at own plant, it is possible to maintain better quality in the finished product. Further, he proposed that the in-house production of the component with other items will provide more flexibility to increase the annual production by another 5,000 units. He estimates the cost of making the component as follows:

Particulars	Per Unit
Direct Materials	80
Direct Labour	75
Factory overhead (70% variable)	40
Total cost	195

The proposal of the Production Manager was referred to the Marketing Manager for his remarks. He pointed out that to market the additional units, the overall unit price should be reduced by 5% and additionally Rs.1,00,000 p.m. should be incurred for advertising. Present selling price and contribution per fan are Rs.2,500 and Rs.600 respectively. No other increase or decrease in all other expenses as a result of this proposal will arise.

Required

Since the making cost of the component is more than the buying cost, the Management asks you to:
(i) ANALYSE the make or buy decision on unit basis and total basis.
(ii) RECOMMEND the most profitable alternative

Answer:

(i) DBA purchases 25,000 units of components to manufacture 25,000 fans annually. The external purchase price per component is Rs.190 per unit. It has the option of manufacturing these components in house. The cost structure of manufacturing these components would be as below:

Cost structure	Cost per component unit
Direct materials	80

Direct Labour	75
Variable factory overheads (70% of 40)	28
Total	**183**

Analysis

If DBA decides to manufacture the components in-house, the following would be the financial impact:
(a) Production Capacity will increase from 25,000 fans to 30,000 fans.
(b) Variable Cost of Production of fan would be Rs.1,710 [(2,500 - 600) -190] per unit.
(c) Fixed Factory Overhead of Rs.12 per component would be incurred irrespective of whether component is produced or not. Therefore, this cost is not considered.
(d) Increase in advertising expense would be Rs.100,000 per month or Rs.12,00,000 annually.
(e) Overall selling price would reduce from the current rate of Rs.2,500 per fan to Rs.2,375 (95% of Rs.2,500) per fan.
(f) Current contribution considering a procurement price of Rs.190 per component unit, is Rs.600 per fan. As calculated above, if produced in house, the variable cost would be Rs.183 per component unit. This would result in an increase in contribution by Rs.7 per fan (procurement price of Rs.190 per component unit less variable cost of Rs.183 per component unit). In addition, there is an impact of Rs.125 on account of reduction in selling price. Therefore, the contribution if component produced in house would be Rs.482 per fan (Rs.600+Rs.7-Rs.125).
To summarize the above figures:

Particulars	**Procurement 25,000 components**		**Produce 30,000 components**	
	Per Fan	Total	Per Fan	Total
Selling price per fan	2,500	6,25,00,000	2,375	7,12,50,000
Contribution per fan	**600**	**1,50,00,000**	**482**	**1,44,60,000**

Therefore, incremental loss by switching to in house production (on a total basis) would be Rs.17,40,000 (incremental loss Rs.5,40,000 – additional advertising expenses Rs.12,00,000). On a per unit basis, it would result in a loss of Rs.58 per fan.

(ii) Recommendation

As explained above, if production increases from 25,000 fans to 30,000 fans, it would not be profitable to make these components in house. Overall profit decreased by Rs.17,40,000. However, DBA may prefer to make component, even though it could be financially beneficial to buy from outside supplier. Sometimes qualitative factors become very important and can override some financial benefit. This can be coupled with uncertainty about the supplier 's ability or intention to maintain the price, quality, delivery dates of the components etc.

Alternatively, DBA may continue with the sale of 25,000 units without any price reduction and advertising expenses. The component required for the 25,000 fans may be produced internally at a cost of Rs.183 per unit. In this situation, the contribution shall be increased by Rs.1,75,000 (Rs.7 ×25,000 units).

Thus, DBA may choice the alternative after due and careful consideration of the facts illustrated above.

25. Subcontracting decision and limiting factor [Category A]

Lee Electronic manufactures four types of electronic products, A,B,C and D. All these products have a good demand in the market. The following figures are given to you:

	A	B	C	D
Material cost (Rs./u)	64	72	45	56
Machining Cost (Rs/u @ Rs. 8 per hour)	48	32	64	24
Other variable costs (Rs/u)	32	36	44	20
Selling Price (Rs/u)	162	156	173	118
Market Demand (Units)	52,000	48,500	26,500	30,000

Fixed overheads at different levels of operation are:

Level of operation (in production hours)	Total fixed cost (Rs.

Upto 1,50,000	10,00,000
1,50,000 – 3,00,000	10,50,000
3,00,000 – 4,50,000	11,00,000
4,50,000- 6,00,000	11,50,000

At present, the available production capacity in the company is 4, 98,000 machine hours. This capacity is not enough to meet the entire market demand and hence the production manager wants to increase the capacity. The company wants to retain the customers by meeting their demands through alternative ways. One alternative is to sub-contract a part of its production. The sub-contract offer received as under:

	A	B	C	D
Sub-contract Price (Rs./u)	146	126	155	108

The company seeks your advice in terms of products and quantities to be produced and/or sub-contracted, so as to achieve the maximum possible profit. You are required to also compute the profit expected from your suggestion.

WN 1: Statement of ranking:

Particulars	**A**	**B**	**C**	**D**
1. Variable manufacturing cost	144	140	153	100
2. Purchase price	146	126	155	108
3. Decision	**Make**	**Buy**	**Make**	**Make**
4. Savings per unit	2	NA	2	8
5. No of hours per unit	6	NA	8	3
6. Savings per hour	0.33	NA	0.25	2.67
7. Rank	**II**	**NA**	**III**	**I**

WN 2: Statement of allocation:

a) Allocation of 1,50,000 hours:

Product	**Units**	**Hrs/unit**	**MH consumed**	**Savings**
D	30,000	3	90,000	2,40,000
A	10,000	6	60,000	20,000
Total			**1,50,000**	**2,60,000**
Less: Fixed cost#				0
Net savings				**2,60,000**

Relevant fixed cost for first level is zero as the company will incur fixed cost of Rs.10,00,000 even if production is zero.

b) Allocation of 3,00,000 hours:

Product	**Units**	**Hrs/unit**	**MH consumed**	**Savings**
D	30,000	3	90,000	2,40,000
A	35,000	6	2,10,000	70,000
Total			**3,00,000**	**3,10,000**
Less: Fixed cost				50,000
Net savings				**2,60,000**

c) Allocation of 4,50,000 hours:

Product	**Units**	**Hrs/unit**	**MH consumed**	**Savings**
D	30,000	3	90,000	2,40,000
A	52,000	6	3,12,000	1,04,000

C	6,000	8	48,000	12,000
Total			**4,50,000**	**3,56,000**
Less: Fixed cost				1,00,000
Net savings				**2,56,000**

d) Allocation of 4,98,000 hours:

Product	Units	Hrs/unit	MH consumed	Savings
D	30,000	3	90,000	2,40,000
A	52,000	6	3,12,000	1,04,000
C	12,000	8	96,000	24,000
Total			**4,98,000**	**3,68,000**
Less: Fixed cost				1,50,000
Net savings				**2,18,000**

- The company would opt for utilization of 3,00,000 hours as it has the highest net savings of Rs.2,60,000. Both 1,50,000 and 3,00,000 hours has net savings of Rs.2,60,000 and company would like to do maximum in-house production

WN 3: Profitability statement:

Particulars	Product A	Product B	Product C	Product D	Total
No of units					
To be manufactured	35,000	0	0	30,000	
To be subcontracted	17,000	48,500	26,500	0	
Contribution per unit					
From manufacture	18	16	20	18	
From subcontracting	16	30	18	10	
Total contribution					
From manufacture	6,30,000	0	0	5,40,000	11,70,000
From subcontracting	2,72,000	14,55,000	4,77,000	0	22,04,000
Total contribution					**33,74,000**
Less: Fixed cost					(10,50,000)
Profit					**23,24,000**

26. Make or buy decision and limiting factor [Category B]

BNZ Ltd. is engaged in the manufacture of plastic bottles of a standard size and produced by a joint process of machines. The factory has 5 machines and capable of producing 40 bottles per hour. The variable cost per bottle is Rs.0.32 and the selling price is Rs.0.80 each. The company has received an offer from another company for manufacture of 40,000 units of a plastic moulded toy. The price per toy is Rs.30 and the variable, cost is Rs.24 each. In case of the company takes up the job, it has to meet the expenses of making a special mould required for the manufacture of the toy. The cost of the mould is Rs.1,00,000. The company's time study analysis shows that the machines can produce only 16 toys per hour. The company has a total capacity of 10,000 hours during the period in which the toy is required to be manufactured. The fixed costs excluding the cost of construction of the mould during the period will be Rs.10 Lakh. The company has an order for the supply of 3,00,000 bottles during the period.

Required

(i) Do you ADVISE the company to take up the order for manufacturing plastic moulded toys during the time when it has an order in its book for the supply of 3,00,000 bottles.

(ii) If the order for the supply of bottles increases to 4,00,000 bottles, will you ADVISE the company to accept the order for the supply of plastic moulded toys? State the reasons.

(iii) An associate company of BNZ Ltd. has idle capacity and is willing to take up the whole or part of the manufacturing of the plastic moulded toys on sub-contracting basis. The subcontract price inclusive of the

cost of construction of mould is Rs.28 per toy. DETERMINE the minimum expected excess machine hour capacity needed to justify producing any portion of the toy order by the company itself rather than subcontracting.

Answer:

Statement Showing "Contribution / Machine Hour"

Particulars	Bottle	Toy
Demand (units)	3,00,000	40,000
Sales (Rs./u)	0.80	30.00
Less: Variable Cost (Rs./u)	0.32	24.00
Less: Specific Fixed Cost (Rs./u)	-	2.50
Contribution (Rs./u)	0.48	3.50
Machine Hours Required per unit	0.025	0.0625
Contribution / Machine Hour	19.20	56.00

Advice on Supply of 3,00,000/ 4,00,000 Bottles

(i) BNZ Ltd. can accept plastic moulded toy's order as sufficient number of hrs. i.e. 2,500 hrs. (10,000 hrs.- 3,00,000 bottles × 0.025 hrs.) are available and would be able to generate additional benefit of Rs.3.50 per unit on 40,000 units of toys i.e. Rs.1,40,000.

(ii) If the order for the supply of bottles increases to 4,00,000 bottles, then 2,500 more hrs. will be required to produce the additional bottles. BNZ Ltd. has to decide whether to utilize 2,500 hrs. for existing bottle order or for toy Order.

Machine time is limiting factor. Therefore, contribution per machine hour from both the activities (i.e. bottles and toys) should be calculated to decide whether the order should be accepted. Contribution per hour is more in case of toys (refer workings). Therefore, BNZ Ltd. should utilize the remaining 2,500 hours for manufacturing toys rather than to fulfil the order for supply of additional bottles.

Prioritizing production based on contribution per machine hour would maximize profits. However, existing order fulfilment is necessary for building long term and sustainable customer relationship. Developing and maintaining long term and intimate relationships with the profitable customers provides valuable benefits to the company as the relationships between company and customers grow, a customer who is satisfied with the company's products and services, tends to commit the relationship, and buy more over time. Cost of keeping the existing customers is less expensive than the cost of acquiring new customers. Hence, BNZ Ltd. should be taken into consideration long term supplier relation before accepting the toy order based on financial consideration as contribution per hour is more in case of toys. Further, company may also explore outsourcing opportunities for production of toys

(iii) Minimum number of toys needed to be manufactured to justify the increase in fixed cost of Rs.1,00,000 to make the mould is 25,000 toys {1,00,000/ (Rs.28 - Rs.24}. Thus, as long as company has excess capacity available to manufacture more than 25,000 toys it is cheaper to produce than to buy from subcontractor.

Minimum Expected Excess Capacity hours to justify = $\left(\frac{25{,}000\ TOys}{16\ Toys}\right)$ = 1,562.5 or 1,563 hours

27. Make or Buy decision and indifference point [Category B]

A company has introduced a new product 'EMO'. EMO is packed in tubes of 50 gram capacity and is sold to the wholesalers in cartons of 24 tubes at Rs.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 Rs.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 product for costing purposes.

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

- Direct Materials = Rs.108 per carton
- Direct wages = Rs.72 per carton
- Overheads = Rs.54 per carton
- Total costs = Rs.234 per carton

After a detailed market survey the company is confident that the production and sales of EMO can be

increased to 3, 50,000 tubes per month and ultimately to 4, 50,000 tubes per month. The company at present has a capacity for the manufacture of 3, 00,000 empty tubes and the cost of the empty tubes if 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 Rs.1.35 per empty tube. If the company desires to manufacture empty tubes in excess of 3, 00,000 tubes, a new machine involving an additional fixed overheads of Rs. 30,000 per month will have to be installed.

- State by showing your workings whether the 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.
- At what volume of sales will it be economical for the company to install the additional equipment for the manufacture of empty tubes?
- 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.

WN 1: Cost of manufacturing one empty tube:

Particulars	EMO	Empty tube	EMO-Empty tube
Direct Material	4.5 [108/24]	0.9 [4.5 x 20%]	3.6 [4.5-3.6]
Direct Labour	3 [72/24]	0.3 [3 x 10%]	2.7 [3-0.3]
Variable Overhead	0.75	0.075 [0.75 x 10%]	0.675 [0.75 – 0.075]
Total	**8.25**	**1.275**	**6.975**

- The company incurs overhead of Rs.2.25 per tube [54/24]. Fixed overheads per empty tube is Rs.1.5[4,50,000/3,00,000] and hence variable overheads will be Rs.0.75
- There will be 20 percent savings in material cost and 10 percent savings in direct labour and overhead cost if empty tube is purchased from empty tube. Therefore, 20 percent of material cost and 10 percent of labour and variable overhead cost would be the cost of empty tube

WN 2: Computation of level at which additional equipment is to be installed:

Particulars	Make	Buy
Variable cost per unit	1.275	1.35
Total fixed cost	30,000	0

- Indifference point between make and buy is computed as follows:

Indifference Point	$\frac{\text{Change in Fixed Cost}}{\text{Change in Variable Cost per unit}}$	$\frac{30{,}000 - 0}{1.35 - 1.275}$	4,00,000 units

- The company should buy additional equipment when production exceeds 4,00,000 units (from the level of 3,00,000 units). Decision at various levels of production is provided in the below table:

Level of production	Decision
0 to 3,00,000	Make
3 lacs to 7 lacs units	Make 3 lacs + Buy balance units (Low Fixed Cost)
At 7,00,000 units	Make 3 lacs+ Make/buy balance 4 lacs units (Indifferent)
> 7,00,000 units	Make 3 lacs+ Make balance units (Low variable cost)

WN 3: Decision on making or buying empty tubes for three levels given in the question:

- Decision at various levels given in the question is provided in the below table

Level of production	Decision	Total cost
3,00,000	Make 3,00,000 units	3,00,000 x 1.275 = 3,82,500
3,50,000	Make 3,00,000 units and buy 50,000 units	3,00,000 x 1.275 + 50,000 x 1.35 = 4,50,000
4,50,000	Make 3,00,000 units and buy 1,50,000 units	3,00,000 x 1.275 + 1,50,000 x 1.35 = 5,85,000

WN 4: Profitability statement of EMO:

Particulars	3,00,000	3,50,000	4,50,000

Sales (units sold x 10)	30,00,000	35,00,000	45,00,000
Less: Material cost (units sold x 3.60)	(10,80,000)	(12,60,000)	(16,20,000)
Less: Labour cost (units sold x 2.70)	(8,10,000)	(9,45,000)	(12,15,000)
Less: Variable overhead (units sold x 0.0675)	(2,02,500)	(2,36,250)	(3,03,750)
Less: Cost of empty tubes (WN 3)	(3,82,500)	(4,50,000)	(5,85,000)
Contribution	**5,25,000**	**6,08,750**	**7,76,250**
Less: Fixed Cost	(4,50,000)	(4,50,000)	(4,50,000)
Profit	**75,000**	**1,58,750**	**3,26,250**

28. Outsourcing decision (Category A - May 2020 RTP):

Mount Sports Manufacturing Facilities (MSMF) deals in manufacturing of sports articles. Although MSMF is major market player but can capture the market further. Currently MSMF manufactures five types of badminton shuttle named as P-101, P-102, P103, P-104 and P-105. Production facilities are limiting factor at MSMF. Production and marginal cost data of these 5 products are specified in table below;

Particulars	**P-101**	**P-102**	**P-103**	**P-104**	**P-105**
Monthly production (in units)	1,000	1,200	2,000	3,000	1,500
Direct material cost per unit	6	4	7	3	6
Direct labour cost per unit	4	9	5	8	5
Variable production overhead per unit	2	3	2	2	1

On drive to cost leadership strategy, MSMF is thinking to out-source some of the products. Shuttles can be sourced from a well-established company 'Protease' at the following prices. There is no tie-in between products, all products can outsources individually. These costs are on CIF basis;

Particulars	**P-101**	**P-102**	**P-103**	**P-104**	**P-105**
Outsourcing Cost/Buy in Cost (₹per unit)	17	18	18	11	15

Company-wide fixed overheads are of ₹15 Lacs each year. Out of which ₹2,40,000 is directly attributable to the production of these 5 products on annual basis. This fixed overhead of ₹2,40,000 is evenly split across such 5 products and entirely avoidable. Till date company does not have experience to outsource any element of production.

Mr. Singh who is newly appointed management accountant, bring the huge experience to the organization on cost control and reduction techniques. While discussing the possibility of outsourcing with CFO, Mr. Singh explained the limitation of out-sourcing and also presents a white paper on gain sharing arrangement; which can be entered with supplier to whom outsourcing is considered.

CEO just entered into the office of CFO (where such discussion is ongoing) on verge of such discussion, but he heard about gain sharing arrangement and curious to know further about the same.

Required

CEO post presentation/ discussion seeks report from Mr. Singh to RECOMMEND, the product/(s) which should be outsourced. Report should also EXPLAIN gain sharing arrangement along with aspects that MSMF need to consider, ensuring success out of gain sharing arrangement as a part of out-sourcing contract with Protease.

Answer:

Report to:
Office of CEO,
Mount Sports Manufacturing Facilities (MSMF),
Dated – 03rd Jan 2020

Report on Outsourcing of Products to Protease

(i) Recommendation on out-sourcing of the products – Product P-102 and P-104 can be out-sourced. (see computations below)

Particulars	**P-101**	**P-102**	**P-103**	**P-104**	**P-105**
Monthly production (in units)	1,000	1,200	2,000	3,000	1,500
Variable manufacturing cost per unit	12	16	14	13	12
Total variable cost	12,000	19,200	28,000	39,000	18,000
Avoidable fixed cost	4,000	4,000	4,000	4,000	4,000

[2,40,000/5] = 48,000 per year/4,000 per month					
Relevant manufacturing cost	**16,000**	**23,200**	**32,000**	**43,000**	**22,000**
Outsourcing cost per unit	17	18	18	11	15
Total outsourcing cost	**17,000**	**21,600**	**36,000**	**33,000**	**22,500**
Savings in outsourcing	(1,000)	1,600	(4,000)	10,000	(500)
Decision on outsourcing	No	Yes	No	Yes	No

However, following aspects needs to be kept in mind, prior to entering to out-sourcing arrangement of product P-102 and P-104

Issue 1

- If products P-102 and P-104 are outsourced, **the company would then have spare capacity**. Since the production function/capacity is a limiting factor and there is scope of selling the further units of P-101, P-103 and P-105; in order to acquire the market share. Hence, spare capacity is of great importance and will be a powerful argument for outsourcing.

Issue 2

- The reaction of the workforce at MSMF is also need to be considered because of two reasons;
  - If production of P-101, P-103 and P-105 cannot be expanded to take up the spare capacity on account of out-sourcing of P-102 and P-104, **then lay-off may be required** – Which may cause problem like strike by remain workforce or an industrial dispute.
  - Facts also suggest that products P-102 and P-104 are labour intensive (due to high comparative high labour cost). **Hence, even the spare capacity on account of out-sourcing of P-102 and P-104 is used, and then also the some of labour forces need to be retrenched.**

Issue 3

- Even if lay-off is accepted by workforce, then also cost associated with redundancies may be critical. Such cost is relevant for decision-making, hence should be considered.

Issue 4

Since the MSMF has no experience in the outsourcing till now, hence while dealing with Protease, MSMF need to ensure;

- Timely delivery in right quantity
- Quality of supplies
- Penalties in case of default

(ii) Gain Sharing Arrangement by MSMF as part of outsourcing agreement with Protease

- Gain Sharing Arrangement is a contractual arrangement where, entity (MSMF) & outsourcing supplier (In this case protease) **share the financial gain which result out of either productivity gains or increased efficiency** at end of outsourcing supplier from continuous improvement, transformation, or innovation.
- This arrangement in form of clause is usually included in Master Agreement of outsourcing. Outsource supplier find it unique selling point and entity is also on for continuous improvement apart this both will get share in cost saved.
- Although gain sharing arrangement is largely useful in case of outsourcing services agreement, **but MSMF can also while entering out-sourcing contract with Protease for P-102 and P-104; but following aspects need to be considered;**

Reason of failure of Gain Sharing Arrangement - Gain Sharing Arrangement sounds great but in practice it is quite difficult to execute. Even after a considerable level of efforts due to following reasons it may fail;

- Unstructured/Poorly structured terms of arrangement, in outsourcing contracts.
- Error in implementation.
- Relationship between outsource supplier and entity.

Precaution need to be taken - Action plan for executing gain share arrangement must contain;

- Be specific in outsourcing agreement
- Predefined formula for sharing of benefits and period thereof

- Effort from entity, because innovation is not only responsibility of outsource supplier
- Constitute innovation team to create an innovation structure, generate the idea and execution of same.

Overall:

In consideration of above analysis, company should consider the outsourcing of P-102 and P-104 by entering out-sourcing contract with Protease. **At this point, it is important to note that cost analysis emphasizes purely quantitative, financial considerations. However, outsourcing decisions are often influenced by qualitative factors, which are not directly affected in calculations**. The impact of the same should also be taken into consideration. The issues suggested above are not exhaustive. Further, before opting gain sharing arrangement, the same should also be reviewed carefully from a business, legal, and tax perspective.

I hope this helps - if you need any further information, please let me know.

Closure of Report

Mr. Singh,

Management Accountant

(For Management Accounting Division)

Mount Sports Manufacturing Facilities (MSMF)

29. Make or Buy Decision and Product Mix (Nov 2019 EXAM):

SEZ Limited produces three products S, Q and L which use the same resources but in varying quantities. Product S uses one unit of component P which is purchased from outside suppliers at, Rs. 120 per unit. Details of the three products are as follows:

Particulars	**S**	**Q**	**L**
Annual Demand	9,000	5,700	7,800
Selling Price	310	275	224
Component P	120	-	-
Direct materials (Rs.8 per KG)	24	32	24
Skilled labour (Rs.40 per hour)	20	60	40
Unskilled labour (Rs.24 per hour)	18	24	36
Variable Overheads (Rs.6 per machine hour)	18	24	24

Maximum availability of skilled labour is 16,200 hours. Other resources are sufficient to meet the annual demand/sales. Engineering division of the company came forward with a proposal to make the component 'P' in house with the following costs break up:

Particulars	**Amount**
Direct materials (Rs.8 per KG)	24
Skilled labour (Rs.40 per hour)	40
Unskilled labour (Rs.24 per hour)	8
Variable overheads (Rs.6 per machine hour)	18
Cost per unit	90

For in-house making of the component 'P' there will not be any change in the annual fixed costs of the company. The company can either buy the component 'P' or make it in house.

Required

RECOMMEND the optimum production plan and profit for the year. Show calculation in support of your answer.

Answer:

WN 1: Statement of ranking:

- Skilled labour is the limiting factor and the same can be used for meeting external demand as well as producing component P.
- Statement of ranking needs to be prepared for four products. Contribution per hour would be computed for FG and saving per hour would be computed for component P

Particulars	**S**	**Q**	**L**	**P**
SP/Outside purchase price	310	275	224	120
Variable cost	200	140	124	90
Contribution/saving per unit	**110**	**135**	**100**	**30**
Hours per unit	0.50	1.50	1.00	1.00

Contribution/saving per hour	220	90	100	30
Ranking	**I**	**II**	**II**	**IV**

Note:

- We have considered the purchase cost of component P while computing variable cost of product S. This is because the difference in purchase price and variable manufacturing cost savings is due to component P and the same is considered in ranking for P

WN 2: Statement of Ranking:

Product	No of units	Hours per unit	Hours consumed	Contribution
S	9,000	0.50	4,500	9,90,000
L	7,800	1.00	7,800	7,80,000
Q	2,600	1.50	3,900	3,51,000
Total			**16,200**	**21,21,000**
Less: Fixed Cost				-15,00,000
Profit				**6,21,000**

Conclusion:

The company should produce the following:

- 9,000 units of S
- 7,800 units of L
- 2,600 units of Q
- Component P should be bought from outside

Part X – Differential Selling prices and product mix

Part XI – Special Orders

30. Decision on maximum discount/inspection cost [Category A – May 2014 (exam)]

PQR Ltd., a manufacturer of tool kits has just completed XY's domestic order of 100 kits at a price of Rs. 1,650 per kit. The details of cost for XY's order are:

Particulars	Amount
Direct Material	90,000
Direct Labour	32,000
Tools and Consumables	16,400
Variable overheads	9,600
Fixed overheads (allocated)	15,000
Total	1,63,000

The company wishes to evaluate a special export order from Expo Ltd. of similar 300 kits at Rs. 1,600 per kit. For the export order, special packing has to be done at Rs. 20 per kit. An additional fixed inspection cost specific to this export order has to be incurred. The allocation of fixed overheads will be revised to increase by Rs. 25,000. Tools and Consumables above include special purpose tools costing Rs. 10,000 incurred for XY's order and these can be reused for the export order and the remaining portion is variable. PQR Ltd. wishes to accept the export order at 10% profit on the selling price.

Required

- What should be the maximum amount that can be incurred as inspection cost for making such an acceptance possible?
- If Expo Ltd. offers to take the products without inspection, what is the maximum discount (as a percentage of the existing export price) that PQR Ltd. can offer to retain its 10% profit on the revised selling price? (Round off calculations to two decimal places).

Answer:

WN 1: Computation of maximum amount that can be incurred as inspection cost:

Particulars	Calculation	Amount
Direct material	(90,000/100) x 300	2,70,000
Direct Labour	(32,000/100) x 300	96,000
Tools and consumables	(6,400/100) x 300	19,200
Variable OH	(9,600/100) x 300	28,800

Fixed OH		0
Special packing	300 x 20	6,000
Total cost excluding inspection		**4,20,000**
Inspection cost (b/f)		**12,000**
Total cost	**Sales – Profit**	**4,32,000**
Profit	10% of sales	48,000
Sales	**300 x 1600**	**4,80,000**

WN 2: Computation of discount that can be offered if the customer agrees to buy the product without inspection:

Particulars	**Calculation**	**Amount**
1. Cost per unit excluding inspection cost	4,20,000/300	1,400
2. Add: Profit (1/10 on sales = 1/9 on cost)		155.56
3. Revised selling price		1,555.56
4. Amount of discount		44.44
5. % of discount	$\frac{44.44}{1600} \times 100$	2.78

31. Price to be quoted for export order [Category A]

A company is operating at 60 % of its capacity with a turnover of Rs. 43.20 lacs. If the company works at 100 %capacity, the sales-cost relation is: Factory cost is two thirds of sales value. Prime cost is 75% of factory cost. Administration and selling expenses (75%variable) are 20% of the sales value. Factory overhead will vary according to operating capacity as given below:

Operating capacity (%)	60	80	100	120
Factory overheads (Rs. lacs)	9.90	10.80	12	15

The company has planned to operate at 80 % of its capacity. Moreover, it has received an export order and its execution will involve 40 % of the capacity. The prime cost of the order is estimated at Rs. 6.0 lacs and the shipping involved will be around Rs. 1.0 lac. Administration and selling expenses will be avoided on the export order. Taking the same percentage of profits as on the domestic sales, determine the minimum price to be quoted for the export order.

WN 1: Computation of price to be quoted for export order:

(in lacs)

Particulars	**100%**	**80% (domestic)**	**40% (export)**
Prime cost (Note 1)	36	28.8	6
Add: Factory OH (Note 2)	12	10.8	4.2
Factory Cost	**48**	**39.6**	**10.2**
Add: Variable admin and selling (Note 3)	10.8	8.64	0
Add: Fixed admin and selling (Note 4)	3.6	3.6	1
Cost of sales	**62.4**	**51.84**	**11.2**
Profit (Note 5)	9.6	5.76	1.24
Sales	**72**	**57.6**	**12.44**

Note:

1) Sales have been estimated for 100 percent capacity as Rs.72 lacs (43.20/60%). Factory cost is two-thirds of sales value and prime cost is 75 percent of factory cost. Hence Prime cost will become 50 percent of sales for domestic scenario and for the export order the value is given
2) Factory Overhead for 100 and 80 percent utilization is given in the question. Factory overhead for export order = FOH at 120 percent utilization – FOH at 80 percent utilization
3) Variable admin and selling expenses are equal to Sales x 15% x 75%. Same formula is followed for domestic order and it is not incurred for export order
4) Fixed admin and selling expenses for 100 percent capacity utilization is equal to sales x 15% x 25%. Same amount of fixed overheads will continue at 80 percent utilization and for export order it is considered at shipping cost of Rs.1 lac

5) Profit for domestic order is 10 percent of sales and hence the same margin is followed for export order. 1/10 on sales is equal to 1/9 on cost

32. Evaluation of multiple alternatives [Category A – Nov 2017 (exam)]

RFH Limited produces a product LEO for which the company has an assured market. The output for 2018 has been budgeted at 2,10,000 units at 80% capacity utilization. The cost sheet based on budgeted output (per unit) is as follows:

Particulars	Amount
Selling Price	Rs.500
Direct material	205
Component X	54
Direct labour @ Rs.48 per hour	96
Factory overheads (60% fixed)	65
Selling overheads (70% variable)	30
Administrative overheads (100% fixed)	10

Factory overheads are absorbed on direct labour hour basis. RFH Limited at present manufactures component X, two units of which is required for the manufacture of one unit of product LEO. The cost details for 1,000 units of component X are as follows:

Direct Material	Rs.12,200
Direct labour	Rs.9,600
Variable overheads	Rs.3,200
Fixed overheads	Rs.2,000

Component X can be brought from outside market at Rs.26 per unit with minimum order of 78,000 units per annum. To utilize the idle capacity and improve the profitability of the company, the following independent proposals were put up before the board of directors of the company:

A. An order has been received from abroad for 48,000 units of product RIO at a price of Rs.466 per unit. Order can not be accepted partly. The cost data are: Direct Material Rs.239 per unit, direct labour 3 hours per unit, variable factory overheads are chargeable on the basis of direct labour hours. Variable selling overheads will increase by Rs.2 per unit
B. Rent out the released capacity at Rs.6 per hour
C. Manufacture component Z which has an assured market. Company can sell any number of units produced. Each unit of component Z requires 0.40 direct labour hour and will generate a contribution of Rs.2.50 per unit.

Required:

(i) Prepare a statement of profitability under marginal costing. Show amount in Lakhs of Rs. with two decimal points

(ii) Whether the component X should be manufactured or purchased from outside assuming there is no use of idle capacity

(iii) Assuming company has decided to buy component X from outside; which proposal for the use of idle/spare capacity will you select? Find out the increase in profits due to acceptance of those proposals

Answer:

(i) Statement of Profitability:

Particulars	**Rs. Lakhs 2,10,000 units**	**Rs Per unit**
Sales	1,050	500.00
Less: Variable costs		
Direct Material (2,10,000 units x Rs.205)	430.50	205.00
Component X (2,10,000 units x 2 Nos. x Rs.27)	113.40	54.00
Direct Labour (2,10,000 units × Rs.48 × 2 hrs.)	201.60	96.00
Factory Overheads (2,10,000 units × Rs.65 × 40%)	54.60	26.00
Selling Overheads (2,10,000 units × Rs.30 × 70%)	44.10	21.00
Contribution	**205.80**	**98.00**
Less: Fixed Overheads		
Factory Overheads (2,10,000 units × Rs.65 × 60%)	81.90	39.00

Selling Overheads (2,10,000 units × Rs.30 × 30%)	18.90	9.00
Administrative Overheads (2,10,000 units ×Rs.10 ×100%)	21.00	10.00
Profit	**84.00**	**40.00**

(ii) Since the cost of purchase is more than cost of manufacturing by Rs.1, hence component X should be manufactured as idle capacity is available.

Statement of Showing Cost to Make vs Buy

Particulars	**Rs. Per unit**
Direct Material (Rs.12,200 units / 1,000 units)	12.20
Direct Labour (Rs.9,600 units / 1,000 units)	9.60
Variable Overheads (Rs.3,200 units / 1,000 units)	3.20
Relevant Make Cost (A)	25.00
Relevant Buy Cost (B)	26.00
Excess Buy Cost (B) – (A)	1.00

(iii) Statement of Showing Contribution per unit "RIO"

Particulars	**Rs. Per unit**
Export Price	466
Less: Variable Cost	
Direct Material	239
Direct Labour (Rs.48 × 3 hrs.)	144
Variable Factory Overheads (Rs.13 × 3 hrs.)	39
Variable Selling Overheads (Rs.21 + Rs.2)	23
Contribution	**21**

Statement showing rank of proposals:

Particulars	**Proposal A**	**Proposal B**	**Proposal C**
Contribution per unit	21.00	6.00	2.50
Hours per unit	3.00	1.00	0.40
Contribution per hour	7.00	6.00	6.25
Rank	I	III	II

Hence, company should utilize the Idle/ Spare capacity to execute export order first and then remaining idle capacity should be used to manufacture component Z.

Capacity Utilization and Production Analysis

- Hours used to manufacture LEO = 2,10,000 units × 2 hrs. = 4,20,000 hrs.
- Hours used to manufacture Component X= 84,000 hrs. $\frac{(9{,}600\ x\ 2\ hours\ x\ 2{,}10{,}000\ units)}{48\ hours\ x\ 1{,}000\ units}$
- Total hours used at 80% Capacity = 4,20,000 + 84,000 = 5,04,000 hours
- Total hours at Full Capacity = (5,04,000/80%) = 6,30,000 hours
- Idle capacity = 6,30,000 – 5,04,000 = 1,26,000 hours
- Hours released by component X = 84,000 hours
- Total hours available = 2,10,000 hours

Allocation of 2,10,000 hours:

Product	**Units**	**Hours consumed**	**Balance Hours**	**Contribution**
RIO	48,000	1,44,000	66,000	10,08,000 (48,000 x 21)
Z	1,65,000 (66,000/0.40)	66,000	0	4,12,500 (1,65,000 x 2.5)
Total Contribution				15,20,500
Less: Opportunity cost of not manufacturing component X (2,10,000 units x 2 per unit x Rs.1)				4,20,000
Net increase in profits				10,00,500

Part XII – Evaluation of multiple alternatives

33. Decision making – Evaluation of multiple alternatives [Category B – May 2013 (exam)]

Better and Best Ltd. Manufacture only one product. Production is regular throughout the year and the capacity of the factory is 1,50,000 units per annum. The summarized Profit and Loss Account for the year ended 31st December is being reviewed by the Board of Directors.

Particulars	Amount
Sales @ Rs.10 per unit	10,00,000
Cost of sales	
Direct Materials	2,50,000
Direct labour	1,50,000
Variable production overheads	30,000
Fixed production overheads	2,30,000
Fixed administration overheads	1,00,000
Variable selling and distribution overheads	50,000
Fixed selling and distribution overheads	1,50,000

- The Production Director proposed to reduce selling price to Rs.9 in order to utilize full capacity.
- The Sales Director proposed to increase selling price by 20 percent. By spending Rs. 2, 25,000 on advertisement, sales will be increased to 1, 20,000 units per annum.
- The Personnel Director pleaded for a change in the method of wage payment. For the present piece rate of Rs.1.50 per unit, a bonus scheme (for each 2% increase in production over the target, there would be an increase of 1% in the basic wage of each employee) will be implemented. A target of 2,000 units per week for the company will be set for 50 week year. Selling price increase by 10%. With an additional advertisement cost of Rs. 1, 60,000, 20% increase in present sales will be achieved.
- The Chairman felt that the packaging of the product required improvement. He wanted to know the sales required to earn a target profit of 10% on turnover with the introduction of an improved packing at an additional cost of 20 paise per unit (no change in selling price).

Required

Evaluate individually the proposals of each of the board member and give your recommendation.

Answer:

WN 1: Identification of alternatives:

- Alternative 1 - Production director proposal - sale of 1,50,000 units @ Rs.9/unit
- Alternative 2 - sales director proposal - sale of 1,20,000 units @ Rs.12/unit
- Alternative 3 - Personnel director proposal - Sale of 1,20,000 units @ 11/unit
- Alternative 4 - Chairman proposal - Sale of xx units @ Rs.10/unit to get profit of 10% on sales

WN 2: Evaluation of alternatives:

Particulars	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**
Selling price	9	12	11	10
Less: Direct Material	(2.5)	(2.5)	(2.5)	(2.5)
Less: Direct Labour (Note 1)	(1.5)	(1.5)	(1.65)	(1.5)
Less: Variable Production overhead	(0.3)	(0.3)	(0.3)	(0.3)
Less: Variable Selling Overhead	(0.5)	(0.5)	(0.5)	(0.5)
Less: Packing expense	0	0	0	(0.2)
Contribution per unit	4.2	7.2	6.05	5
No of units	**1,50,000**	**1,20,000**	**1,20,000**	**X**
Total contribution	6,30,000	8,64,000	7,26,000	5X
Less: Fixed costs (Note 2)	(4,80,000)	(7,05,000)	(6,40,000)	(4,80,000)
Profit	**1,50,000**	**1,59,000**	**86,000**	**5X-4,80,000 (Note 3)**

Note 1: Computation of labour cost for Alternative 3:

- Standard output = 2,000 per week x 50 weeks = 1,00,000
- Actual output = 1,20,000
- Efficiency = Actual output/Standard output = 1,20,000/1,00,000 x 100% = 120%

- Workers are 20 percent more efficient than standard and hence the labour rate will increase by 10 percent. The normal piece rate is 1.50 per unit and for alternative 3 it would be Rs.1.65 per unit

Note 2: Analysis of fixed cost

- Normal fixed cost = Fixed production OH + Fixed Admin OH + Fixed S&D OH = 4,80,000
- Fixed cost will increase by Rs.2,25,000 in case of Alternative 2 for Advertisement
- Fixed cost will increase by Rs.1,60,000 in case of Alternative 3 for Advertisement

Note 3: Computation of profit under alternative 4:

- The company wants to earn profit of 10 percent on sales. Selling price is Rs.10 per unit and hence total sales will be 10X
- The company wants to earn profit of 10 percent and the same would be equal to X (10% of 10X)
- X = 5X – 4,80,000; X = 1,20,000 units
- Sales = 1,20,000 x 10 = Rs.12,00,000 and profit equals Rs.1,20,000

Conclusion:

The company should go ahead with Alternative 2 as the same leads to maximum profit

34. Own salesman versus retail outlets [Category B – May 2016 (exam)]

XYLtd. is manufacturing a consumer product and doing marketing through 200 depots all over the country. The company is considering closing down the depots and resorting to dealership arrangements. The total turnover of the company is Rs. 160 crores per annum.

The following information is given for each depot. (amount in lacs)

- Annual turnover…….80.00
- Average inventory…….16.00
- Administrative expenses per annum……1.60
- Staff salary per annum……...2.88

The inventory carrying cost is 16% p.a. which is also the interest rate prevailing in the market for working capital finance. The other fixed cost per annum is Rs. 16 crores. Marketing through dealers would involve engaging dealers for each area. The dealers will assure minimum sales for each area. This would result in increasing the capacity utilization from 80% to 100%. At present the company's P/V ratio is 20%. Marketing through dealers would involve payment of commission of 8% on sales. Half of the existing depot staff will have to be absorbed in the company. The dealer will deposit Rs. 3.20 crores with company on which interest at 12%p.a. will be paid. You are required to work out the impact on profitability of the company by accepting the proposal.

WN 1: Profitability statement of depot model and dealership model:

(in lacs)

Particulars	Depot Model	Dealership model
Sales	16,000 (80 x 200)	20,000 (16,000/80%)
Interest on Deposit (Note 1)	0	2,560
Less: Variable cost (Sales x 80%)	(12,800)	(16,000)
Less: Administration expense	(320) (1.6 x 200)	0
Less: Staff salary (Note 2)	(576)	(288)
Less: Carrying cost (Note 3)	(512)	0
Less: Other fixed cost	(1,600)	(1,600)
Less: Commission (Sales x 8%)	0	(1,600)
Net profit	**192**	**3,072**

Note:

1) The company takes deposit of Rs.320 lacs per dealer. There are 200 dealers and hence the company would have taken deposit of Rs.64000 lacs. It pays interest of 12 percent on deposit (as compared to 16 percent on loan) and hence would save 4 percent on deposit. Therefore, interest saving due to deposit is Rs.2560 lacs (64000 x 4%)
2) The company currently pays Rs.2.88 lacs per depot. There are 200 depots and hence administrative

expense today is Rs.576 lacs. Half of the staff would be retained in the company and hence expense will be Rs.288 lacs in dealership model

3) Carrying cost = Average inventory x No of depots x 16%; Carrying cost = 16 x 200% x 16% = Rs.512 lacs

Conclusion: The company should go ahead with proposed dealership model as the net benefit is Rs.3072 lacs in dealership model as compared to Rs.192 lacs in depot model

Part XIII – Further Processing Decisions

35. Decision on further processing [Category B – May 2017 RTP]

A process industry unit manufactures three joint products: A, B and C. C has no realizable value unless it undergoes further processing after the point of separation. The cost details of C are as follows:

- Upto point of separation
  - Marginal cost……...30
  - Fixed Cost……20
- After point of separation
  - Marginal cost……..…….15
  - Fixed cost……..……5

C can be sold at Rs.37 per unit and no more.

- Would you recommend production of C?
- Would your recommendation be different if A, B and C are not joint products?

Answer:

Situation 1: A, B and C are joint products:

- A, B and C are joint products and hence cost incurred upto the split off point are irrelevant while analyzing the profitability of a single product. This is because these cost can be avoided only if all three products are not manufactured and hence the relevant cost till the point of split-off is zero for manufacturing product C
- Cost incurred after point of separation is relevant cost. However fixed costs are irrelevant as they are committed in nature. Hence the relevant cost to manufacture product C is Rs.15 per unit (marginal cost after point of separation).
- The company should continue manufacture C as it would contribute Rs.22 towards recovery of joint costs and other fixed costs

Situation 2: A, B and C are not joint products:

- All variable costs will be relevant now as the products are not joint products. Hence the relevant cost of manufacturing is Rs.45 per unit whereas the selling price is Rs.37. Hence the company should not go ahead with manufacturing product C

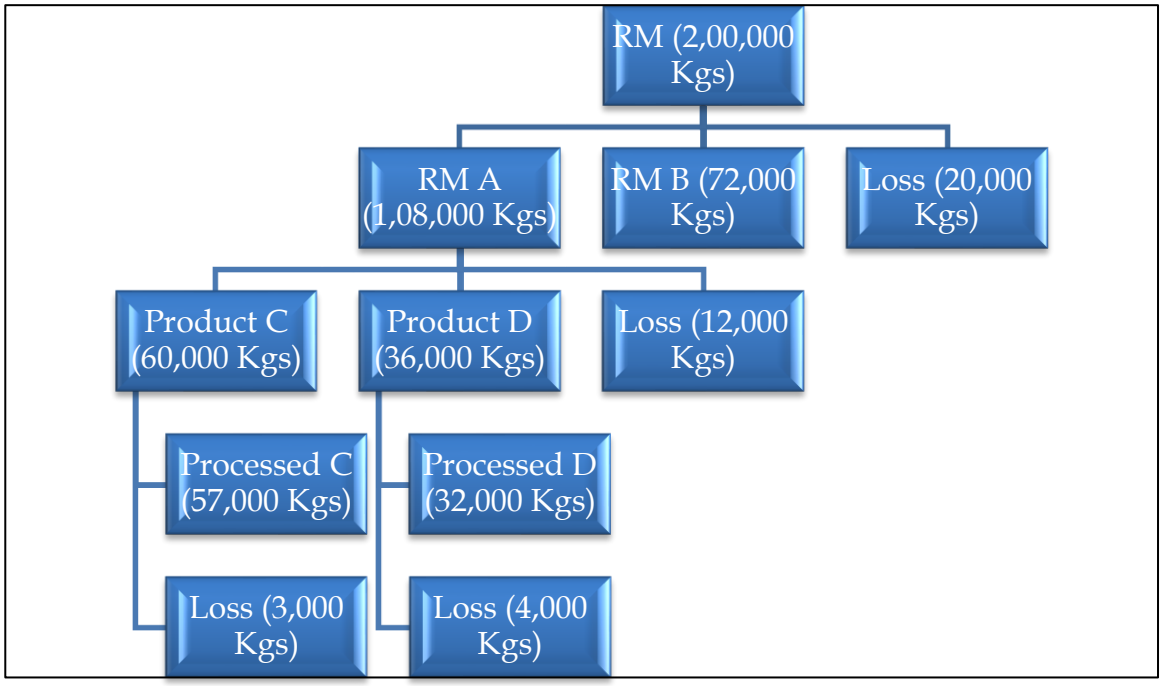
36. Decision on further processing [Category A – May 2014 (exam)]

A company processes different products from a certain raw material. The raw material is processed in process I (where normal loss is 10% of input) to give products A and B in the ratio 3: 2. B is sold directly. A is processed further in process II (where normal loss is 12.5% of output) to give products C and D in the ratio 5:3. At this point C and D have sale values Rs. 55 and Rs. 40 per kg respectively. C can be processed further in process III with processing cost Rs. 3, 95,600 and normal wastage 5% of input and then be sold at Rs. 66 per kg. D can be processed further in process IV with processing cost Rs. 3, 82,500 and normal wastage 12.5% of output and then be sold at Rs. 55 per kg. The normal wastage of each process has no realizable value. During the production period, 2,00,000 kgs of raw material is to be introduced into Process I.

Using incremental cost-revenue approach, advice whether sale at split off or further processing is better for each of the products C and D.

Answer:

WN 1: Input-output Chart



Note:

- Loss has been expressed as a percentage of both input and output in this question. Loss of 12.5 percent (1/8) on output has been taken as 1/9 on input.

WN 2: Decision on further processing:

Particulars	Product C	Product D
Sale value at split off		
Units sold	60,000	36,000
SP	55	40
Sale value at split off	33,00,000	14,40,000
Sale value after further processing		
Units sold	57,000	32,000
SP	66	55
Sale value after further processing	37,62,000	17,60,000
Incremental revenues	**4,62,000**	**3,20,000**
Incremental cost	**3,95,600**	**3,82,500**
Incremental profit	**66,400**	**-62,500**
Decision	**Sell after further processing**	**Sale at split off**

Part XIV – Dropping a product line

37. Dropping a product Line [Category A – May 2018 (exam)]

JK Limited manufactures three products D, E and F each requiring similar material, labour and production facilities. Trading results of the company for the year ending March, 2018 are as under:

Particulars	D	E	F	Total
Sales	38,50,000	13,90,000	30,20,000	82,60,000
Material cost	10,78,000	6,25,500	9,06,000	26,09,500
Labour cost	9,24,000	4,86,500	6,04,000	20,14,500
Overheads	7,39,200	2,91,900	4,83,200	15,14,300
Total variable cost	27,41,200	14,03,900	19,93,200	61,38,300
Contribution	11,08,800	(13,900)	10,26,800	21,21,700

Fixed overheads				12,60,000
Profit				8,61,700

Product E, despite best efforts, does not show any good prospect to yield reasonable margins and it is not possible to raise its price so as to make it profitable. The company has decided to discontinue its production with effect from April 1, 2018. Product D and F have good potential to grow and the market can easily absorb the increased production. The company has decided to raise the production of Products D and F by diverting the 60% labour of Product E to Product D and balance 40% to Product F.

Following additional information is available for the year ending April 2018:

A. Total Direct wage bill for the year would be at the same level as for the year ending 31.03.2018. Material cost per unit will increase by 5%, however variable overheads per unit will remain same. Fixed overheads would increase by Rs.96,500
B. Selling price per unit of Product D will increase by 4% and of Product F by 5%

Required:

(i) Prepare budget for the next year beginning April 2018 in the format as detailed above
(ii) Compare and analyze the budget for the year 2018 and 2019 highlighting main features. Show calculation of Amount to the nearest rupee
(iii) To advise the management on comparative contribution/profitability if 60% labour of Product E is transferred to product F instead of Product D as above and balance 40% to Product D instead of Product F. Show calculation up to three decimal points. Give detailed reasoning for your advice

Answer:

WN 1: Budget of next year:

a) Computation of production of Product D and F

Let us assume 100 units have been sold in past year for each of D, E and F

Particulars	**Product D**	**Product E**	**Product F**
Existing:			
Labour cost	9,24,000	4,86,500	6,04,000
No of units	100	100	100
Cost per unit	9,240	4,865	6,040
Revised:			
Labour cost post diversion of labour of Product E	12,15,900	0	7,98,600
No of units (Bal figure)	**131.59**	**0**	**132.22**
Cost per unit	9,240	4,865	6,040

b) Budget of next year:

Particulars	**Product D**	**Product F**	**Total**
Sales	52,68,864 (131.59 x 38,500 x 1.04)	41,92,696 (132.22 x 30,200 x 1.05)	94,61,560
Material cost	14,89,467 (131.59 x 10,780 x 1.05)	12,57,809 (132.22 x 9,060 x 1.05)	27,47,276
Labour cost	12,15,900 (Part A)	7,98,600 (Part A)	20,14,500
Overheads	9,72,713 (131.59 x 7,392)	6,38,887 (132.22 x 4,832)	16,11,600
Total variable cost	**36,78,080**	**26,95,296**	**63,73,376**
Contribution	**15,90,784**	**14,97,400**	**30,88,184**
Fixed Overheads			13,56,500
Profit			**17,31,684**

WN 2: Comments on budget of next year:

Sales Volume of both products D and F has been increased by 31.59% and 32.22% respectively. Due to change in price of cost and revenue components, Profit Volume Ratio (PVR) of product D has been increased to 30.19% from 28.80% while for product F, it has been increased to 35.71% from 34%. However,

change in PVR for product F is slightly higher. Overall, discontinuing product E and diverting the labour and production facilities to Product D and F have increased the profitability of the company.

Existing PVR of Product D	$\frac{11,08,800}{38,50,000}$ x 100	28.80%
Revised PVR of Product D	$\frac{15,90,784}{52,68,864}$ x 100	30.19%
Existing PVR of Product E	$\frac{10,26,800}{30,20,000}$ x 100	34.00%
Revised PVR of Product E	$\frac{14,97,400}{41,92,696}$ x 100	35.71%

WN 3: Revised budget if 60% of labour is diverted to Product F and 40% is diverted to Product E:

a) Computation of production of Product D and F

Let us assume 100 units have been sold in past year for each of D, E and F

Particulars	**Product D**	**Product E**	**Product F**
Existing:			
Labour cost	9,24,000	4,86,500	6,04,000
No of units	100	100	100
Cost per unit	9,240	4,865	6,040
Revised:			
Labour cost post diversion of labour of Product E	11,18,600	0	8,95,900
No of units (Bal fig)	**121.06**	**0**	**148.33**
Cost per unit	9,240	4,865	6,040

b) Budget of next year:

Particulars	**Product D**	**Product F**	**Total**
Sales	48,47,242 (121.06 x 38,500 x 1.04)	47,03,544 (148.33 x 30,200 x 1.05)	95,50,786
Material cost	13,70,278 (121.06 x 10,780 x 1.05)	14,11,063 (148.33 x 9,060 x 1.05)	27,81,341
Labour cost	11,18,600 (Part A)	8,95,900 (Part A)	20,14,500
Overheads	8,94,876 (121.06 x 7,392)	7,16,731 (148.33 x 4,832)	16,11,607
Total variable cost	**33,83,754**	**30,23,694**	**64,07,448**
Contribution	**14,63,488**	**16,79,850**	**31,43,338**
Fixed Overheads			13,56,500
Profit			**17,86,838**

Part XV – Ethics and non-financial considerations in decision making

38. Case study on ethics and non-financial considerations [Category A]

Star Limited is in the business of manufacturing copper rods. The copper rods are sold to various cable wires manufacturers across the country. The growth in economy, especially the power sector, has led to a sharp increase in demand of cable wires and copper rods. The company is considering an opportunity to set up its own copper wire manufacturing plant and gain a share of cable wire's market. A detailed study was carried out to understand the market of cable wires, market growth, competitive landscape, financial feasibility etc. The Chairman has asked the Director of Finance to review the financial feasibility study and highlight concerns, if any.

The following paragraphs contain summarised information of financial study carried out:

- The project of setting up a new cable wire manufacturing plant is expected to yield a Net Present Value of 200 crores considering a project life of 20 years. The initial cost of setting up the plant is

500 crores which is readily available with the company. The project would yield an IRR of 17.5% which is higher than the IRR of other plants under operation.

- The plant would employ about 70% of labour on contractual basis. These labours would mostly comprise immigrants from neighbouring countries. The feasibility study has assumed that the immigrants labours would be paid 15% less wage than that paid to other workers. However, the wage paid to immigrants would still be higher than the minimum wage requirements. The contribution to retirement funds is also not considered in the project evaluation. The company feels that immigrant workers would not stay beyond a period of a year and thus there is no requirement to contribute to retirement funds.
- The existing plants of the company do not have free space available and hence the company will need to buy land adjacent to its existing plant. A part of the proposed land to be acquired falls under the forest reserve area where no commercial activity is allowed. The company officials are in liaison with the government officials to get the land parcel approved. A certain amount of the value of land would be paid to certain government officials through a consultant. This cost is not a part of the project evaluation report.
- The new plant would also produce certain chemically harmful waste which would be disposed off into a nearby river after treatment. The company however does not have any technology to treat the waste fully. A new treatment plant would cost about 100 crores.

The finance director has forwarded the entire report to you for comments.

Required

(i) LIST Various non-financial and ethical consideration in decision making.

(ii) EVALUATE the impact of the various issues in the financial study and give your RECOMMENDATION.

Answer:

Issue

Star Limited manufactures copper rods and is considering commencing a new plant for manufacturing of cable wire. A financial evaluation has been carried out and the project appears to be financially viable. The project has a positive NPV of 200 crores and an IRR of 17.5%. Though the project is financial viable, there are certain concerns relating to the project.

Non-Financial and Ethical Consideration in Decision Making

Capital Budgeting or Investments decisions are generally made based on the various financial evaluation like Net Present Value, Internal Rate of Return, Payback Period etc. The financial considerations in capital budgeting decisions are important because the end objective of every for-profit business is maximisation of shareholders wealth. However, an important aspect of capital budgeting is that investment decisions cannot be purely based on financial analysis; there are other soft non-financial aspects of the investment appraisal that need to be thoroughly looked into. Some of the non-financial considerations that a company factors for capital budgeting or investment decisions are listed below:

Environmental Factors

Environmental factors like pollution, deforestation, impact on climate and weather, greenhouse effects etc. must be considered by companies while selecting a project for implementation. Any project which adversely affects the environment is not taken positively by common public and environmentalists. A lot of projects have been stalled or delayed due to the protests by pro-environment groups leading to cost and time overrun. The government through ministry of environment could impose penalties on projects which are violating environmental norms or green norms.

Staff Motivation

Staff motivation and satisfaction is another important factor which companies might consider while choosing projects. If, for example, a company decides to implement automation in its plants for operations which would result in redundancy in labour, the overall staff motivation would come down. Staff and workers would resort to strikes and lockouts to protest against such decisions. The company should adopt a participative approach while taking such decisions considering the impact it would have on the labours.
Government Regulations

The companies must comply with relevant government regulations while implementing projects. Some projects might be profitable and yield excellent returns. However, if the profits and cashflows are generated by violating government regulations, it could be harmful in the longer run for the company and its brand. The companies must ensure that all relevant laws and regulations are complied with.

Availability of Resources

The evaluation of any project must also consider availability of key resources like raw material, manpower, logistics infrastructure, electricity etc. If there is any constraint on any of the key resources at a future date, a financially viable and excellent project could well turn into a failed project. It is thus important that the requirements and availability of key resources are analysed in advance.

Availability of Project Site

Site selection involves measuring the needs of a new project against the merits of potential locations. This indicates the practice of new facility location, keeping in mind project requirements. A wrong or unsuitable project location may mar the very benefits of a financially lucrative investment proposal.

Corporate Social Responsibility

Corporate social responsibility refers to "the ethical principle that an organisation should be responsible for how its behaviour might affect society and the environment". The companies do not function in silos but are a part of the larger society and environment. They have a responsibility towards the society and environment to use the various resources judiciously and ensure a sustainable development. Companies are expected to uplift the well being of the society at large and to not harm the environment through operations. The aspects of corporate social responsibility must also be considered while deciding the project to be implemented.

Ethics

Ethics are a set of guiding moral principles for individuals and corporates. Every company has a duty of care to various stakeholders (shareholders, employees, suppliers, customers etc.). A company is expected to act in a fair and transparent manner and be honest in all its dealings with stakeholders.

Issues in the Financial Study

As discussed earlier, the project is financial viable with a very good NPV and IRR. The amount required to build the plant is also available with the company. Financially, the project must be accepted. However, there are certain non-financial issues which must be addressed before a decision to build the plant is taken.

Payment to Labour and Ethics

- As explained earlier, every company has a duty of care to all its stakeholders and the stakeholders must be treated fairly. Labours are a key stakeholder for the construction and running of the plant. The company has chosen to pay 15% lower wage to immigrant workers and not contribute anything towards their retirement benefits.
- The company is paying a higher wage to the labours than required by law and hence there is nothing illegal in such payments. However, the company must not discriminate between workers who are doing same nature of work just because the workers are immigrants. The reputation of the company might be affected because of the lower wages paid to immigrants. There is a possibility that these labours go on protests and strikes or decide not to work for the company.
- The company has also decided not to contribute to retirement funds for these workers. This could have a legal implication as well. The financial impact of paying wages at par with other workers and contributing to the retirement fund for immigrant workers is not known. However, the company should reconsider this decision and pay all the workers the same level of wages. The company should also contribute to the retirement fund of employees.

Availability of land and bribery

- The existing plant does not have sufficient space to build a new plant and hence the company is planning to acquire additional land which falls under the forest reserve area where no commercial activity is allowed. The company is in liaison with government officials to get the land acquisition

approved. The company would also be paying bribes indirectly to the government officials to get the land allotment approved.

- The payment of bribes to government officials, whether directly or indirectly would be unethical. The company could face litigation for acquiring land by unfair means and in future, there is a possibility of such allotments being cancelled. The company's reputation would also be dented if news of bribery is published by the media. The company also has a responsibility towards the environment and must contribute towards a sustainable development. The society at large would not take acquisition of forest land by unfair means positively. This impact the overall goodwill and brand image of the company.
- The company must evaluate if land at other sites can be acquired for construction of the plant. Such acquisition would be at a higher cost but would be beneficial to the company in the longer run.

Chemical waste and technology

- The proposed plant is likely to emit chemically harmful waste which would pollute the environment. The technology available with the company can treat such waste partially. The company has to incur an additional cost of 100 crores to build a new treatment plant. This means that the NPV of the project would be reduced by 100 crores and IRR would also be lesser if the new treatment plant is built.
- As discussed earlier, the company must operate in a socially responsible manner and consider implication of its action on the environment. The pollution caused by plants affects the surrounding environment and might lead to protests by local residents. Sometimes such protests are backed by NGOs as well. The commissioning of environmentally sensitive projects is difficult at times and can cause project delays as well.
- The company should consider acquiring a new chemical waste treatment plant to ensure that there is no discharge of harmful waste from the company's plant. Though, there is an additional cost involved in building a new plant, it is important that the society at large perceives that the company is operating in a socially responsible manner. The company operates in a society and is an integral part of it and hence, it has certain responsibilities towards the society as well.

Conclusion

The ultimate objective of a company is to maximise shareholders wealth. The company must, however, operate in a socially responsible manner in achieving the objective of wealth maximisation. The company has a duty of care to other stakeholders like employees, society at large etc. In some cases, there may be conflict between different stakeholder's objectives. For instance, a new waste treatment plant would be good for the environment and society at large but would be adverse for shareholders as an additional cost of 100 crores would be incurred. The company must definitely consider non-financial factors along with financial factors while deciding on whether to build a new plant or not.

39. Ethics and non-financial considerations in decision making: (Category A – Nov 2019 RTP)

Nutty Bites produces many edible snacks that are very popular especially among children. Peanuts, Peanut oil are essential ingredients in many of its products. They are currently facing this ethical issue –

"Medical studies have indicated peanut allergic reactions are on the rise. The prevalence is more profound among children. Reactions can range from hives around the mouth to potentially life threatening reactions when exposed even to the slightest trace of peanuts. There is growing media campaign to force companies like Nutty Bites to make disclosure about the presence of peanut on its package labelling" Nutty Bites is a mid-size company that has a growing market. Risk to peanut exposure can come not just from the presence of peanuts in its products. Some of its bought-in ingredients (raw material input) are cooked in peanut oil. There are risks of "crosscontamination" amongst products. Let us say, an equipment has been used produce cookies that has peanuts. Next, the equipment is used, without being cleaned, to produce chips that does not have peanuts as an ingredient. Some portion of the peanuts / peanut oil could contaminate that specific batch of chips produced. Since labels of chips would not mention "peanuts" as an ingredient, it poses a potential risk of causing allergic reaction to a customer unaware of this contamination.

Management of Nutty Bites has called for a meeting to discuss this issue. "The issue need not be addressed at all. After-all Nutty Bites is doing nothing against the law" is the opinion of many members on the board of the company.

Required

(i) EXPLAIN why Nutty Bites should attempt to address this issue.
(ii) STATE potential benefits that business can garner by addressing this issue.
(iii) RECOMMEND, with reasons, the avenues available to Nutty Bites to address this ethical issue.
(iv) EVALUATE the recommended solutions.

Answer:

(i) Modern organizations have a **moral duty of care to a wider range of stakeholders** not just its owners / investors. In this case, **it owes a duty of care to anybody who consumes its products**. The presence of peanuts or peanut oil makes it a potential "health hazard" to some consumers. **Food safety is a fiduciary duty that Nutty Bites owes to the society**. Corporate Social Responsibility (CSR) is the duty an organization has towards a wider community.

(ii) **Addressing this ethical issue will help Nutty Bites to become a morally responsible organization**. The long- term benefits to its business could be as follows:
(a) **Avoid bad publicity** that could potentially damage its reputation and brand image.
(b) **Avoid potential legal action for tort**, committing a civil wrong.
(c) Operating environment within the business is more ethical, **giving a sense of well-being to its employees.**

(iii) Following could be some of the responses that Nutty Bites could take to address the issue
(a) **A clear warning in the ingredients box that the factory uses peanuts** while manufacturing some of its products. This should be included even in products that do not contain peanuts, to avoid any harm due to risk of crosscontamination. Customers who suffer this allergy, would then be aware of the potential risk of consuming products of Nutty Bites. Protection from potential lawsuits counters any loss of business for Nutty Bites.

(b) **Segregate areas to have separate processing lines for products with peanuts / peanut oil and those without it**. If possible, have **segregated staff for the two production lines in order to avoid the risk of cross-contamination**. If this is not possible, staff have to be well trained on the risks of cross-contamination. Gloves need to be provided while handling material during production of food products. This should be changed each time staff handle production changes from "peanut variety" to the "non-peanut variety".

(c) **Equipment should be thoroughly cleaned while switching production from one variety to another**. Fewer changeovers in the production cycle, that is producing products in larger batches, reduces the number of switches during production of different varieties of food products.

(d) **Storage of peanut material should be well segregated** and monitored to avoid contamination.
(e) If Nutty Bites has the resources, **it could invest in pharma companies that are finding a medical solution to this problem**. The food industry could benefit from research and development of treatments to address this life-threatening allergy. A break-through would address a societal problem, while also having a positive impact for growth of Nutty Bites.

(iv) Risk of product safety is an important issue that needs constant review. **Review would be of the production process, storage, material handling as well as ingredient of purchased raw materials**. The benefit of constant review is that Nutty Bites can immediately identify danger of contamination. For example, is a supplier of raw material changes the production of the ingredients to include peanut / peanut oil, then Nutty Bites can be immediately aware of the change due to its review process. In case of any future litigation, Nutty Bites could defend itself by proving that it had a robust review process in place.

On the other hand, **constant review requires time and money, with an ever-present possibility of contamination**. It is not feasible to ensure complete safety. Reviewers / quality inspectors could become

negligent once the process is well established. This could lead to instances of contamination, even with a review process in place.

To conclude, Nutty Bites is morally responsible to spread awareness that some of its products may contain allergy causing peanuts / peanut oil. It should streamline its storage and production process to avoid risk of cross-contamination.

40. Ethics and non-financial considerations in decision making (Category B – Nov 2019 RTP)

Sprinter Sportswear is a multi-national company with that has a market presence in 23 countries. Yet, the company does not own even a single factory. Production has been entirely outsourced to 175 factories located in places where cost of operations is low. Factories cater entirely to Sprinter's procurement demands. These factories operate independently, Sprinter plays no role in their operations. Procurement from this supplier network is the stored at distribution centers from where dispatches are made to wholesalers of sportswear and apparel.

Recent news reports from some of the Third World foreign countries have indicated that high child labor employment. Child labor although against the law in these countries is resorted in order to keep cost of operations low. Factories in these countries do not directly employ children. Instead they subcontract the work to contractors. These contractors in turn hire children illegally without the local knowledge of local law enforcement authorities. In addition, working conditions in these factories are very unhygienic and oppressive.

Sprinter initially turned a blind eye to this problem, since it only acts as a customer of these factories. Sprinter, as a company, has done nothing illegal as part of company operations. However, increased focus given to corporate social responsibility, has forced the Board members to consider taking action against such factories.

(i) DISCUSS why Sprinter sportswear should attempt to address this issue.

(ii) SUGGEST some of the actions that the company can take to address this issue.

Answer:

(i) Work can be outsourced to locations to countries on the other side of the globe, in order to achieve low cost advantage. **A company may not be directly responsible for faulty practices of its suppliers. However, modern organizations have a moral duty of care to a wider range of stakeholders who may not directly be related to the company**. In this case, it owes a duty of care towards employees hired by factories within its supply chain. The issue it is dealing with relates to exploitation of child workers by factories, perpetrated by sub-contracting work to third party workers. **While Sprinter sportswear has not done anything illegal, it owes moral responsibility towards these children. Children have a right to education, because of which child labor is illegal in most countries**. Since children are employed directly on account of the work that has been outsourced, Sprinter should attempt to address this issue. Also, any negative news about how its products are made, could impact its business.

(ii) Sprinter should aim to make its products responsibly. Some actions it can take are:

- Sprinter can develop a **Code of Conduct that details the acceptable standards of conducting business**. These standards could relate to hiring practices, of which it can specify that workers should be above a particular age to be employed for manufacturing a product. **Others could relate to workplace environment, safety, and environment sustainability**. Sprinter should insist that suppliers implement these Codes of Conduct along with other complying with laws. It should insist that the supplier be open to periodic inspection by Sprinter to ensure compliance with standards as per its Code.
- **Sprinter can set up an audit team that regularly audits factories on the pre-sourcing and follow-up stages**. Sprinter should do business only with those factories are complying with its standards. Any offenders to the Code of Conduct in the follow-up stages, should be appropriately be liable to penalty or termination of contract for serious offenses.
- **Sprinter can list on its website location wise suppliers from whom it procures its products. It can even give information about products made by each of its suppliers, average age, worker diversity etc.** This will enable watch groups to know who the suppliers are and warn the company if there are any labor issues within these factories.

Chapter 7 – Pricing Decision

Pricing Decision:

- A pricing decision is one of the **most crucial & difficult** decision that a firm has to make. Such a decision **affects the long-term survival** of any profit oriented enterprise
- Firms can fix the **price based on cost information by adding a suitable profit margin**. In other cases an established market prices is accepted
- Pricing policy are based on the objectives of an organization and the same could be either to **maximize profit/sales/output/utilization of resources**

Theory of Price:

- One of the basic assumption of pricing theory is that **firm's main objective is to maximize profits**. Optimum price is the one which yields the maximum profits.
- Firm should also take into account the position of **demand and cost functions while fixing on the price**
- If a firm sells unlimited number of units, total revenue will be a straight line arrived at by TR = mx; TR = Total revenue line; m = Quantity of units sold; x = Price per unit
- However in market situations, **additional units can be solved only by reducing the price**. This would mean that although total sales will increase as more and more units are sold, the increase in total revenue will gradually decrease
- Company can **identify the optimum price by finding a level at which Marginal revenue is equal to Marginal cost**. Any attempts of increasing the output beyond this level will lead to reduction in profits

Profit Maximization Model:

- Profit is said to be **maximum at a level of output where Marginal revenue (MR) is equal to Marginal cost (MC)**
- Basic price equation which is used to determine the price at which profit is maximum is given below:

P = a-bQ
Where P = Price; b = Slope of demand curve [Change in Price/Change in Quantity]; Q = Quantity demanded; a = Price at which demand is zero

- Marginal revenue equation = a-2bQ
- **Marginal cost is equated with Marginal revenue to identify the optimum quantity and based on that optimum price is derived**

Pricing under different market structures:

Perfect competition:

- Under perfect competitive market, there are **large number of sellers selling a homogenous product using identical production process** and all of them have perfect competition about the market and price
- Perfect market allows **free entry and exit of firms** into and out the industry
- There is no pricing policy under this market and the firms have to be price takers
- **Under this market the Total revenue will be a straight line but the marginal cost will increase with every level of output.** Hence company should continue to produce and sell as long as marginal cost is lower than marginal revenue

Monopoly:

- Monopoly is a market condition where **there is only one supplier or producer of a homogenous product** for which there is no close substitute but has many buyers
- Under this market, **a firm is a price setter**. It **can fix any price but it has to take into account elasticity of demand** and fix a price at which it can make maximum profits

Monopolistic competition:

- Under monopolistic competition **there are large number of firms producing similar but no identical products**. Since there is a limit to the growth of competitors the excess profit earned by monopolistic situation attracts new competition

- **Under monopolistic competition consumers may buy more at a lower price than at higher price**. The profit may be maximized by equating marginal revenue with marginal cost

Oligopoly:

- A market structure **where there are few firms producing or selling homogenous or identical product**
- In this type of market structure the firms are aware of the mutual interdependence of investment, production process, advertising and sales plan of its rival firm
- **In this market, the price is determined not only based on demand but also the reactions of the other firms in the industry to any action or decision it may take**
- Following price strategies can be used in this market:
  - **Predatory Pricing** – Keep price artificially low which is below full cost of production
  - **Limit-pricing strategy** – This can be used to discourage entrants
  - **Cost-plus pricing**
  - **Players can collude and raise price together**, but this can attract new entrants

Pricing Policy:

- Pricing policy plays an important role in a business because the **long run survival of a business depends upon the firm's ability to increase its sales** and derive maximum profit from the existing and new capital investment
- Although **cost is an important aspect of pricing, consumer demand and competitive environment are far more significant** in pricing decisions
- Pricing policy should ensure the following:
  - **Provide an incentive for adopting improved technology** and maximizing production
  - **Work towards better balance** between demand and supply
  - Avoid adverse effects on the rest of the economy
  - Encourage optimum utilization of resources
  - Promote export

Principles of Product Pricing:

Price customization: Pricing of a product is some **time customized keeping taste, preference and perceived value of a consumer into consideration**. Price customization is done in various ways:

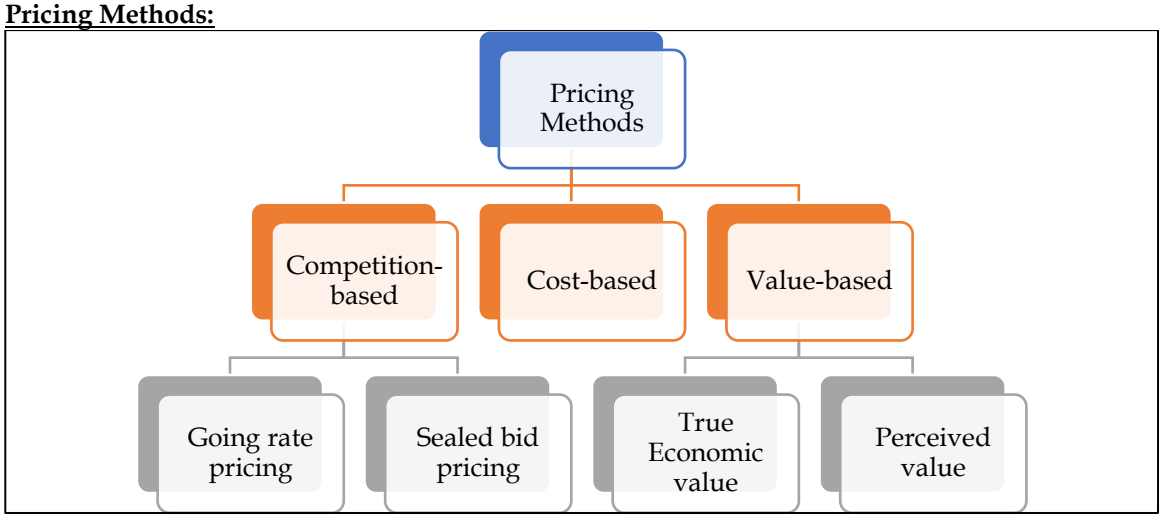
- **Based on Product Line:** Pricing can be different for a phone having 16GB memory as compared to a phone having 32GB memory
- **Based on customer's past behavior:** Customer with good payment track record can be given more discounts as compared to others
- **Based on demographics:** Different pricing can be based on age and social status. Example: Railway concession can be given for senior citizens and military personnel
- **Based on time differential:** Pricing for a product or service is also done on the basis of time differential i.e. different price for different time period

Price sensitivity: It measures the **customer's behavior to change in price of a product**. Sensitivity of the product can be measured through controlled experimentation wherein customers are offered different brands at different prices and customer's responses are obtained. Then the company change the price of its product and assess the consumption pattern. **The price at which the demand for the product starts declining is the level where price sensitivity begins and based on the response level, sensitivity can be measured. Following are the nine factors which can impact price sensitivity:**

- **Unique value effect** – More unique the product lower is price sensitivity
- **Substitute awareness effect** – High sensitivity if the buyers are aware of close substitutes
- **Difficult comparison effect** – Price sensitivity will be low if the buyers have difficulty in comparing two alternatives
- **Total expenditure effect** – If the expenditure is a very low proportion of total expenditure then price sensitivity will be less
- **End-benefit effect** – Buyers are less price sensitive where the expenditure on the product is low compared to total cost of the end product
- **Shared cost effect** – If the cost of the product is shared by another party, the buyer will have less prone to price sensitivity

- **Sunk investment effect** – Price sensitivity is low when products are used along with assets previously bought
- **Price quality effect** – Higher the perceived quality of the product, lower the price sensitivity
- **Inventory effect** – If the product cannot be stored, the buyer will be less price sensitive

Pricing Methods:



Cost-based pricing method:

- This is the **most commonly used method** wherein the company estimates the cost of the product & fix a margin of profit
- The term **cost would mean full cost** and include all fixed costs, allocated costs, labour costs among others
- Pricing based on total costs is subject to the following limitations:
  - **Allocation of inter-departmental overheads** is based on arbitrary basis and
  - **Allocation of overheads will require estimation of normal output** which often cannot be done precisely
- In order to avoid these two limitations firms can fix the price by adding **a suitable markup to variable costs.** The markup should cover the fixed cost and profit
- Sometimes instead of arbitrarily adding a percentage on cost, **the firm can determine the mark-up on the basis of required rate of return on investment**

Competition based pricing methods: When a company sets its price **mainly on the consideration of what its competitors are charging**, its pricing policy under such a situation is called competitive pricing or competition-oriented pricing. The price under this system is altered **based on competitor's action and not based on own costs/demand**. Following are the different types of competitive pricing in practice:

Going Rate Pricing:

- It is a competitive pricing method under **which a firm tries to keep its price at the average level charged by the industry**
- Going rate pricing is especially useful where it is difficult to measure costs
- Going rate pricing can lead to fair return and the same would be least disruptive for industry's harmony
- Going rate pricing is suitable for highly competitive conditions in a homogenous product market (food, raw materials and textiles)
- Going rate pricing is used in pure oligopoly wherein a few large concerns dominate the industry and hence the players have to fix price based on what the competitors charge

Sealed-bid pricing:

- **Competitive pricing also dominates in those situations where firms compete on the basis of bids, such as original equipment manufacturer and defense contract work**
- Bid is the firm's offer price and is a prime example of fixing the price based on how competitors will price rather than on a rigid relation based on concern's own costs or demand

Value-based Pricing Methods: There is an increasing trend to price the product on the basis of customer's perception of its value. This method helps the firm in reducing the threat of price wars. It is based on:

Objective value or true economic value:

- **This is a measure of benefits that a product is intended to deliver to the consumers relative to the other products without giving any regard whether consumer can recognize the benefits or not**
- **True Economic value = Cost of the next best alternative + Value of Performance differential**
- Cost of the next best alternative is the price of the competitors whereas value of performance differential is the value of additional features provided by a seller of a product

Perceived value:

- **This is the value that consumer understands the product deliver to it**. It is the price of a product that a consumer is willing to spend to have that product
- **Fixing the price below perceived value but above cost of production can be a win-win situation for both buyer and seller. Buyer's benefit = Perceived value – Price; Seller's benefit = Price – Cost of production**
- A firm focuses on creating value for its customers. The value can be created using the following strategies:
  - It should develop a product that satisfy the wants and needs of the customers
  - After identification and development, it should design a promotion program to convey the value of the products to the customers
  - Choosing the right distribution channel through which its product will reach to the customers
  - Design a pricing strategy that creates incentive to purchaser to buy the product and to seller to sell the product

Pricing in periods of recession: In periods of recession a firm may sell its articles at a price less than the total cost but above the marginal cost for a limited period. The advantage of this practice are:

- Firm can **continue to produce and use the services of skilled employees** who are well trained and will be difficult to re-employ later if discharged
- **Plant and machinery can be prevented from deterioration** through idleness
- Business would be ready to take **advantage of improved business conditions**
- **Avoids competition** of securing the business of the firm

Pricing below marginal cost: Firm may also be justifiable to sell the product at a price **below marginal cost for a limited period** provided the following conditions prevail:

- Where materials are of **perishable nature**
- Where stocks **have been accumulated in large quantities** and the market prices have fallen. This will save the cost of carrying stocks
- To **popularize a new product**
- Where such reduction **enables the firm to boost the sales of other products having larger profit margin**

Strategic pricing of new products: Pricing of a new product poses a bigger problem because of the **uncertainty involved in the estimation of the demand**. Pricing of a new product is very critical issue which should be decided after a thorough market study and consumer behavior analysis. A new product in analyzed into three categories for the purpose of pricing:

- **Revolutionary Product:** A product is said to be revolutionary when it **is new for the market and has the potential to create its own value**. This type of product has revolutionary impact on the market and consumer behavior. Revolutionary product may enjoy the premium price as a reward for its innovation and taking first initiative
- **Evolutionary Product:** A product introduced **with upgraded version with few additional characteristics of the product is known as evolutionary product**. Evolutionary product may be priced taking cost-benefit, competitor and demand for the product
- **Me-too product:** A product is said to be **me-too product when its emergence is a result of the success of a revolutionary product.** These type of products are very similar to revolutionary

and/or evolutionary products of other firms. The me-too products are price takers as the price is determined by the market mainly by the competitive prices

Market entry strategies:

Skimming Pricing: It is a **policy of high prices during the early period** of product's existence. This can be synchronized with high promotional expenditure and in later years the prices can be gradually reduced. The reasons for following such policy are:

- Demand is likely to be **inelastic**
- Charge of high price in the initial period **serves the cream of the market that is relatively insensitive to price**
- Method is preferred in the beginning because in the initial periods when the demand for the product is not known **the price can cover the initial cost of production**
- **High initial capital outlays and high promotional advertising expenditure** is incurred in the beginning. Hence it is necessary to charge high prices

Penetration pricing: It is **a policy in favor of using a low price as the principal instrument for penetrating mass markets early**. It is opposite to skimming price. Penetration pricing is to be distinguished from predatory pricing. Predatory pricing is the practice of selling a product or service at a very low price, intending to drive competitors out of the market. Following are the circumstances under which penetration pricing can be used:

- Demand is said to be **elastic**
- Substantial savings due to **large scale production**
- When there is a **threat of competition**. Prices fixed at a low level becomes an entry barrier

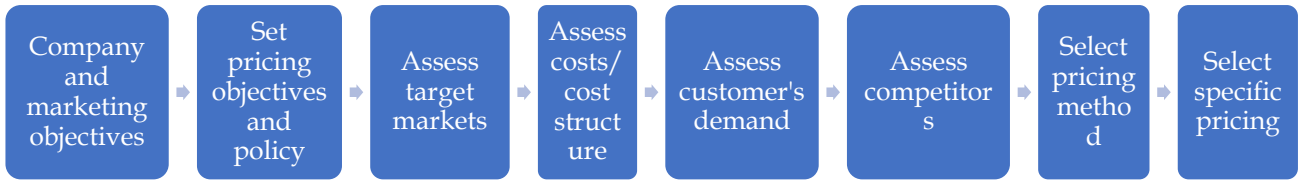
Pricing and Product Cycle:

Introduction Stage	Growth Stage	Maturity Stage	Decline stage
Skimming policy with high prices, but low profit margin due to high fixed costs	Reduce price to penetrate market further	Price to match or beat competitor	Cut price if not repositioning
Penetration pricing to enter the market and gain a high share quickly or to prevent competitors from entering		Retain higher prices in some market segments	Some increases in price may occur in the late decline stage

Price adjustment policies: **These are tools to change the prices for various customer differences** and changing situations.

- **Distributor's discounts:** It means price deductions that systematically make the net price vary according to buyer's position in the chain of distribution. Discounts vary on the basis of marketing functions (wholesaler, retailer, dealer) performed by them different prices for different customers and hence are also called as functional discounts
- **Quantity discounts:** Quantity discounts are price reductions related to the quantities purchased. This can be based on quantity per order or value of purchases
- **Cash discounts:** Cash discounts are price reductions based on promptness of payment. It is a convenient device to identify and overcome bad credit risks
- **Price discrimination:** Price discrimination means charging different prices and it takes various forms according to whether the basis is customer, product, place or time. Price discrimination is possible if following conditions are satisfied:
  - Maker must be capable of being segmented for price discrimination
  - Customer should not be able to resell the product of the segment paying higher price
  - Change of competitor's underselling in the segment of higher prices should not be possible
- **Geographic Pricing:** Seller should consider the cost of shipping goods to the buyer and hence the pricing can vary based on geography due to the freight costs

Structured approach to pricing decisions:



Sensitivity analysis in pricing decisions:

- Sensitivity analysis is **very significant in making pricing decisions, and striking the right balance in which the price is good-looking enough to generate enough sales, yet also profitable for the firm**
- Sensitivity analysis can also be used in determining how much can be spent on development or marketing
- **Product pricing decisions must be balanced against cost and competitive market conditions**. Sensitivity analysis is required to determine how sales and costs will respond to changes in the market conditions
- Sensitivity analysis is performed by **choosing the critical parameters upon which the proforma computations are done and systematically changing them to assess how the changes will impact the overall outcome**. This analysis is important towards understanding how the company will withstand external changes
- Sensitivity analysis can be based on market demand, changes in market price, exchange rate fluctuation, Initial outlay, R&D, Production cost, Marketing costs, Introduction dates, product prices among others

Pricing of services

- When services are uniquely tailored to each customer's needs, the pricing cannot be easy. **Each service transaction is likely to have distinct pricing pressure**
- In certain services the customer's participation is essential. **Hence the customer may have to incur certain intangible costs over and above monetary cost while making use of the service**. The company should consider these intangible costs that a customer has to bear while fixing the price
- Some services like **education, healthcare, transport fall within the ambit of Government** and hence the price tends to be regulated
- Services pricing can **also be determined in a collective manner.** Trade association, professional bodies or other institutions may impose certain guidelines for fixing price

Practical problems/ case studies/ important questions:

1. **Acceptance of additional order [Category B – May 2013 (exam)]**

Rational Ltd. produces 3, 00,000 kgs of S and 6,00,000 kgs. of Y from an input of 9, 00,000 kgs. Of raw material- Z simultaneously. The selling price of S is Rs.8 per kg and that of Y is Rs.6 per kg. Processing costs amount to Rs.54 lakhs per month as under:

Raw material Z 9,00,000 kgs at Rs.3 per kg	27,00,000
Variable processing costs	18,00,000
Fixed processing costs	9,00,000

There is an offer to purchase 60,000 kgs of Y additionally at a price of Rs.4 per kg. The existing market of Y will not be affected by accepting the offer. But the price of S is likely to be decreased uniformly on all sales. Find the minimum reduced average price for S to sustain the increased sales

Answer:

- The company is currently selling 3,00,000 KG of S and 6,00,000 KG of Y from input of 9,00,000 KG.
- The company has received an order for 60,000 of Y and this will also lead to increased production of S. The company wants to know the minimum price of S at which the order can be taken up by the company
- We shall first compute the existing profit of the company. The company should ensure that overall profit is maintained when the new order is accepted

Computation of existing profit of company:

Particulars	Calculation	Amount
Sale value of S	3,00,000 x 8	24,00,000
Sale value of Y	6,00,000 x 6	36,00,000
Less: Costs		
Raw material cost		(27,00,000)
Variable processing costs		(18,00,000)
Fixed processing costs		(9,00,000)
Profit		**6,00,000**

Computation of minimum price of S:

Particulars	Calculation	Amount
Sale value of S	Balancing figure	26,10,000
Sale value of Y	(6,00,000 x 6) +(60,000 x 4)	38,40,000
Less: Costs		
Raw material cost	(27,00,000/9,00,000) x 9,90,000	(29,70,000)
Variable processing costs	(18,00,000/9,00,000) x 9,90,000	(19,80,000)
Fixed processing costs		(9,00,000)
Profit		**6,00,000**
Minimum selling price	**26,10,000/3,30,000**	**7.91**

Note: The above has been reverse worked taking profits of 6,00,000 and finding sales value of S as balancing figure

2. Differential price fixation [Category B]

Hind Metals Manufactures an alloy product 'INCOP' by using iron and copper. The metals pass through two metals X and Y. The company gives you the following details for the manufacture of one unit of Incop:

Materials	Iron: 10 Kgs @ Rs.5 per kg
	Copper: 5Kg@ Rs.8 per kg
Wages	3 hours @ Rs.15 per hour in Plant X
	5 hours @ Rs.12 per hour in Plant Y
Overhead recovery	On the basis of direct labour hours
Fixed overhead	Rs.8 per hour in Plant X
	Rs.5 per hour in Plant y
Variable overhead	Rs.8 per hour in Plant X
	Rs.5 per hour in Plant y
Selling overhead	Rs.20 per unit – Fully variable

(i) Find out the minimum price to be fixed for the alloy, when the alloy is new to the market. Briefly explain its pricing strategy

(ii) After the alloy is well established in the market. What should be the minimum selling price and why?

Answer:

WN 1: Computation of variable cost per unit and total cost per unit:

Particulars	Calculation	Amount
Direct Material		
Iron	10 kg x 5	50
Copper	5 kg x 8	40
Direct wages		
Plant X	3 hrs x 15	45
Plant Y	5 hrs x 12	60
Variable OH		
Plant X	3 hrs x 8	24

Plant Y	5 hrs x 5	25
Selling OH		20
Variable cost per unit		**264**
Fixed OH		
Plant X	3 hrs x 8	24
Plant Y	5 hrs x 5	25
Total cost per unit		**313**

Pricing strategy:

(i) **If pricing strategy is to penetrate the market, the minimum price for a new product should be the variable cost** i.e. Rs. 264/-. In some circumstances, it can also be sold below the variable cost, if it is expected to quickly penetrate the market and later absorb a price increase. Total Variable Cost is the penetration price.

(ii) **When the alloy is well established, the minimum selling price will be the total cost** – including the fixed cost i.e. Rs. 313 per unit. Long run costs should cover at least the total cost.

3. Fixation of selling price [Category A – May 2013 RTP]

Computer Tec a manufacturing firm has entered into an agreement of strategic alliance with Comp Inc. of United States of America for the manufacture of Super Computers in India. Broadly, the terms of agreement are:

- Comp Inc. will provide Computer Tec with kits in a dismantled condition. These will be used in the manufacture of the Super Computer in India. On a value basis, the supply, in terms of the FOB price will be 50% thereof.
- Computer Tec will procure the balance of materials in India.
- Comp Inc will provide to Computer Tec with designs and drawings in regard to the materials and supplies to be procured in India. For this, Computer Tec will pay Comp Inc. a technology fee of Rs. 8 crores.
- Comp Inc. will also be entitled total royalty at 10% of the selling price of the computers fixed for sales in India as reduced by the cost of standard items procured in India and also the cost of imported kits from Comp Inc.
- Computer Tec will furnish to Comp Inc. detailed quarterly returns.

Other information available:

- FOB price agreed $2,040. Exchange rate to be adopted $1 = Rs. 55.00
- Insurance and freight – Rs. 2,000 per imported kit;
- Customs duty leviable is 200% of the CIF prices; but as a concession, the actual rate leviable has been fixed at 40% of CIF.
- The technology agreement expires with the production of 8,00,000 computers;
- The quoted price on kits includes a 25% margin of profits on cost to Comp Inc.
- The estimated cost of materials and supplies to be obtained in India will be 150% of the cost of supplies made by Comp Inc. 50% of the value in rupees of the locally procured goods represent cost of the standard items.
- Cost of assembly and other overheads in India will be Rs. 8,000 per Super Computer.

Calculate the selling price, of a personal computer in India bearing in mind that Computer Tec Ltd has targeted a profit of 20% to itself on the selling price.

Answer:

WN 1: Fixation of Price of Super Computer:

Particulars	**Calculation**	**Amount**
1. Cost of dismantled kit	Note 1	81,340
2. Technology fee	8 crores/8 lacs	100
3. Material and supplies	Note 2	67,320
4. Assembly and other OH	Given	8,000
5. Royalty (assumed as X)		X
Total cost		**1,56,760 + X**

Profit	1/5 on sales = 1/4 on cost	39,190 + 0.25 X
Selling Price (assumed as Y)		**Y**

Note 1: Computation of cost of dismantled kit:

Particulars	**Calculation**	**Amount**
1. FOB Price	50% x 2,040$ x 55	56,100
2. Insurance and freight	Given	2,000
3. CIF value		**58,100**
4. Customs duty	40% of 58,100	23,240
5. Cost of dismantled kit		**81,340**

Note 2: Computation of material and supplies:

- The material and supplies will be at 150 percent of the cost of supplies made by Comp Inc.
- Comp Inc makes margin of 25%(1/4) on cost and hence it will be 20 percent margin on sales. Selling price of Comp Inc is Rs.56,100 and hence the cost price will be Rs.44,880 (80% of Rs.56,100)
- Value of materials and supplies = 150 percent of 44,880 = Rs.67,320

Computation of royalty and selling price:

- Royalty (X) = 10% of [Y – 50%(67,320) – 81,340)
- X = 0.1Y -11,500
- Selling Price = Cost + Profit; Y = 1,56,760 + X + 39,190 + 0.25X; Y = 1,95,950 + 1.25 X
- Substituting the value of X in Y
- **Y = 1,95,950 + 1.25(0.1Y – 11,500); Y = 2,07,514**
- X = 0.1(2,07,514) – 11,500; X = 9,250
- **Royalty = Rs.9,251 per unit and Selling Price per super computer = Rs.2,07,514**

4. Fixation of price [Category B – November 2014 (exam)]

An organization manufactures a product, particulars of which are detailed below:

Particulars	Amount
Annual Production (units)	20,000
Material cost	50,000
Other variable cost	60,000
Fixed cost	40,000
Apportioned investment	1,50,000

Determine the unit selling price under two strategies mentioned below. Tax rate is 40%.

- 20% return on investment
- 6% profit on list sales, when trade discount is 40%

WN 1: Fixation of selling price to earn return of 20 percent on investment:

- The company needs to earn 20 percent ROI. It is assumed that the given 20 percent return is post-tax return
- PAT = 20 % x Rs.1,50,000 = Rs.30,000
- PBT = PAT/(1-Tax rate); PBT = Rs.30,000/(1-0.4) = Rs.50,000
- Total sales = Total cost + Profit
- Total sales = 1,50,000 + 50,000 = Rs.2,00,000
- Selling Price = Rs.2,00,000/20,000 units = Rs.10 per unit

WN 2: Computation of selling price to earn profit of 6 percent on list sales:

- The company needs to earn profit of 6 percent on list sales. It is assumed that 6 percent is post-tax return and hence 10 percent would be the pre-tax return
- Let us assume selling price to be X

Particulars	**Amount**
List sales	20,000X
Less: Trade discount	(8,000X)

Net realizations	12,000X
Less: Cost	1,50,000
Profit	12,000X-1,50,000

Computation of Price:

Profit = Profit
12,000X – 1,50,000 = 10% of sales (12,000X)
12,000X – 1,50,000 = 2,000X
X = Rs.15 per unit

- Hence list price is Rs.15 per unit and net realization is Rs.9 per unit

5. Pricing Policy [Category B]

State the pricing policy which is most suitable in each of the following independent situations:

a. The company makes original equipments and also does defense contract work. There are other companies which also undertake such projects
b. The product made by the company is new to the market. It is expected to enjoy a long-term demand. Competition is expected very soon, since the product will be desirable to most customers.
c. Stock of processed ready-to-eat product, whose shelf life will soon be over in the next 2 months. The product is going to be discontinued.
d. A company sells a homogenous product in a highly competitive market.

Answer:

a) Sealed bid pricing
b) Skimming Pricing
c) Any price at which the product can be sold even if its lower than variable cost
d) Competitive pricing or Going rate pricing

6. Pricing policy [Category B]

State the appropriate pricing policy in each of the following independent situations:

a. 'A' is a new product for the company and the market and meant for large scale production and long term survival in the market. Demand is expected to be elastic.
b. 'B' is a new product for the company, but not for the market. B's success is crucial for the company's survival in the long term.
c. 'C' is a new product to the company and the market. It has an inelastic market. There needs to be an assured profit to cover high initial costs and the usual sources of capital have uncertainties blocking them.
d. 'D' is a perishable item, with more than 80% of its shelf life over.

Answer:

a) Penetration pricing
b) Market price or price just below market price
c) Skimming pricing
d) Any cash realizable value

7. Pricing policy [Category B]

State the most appropriate pricing policy to be adopted in the following independent situations:

a. Modern patented drug entering the market.
b. The latest version of a mobile phone is being launched by an established, financially strong company.
c. An established company has recently entered the stationery market segment and launched good quality paper for printing at home and office.
d. A car manufacturer is launching an innovative, technologically advanced car in the highly priced segment.
e. A new product is to be launched. It has had high promotional expenditure and its demand in the market is not known
f. A new product is to be launched. It is to be mass manufactured
g. A product which has an external market demand is to be transferred to another division of the same company. For the external market, variable selling costs of Rs.10 per unit and fixed selling

costs amounting to Rs.10 lakhs per annum are incurred. These costs are not applicable to divisional transfer. The divisional transfer can take up only 20% of the output produced

h. A special one-time order for the use of idle capacity is offered. This order will not impact the existing sales of the company. The product has competition in the market

i. There is stock of a discontinued product. It has severe competition and the product is perishable

Answer:

a) Skimming pricing
b) Penetration pricing
c) Market Price
d) Skimming Pricing
e) Skimming Pricing
f) Penetration Pricing
g) External selling price – savings in costs
h) Relevant cost plus reasonable markup
i) Any price at which the product can be sold even if its lower than variable cost

8. Pricing Methods (Category B – May 2019 (exam)]:

RECOMMEND the Pricing Strategy to be adopted with reference to the following situations. You are not required to explain the reasons for your answer.

a. Star Coffee Shop follows the practice of keeping the price of its coffee or service artificially high in order to encourage favourable perceptions among buyers, based solely on the price.

b. Sky TV gave away their satellite dishes for free in order to set up a market for them.

c. Princeton Hotels Ltd. follows a competitive pricing method under which it tries to keep its price at an average level charged by the Industry.

d. Eddisson Enterprises has piled up stocks in large quantities and the market price has fallen.

e. Acqua LLP follows a new product pricing strategy through which company makes profitable sales by selling out few units.

f. X Ltd. produces Product X a revolutionary product and as a reward for innovation and for taking first initiative which pricing strategy should X Ltd. adopt?

g. An established company has recently entered the stationery market segment and launched quality paper for printing at home and office.

h. D is a perishable item, with more than 80% of its shelf life is over.

Answer:

a. Premium Pricing
b. Penetration Pricing
c. Going Rate Pricing
d. Pricing Below Marginal Cost
e. Skimming Pricing
f. Premium Pricing
g. Market Price
h. Any Cash Realizable Value

9. Pricing decision [Category A]

AHEL produces product A. To manufacture one unit of A, a variable cost of Rs.2, 20,000 is incurred. Market research has indicated that demand will increase by 2 units for price change of Rs.5, 000. The company can sell 20 units at a price of Rs.4, 60,000. Determine the unit selling price that will maximize the profits of product A.

Answer:

- The company can sell 20 units at a price of Rs.4,60,000. Demand changes by 2 units for price change of Rs.5,000
- The company would sell 18 units if the price is revised to Rs.4,65,000. Similarly, the company will sell 0 units if the price is Rs.5,10,000

❖ P = a-bQ Where P = Price; b = Slope of demand curve [Change in Price/Change in Quantity]; Q = Quantity demanded; a = Price at which demand is zero
❖ Price = 5,10,000 – [5,000/2]Q
❖ MR = a – 2bQ

- MR = 5,10,000 – 2[5,000/2]Q
- MR = 5,10,000-5,000Q

Computation of optimum level:

- At optimum level MR = MC
- 5,10,000 – 5,000Q = 2,20,000
- **Q = 58 units**

Computation of optimum price:

- Price = 5,10,000 – 2,500 (58)
- **Price = Rs.3,65,000**

10. Calculation of True Economic Value (TEV) [Category B]

Mr. Aditya went for a holiday vacation with his family consists of his wife and a three years old son, to Munnar in Kerala through Deccan Tour Ltd. a tour & travel agency which took Rs. 15,000 for the tour. The feature of the holiday package was as follows:

Number of days:	3 days and 2 nights
Stay:	At 3 star hotel
Food & beverages:	Breakfast and Dinner
Sightseeing:	By Indica car with A/c

There is an another travel agency Munnar Crocks Pvt. Ltd. which provides the same tour package with almost the same features with an additional airport pickup and drop facility at Rs. 14,500 only. Airport pickup and drop facility costs Rs.1,600. Calculate the True Economic value?

Answer:

- True Economic Value = Cost of the next best alternative + Value of performance differential
- TEV of Deccan Tour Limited Package = 14,500 – 1,600 = Rs.12,900
- TEV of Munnar Crocks Private Limited Package = 15,000 + 1,600 = Rs.16,600

11. Cost Plus Pricing [Category A – May 2019 (exam)]

The budgeted cost data of a product manufactured by Ayudhya Ltd. is furnished as below:

Budgeted units to be produced…… ….2,00,000
Variable cost (Rs.)……..... 32 per unit
Fixed cost (Rs.)……..... 16 lacs

It is proposed to adopt cost plus pricing approach with a mark-up of 25% on full budgeted cost basis. However, research by the marketing department indicates that demand of the product in the market is price sensitive. The likely market responses are as follows:

Selling price (Rs. **per unit)**	44	48	50	56	60
Annual Demand (units)	1,68,000	1,52,000	1,40,000	1,28,000	1,08,000

Required

Analyse the above situation and determine the best course of action.

Answer:

WN 1: Computation of selling price to earn profit margin of 25 percent on full cost:

Particulars	**Calculation**	**Amount**
Variable cost	2,00,000 x 32	64,00,000
Fixed cost		16,00,000
Total cost		**80,00,000**
Add: Profit	25% on cost	20,00,000
Total sales		**1,00,00,000**
Number of units		2,00,000
Selling Price		**50**

However, at selling price Rs.50 per unit, the company can sell 1,40,000 units only, which is 60,000 units less than the budgeted production units.

After analyzing the price-demand pattern in the market (which is price sensitive), to sell all the budgeted units market price needs to be further lowered, which might be lower than the total cost of production.

WN 2: Identification of Optimum Price:

Particulars	Price of 44	Price of 48	Price of 50	Price of 56	Price of 60
Units sold	168,000	1,52,000	1,40,000	1,28,000	108,000
Sales	73,92,000	72,96,000	70,00,000	71,68,000	64,80,000
Less: Variable cost	-53,76,000	-48,64,000	-44,80,000	-40,96,000	-34,56,000
Less: Fixed cost	-16,00,000	-16,00,000	-16,00,000	-16,00,000	-16,00,000
Profit	**4,16,000**	**8,32,000**	**9,20,000**	**14,72,000**	**14,24,000**
Total Cost	69,76,000	64,64,000	60,80,000	56,96,000	50,56,000
Profit as % of total cost	**5.96**	**12.87**	**15.13**	**25.84**	**28.16**

Determination of the Best Course of Action

(i) Taking the above calculation and analysis into account, the company should produce and sell 1,28,000 units at Rs.56. At this price company will not only be able to achieve its desired mark up of 25% on the total cost but can earn maximum contribution as compared to other even higher selling price

(ii) If the company wants to uphold its proposed pricing approach with the budgeted quantity, it should try to reduce its variable cost per unit for example by asking its supplier to provide a quantity discount on the materials purchased.

12. Pricing Decisions and Product Life Cycle [Category A]

Rapid Heal Tech Ltd. (RHTL) is a leading IT security solutions and ISO 9001 certified company. The solutions are well integrated systems that simplify IT security management across the length and depth of devices and on multiple platforms. RHTL has recently developed an Antivirus Software and company expects to have life cycle of less than one year. It was decided that it would be appropriate to adopt a market skimming pricing policy for the launch of the product. This Software is currently in the Introduction stage of its life cycle and is generating significant unit profits.

Required

(i) Explain, with reasons, the changes, if any, to the unit selling price that could occur when the Software moves from the Introduction stage to Growth stage of its life cycle.

(ii) Also suggest necessary strategies at this stage.

Answer:

Following acceptance by early innovators, conventional consumers start following their lead. New competitors are likely to now enter the market attracted by the opportunities for large scale production and profit. RHTL may wish to discourage competitors from entering the market by lowering the price and thereby lowering the unit profitability. The price needs to be lowered so that the product becomes attractive to different market segments thus increasing demand to achieve the growth in sales volume. Strategies at this stage may include the following

- Improving quality and adding new features such as Data Theft Protection, Parental Control, Web Protection, Improved Scan Engine, Anti Spyware, Anti Malware etc.
- Sourcing new market segments/ distribution channels.
- Changing marketing strategy to increase demand.
- Lowering price to attract price-sensitive buyers.

13. Pricing decision and Product Life Cycle [Category A]

Netcom Ltd. manufactures and sells a number of products. All of its products have a life cycle of less than one year. Netcom Ltd. uses a four stage life cycle model (Introduction, Growth, Maturity and Decline). Netcom Ltd. has recently developed an innovative product. It was decided that it would be appropriate to adopt a market skimming pricing policy for the launch of the product. However, Netcom Ltd. expects that other companies will try to join the market very soon. This product is currently in the Introduction stage of its life cycle and is generating significant unit profits. However, there are concerns that these current unit profits will not continue during the other stages of the product's life cycle.

Required

EXPLAIN, with reasons, the changes, if any, to the unit selling price and the unit production cost that could occur when the products move from the previous stage into each of the following stages of its life cycle:

i. Growth
ii. Maturity

Answer:

Growth Stage

Compared to the introduction stage the likely changes are as follows:

Unit Selling Prices: These are likely to be reducing for a number of reasons:

- The product will become less unique as competitors use reverse engineering to introduce their versions of the product.
- Netcom may wish to discourage competitors from entering the market by lowering the price and thereby lowering the unit profitability.
- The price needs to be lowered so that the product becomes attractive to different market segments thus increasing demand to achieve the growth in sales volume.

Unit Production Costs:

These are likely to reduce for a number of reasons:

- Direct materials are being bought in larger quantities and therefore Netcom may be able to negotiate better prices from its suppliers thus causing unit material costs to reduce.
- Direct labour costs may be reducing if the product is labour intensive due to the effects of the learning and experience curves.
- Other variable overhead costs may be reducing as larger batch sizes reduce the cost of each unit.
- Fixed production costs are being shared by a greater number of units.

Maturity Stage

Compared to the growth stage the likely changes are as follows:

Unit Selling Prices:

These are unlikely to be reducing any longer as the product has become established in the market place. This is a time for consolidation and whilst there may be occasional offers to tempt customers to buy the product the selling price is likely to be fairly constant during this period

Unit Production Costs:

- Direct material costs are likely to be fairly constant in this phase and may even rise as the quantities required diminish compared to those required in the growth stage with the consequential loss of negotiating power.
- Direct labour costs are unlikely to be reducing any longer as the effects of the learning and experience curves have ended. Indeed the workers may have started working on the next product so that their attention towards this product has diminished with the result that these costs may increase.
- Overhead costs are likely to be similar to those of the end of the growth phase as optimum batch sizes have been established and are more likely to be used in this maturity stage of the product life cycle where demand is more easily predicted.

14. Pricing Decisions [Category A – May 2018 (exam)]

A manufacturer of electrical appliances is continually reviewing its product range and enhancing its existing products by developing new models to satisfy the demands of its customers. The company intends to always have products at each stage of the product life cycle to ensure the company's continued presence in the market.

Currently the company is reviewing three products:

Product K was introduced to the market some time ago and is now about to enter the maturity stage of its life cycle. The maturity stage is expected to last for ten weeks. Each unit has a variable cost of Rs.38 and takes 1 standard hour to produce. The Managing Director is unsure which of four possible prices the company should charge during the next ten weeks. The following table shows the results of some market research into the level of weekly demand at alternative prices:

Selling price per unit	Rs.100	Rs.85	Rs.80	Rs.75
Weekly demand (units)	600	800	1,200	1,400

Product L was introduced to the market two months ago using a penetration pricing policy and is now about to enter its growth stage. This stage is expected to last for 20 weeks. Each unit has a variable cost of Rs.45 and takes 1.25 standard hours to produce. Market research has indicated that there is a linear relationship between its selling price and the number of units demanded, of the form P = a - bx. At a selling price of Rs.100 per unit demand is expected to be 1,000 units per week. For every Rs.10 increase in selling price the weekly demand will reduce by 200 units and for every Rs.10 decrease in selling price the weekly demand will increase by 200 units.

Product M is currently being tested and is to be launched in ten weeks' time. This is an innovative product which the company believes will change the entire market. The company has decided to use a market skimming approach to pricing this product during its introduction stage.

The company currently has a production facility which has a capacity of 2,000 standard hours per week. This facility is being expanded but the extra capacity will not be available for ten weeks.

i. Calculate which of the four selling prices should be charged for product K, in order to maximise its contribution during its maturity stage;
ii. and as a result, in order to utilise all of the spare capacity from your answer to (i) above, Calculate the selling price of product L during its growth stage.
iii. Compare and contrast penetration and skimming pricing strategies during the introduction stage, using product M to illustrate your answer.

Answer:

Part one:

Product K

Selling Price per unit	100	85	80	75
Contribution per unit	62	47	42	37
Demand (units)	600	800	1,200	1,400
Total Contribution (Rs.)	37,200	37,600	50,400	**51,800**

Capacity remaining to produce L	600 standard hours
Maximum Production of Product L	480 units

In order to maximise contribution during its maturity stage product K should be sold for $75 per unit.

Part two:

- The company can sell 1,000 units at a selling price of Rs.100. There will be a unit change of 200 for selling price change of Rs.10
- The company can hence sell 800 units at a selling price of Rs.110. Similarly, it can sell 600 units at a selling price of Rs.120. As a result product L should be sold for Rs.126 per unit during its growth stage.

Part three:

- Penetration pricing is based on a much lower selling price, but as a result the demand for the product is much higher so that the volume of sales each making a profit will be used to recover the costs of developing the product. This approach is recommended when the product is similar to others available in the market, i.e. it is not unique.
- In contrast, skimming is a strategy that charges a high unit price thus making significant profit per unit which can be used to recover the costs of developing the product. This approach requires that the product be unique and in high demand by those that can afford to pay for it, because the level of demand will be relatively low. Product M is a suitable product for a skimming strategy because it is highly innovative and is expected to change the market for this type of product.

Chapter 8 – Performance measurement and evaluation

Responsibility Accounting:

- Responsibility accounting is the collection, summarization, and reporting of financial information **where individual manager is held accountable for certain costs, revenue, or assets of the firm**
- Responsibility accounting is apt **where top management has delegated authority to make decisions**. The idea behind responsibility accounting is that each manager's performance should be judged by how well he or she manages those items under his or her control.

Functional organizational structure versus Divisional organizational structure:

Functional organizational structure:	**Divisional organizational structure:**
❖ A functional organizational structure forms when a **business departmentalizes, according to the basic functions** such as production, sales, marketing and finance ❖ **Small and medium-sized enterprises** frequently implement this structure. ❖ Under this structure pricing, product mix and output decisions will be made by central management. **Consequently the functional managers in a centralized organization will have far less independence than divisional managers**	❖ An organization with a division organizational structure has various **divisions operating autonomously as business under a broad corporate framework** according to geographical areas, markets, or products and services. ❖ Under this structure **there is decentralization of the decision-making process** and hence appropriate performance measurement systems is to be developed

Recognized levels of decentralization:

Cost or expense centres	Cost or Expense Centres are responsibility centres where the manager of such a centre or division is responsible for the costs associated with that centre and hence the main focus is cost minimisation. This level of decentralisation occurs normally in functional organisation types.
Revenue Centres	Revenue centres are responsibility centres where the manager is totally concerned with raising revenue with no responsibility for costs. The key measures used in appraising performance would be monitoring sales variances from budget
Profit centres	Manager of the division is responsible for both revenues and costs. Performance is measured through profits generated by the division
Investment centres	Investment centres are those divisions where manager is responsible not only for revenues and costs, but also the assets that generate these costs and revenues and the investment decisions relating to disposal and acquisition of assets

Divisional performance measures:

A good performance measure should:

- Provide incentive to the divisional manager to make decisions which are in the best-interests of the overall company **(goal congruence)**
- Only include factors for which divisional manager **can be held accountable**
- Recognize the **long-term as well as short-term objectives** of the organization

Divisional Performance Measures:

Financial Measures:	**Other Measures:**
❖ **Return on Investment (ROI)** ❖ **Residual Income (RI)** ❖ **Economic value added (EVA)** ❖ **Shareholder value added (SVA)**	❖ **Balanced scorecard** ❖ **The Performance Pyramid** ❖ **Building Block Model** ❖ **The Performance Prism** ❖ **Triple Bottom Line (TBL)**

Common thread in all performance measures:

- Be allied to corporate strategy.

- Include internal as well as external measures.
- Include financial as well as non-financial measures.
- Make explicit the trade-offs between different dimensions of performance.
- Include all important but difficult to measure factors as well as easily measurable ones.
- Consider measures for managers/ employees' motivation.

Return on Investment (ROI):

Meaning	❖ ROI expresses **divisional profit as a percentage of the assets employed** in the division ❖ Assets employed can be defined as total divisional assets, assets controllable by the divisional manager or net assets
Formula	$\frac{\textbf{EBIT}}{\textbf{Investments}}$ **(or)** $\frac{\textbf{EBIT x (1 − Tax rate)}}{\textbf{Investments}}$ ❖ EBIT is otherwise known as operating profit. We should take controllable profit (profit before HO expenses) for proper evaluation ❖ If we use EBIT then it is called pre-tax ROI and if we use EBIT x (1-Tax rate) then it is called as post-tax ROI ❖ **Investments = Capital Employed = Long term money = Long term Debt + Equity + Preference** ❖ **Capital employed can also be calculated from assets side as Fixed Assets + Current assets – Current Liabilities (or) Total Assets – Current Liabilities** ❖ **Capital employed can be taken as per opening capital employed, closing capital employed or average capital employed**
Goal Congruence	❖ **Divisional ROI can be increased by actions that will make the company's ROI worse off and conversely, actions that decrease the divisional ROI may make the company as a whole better off** ❖ In other words evaluating divisional managers on the basis of ROI **can lead to goal congruence issues**

Residual Income (RI):

Meaning	❖ Residual income is defined as controllable contribution less a cost of capital charge on the investment controllable by the divisional manager
Formula	**EBIT – (Cost of capital x Capital Employed) (or) EBIT x (1 – Tax rate) – (cost of capital x capital employed)**
Goal Congruence	❖ There is a **greater probability that managers will be encouraged, when acting in their own best interests, also to act in the best interests of the company**
Disadvantage	❖ Residual income suffers from the disadvantages of **being an absolute measure**, which means that it is difficult to compare the performance of a division with that of other divisions or companies of a different size

Economic value added (EVA):

- Economic Value Added is **a measure of economic profit**.
- Economic Value Added is calculated as the difference between the Net Operating Profit After Tax (NOPAT) and the Opportunity Cost of Invested Capital.

- **EVA = NOPAT – WACC × Capital**
- **NOPAT means net operating profit after tax. This profit figure shows profits before taking out the cost of interest**

EVA Versus Residual Income:

- **EVA, as a measure, follows the same principle as RI**. Value addition by a project is measured by EVA. **However, this measure looks at the impact on economic value of the business by the project**. This requires a procedure which may deviate from the conventional accounting principles. For example, fully written off goodwill, research and development may be reinstated at their economic values with corresponding adjustments to the reported profit. The use of all the assets to generate economic benefits is thus highlighted.

Adjustments to NOPAT and capital Employed:

- **For Advertising, Research and Development Items expensed, Staff Training**
  - **Impact on Profit:** Increase CY's profit, deduct economic depreciation on PY's EVA adjustment.
  - **Impact on Capital Employed:** Increase capital employed at the end of the year, increase capital employed in respect of similar add backs of PY's investments not treated as such in financial statements (net of economic depreciation)
- **For Depreciation**
  - **Impact on Profit:** Add accounting depreciation and subtract economic depreciation.
  - **Impact on Capital Employed:** Alter value of non-current assets (and capital employed) to reflect economic depreciation not accounting depreciation.
- **For Non- Cash Expenses**
  - **Impact on Profit:** Add back to profit.
  - **Impact on Capital Employed:** Add to retained profits at the end of the year.
- **For tax charge**, this will be based on 'cash taxes' rather than the accruals based methods used in financial reporting.

Note:
- **EVA is calculated on the basis of current year NOPAT and opening capital employed. Hence any current year adjustments are made only to NOPAT and not to capital employed**
- **WACC is computed based on post-tax cost of debt**

Shareholder value added (SVA):
- The process of analyzing **how decisions affect the net present value of cash to shareholders**. The analysis measures a company's ability to earn more than its total cost of capital.
- With in business units, **SVA measures the value the unit has created by analyzing cash flows over time**. At the corporate level, SVA provides framework for evaluating options for improving shareholder value by determining the tradeoffs between reinvesting in existing businesses, investing in new businesses and returning cash to stockholders
- SVA is affected by the following parameters:
  - Rate of sales growth
  - Operating profit margin
  - Income tax rate
  - Investment in working capital
  - Fixed capital investment
  - Cost of capital
  - Life of the project

Linking Financial and non-financial measures of performance:
- The main objective of **profit-making organizations is to maximize shareholder value**. Hence managers would analyze their performance through financial measures such as ROI/EVA. **However these performance measures can inspire managers to become short-term oriented**
- To overcome this issues the company should add non-financial measures for performance evaluation. This has created the need for linking financial and non-financial measures of performance

Linking critical success factors (CSFs) to Key Performance Indicators (KPIs) and corporate strategy:
- **Critical Success Factors are elements tied to the strategy of business and they represent objectives that businesses are trying to** achieve. They are derived from the strategic goals of the organization.
- The company should consider the following when identifying CSF's:
  - Industry structure
  - Competitive strategy
  - Environmental factors
  - Temporary influences
- **Key Performance Indicators**, on the other hand, are a consequence of critical success factors – they **represent the 'how'**. Having outlined 'what' businesses want to achieve, a company must subsequently define sets of measures and associated targets in such a way that achieving those targets will translate into successful completion of a CSF

- **Ideally, each critical success factor should have a KPI associated with it. A single Critical Factor can also have more than one KPI, if need be.** The KPI targets are more formally called thresholds, and the thresholds must be ascertained with a great deal of industry analysis, as well as internal analysis. **KPI targets should be Specific, Measurable, Achievable, Relevant and Time Constrained.**
- The objectives, CSFs, and KPIs together represent a chain of links that together deliver a company's strategic goal, by breaking down that strategic vision in to a set of quantifiable targets
- Setting up KPIs is a step in the right direction, but the benefit of KPIs is only truly realized when they are implemented in the right way, and understanding their linked relationship with CSFs and objectives is paramount to this effect

Triple Bottom Line (TBL):

- TBL expands traditional accountancy reporting systems, looking at social and environmental performance, rather than simple financial performance
- TBL **encourages managers to make decisions in a socially responsible manner**
- TBL incorporates the following three dimensions:
  - **Environmental**: Measures the impact on resources, such as air, water, ground and waste emissions
  - **Social:** Relates to corporate governance, motivation, incentives, health and safety, human capital development, human rights and ethical behavior
  - **Economic:** refers to measures maintaining or improving the company's success

Balanced Scorecard:

- The balanced scorecard is a method which displays organisation's performance into four dimensions **namely financial, customer, internal and innovation**
- The four dimensions acknowledge the interest of shareholders, customers and employees taking into account of **both long-term and short-term goals**

Four perspectives of balanced scorecard:

Financial Perspective – How do we look to shareholders?

- Manager of a division or a unit, links its business objectives to the corporate strategy of the company as a whole. Financial performance measures indicate whether the company's strategy implementation and execution **are contributing to its revenue and earnings**
- Financial objectives chosen at the onset of the balanced scorecard implementation should serve two purposes:
  - To **provide definite performance** that was expected at the time of strategies selection.
  - To provide a **focus for objectives and appropriate measures in each of the other three perspectives.**

Customer Perspective – How do customers view us?

- Managers **identify the lead indicators which make a particular business unit or product different from that of others.**
- Lead indicator may vary from customer to customer or market segment. If for example, a customer values **on-time delivery then on-time delivery becomes a lead indicator**. Some of the lead-indicators are on-time delivery, on-site service, after sales support, defects per order, cost of the product, free shipments etc

Internal Business Perspective – At what must we excel?

- Companies identify objectives and processes which are necessary to **achieve objectives set at financial and customer perspective stage**
- These objectives may be achieved by reassessing the value chain and making necessary changes to the existing operating activities

Learning and growth perspective – How do we continue to improve and create value?

- Companies determine the activities and infrastructure **that the company must build to create long term growth**, which are necessary to achieve the objectives set in the previous three perspectives.

- Organizational learning and growth comes from the following three sources:
  - **People (employee capabilities)**
  - **Systems (information system capabilities) and**
  - **Organizational procedures (motivation, empowerment and alignment)**

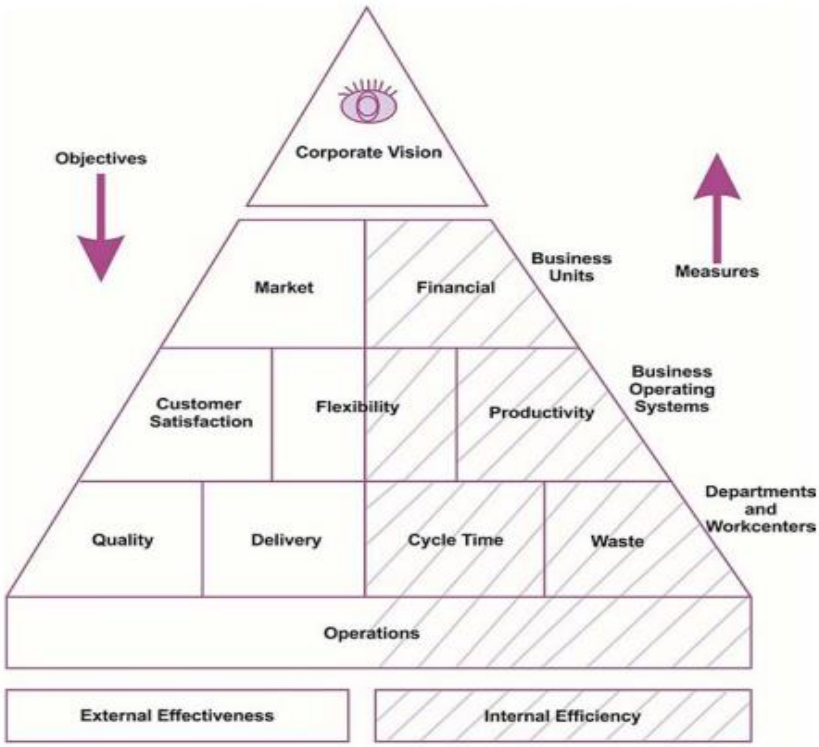
Benefits of Balanced scorecard:

- The ultimate result of using the Balanced Scorecard approach should **be an improved long term financial performance**. Since the scorecard gives equal importance to the relevant non –financial measures, it **should discourage the short termism that leads to cuts in spending on new product development, human resource development etc** which are ultimately detrimental for the future prospects of the company.

Reasons for failure of balanced scorecard:

- Managers mistakenly think that since they already use non – financial measures, they already have a Balanced Scorecard.
- **Senior executives misguidedly delegate the responsibility of the Scorecard implementation to middle level managers**.
- Company's try to **copy measures and strategies used by the best companies** rather than developing their own measures suited for the environment under which they function.
- **There are times when Balanced Scorecards are thought to be meant for reporting purposes only.** This notion does not allow a Business to use the Scorecard to manage Business in a new and more effective way.

Performance Pyramid:



- Performance pyramid model **viewed businesses as performance pyramids**. Attractiveness of this framework is that it links the business strategy with day-to-day operations
- **Objectives of the organizations are shown from top to bottom whereas the measures are from bottom to top**
- At the **top is the organization's corporate vision** through which long term success and competitive advantages are described
- The 'business level' focuses on achievements of organization's **CSF in terms of market and financial measures**. The marketing and financial success of a proposal is the initial focus for the achievement of corporate vision.
- The above business are linked to achieving customers satisfaction , increase in flexibility and high productivity .

- The above driving forces can be monitored using the operating forces of the organization. The **left-hand side of the pyramid contains external forces which are 'non-financial'. On the other hand, the right-hand side of the pyramid contains internal efficiency which are predominantly 'financial' in nature.**

The Building Block Model:

- Building Block Model suggests the **solution of performance measurement problems in service industries**

Standards: These are the measures used to assess performance (KPI's). These should have the following characteristics:

- **Equity**: Performance measures should be equally challenging for all parts of business
- **Achievable:** Performance measures should be realistic
- **Ownership:** Performance measures should be acceptable to everyone. Employees should be involved in identification of measures rather than being imposed on them

Rewards: To ensure that employees are motivated to meet standards, standards need to be clear and provide for adequate rewards. Rewards should possess the following characteristics

- **Motivation:** Rewards scheme should be set in manner which motivates employees to achieve the business goals
- **Clear:** Rewards scheme should be clearly communicated to employees in advance. What kind of performance will be rewarded and how their performance will be measured?
- **Controllability:** Employees should only be reward or penalized of the result over which they some control or influence.

Dimensions: Dimensions are the goals for the business. These are further divided into two sub-categories

Determinants – Performance areas which influence results	**Results – Reflects success or failure of determinants**
Quality: Ability to deliver goods and services with consistency. **Quality should be viewed from the eyes of the customer and it should be enough for price paid** **Flexibility: Responsiveness to change** in the factor influencing the business performance **Innovation:** Ability of the business to devise new products and new ways of doing things	**Financial performance:** Financial performance gives an indication **of overall business at a glance in monetary terms.** These can be used to identify areas of strengths and weaknesses. It may also highlight other areas previous identified which may be critical to business success

Resource utilization: Ability to use resources to achieve business objectives. Business assets should be used for the proper purpose and in most efficient way.	**Competitive Performance:** How do we stand in **comparison to its competitors**? How are we different from their competitors?

Performance Prism:

- Performance Prism is an approach to performance management which aims to effectively **meet the needs and requirements of all stakeholders** . This is in **contrast with the performance pyramid which tends to concentrate on customers and shareholders** and is also in contrast with value based management, which prioritizes the needs of shareholders
- Performance Prism takes stakeholder requirement as the start point for the development of performance measures rather than the organization strategy. It also recognizes the need to work with stakeholders to ensure that their needs are met

Key questions in Performance Prism:

- **Stakeholders Satisfaction:** The organization needs to focus on who are the stakeholders? What are the needs and wants of the stakeholders.
- **Strategies:** What are the strategies required by the organization to fulfill the wants and needs of the stakeholders?
- **Processes:** What are the necessary processes required for satisfying the above strategies?
- **Capabilities:** What capabilities does the organization needs for operating and enhancing the process?
- **Stakeholders Contributions:** It further takes into account what contribution does the management needs from its stakeholders?

Benefits of Performance Prism:

- Develops agreed measures of activity.
- Clarifies the objectives of the organization.
- Greater understanding of process.
- Helps facilitate comparison between divisions.
- Promotes accountability to stakeholder.
- Helps in setting of targets for managers.
- Helps facilitate comparison between different organizations

Performance Prism – Problems:

- **Tunnel Vision**: Undue focus on measurements to the detriment of other areas
- **Sub-optimization:** Focus on one measurement to the detriment of others
- **Myopia:** Focusing too much on short-term measures and not looking long-term
- **Misrepresentation:** Not presenting the data correctly
- **Misinterpreting:** Misinterpreting the data
- **Ossification:** Keeping of out of date measures

Benchmarking:

- Benchmarking is a **technique for continuous improvement in performance**. It involves comparing a firm's products, services or activities against other best performing organisations, either internal or external to the firm
- **The objective is to find out how the product, service or activity can be improved and ensure that the improvements are implemented**. It attempts to identify an activity such as customer order processing needs to be improved and finding a non-rival organisation that is considered to represent world class best practice and studying how it performs the activity
- It is a performance measure **that provides the driving force to establish high performance and means to accomplish these goals**

Types of Benchmarking:

- **Competitive Benchmarking:** It involves the comparison of competitors products, processes and business results with own. Benchmarking partners are drawn from the same sector.

- **Process Benchmarking:** It involves the comparison of an organisation critical business processes and operations against best practice organisation that performs similar work or deliver similar services. For example, how do best practice organisations process customers' orders.
- **Strategic Benchmarking:** It is similar to the process benchmarking in nature but differs in its scope and depth. It involves a systematic process by which a company seek to improve their overall performance by examining the long term strategies. It involves comparing high level aspects such as developing new products and services, core competencies etc.
- **Global Benchmarking:** It is a benchmarking through which distinction in international culture, business processes and trade practices across companies are bridged and their ramification for business process improvement are understood and utilised.
- **Functional Benchmarking:** This type of benchmarking is used when organisations look to benchmark with partners drawn from different business sectors or areas of activity to find ways of improving similar functions or work processes.
- **Internal Benchmarking** involves seeking partners from within the same organisation, for example, from business units located in different areas. The main advantages of internal benchmarking are that access to sensitive data and information are easier; standardised data is often readily available; and, usually less time and resources are needed.
- **External Benchmarking** involves seeking help of outside organisations that are known to be best in class. External benchmarking provides opportunities of learning from those who are at the leading edge, although it must be remembered that not every best practice solution can be transferred to others.

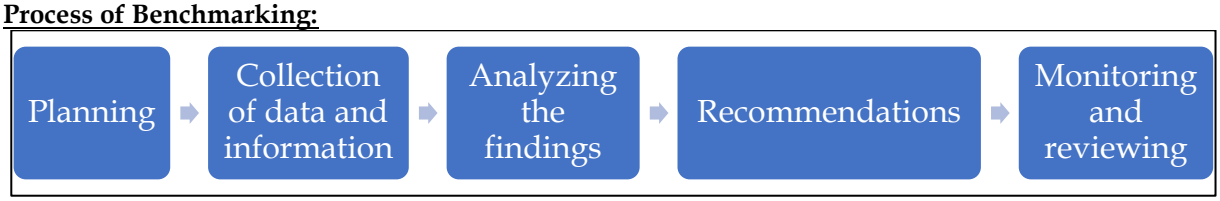
Categorization of benchmarking:

- **Intra-Group Benchmarking:** In intra group benchmarking the groups of companies in the same industry agree that similar units within the cooperating companies will pool data on their process. The processes are benchmarked against each other at or operational level.
- **Inter-Industry Benchmarking:** In inter-industry benchmarking a non-competing business with similar process is identified and asked to participate in a benchmarking exercise. For example, a publisher of school book may approach a publisher of university level books to establish a benchmarking relationship

Goals of Benchmarking:

- Benchmarking can **deliver significant performance improvements and returns based on efficiency, cost savings and new revenues**
- Benchmarking projects typically **target cycle times, productivity, customer service, quality and production costs**. They also can be part of an effort to shift the culture of a company to be more customer oriented and results focused

Process of Benchmarking:



Planning:

- **Determination of benchmarking goal statement:** The company should identify the areas to be benchmarked. It should look at the following criteria for identifying the areas to be benchmarked:
  - What would **make the most significant improvements in our relationships** with our customers.
  - What would make the most significant improvements to our bottomline.
- Identification of best performance
- Establishment **of the benchmarking or process improvement team**
- Defining the relevant benchmarking measurement

Collection of data and information: The data gathering for benchmarking could be done through national/international clearing houses, mail surveys, suppliers, company visits etc. The collection of information involve the following steps:

- **Compile information** and data on performance. They may include mapping processes.
- Select and contact partners.
- **Develop with partners**, a mutual understanding about the procedures to be followed and, if necessary, prepare a Benchmarking Protocol.
- **Prepare questions** and agree terminology and performance measures to be used.
- **Distribute schedule** of questions to each partner.
- **Undertake information** and data collection by chosen method for example, interviews, site-visits, telephone, fax and e-mail.
- **Collect the findings** to enable analysis.

Analysing the findings:

- **Review the findings** and produce tables, charts and graphs to support the analysis.
- **Identify gaps in performance** between our organisation and better performers.
- **Seek explanations for the gaps in performance**. The performance gaps can be positive, negative or zero.
- Ensure that comparisons are meaningful and credible.
- Communicate the findings to those who are affected.
- Identify realistic opportunities for improvements

Recommendations:

Making Recommendations:	**Implementing Recommendations:**
❖ **Deciding the feasibility of making the improvements** in the light of the conditions that apply within own organisation. ❖ Agreement on the improvements that are likely to be feasible. ❖ **Producing a report on the Benchmarking in which the recommendations are included.** ❖ Obtaining the support of key stakeholder groups for making the changes needed. ❖ **Developing action plan(s)** for implementation.	❖ Implement the action plans. ❖ Monitor performance. ❖ Reward and communicate successes. ❖ Keep key stakeholders informed of progress.

Monitoring and Reviewing:

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

Pre-requisites and difficulties in benchmarking:

Pre-requisites	**Difficulties:**
❖ Senior Management Support ❖ Clear definition of objectives ❖ Scope of work is appropriate in light of the objectives ❖ Availability of sufficient resources ❖ **Benchmarking team should have clear view of organization performance** ❖ **Stakeholders and staff to be informed about the reasons for benchmarking**	❖ **Time-consuming and at times difficult** ❖ **Requires direct involvement of senior manager** ❖ **Resistance of employees** ❖ Pre-occupied with measures. Hence companies don't look at improving process but look at matching the best practices ❖ Wastage of time in benchmarking non-critical functions ❖ Non-adaptation of best practice to tailor to a company's needs and culture

Benchmarking code of conduct:

Principle of Legality	Avoid discussions or actions that might lead to or imply an interest in restraint of trade. Do not discuss costs with competitors if costs are an element of pricing.
Principles of exchange	Be willing to provide the same level of information that you request, in any benchmarking exchange.
Principle of confidentiality	Treat benchmarking interchange as something confidential to the individuals and organizations involved. Information obtained must not be communicated outside the partnering organizations without prior consent of participating benchmarking partners.
Principle of use	Use information obtained through benchmarking partnering only for the purpose of improvement of operations within the partnering companies themselves
Principle of First Party Contact:	Initiate contacts, whenever possible, though a benchmarking contact designated by the partner company
Principle of Third Party Contact	Obtain an individual's permission before providing their name in response to a contact request.
Principle of Preparation	Demonstrate commitment to the efficiency and effectiveness of the benchmarking process with adequate preparation at each process step; particularly, at initial partnering contact

Performance measurement in the not for profit sector:

Not-for-profit organisation does not exist for earning profits but for achieving certain social or charitable cause. The activities carried out by such organisations must be measure to give a confidence to the donors/ members that the resources contributed are being utilized efficiently and effectively. Following are the key challenges in measuring performance:

- **Benefits cannot be quantified:** A large part of benefits derived from the activities of these organisations are not quantifiable. For example - if a not-for-profit organisation is formed for providing free education to poor students, the benefits derived by the students cannot be quantified.
- **Benefits may accrue over a longer term:** The expenditure incurred in one year may yield benefits over several years. A hospital may invest in creating ICU (Intensive Care Units) facility, the benefit of which will be obtained over multiple years.
- **Measurement of utilisation of funds & expenditure:** Some not-for-profit organisation spend out of their fixed budget and do not earn any revenue. The assessment of whether the spending have been appropriate is a key challenge
- **Multiple objectives:** Many not-for-profit organisations are formed for multiple objectives. The prioritisation of objectives can be a challenging task

Performance measures in not-for-profit sector:

Value for Money (VFM) Framework: A framework which can be used for measurement of performance in not-for-profit sector is the Value for Money framework. Not-for-profit organisations are expected to provide value for money which is demonstrated by:

- **Effectiveness:** Whether the organisation has achieved its desired mission and objectives?
- **Efficiency :** Whether the resources and funds available to the organisation has been utilized efficiently **i.e, maximum output has been obtained with minimum input.?**
- **Economy :** Whether the desired output has been obtained using the lowest cost? **It must be noted that use of lowest cost approach should not compromise quality.**

Adapted Balanced Scorecard:

Customer Perspective	Satisfaction of beneficiary and other stakeholder's interest
Financial Perspective	Fund raising, funds growth and funds distribution
Internal processes perspective	Internal efficiency, volunteer development and quality
Innovation and learning perspective	Capability of the organization to adjust to the changing environment

Other performance measures:

- The ability to raise funds to meet the objectives efficiently.
- Submitting periodic reports to the stakeholders in a transparent manner.
- **The best use of financial as well as non-financial resources to achieve desired objectives and mission.**
- **The long- term impact (benefits) of the activities of the not-for-profit organisations.**
- The quality of services provided by the organisations.

Performance reports:

- Responsibility Accounting is implemented by issuing performance reports at frequent intervals that inform responsibility centre managers of the deviations from budgets for which they are countable and required to take action.
- **Performance reports are useful for not only comparing budgeted results to actual results, but for also showing managers the effects of activity changes and how well these changes are controlled by management.**
- Note that the reports start from the bottom and move upward with each manager receiving information on the operations of the unit for which he is directly responsible and summary information on performance of other lower level managers under their direct or indirect control.
- **No matter how much authority and autonomy is given to responsibility managers, performance reports are needed to evaluate the performance of the managers at all operating levels of the organization.**
- At bottom levels, it helps in determining what all corrective measures are required in their segments. At top management level, these reports keep them top managers informed on the performance of all segments.

Overview of practical problems/ case studies/ important questions:

- Part I – Financial Measures of Performance
- Part II – Non-financial Measures of Performance
- Part III – Balanced Scorecard
- Part IV – Benchmarking
- Part V - Performance Measurement in the not for profit sector

Part I – Financial Measures of Performance

1. RI versus ROI [Category B]

The following data pertain to two divisions. W_1 and W_2, of a large Shipping Company.

	W_1 (Rs.)	**W_2 (Rs.)**
Profit	1,20,00,000	31,20,000
Investment	9,60,00,000	1,56,00,000

Cost of Capital at 10%

Required

INTERPRET the conflicting results based on financial performance measure ROI and RI.

Answer:

This questions shows that RI is subject to a **size effect** but ROI is not. The larger size for the W_1 Division (which is more than 6 times that of the W_2 Division) overcomes its lower profitability, as measured by ROI. Thus, RI is not a good way to compare divisions that differ greatly on size.

Workings

	W_1 (Rs.)	**W_2 (Rs.)**	**Remark**
ROI	12.50% (Rs.1,20,00,000 / Rs.9,60,00,000)	20.00% (Rs.31,20,000 / Rs.1,56,00,000)	W_2 division has the higher ROI.

RI	Rs.24,00,000 (Rs.1,20,00,000 – 0.1 × Rs.9,60,00,000)	Rs.15,60,000 (Rs.31,20,000 – 0.1 × Rs.1,56,00,000)	W_1 division has the higher RI.

2. RI Versus ROI [Category A – May 2019 (exam)]:

PTC Limited has three divisions. Its desired rate of return is 14%. The operating assets and income for each division are as follows:

Division	Operating Assets	Operating Income
P	19,20,000	3,45,600
T	10,50,000	1,73,250
C	12,30,000	1,67,280
Total	**42,00,000**	**6,86,130**

PTC Limited has Rs.8,00,000 of additional cash to invest in one of its divisions. The divisional managers have identified investment opportunities that are expected to yield the following ROIs:

Division	Expected ROI for additional investment
P	16%
T	12%
C	15%

Required:

i. Calculate ROIs at present for each division and state which division manager is currently providing the highest ROI
ii. Based on ROI, identify the division manager who would be most eager to accept the additional investment funds
iii. Based on ROI, identify the division manager who would be least eager to accept the additional investment funds
iv. State the division that offers the best investment opportunity for PTC Limited
v. Discuss the conflict between requirement (ii) and (iv) above
vi. Advise how the residual income performance measure could be used to motivate the managers to act in the best interest of the company

Answer:

Part 1:

Computation of ROI:

Division	Operating Assets	Operating Income	ROI (OI/OA)
P	19,20,000	3,45,600	18%
T	10,50,000	1,73,250	16.5%
C	12,30,000	1,67,280	13.6%

The division manager of P division is currently providing the highest ROI of 18% among the three divisions.

Part 2:

- The new project is expected to give ROI of 15% to Division C. It currently has ROI of 13.6% and hence Division C would be most interested in doing this new investment

Part 3:

- ROI of new project is lower than existing ROI for Division P and Division T. Hence both divisions would not be interested in doing the project. However, difference in ROI is highest for Division manager T and hence he would be least eager to do this new project

Part 4:

- The new investment would provide highest ROI for Division manager P and hence the company would want the investment to be done by Division Manger P

Part 5:

- The managers are forced to choose between their personal best interests and the best interests of the company as a whole. When faced with decisions such as these, many managers choose to benefit themselves at the expense of their company, a condition described as sub optimisation.

Part 6:

- Residual income will motivate managers to perform in the best interests of the company. Here we consider the excess returns earned by the managers in comparison to same cost of capital for all managers.
- Let us assume cost of capital of the company is 12% and therefore residual income for three divisions is computed below:

Residual Income	Operating Income – (Operating assets x cost of capital)
Division P	(8,00,000 x 16%) – (8,00,000 x 12%) = Rs.32,000
Division T	(8,00,000 x 12%) – (8,00,000 x 12%) = 0
Division C	(8,00,000 x 15%) – (8,00,000 x 12%) = Rs.24,000

- In this case Division P would be most interested in doing the project and the company would also want Division P to take up the project. Hence Residual Income approach can motivate managers to work in the best interests of the company

3. Return on Investment [Category A]

Cardale Industrial Metal Co (CIM Co) is a large supplier of industrial metals. The company is split into two divisions: Division F and Division N. Each division operates separately as an investment centre, with each one having full control over its non-current assets. In addition, both divisions are responsible for their own current assets, controlling their own levels of inventory and cash and having full responsibility for the credit terms granted to customers and the collection of receivables balances. Similarly, each division has full responsibility for its current liabilities and deals directly with its own suppliers.

Each divisional manager is paid a salary of $1,20,000 per annum plus an annual performance-related bonus, based on the return on investment (ROI) achieved by their division for the year. Each divisional manager is expected to achieve a minimum ROI for their division of 10% per annum. If a manager only meets the 10% target, they are not awarded a bonus. However, for each whole percentage point above 10% which the division achieves for the year, a bonus equivalent to 2% of annual salary is paid, subject to a maximum bonus equivalent to 30% of annual salary.

The following figures relate to the year ended 31 August 2015:

Particulars	Division F $ '000	Division N $ '000
Sales	14,500	8,700
Controllable Profit	2,645	1,970
Less: Apportionment of head office costs	(1,265)	(684)
Net Profit	1,380	1,286
Non-Current Assets	9,760	14,980
Inventory, cash and trade receivables	2,480	3,260
Trade Payable	2,960	1,400

During the year ending 31 August 2015, Division N invested $6.8m in new equipment including a technologically advanced cutting machine, which is expected to increase productivity by 8% per annum. Division F has made no investment during the year, although its computer system is badly in need of updating. Division F's manager has said that he has already had to delay payments to suppliers (i.e. accounts payables) because of limited cash and the computer system 'will just have to wait', although the cash balance at Division F is still better than that of Division N.

Required:

(a) For each division, for the year ended 31 August 2015, calculate the appropriate closing return on investment (ROI) on which the payment of management bonuses will be based. Briefly justify the figures used in your calculations.

(b) Based on your calculations in part (a), calculate each manager's bonus for the year ended 31 August 2015.

(c) Discuss whether ROI is providing a fair basis for calculating the managers' bonuses and the problems arising from its use at CIM Co for the year ended 31 August 2015.

Answer:

(a) Computation of return on investment:

Particulars	Division F	Division N
Controllable Profit	2,645	1,970
Investment (Total assets – Payables)	9,280	16,840
Return on investment	28.5%	11.7%

- In both calculations controllable profit has been used to reflect profit, rather than net profit. This is because the managers do not have any control over the Head Office costs and responsibility accounting deems that managers should only be held responsible for costs which they control.
- The same principle is being applied in the choice of assets figures being used. The current assets and current liabilities figures have been taken into account in the calculation because of the fact that the managers have full control over both of these

b) Bonus

- Bonus to be paid for each percentage point = $1,20,000 x 2% = $2,400.
- Maximum bonus = $1,20,000 x 0.3 = $36,000.
- **Division F:** ROI = 28.5% = 18 whole percentage points above minimum ROI of 10%. 18 x $2,400 = $43,200. Therefore manager will be paid the maximum bonus of $36,000.
- **Division N:** ROI = 11.7% = 1 whole percentage point above minimum. Therefore bonus = $2,400.

(c) Discussion

- The manager of Division N will be paid a far smaller bonus than the manager of Division F. This is because of the large asset base on which the ROI figure has been calculated. Total assets of Division N are almost double the total assets of Division F. This is largely attributable to the fact that Division N invested $6.8m in new equipment during the year.
- If this investment had not been made, net assets would have been only $10.04m and the ROI for Division N would have been 19.62%. This would have led to the payment of a $21,600 bonus (9 x $2,400) rather than the $2,400 bonus. Consequently, Division N's manager is being penalised for making decisions which are in the best interests of his division.
- It is very surprising that he did decide to invest, given that he knew that he would receive a lower bonus as a result. He has acted totally in the best interests of the company. **Division F's manager, on the other hand, has benefitted from the fact that he has made no investment even though it is badly needed. This is an example of sub-optimal decision making.**
- Division F's trade payables figure is much higher than Division N's. This also plays a part in reducing the net assets figure on which the ROI has been based. Division F's trade payables are over double those of Division N. In part, one would expect this because sales are over 50% higher (no purchases figure is given). However, it is clear that it is also because of low cash levels at Division F. **The fact that the manager of Division F is then being rewarded for this, even though relationships with suppliers may be adversely affected, is again an example of sub-optimal decision making.**
- If the **controllable profit margin (Controllable Profit/sales)** is calculated, it is 18.24% for Division F and 22.64% for Division N. Therefore, if capital employed is ignored, it can be seen that Division N is performing better. ROI is simply making the division's performance look worse because of its investment in assets. **Division N's manager is likely to feel extremely demotivated by his comparatively small bonus and, in the future, he may choose to postpone investment in order to increase his bonus.** Managers not investing in new equipment and technology will mean that the company will not keep up with industry changes and affect its overall future competitiveness.
- **To summarise, the use of ROI is leading to sub-optimal decision making and a lack of goal congruence, as what is good for the managers is not good for the company and vice versa.** Luckily, the manager at Division N still appears to be acting for the benefit of the company but the other manager is not. The fact that one manager is receiving a much bigger bonus than the other is totally unfair here and may lead to conflict in the long run. This is not good for the company, particularly if there comes a time when the divisions need to work together.

4. Computation of EVA [Category A]

XYZ Ltd. provides you with the following financial information as at 31st March 2018.

Particulars	Amount (in lacs)
Share capital	981.46
Reserves and surplus	1,313.62
Long term debt	144.44
Trade payables	20.38

Additional information provided is as follows:
(i) Profit before interest and tax is Rs. 2,202.84 lakhs
(ii) Interest paid is Rs.13.48 lakhs.
(iii) Tax rate is 30%
(iv) Cost of equity = 12.42% and cost of debt = 6.53%.

Required

CALCULATE Economic Value Added of XYZ Ltd.

Answer:

- EVA = NOPAT – (WACC x Capital employed)
- Capita employed = 981.46 + 1,313.62 + 144.44 = 2,439.52 lacs
- **Computation of WACC:**

Source	Cost	Weight	Product
Equity	12.42%	2,295.08	285.05
Debt	6.53%	144.44	9.43
Firm	**12.07%**	**2,439.52**	**294.48**

Computation of NOPAT:

Particulars	Amount
PBIT	2,202.84
Less: Interest	(13.48)
PBT	2,189.36
Less: Tax @ 30%	(656.81)
PAT	1,532.55
Add: Interest (net of tax) [13.48 x 0.70]	9.44
NOPAT	**1,541.99**

Computation of EVA:

NOPAT	1,541.99
Less: WACC x Capital employed (12.07% x 2,439.52)	294.45
EVA	**1,247.54**

5. Computation of EVA [Category A]

X Greetings is a Korean company based in Seoul committed to supplying the highest quality stationery, greeting cards, gifts, and children's products, which are sourced from all over the world. Company also distributes Sunday Paper – Korean made eco-friendly stationery designed and manufactured in Seoul. X's home currency is the KRW. It is also listed on the KRX for last 20 years and its current share price is KRW 23.25.

You are a Management Accountant of the X Greetings and directors have asked you to study X on value-based management which is a different approach to the performance management. The directors have heard about this method considering it a way of focusing on shareholder's interests and in the present economic scenario, they think it to be useful for the growth of X.

Conventionally earnings per share (EPS) and share price were being used to assess performance. The proposed changes ar important and the directors require you to have the implications of the new analysis and also want to convince the major investors for the future benefits.

Financial data for X Greetings

Particulars	2018-19	2017-18
	KRW in million	KRW in million
Profit after interest and tax	55.55	65.38
Interest	15.60	8.00
Opening capital employed	273.58	198.40
Closing capital employed	329.13	273.58
	Debt to equity	Debt to equity
Capital structure	40:60	40:60
Costs of capital	%	%
Equity	14.20	11.50
Debt (pre-tax rate)	8.00	6.00
Tax rate	30	30
Stock market information		
Average number of shares in issue	3.2 million	3.2 million
Stock market all-share index	1,985	2,561
Retailing sector index	1,155	1,408
X Greetings (share price)	KRW 22.50	KRW 24.40

Required

ASSESS the performance of X Greetings using Economic Value Added and ANALYSE the result relative to those of earnings per share (EPS) and share price. Assumptions, if any, should be clearly stated.

Answer:

The performance of X Greetings has gone down since earnings per share is down by 15.03% (W2) from last year. This indicates the company being not in the favor of investors. However the share price seems up with a decline of only 7.79% relative to fall in retailing sector of 17.97% and the stock market down by 22.49% (W3). The sector comparison is more material for the performance of X as stock market all-share index (KOSPI) is composed of data from financial, manufacturing and other industries whereas retailing sector comparison is specific. This implies that the market views X as one of the better prospects within the retailing sector that will encourage the shareholders to continue to hold their shares in the company .

In addition, X Greetings has generated positive EVA for 2018-19 KRW 37.03 m (W1). EVA of FY 2018-19 has fallen from 2017-18 but still it is remained positive and so the company continues to create value for its shareholders even in the bearish market. It is therefore a good investment option even in a falling market.

Working Note 1:

EVA calculations for the periods given are:

Particulars	**2018-19 (KRW in millions)**	**2017-18 (KRW in millions)**
Profit after interest and tax	55.55	65.38
Add: Interest (net of tax @ 30%)	10.92	5.60
Net operating profit after tax (NOPAT)	66.47	70.98
Opening Capital employed	273.58	198.40

Assumptions:

- There are no non-cash expenses to adjust the profit.
- Economic depreciation and Accounting depreciation are equal.
- No lease exists for capitalisation.

Cost of capital:

- WACC of 2018-19 = 0.60 x 14.20% + 0.40 x 5.60% = 10.76%
- WACC of 2017-18 = 0.60 x 11.50% + 0.40 x 4.20% = 8.58%

Calculation of EVA (NOPAT – WACC X capital employed)

- EVA of 2018-19 = 66.47 million – (273.58 x 10.76%) = KRW 37.03 million
- EVA of 2017-18 = 70.98 million – (198.40 x 8.58%) = KRW 53.96 million

Working Note -2:

Particulars	**2018-19**	**2017-18**	**Change**

EPS	KRW 17.36	KRW 20.43	-15.03%

Working Note-3:

Particulars	2018-19	2017-18	Change
KOSPI (capitalization-weighted index of all common shares)	1,985	2,561	-22.49%
Retailing sector index	1,155	1,408	-17.97%
X share price	KRW 22.50	KRW 24.40	-7.79%

6. EVA and performance analysis [Category A]

Water Utilities Services (WUS) is a parastatal company established with an aim for supply and distribution of water in Mumbai as well as supply of water to the various local authorities for distribution to villages and other small cities adjacent to Mumbai. This involved planning, operating, treating, maintaining, and distributing water resources in the country's urban centres and other areas mandated by Maharashtra Government. Its mission is "To provide sustainable water in a cost effective and environmentally friendly manner to the economy".

The government ensures that WUS does not take advantage of its monopoly position in the regional area by increasing prices. The government controls majority of services through its water regulatory body which determines an acceptable margin level (ROCE) and ensures that the pricing of WUS within these areas does not break this level. The remaining work i.e. a water bottle operation (WBO) is not regulated by government and WUS charges a market rate for water supply in bottle. The regulator compute return on capital employed (ROCE) of WUS based on its own valuation of the capital assets which are used in operation and the profit from those services.

Acceptable level of ROCE set by the regulator is 7.00%. If WUS breach this level, then the company would be penalized. WUS board is trying to improve the performance for the benefit of the shareholders. In order to communicate the objective of maximizing shareholders' wealth, the directors have decided to consider economic value added (EVA) as the key performance indicator.

Compute EVA of WUS based on the following information for the year ending 31 March 2019:

Particulars	Water distribution operation (WDO)	Water Bottle Operation (WBO)	Total
Revenues	555.00	186.00	741.00
Less: Operating cost	460.00	119.00	579.00
Operating profit	95.00	67.00	162.00
Less: Finance charges			46.00
Profit before tax			116.00
Less: Tax at 30%			34.80
Profit after tax			81.20

Capital employed	2018-19	2017-18
Audited accounts	1,616.20	1,495.00
Determined by regulator (for WDO only)	1,558.00	1,422.00

Notes:

1. Operating costs include:

Particulars	2018-19	2017-18
Depreciation	118	114
Provision for doubtful debts	4	1
Research and development	24	-
Other non-cash items	14	12

2. Economic depreciation is Rs.166 Crore in 2018-19. In FY 2017-18, economic and accounting depreciation were assumed to be the same.

3. Current year tax paid is (Rs.18crore) and deferred tax provisions of Rs.1.50 crore has been adjusted. There was no deferred tax balance before 2018-19. The provision for doubtful debts was Rs.9 crore in the 2018-19 balance sheet.

4. Research and development has been non-capitalized. It belongs to a new project that will be developed over five years and is expected to be of long-term benefit to the company. 2018-19 is the first year of this project.

5. Cost of capital

Equity	14%
Debt (Pre-tax)	6%

6. Gearing of WUS

Equity	45%
Debt (Pre-tax)	55%

Required

(i) EVALUATE the financial performance of WUS using EVA.
(ii) ASSESS whether WUS comply with its acceptable ROCE level
(iii) Advise on how to improve profitability.

Answer:

Computation of NOPAT:

Particulars	**Amount in crores**
Operating profit	162.00
Add:	
Non-cash items	14.00
Accounting depreciation	118.00
Doubtful debts	4.00
Research and Development	24.00
Less:	
Economic Depreciation	166.00
Tax paid	18.00
Tax saving on interest (46 x 30%)	13.80
NOPAT	**124.20**

Computation of capital employed:

Particulars	**Amount in crores**
Capital Employed as on 31.03.2018	1,495.00
Add:	
Provision for Doubtful Debt as on 31.03.2018	5.00
Other Non-Cash Items (incurred in 2017-18)	12.00
Adjusted Opening Capital Employed	**1,512.00**

Computation of EVA:

- WACC = 0.45 x 14% + 0.55 x 6% x (1-0.3) = 8.61%
- EVA = NOPAT – (WACC X capital employed)
- EVA = 124.20 – (1,512 x 8.61%) = -5.98 crores

Evaluation

Presently, WUS is distorting value as it is not able to meet the economic cost of its own capital. This put the company into the question of perpetual succession and lead the company against shareholder's interest. The reason could be a higher cost of equity for WUS. The investing risk should be low since 75% of the services that the company renders are important for the economy and demand is guaranteed in future. Optionally, WUS needs to either increase its NOPAT enough for break even on economic value added or slash its capital employed by selling unutilized or under-utilized assets.

(ii) Regulatory ROCE: Target 7.00%

ROCE = $\frac{Operating\ profit}{Capital\ employed}\ x\ 100\%$

ROCE = $\frac{95}{1,422}\ x\ 100\% = 6.68\%$

The ROCE is within the acceptable ROCE of 7.00%.

(iii) Operating Margins

- Water Distribution Operation = 17.12%
- Water Bottle Operation = 36.02%

Advise

Operating margin from WBO is 36.02% compared to 17.12% (WDO). WUS may use the WDO activities as a trusted source of cash profit to reinvest in expansion of the WBO. Expansion through acquisition of appropriate non-regulated businesses using the cash generated by the regulated activities might be a good decision.

Further, WUS may improve profitability by controlling costs within WDO activities through performance measurement. The regulatory body cannot argue that the company is overcharging its customers to increase profit margin. This is possible through strict observance of expenses and using cost savings techniques through efficiency improvements. In order to control cost within WDO, targets should be based on minimal variances and adopting cost cutting methods.

Overall, In WDO, there is only a limited scope for increase in the operating profit since the maximum operating profit allowed is Rs.99.54 crore i.e. 7.00% of Rs.1,422 crore of capital employed. Thus, WUS should go to expand its WBO as this is producing higher operating profit margins.

7. Accuracy of EVA computation [Category A]

Beta Control (BC) is a global leader in manufacturing of commercial building control systems with over 250 distributors and many thousands of installations in more than 50 countries. Control systems involve air conditioning systems, facility management, energy and water management, access control and security controls etc. At BC, manufacturing is done at a number of factory sites where some products are easy and largely produced and have a long life while other products are intricated and have a short life due to changing technologies. BC's mission statement is 'to keep you ahead through control systems that improve productivity and save energy'.

A Newly appointed chief executive officer (CEO) is anxious about declining share price of BC in the last two years. She identified that the business has grown through acquisition and senior management have focused on making corporate deals but not on making control systems. She announced that the BC's focus must be on optimization and upgradation of its value generation rather than just getting bigger through acquisitions.

Assuming yourself as a performance management expert of BC, the CEO has asked you to aid her in her improvement programme. Firstly, she wants your views on the use of EVA as the key performance metric at BC. You are given the current EVA computation (Annexure1) but there is some suspicion about whether the assistant who has done this work is sufficiently well trained about this method. So, she requires you to examine his accuracy and the assumptions forming part of the calculation.

Required

Write a report to the chief executive officer to EVALUATE the accuracy of the EVA calculation and the assumptions.

Annexure 1 – NOPAT computation:

Particulars	**Year ended 31st March 2019**	
	Rs. In lacs	Notes
Operating profit	1,102.80	
Add:		
Non-cash expenses	30.20	

Marketing expenses capitalized	46.20	7
Less:		
Tax	269.60	9
Lost tax relief on interest	48.96	
Net operating profit after tax (NOPAT)	**860.64**	

Capital employed computation:

Particulars	**Year ended 31st March 2019**	
	Rs. In lacs	Notes
From the statement of financial position	4,802.00	10
Add:		
Marketing expenses capitalized	46.20	7
Adjusted capital employed	4,848.20	

WACC = (1/2 × 15%) + (1/2 × 7.8%) = 11.40%

EVA = NOPAT – (WACC × Capital Employed)

= Rs.860.64 L – Rs.4,848.20 L × 11.40%

= Rs.860.64 L – Rs.552.69 L = Rs.307.95 L

Assumptions and Notes

1. Debt/Equity 1:1
2. Cost of Equity is 15.00%
3. Cost of Debt (pre-tax) is 7.80%
4. Tax Rate is 30.00%
5. Interest charged in the period was Rs.163.20 L.
6. In current fiscal year, BC spend Rs.80.00 L in Training and Development by leveraging the latest digital technologies including virtual classrooms to deliver highly relevant training to staff at the point of need.
7. Marketing Expenditure has been Rs.46.20 L each year for the last two years to build the long- term brand.
8. The total R & D spending was Rs.20 L during this year for in- depth study of the TCP/IP protocols. The TCP/IP based products have not been launched yet.
9. BC has paid Tax of Rs.260 L while the tax charged per the accounts was Rs.269.60 L.
10. Capital employed during the Period (from the statement of financial position):

Opening	4,564.00 L
Closing	4,802.00 L

Answer:

Report

To: CEO, Beta Control

From: Performance Management Expert

Date: 31st May 2019

Subject: Evaluation of EVA at Beta Control

EVA provides a link between decisions, performance measures and rewards, which focuses managers on performing better. Incentive schemes based on EVA provide better quality information and motivation in making decision which in turn maximise shareholder's wealth. In other words, EVA links the operating returns to the assets that were used to generate those returns. The learning which flows from EVA analyses can be perceptive and can allow the manager not only to identify areas of weakness in performance but also to easily find solutions. BC is a multiproduct company having number of factory sites. EVA can help to appraise divisional contributors to, or detractors from, overall profitability. Thus, managers may be educated through EVA and pursue such objectives that improve operating profits investing more capital.

In addition, this report deals with evaluation of the accuracy and assumptions used in the calculation of BC's EVA. There are many errors in the present calculation of EVA. These have been discussed below and revised calculations are enclosed.

- Non-Cash Expenses have been correctly added back to the profit as these are expenses which do not affect the cash flow of a given period.

- ❖ Addition back of Marketing Expenditure is also correct as spending contributes to future value-creation. For the same reason, the prior year spending is also added in to capital employed.
- ❖ Training and Development Expenses should be capitalised. Training and Development Expenses have been treated as an expense in the income statement, they should be added back to profit, and added to capital employed (at the end of the year).
- ❖ Research and Development (R & D) Expenses should be treated as marketing expenditure for long period.
- ❖ The tax expenses in the EVA calculation should be the tax paid with adjustment for lost tax relief on interest and not the adjusted amount of tax charged in the accounts.
- ❖ The WACC is incorrect because it should be based on post-tax cost of debt.
- ❖ Generally, a company takes, at least, a year's time to earn a return on investment. Thus, the capital employed figure should be based on the beginning numbers.

Computation of NOPAT:

Particulars	**Amount (in lacs)**
Operating profit	**1,102.80**
Add:	
Non-Cash Expenses	30.20
Marketing Expenditure Capitalised	46.20
Training & Development Expenses	80.00
R & D Expenses	20.00
Less:	
Tax	260.00
Lost Tax Relief on Interest	48.96
Net Operating Profit After Tax (NOPAT)	**970.24**

Computation of capital employed:

Particulars	**Amount (in lacs)**
From the Statement of Financial Position (Starting)	4,564.00
Marketing Expenditure Capitalized	46.20
Adjusted Capital Employed	**4,610.20**

Computation of EVA:

- ❖ WACC = (1/2 x 15%) + (1/2 x 7.8% x 70%) = 10.23%
- ❖ EVA = NOPAT – (WACC x Capital employed)
- ❖ EVA = 970.24 lacs – (4,610.20 lacs x 10.23%)
- ❖ EVA = Rs.498.62 lacs

The recomputed EVA has increased from Rs.307.95 Lacs to Rs.498.62 Lacs which shows a positive position for BC as it adds up the shareholder's wealth.

Further, the revised calculation of EVA is largely based on the following assumptions:

- ❖ There is an implicit assumption that accounting depreciation (included in operating profit) is equivalent to economic depreciation (which should be used for EVA calculations). This assumption is doubtful, although there is no information for more accurate calculation.
- ❖ For Additional Marketing Expenditure, no estimation of economic life (expected period during which an asset remains useful) in building the brand and corresponding economic depreciation has been considered in the above calculation.
- ❖ No amortisation on the R & D Costs is required to be recognised as the product has not been introduced yet. This is in line with the accounting treatment of such items. There was no Research & Development expenditure in the previous year.

8. Performance Analysis [Category A - May 2020 RTP]:

Spicy is one of the top Engineering coaching institute, it operates a chain of 157 centres across the country of Mayaland. Spicy is equipped with the team of top most faculties for preparation of JEE who are known for giving best results year after year. Students willing to join Spicy have to appear for admission test/(s). These tests help the students in understanding their potential and also provide them with the opportunity for scholarships that help them rewards academically and monetarily. In addition, Spicy provides comfortable class rooms, libraries, and ambience for overall development of students. Spicy delivers

quality coaching for JEE by providing innovative ways and therefore prepares students for all challenges. Spicy prides itself on their results and level of educational service it offers to its students.

It has previously been successful in attracting students across the nation. However, in recent years, the number of enrolment of students has started to decline as a result of introduction of online platform. Several recent surveys have painted a disappointing picture for market conditions in 2020. A survey by the "My Education Outlook" over the month to 31st December found that only one in five respondents believes their business will be better off in 2020 compared with 2019.

Spicy has a policy to set the standard fees based on the location of a particular coaching centre. It also takes into account fees charged by the competitors. However, the institute's managers have the right to offer discount to underprivileged students or scholarship to merit students, and to reduce fees structure when student hiring ratio (SHR) in their class rooms are expected to be low. The average standard fees per student, across all the centers of institute, was M$ 15,000 in 2019, compared to M$12,000 in 2018.

Spicy also generates revenue from the additional services available to students, such as selling books, providing test series etc. The series of periodic tests are identical to the pattern of various competitive engineering examinations and give sufficient practice to the aspirants for the same. Every test attempted by the students gives them a clear idea of their understanding of the concept, timeliness, strengths, weaknesses, and ranking amongst the aspirants across Mayaland.

Summary from Spicy's Management Accounts:

Particulars	**Year ended 31 Dec. 2019 M$'000**	**Year ended 31 Dec. 2018 M$'000**
Gross fees	1,11,980	1,05,977
Less: Fees Discount/Scholarship	(18,783)	(13,900)
Net fees	93,197	92,077
Add: Other income (Selling books, tests)	27,250	25,895
Total revenues	1,20,447	1,17,972
Less: Operating costs	(97,685)	(93,758)
Operating profit	**22,762**	**24,214**

Other performance information:

Particulars	**Year ended 31 Dec. 2019**	**Year ended 31 Dec. 2018**
Capital employed	M$ 3,77,50,000	M$ 3,77,10,000
Average SHR	78%	73%
Average SSR (Student satisfaction rating)	8	9.5

At the end of the course, or at the end of the unit within the course, students are asked to complete a questionnaire rating based on a scale of 1–10 where '10' represents 'Excellent' with various aspects of course, for example, the knowledge level of faculty, the quality of support material, and the approachability of faculty to ask them questions.

Two issues are becoming increasingly frequent in the students' comments alongside the scores:

- Students complaint that faculties in the institute were full of attitude not taking the doubts of students, instead of encouraging students to solve their doubts in the class, they insulted the students who raise their doubt during class. So, their standard of education has not been as good as in previous sessions.
- Students in classes need special individual attention, there is need of smart classes, doubt solving sessions etc. to improve the result of students.

Spicy had planned to start a remedial programme for average students for all the centres at the beginning of 2018. However, this programme has been put on hold to reduce expenditure.

Required

ANALYZE Spicy's performance for the year ended 31 December 2019.

Answer:

Performance of Spice for the year ended 31March 2019

Revenue

- Gross Fees of Spicy **has increased by 5.66% in 2019, which reflects the higher SHR (78% vs. 73%) and the increase in average standard fees per student (M$ 15,000 vs. M$ 12,000 per student).** However, this information is not enough to conclude how well institute have performed in the year to 2019.
- Net Fees has only increased 1.22%, this reflects the significant 35.13% increase in the discounts or scholarships offered.
- It is observed that even though % change in the SHR is +6.85% (from the budgeted level of 73% to 78%), revenue from fees, net of discount/ scholarship, only increased by 1.22%. **This means that average fees collection per student in 2019 was lower than in 2018, despite the higher average standard rate (M$15,000 vs M$12,000).**
- It is also important to mention that in tough market conditions, managers have managed SHR, higher than budgeted figure by offering/ awarding the discount or scholarship.
- With the increase in SHR, one of the best possible benefit is that, even if students are paying less fees, they will generate additional revenue from sale of books and test series. **For example, in the given case additional revenue has increased by approximately 5.23% from M$ 25,895 to M$27,250.**
- In total, revenue has increased 2.1% in 2019 v 2018.
- **Overall, given the tough market conditions, any increase in revenues can be viewed as positive, however, the revenue achieved from per student should be greater than the variable cost of providing it.**

Operating Profit

- Notwithstanding the increase in revenue, operating profits have fallen by M$ 14,52,000 (6.00%) between 2019 and 2018, due to a sizeable increase in operating costs. There is no detail about Spicy's operating costs, for example, the split between fixed and variable costs. However, in tough market conditions, cost control is likely to be very important. **As such, increase in operating costs M$ 39,27,000 (4.19%) between 2018 and 2019 is potentially a cause for concern and the reasons for the increase should be investigated. However, when looking to reduce costs, it will be very important to do so in a way which does not compromise student's satisfaction. More generally, Spicy needs to avoid cutting expenditure in areas which will have a detrimental impact on student satisfaction ratings, for example, not providing enough time by faculty to students for doubt solving.**
- The increase in costs has also led to a fall in operating profit margin. The margin falls from 18.36% to 16.35%. **This reduced profitability is also reflected in the institute's return on capital employed (operating profit/capital employed) which has fallen slightly from 64.21% to 60.30%.** This suggests that the value which Spicy is generating from its assets is falling.

Students Satisfaction Rate (SSR)

- Although the reduction in profitability should be a concern for Spicy, the reduction in student satisfaction rate should potentially be seen as a greater cause for concern. **The rating suggests that, in the space of one year, it has lost 1.5 points in the scale of 1-10, being the top Engineering Coaching Institute, Spicy cannot afford to lose the points.**
- Spicy Institute pride itself on their results and level of educational service it offers to its students. Both factors are important considerations for students when considering whether or not to join Spicy Institute.
- Therefore, Spicy needs to ensure that student satisfaction levels are maintained as high as possible and it is also important to know that how its students feel about the services it offers.
- **Moreover, the decision to defer the remedial programme is likely to have a detrimental impact on the future performance.**

Part II – Non-financial Measures of Performance

9. Performance report as per Fitzgerald and moon model [Category A]

Learning Horizons is an educational institute that conducts courses for students in accounting, law and economics. The institute is partially funded by the government. The institute aims to provide quality

education to students of all backgrounds. The institute admits students who can fund their education privately as well as those who get sponsorship from the government. Knowledgebase is another educational institute in the same city providing courses similar to Learning Horizons. It is entirely private funded college where students arrange to pay for their own fees. It can be taken as a peer institution for comparison purposes.

Information about their operations for the year ended March 31, 2019 are as follows:
(1) Both Learning Horizons and Knowledgebase offer their courses that last the entire year. All of them are regular classroom lectures conducted through the week.
(2) Budget and actual fee rate structure for the year are the same. Information about the fees for each course are as follows:

Course Type	Learning Horizons		Knowledgebase
	Privately funded	Government funded	Privately funded
Accounting	1,20,000	75,000	1,00,000
Law	1,20,000	90,000	1,50,000
Economics	80,000	60,000	1,00,000

(3) Salary details for lecturers and administrative staff are as follows:

Staff Type	Learning Horizons		Knowledgebase
	Budget	Actuals	Actuals
Lecturers	5,00,000	5,50,000	6,00,000
Administrative staff	3,00,000	3,00,000	4,00,000

(4) Budgeted costs for the year based on 8,500 students per annum for Learning Horizons are as below:

Costs	Amount	Variable cost %	Fixed cost %
Tuition material	40,00,00,000	100%	-
Catering	10,00,00,000	75%	25%
Cleaning	1,00,00,000	25%	75%
Other operating costs *	5,00,00,000	25%	75%
Depreciation	1,00,00,000	-	100%

* includes cost of freelance staff

(5) Actual costs (other than salary costs) incurred during the year:

Costs	Learning horizon	Knowledgebase
Tuition material	42,00,00,000	40,00,00,000
Catering	10,00,00,000	13,00,00,000
Cleaning	1,00,00,000	1,50,00,000
Other operating costs *	6,00,00,000	5,00,00,000
Depreciation	1,00,00,000	1,50,00,000

(6) Keeping in line with latest technological developments, the management of Knowledgebase is introducing on-line tuition support by its lecturing staff. Learning Horizons on the other hand offers distance learning course. A general feedback from prospective students has revealed that some students would like weekend courses since during the week they focus on their regular jobs. Also, some students have requested for intermediate qualification, in the event that they discontinue the course halfway due to inability to complete the course or for other personal reasons.

(7) Both Learning Horizon and Knowledgebase have a policy to have a lecture staff of 50 throughout the year. When there is a shortfall in teaching staff available, instead of recruiting a fulltime lecturer, Knowledgebase substitutes the requirement with freelance staff for lectures. The cost of freelance staff is much lower than regular staff.

(8) Appendix with further details:

Sundry Statistics For the year ended 31st March 2019

Particulars	Learning Horizons		Knowledgebase
	Budget	**Actuals**	**Actuals**
Number of students			
Accounting	4,000	3,800	4,100
Law	2,500	2,550	2,500
Economics	2,000	1,500	1,200
Total	**8,500**	**7,850**	**7,800**
Student mix (%) for each course:			
Privately funded	80%	70%	100%
Government funded	20%	30%	0%
Number of enquiries received:			
Accounting	4,500	4,500	4,600
Law	2,800	2,700	3,050
Economics	2,200	1,600	1,225
Total	**9,500**	**8,800**	**8,875**
Number of lecturers employed during the year	50	50	50
Number of lecturers recruited during the year:			
Accounting	2	4	1
Law	1	3	-
Economics	1	3	-
Total	4	10	1
Number of administrative staffs	12	12	9
Pass Rate:			
Accounting	95%	99%	93%
Law	95%	98%	90%
Economics	95%	95%	95%
Total	**95%**	**97%**	**93%**
Days in a year when freelance lecturers were used	-	-	30
Number of new courses under development	-	-	6

You are the management accountant of Learning Horizons. The results for the year are to be reviewed next week by the management. To assess performance, you want to prepare the report as per the Fitzgerald and Moon model.

Required

(i) Using the "Results" dimension of performance as per the Fitzgerald Moon model prepare a variance ANALYSIS of Learning Horizons actual and budgeted financial performance. Also, based on the information given in the problem, collate the actual financial figures for Knowledgebase, use it as a basis to prepare ANALYSIS of competitiveness of Learning Horizons and Knowledgebase.

(ii) Using the "Determinants" dimension of performance as per the Fitzgerald Moon model EXPLAIN

(a) Quality of service
(b) Flexibility
(c) Resource utilization
(d) Innovation

(iii) Course fees set by the government for various subjects cannot be increased beyond an average of Rs.75,000 per student. If the costs are maintained within this budget, the government can provide more sponsorship or grants in future. ADVISE a method that the management of Learning Horizons can use to resolve this.

Answer:

(i) Analysis of the "Results" dimension of performance as per the Fitzgerald and Moon model

Financial Performance of Learning Horizons and Knowledgebase

The original budget had been prepared for 8,500 students, while actual enrollments are 7,850 students. At the very onset, reasons for lower enrollments have to be found and analyzed. For comparison of actual and budget, the budget of Learning Horizons has to be flexed to scale. Hence the budget needs to be scaled down to 7,850 for preparing a variance analysis.

Particulars	Learning Horizons				Knowledgebase	
	Budget		Actual		Actual	
	Number	Amount	Number	Amount	Number	Amount
Revenue						
(a) Private Funded						
Accounting	2,955	35,46,00,000	2,660	31,92,00,000	4,100	41,00,00,000
Law	1,847	22,16,40,000	1,785	21,42,00,000	2,500	37,50,00,000
Economics	1,478	11,82,40,000	1,050	8,40,00,000	1,200	12,00,00,000
Subtotal (a)	**6,280**	**69,44,80,000**	**5,495**	**61,74,00,000**	**7,800**	**90,50,00,000**
(b) Government Funded						
Accounting	739	5,54,25,000	1,140	8,55,00,000		
Law	462	4,15,80,000	765	6,88,50,000		
Economics	369	2,21,40,000	450	2,70,00,000		
Subtotal (b)	**1,570**	**11,91,45,000**	**2,355**	**18,13,50,000**		
Total revenue (a + b)	**7,850**	**81,36,25,000**	**7,850**	**79,87,50,000**	**7,800**	**90,50,00,000**
Expenditure						
Salaries						
Lecturers	50	2,50,00,000	50	2,75,00,000	50	3,00,00,000
Admin staff	12	36,00,000	12	36,00,000	9	36,00,0000
Subtotal of salaries	62	2,86,00,000	62	3,11,00,000	59	3,36,00,000
Tuition Material		36,94,11,765		42,00,00,000		40,00,00,000
Catering		9,42,64,706		10,00,00,000		13,00,00,000
Cleaning		98,08,824		1,00,00,000		1,50,00,000
Other operating cost		4,90,44,118		6,00,00,000		5,00,00,000
Depreciation		1,00,00,000		1,00,00,000		1,50,00,000
Total Expenditure		**56,11,29,413**		**63,11,00,000**		**64,36,00,000**
Net Profit		**25,24,95,587**		**16,76,50,000**		**26,14,00,000**

Notes:

- **Students for flexible budget:** Actual number of students is 7,850. This has to be split in the ratio of 40:25:20 to get the students for flexible budget. Further we have to split this in budgeted mix of 80:20
  - Accounting students = 7,850 x (40/85) = 3,694 students.
    - Private funded accounting students = 3,694 x 80/100 = 2,955 students
    - Government funded accounting students = 3,694 x 20/100 = 739 students
  - Likewise, we will compute the students for other subjects
- **Tuition material cost** is a variable cost and hence it has been computed as 40 cr x (7,850/8,500) = Rs.36,94,11,765
- **Catering cost** include fixed component as well as variable component. Fixed component will remain same irrespective of fall in number of students. Catering cost for flexible budget = Fixed component of 2.5 Crores + Variable component (7.5 crores x (7,850/8,500) = Rs.9,42,64,706. We can estimate the other expenses based on this.

Analysis of Actual Financial Performance with respect to Budget

(a) Originally the student strength was expected to be 8,500 in comparison to an actual number of 7,850. **The reason for this shortfall in enrollment should be analyzed** by looking into non-financial performance measures.

(b) On the revenue side, actual revenue of Rs.80 crore is marginally lower than the adjusted budget of Rs.81.4 crore. **Since the budget and actual course fee rates are the same, the reason for this difference is on account of the mix between the private and government funded students**. Actual enrollments had a greater ratio of government funded students, for which the fees are lower. As per the flexed budget, government funded students were expected to be 1,570 versus an actual of 2,355, higher by 50%. Reasons for the change in student mix from a budget of 80:20 to actual mix of 70:30 has to be analyzed.

(c) On the expenditure side, actual costs of Rs.63 crore is 12% more than the corresponding budget of Rs.56 crore. The increase for salaries over budget is because a higher market rate that has to be paid for a lecturer.

Given that Knowledgebase also pays a higher rate, the budget may need to be amended to reflect a more realistic salary rate. **The other major variance is on account of the tuition materials procured for the students.** While the budget for 7,850 students is only Rs.37 crore, the actual expenditure is Rs.42 crore. Reasons for this large variation has to be analyzed. Reasons could reflect the quality of education imparted. If in reality better quality study materials costs more, the management has to decide whether they would be willing to incur this additional cost. This might have a further impact on the fees charged to privately funded students and the management may also want to ask for increase in the government sponsored fee rate.

(d) Overspend is noticed in other operating costs as well, actual cost is Rs.6 crore versus Rs.4.9 crore budget. As mentioned in the problem, 75% of this cost is fixed in nature, amounting to Rs.3.75 crore (75% of Rs.5 crore original budget). This portion of the cost should remain the same irrespective of variation in student enrollments. The remaining portion of the budget Rs.1.15 crore is variable. The actual spend is Rs.6 crore, of which ideally Rs.3.75 crore would be fixed. If there is any variation in fixed cost, it should be looked into. If justified, future budgets need to be adjusted to reflect the higher cost. The remaining variable portion should also be analyzed to understand the reason for the higher spend.

(e) **Overall, the impact of lower revenue and higher cost, has resulted in a shortfall of Rs.8.48 crore (34% shortfall) as compared to the adjusted budget for 7,850 students.** Action should be taken by further studying other parameters like competitor's performance and other non-financial factors like quality of education, pass rate, innovation.

Competitive Performance of Learning Horizons and Knowledgebase

Particulars	Learning Horizons		Knowledgebase
	Budget	Actual	Budget
Total revenue (Rs.)	81,36,25,000	79,87,50,000	90,50,00,000
Number of students	7,850	7,850	7,800
Revenue per student (Rs.)	**1,03,646**	**1,01,752**	**1,16,026**
Total cost (Rs.)	56,11,29,413	63,11,00,000	64,36,00,000
Number of students	7,850	7,850	7,800
Cost per student	**71,481**	**80,395**	**82,513**

The cost per student at Learning Horizons is marginally lower than Knowledgebase. However, the revenue per student at Knowledgebase is much higher. Analyzing the components further:

(a) Student Mix: Knowledgebase has higher revenue by more than 10 crore, almost 13.3% higher compared to Learning Horizons. Reasons could be on account a higher fee rate structure at Knowledgebase as compared to Learning Horizons, where part of the fee structure is government funded at a lower rate.

(b) Course Rate for Accountancy: Learning Horizons charges Rs.1,20,000 per year for its accountancy course which is higher compared to Knowledgebase's rate of Rs.100,000 per year. This might be a reason for a higher enrollment at Knowledgebase of 4,100 students compared to Learning Horizons enrollment of 3,800 for the same course. The management has to verify if this higher rate is sustainable.

(c) Course Rate for Law: Learning Horizons charges Rs.120,000 for its law course compared to Rs.150,000 at Knowledgebase. However, despite being lower, the enrollment for the course is almost the same. The management has to look at non-financial parameters related to quality, in order to improve enrollments for this course.

(d) Course Rate for Economics: Learning Horizons charges Rs.80,000 for its economics course compared to Rs.100,000 at Knowledgebase. Consequently, it is able to have higher enrollment for its economics course.

(e) Compared to Learning Horizons, **Knowledgebase is incurring Rs.2 crore lesser on tuition materials**. As pointed out earlier, Learning Horizons must try to find out reasons for its higher cost and try to economize on this expense, if required.

(f) Knowledgebase has been using freelance staff for 30 days in a year to keep its expenses lower. Therefore, although it has a higher pay scale for its lecturers, it uses a lower cost resource to meet its teaching staff requirements. Compared to 1 new recruitment by Knowledgebase, Learning horizons has 10 new recruitments during the year. Knowledgebase has substituted any shortfall in teaching staff by hiring freelancers during the year. At the same time, non-financial aspects like quality of education need to be assessed while using the service of freelancers.

(g) **The other indicator of competitive performance, the take up rate, the rate of conversion of enquiries from prospective students into enrollments for the course.** Reference to the budget here is the original budget prepared for 8,500 students, which represents the capacity that Learning Horizons wants to achieve.

Particulars	Learning Horizons		Knowledgebase
	Budget	Actual	Budget
Accounting – number of students	4,000	3,800	4,100
Number of enquiries	4,500	4,500	4,600
Take up rate	**89%**	**84%**	**89%**
Law - number of students	2,500	2,550	2,500
Number of enquiries	2,800	2,700	3,050
Take up rate	**89%**	**94%**	**82%**
Economics - number of students	2,000	1,500	1,200
Number of enquiries	2,200	1,600	1,225
Take up rate	**91%**	**94%**	**98%**
Overall- number of students	8,500	7,850	7,800
Number of enquiries	9,500	8,800	8,875
Take up rate	**89%**	**89%**	**88%**

- The **take up rate is lower for accounting course** at Learning Horizons as compared to Knowledgebase. As explained in point (b), this may be attributed to the higher rate that Learning Horizons charges privately funded students. The higher rate should be justifiable.
- The **take up rate for law** is higher compared to Knowledgebase. As explained in point (c) this could be due to the lower fee rate. Higher enrollment could indicate the popularity of the course. At the same time the comparative pass rate may have to be looked into to judge the quality of the course.
- The **take up rate for economics** is marginally lower than Knowledgebase. However, overall enrollment for this course is much higher compared to Knowledgebase, possibly to the substantially lower rate offered for the course. The management could look at better publicity to improve the take up rate.

(ii) Analysis of the "Determinants" dimension of performance as per the Fitzgerald and Moon model
Quality of Service

The pass rate for each course indicates the quality of course offered. Summarizing from the problem:

Particulars	Learning Horizons		Knowledgebase
	Budget	Actual	Budget
Accounting	95%	99%	93%
Law	95%	98%	90%
Economics	95%	95%	95%
Overall	95%	97%	93%

- The targeted pass rate of 95% has been met in all courses, thereby it indicates that a satisfactory level of education is being imparted. In comparison with Knowledgebase the pass rate for all courses is higher, which is a good indicator. This could be a reason to justify the use of full time staff instead of substituting it with freelancer staff.
- In the case of accountancy, the management can use the higher pass rate to justify the higher course rate, which may lead to better enrollments for the course. In the case of law, it has the potential of becoming a very popular course, lower course fee with higher pass rate. This can be used to improve enrollments. In the case of economics, the pass rates are at par. The management may use the lower course fee to attract students else may find other ways to make the course more attractive to have higher enrollments.

- ❖ Feedback from current students and the institute's alumni also provide value information about the quality of the courses and opportunities to improve.

Flexibility:

The management of Learning Horizons has to consider the feedback from current and prospective students in order to bring in flexibility to their services. While long distance learning offers some flexibility, the management has to look at alternate channels of delivery like online lecture support by faculty similar to the model that Knowledgebase has developed. Also, offering weekend courses could help improve enrollments. Providing the option to get an intermediate degree gives flexibility to students who are not able to cope up with the course. While this cannot be a main objective of the institute, it still can maintain its motto of imparting quality education for students of all backgrounds.

Resource utilization:

The main resource of an educational institute is its staff. Management of Learning Horizon has to look at the teacher student ratio and compare it to benchmarks of peer institutes. Learning Horizons is having a higher recruitment of 10 lecturers for the year as compared to a budget of 4 recruitments for the year. Reasons for the same need to be looked into. One reason could be a higher turnover ratio among lecturers due to lower salary paid in comparison to the market rate. In comparison, Knowledgebase has a more stable staff, having a recruitment of only 1 lecturer during the entire year. This might be due to the use of freelance teaching staff. Learning Horizon can explore options of using freelance teaching staff to meet its teaching needs, without compromising quality of education.

Innovation:

From the information provided, Learning Horizons has a better quality of service in terms of pass rates. However, Knowledgebase planning to offer 6 new courses in the future. Learning Horizons has to explore options to improve on its current course offerings in order to maintain its market share.

(iii) There is a limit to fees sponsored by the government. Currently, government funded revenue is Rs.18 crore, almost 23% of the total revenue of 80 crore. Average actual cost per student, referring to the table above, is Rs.80,395. Since, the government is unwilling to spend more than Rs.75,000 per student, the management could look at target costing methods to resolve this issue. This reduction of Rs.5,395 per student can be achieved by identifying opportunities to economize on costs. If feasible, the cost per student can be calculated for each of the courses, to identify where these economies can be achieved. This drive should encompass the administration and support services too. Thus, using target costing approach, the cost can be reduced below Rs.75,000 to make government funded education profitable, within reasonable limits.

10. Performance Pyramid [Category A]

You are a paid assistant working in SBC LLP – an accounts consultancy firm. You have received the following email from one of SBC's senior partner:

To: DG
From: SB
Date: 22/06/20XX
Subject: PEL meeting this afternoon

As you are probably aware, we are meeting with the managers of PEL later this afternoon to discuss several key issues, and I need you to do some research for me. I need a report that covers the following:

Analysis of the new proposal for the period 2015 to 2017 based on

- external effectiveness and
- internal efficiency

To help you with this, I've attached a copy of our forecast of PEL's financial and non-financial data for the period 2015 to 2017. Please read it carefully and email me back as soon as possible so I have time to prepare before the meeting.

Thanks
SB

----------Attachment----------

Background to PEL

Precision Engineering Ltd (PEL) specialises in engineering design and manufacture in the automotive and motorsport industry. PEL's design team has many years' experience in the design and development of engine components for the market and high performance engines. PEL has identified a number of key competitors and intends to emphasis on close co-operation with its customers in providing products to meet their specific engineering design and quality requirements. Efforts will be made to improve the effectiveness of all aspects of the cycle, from product design to after-sales service to customers. This will require data from a number of departments in the achievement of the specific goals of the new proposal. Efforts will be made to improve productivity in conjunction with increased flexibility of methods.

Forecast of PEL's Financial and Non-Financial Data

Particulars	2015	2016	2017
Total Market Size (Rs.lacs)	110	115	120
PEL Sales (Rs.lacs)	18	21	23
PEL Total Costs (Rs.lacs)	14.10	12.72	12.55
Production Achieving Design Quality Standards	95.5%	98.0%	98.5%
Returns from Customers (% of Deliveries)	2.0%	1.0%	0.5%
Cost of After-Sales Service (Rs.lacs)	1.3	1.1	1.0
Sales Meeting Planned Delivery Dates	85%	90%	95%
Average Cycle Time (Customer Enquiry to Delivery) (weeks)	5.0	4.5	4.0
Components Scrapped in Production (%)	6.5%	4.0%	1.5%
Idle Machine Capacity (%)	9%	5%	1%

Required

Draft the email as requested by the partner.

Answer:

To: SB

From: DG

Date: 22/06/20XX

Subject: Re: PEL Meeting this afternoon

Please find below my analysis of the points you wished me to examine for PEL. Please let me know if you wish to discuss any of these points in more detail.

Kind regards

DG

External Effectiveness- The marketing success of the proposal is associated with the achievement of customer satisfaction. The success will need an efficient business operating system for all aspects of the cycle from product design to after-sales service to customers. Customer satisfaction is linked with Improved quality and delivery. Quantitative measures of these factors are as follows:

- Quality is expected to improve. The percentage of production achieving design quality standards is expected to increase from 95.5% to 98.5% between 2015 and 2017. In the same period, returns from customers for replacement or rectification should drop from 2% to 0.5% and the cost of after-sales service should drop from Rs.1.3lacs to Rs.1.0lacs.
- Delivery efficiency improvement that is expected may be measured in terms of the rise in the percentage of goods achieving the planned delivery date. This percentage rises from 85% in 2015 to 95% in 2017.

Internal Efficiency- The financial success of the proposal is linked to the achievement of high productivity. This should be helped through reduced cycle time and decreased levels of waste. Quantitative measures of these factors are as follows:

- The average total cycle time from customer enquiry to delivery should drop from 5 weeks in 2015 to 4 weeks in 2017.
- Waste in the form of idle machine capacity is expected to drop from 9% to 1% between 2015 and 2017. Also, component production scrap is expected to drop from 6.5% in 2015 to 1.5% in 2017.

11. Performance Prism [Category A]

Galaxy Limited is in the business of logistics and distribution. In 2002, Galaxy limited had implemented Balance Scorecard as a performance measurement & management system. The balanced scorecard measures performance across Financial, Customer, Business and Innovation perspective. The implementation of Balanced Scorecard had the following impact

- The company's financial performance improved substantially.
- The complaints from customers regarding poor service reduced.
- The company has pioneered in innovation in the field of door to door delivery of goods.

All these led to improvement in profitability of the company. The share prices are trading at life time highs. Since the ultimate objective of a commercial organisation is to maximise shareholder's wealth, the CEO of the company is extremely pleased with the affairs at the company.

Of late, the company has witnessed high employee turnover ratio. Though the company has a formal exit interview process for the resigning employees, the inputs received from these interview is rarely considered in improving the HR practices. One of the common feedback from employees who left the company was that there is too much pressure to perform and improve customer service without adequate support of systems and processes.

Also, the truck drivers who move consignment from one city to another have been on strike thrice in the last one year demanding better pay and working conditions. These drivers are generally hired on contractual basis. They are not entitled to any retirement benefits. The drivers have been insisting that they be taken as permanent employee and are given benefits applicable to employees of the company.

The above two issues were discussed in one of the board meetings. The directors wondered if they had the right performance measurement mechanism to address the issues. The company is doing great financially but must also ensure that the employees and other stakeholders are taken care of apart from shareholders. The board is also concerned that they have too much of data and reports to look at on performance management as the current measurement is done on a monthly basis. However, the alignment of such reports to the overall strategy of the company is missing.

Required
RECOMMEND an alternative performance measurement mechanism which considers all stakeholders instead of just shareholders and employees.

Answer:

Issue

Galaxy limited use Balance Scorecard to measure performance. Balance scorecard focusses on the financial, customer, business and innovation perspectives. The company has been doing great on financial parameters and customer satisfaction parameters. However, of late the company has been facing issues related to high employee turnover and dissatisfaction of the truck drivers.

The board of directors is also concerned about the volume of performance measurement data and alignment of performance measurement with the strategy of the company. An alternate performance measurement mechanism is Performance Prism.

Performance Prism

Performance Prism is considered to be a second-generation performance management framework conceptualized by Andy Neely and Chris Adams. The following are the factors which make Performance prism should replace the models like Balanced Scorecard -

- Organisations cannot afford to focus on just two stakeholder group - Investors and Customers. Other stakeholders group like employees, suppliers, government etc. should not be forgotten. This is important for sustainable growth of companies both profit oriented and non-profit oriented.
- Most of the performance measurement models do not focus on changes that could be made to the strategies and processes. The underlying assumption is that if right things are measured, the rest will fall into place automatically.
- Stakeholders expect somethings from the organisation. The organisation also must expect contribution from the stakeholders. There is a 'Quid Pro Quo' relationship between the stakeholders and organisation.

Another problem highlighted by Andy Neely and Chris Adams was that management are measuring too many things. They believe that in doing so they are controlling the organisations well. The problem with increased measurement is that the management starts micro-managing things and lose sight of the strategic direction. This negatively impacts the organisation in the longer run.

The performance Prism aims to measure performance of an organisation from five different facets listed below:

- Stakeholder Satisfaction
- Stakeholder's Contribution
- Strategies
- Processes
- Capabilities

Stakeholder Satisfaction

The first facet of prism focusses on stakeholder's satisfaction. Though balanced scorecard also focusses on stakeholder's satisfaction, it is primarily concerned with the shareholders and customers and ignores other stakeholders. This is precisely the issue at Galaxy limited where the shareholders and customers are happy with the company, other stakeholders are not.

The company must identify all stakeholders and determine relative importance of each of the stakeholders. The company can use Mendelow's matrix to identify key shareholders in terms of power and interest of stakeholders. A stakeholder group which has high power and high interest (say a trade union) must be kept satisfied. The key stakeholders for a company are:

- Investors - They want return on investment.
- Customers - They want good quality products at cheap prices.
- Suppliers - They want better price for products.
- Government - They want revenues and development.
- Society at large - They want employment opportunities.

Each of the stakeholders group exercise different level of power/influence on the company. The interest of each stakeholder group in the company also differs. Based on the power and interest of the stakeholders, the company must appropriately perform activities for stakeholder's satisfaction.

After identification of the stakeholders, the company must identify the requirements of each of the stakeholders group. What must the company do to ensure stakeholder satisfaction?
Galaxy limited must ensure satisfaction of the two stakeholders highlighted above. The company must take steps to improve employee satisfaction and reduce the employee turnover. The company must also address the issues related to truck drivers and involve them in a dialogue. The impact of not keeping these stakeholders group satisfied is that the company might suffer financially in the longer run.

Performance measure - Employee Turnover Ratio, Average employment duration of employees, Number of strikes by truck drivers etc.

Stakeholders Contribution

In the second facet of Performance Prism, the organisations identify the contribution required from the stakeholders. The organisations must then define ways to measure the contribution of stakeholders. This aspect is different from traditional measures where the organisations were just concerned with what they could contribute to the stakeholders.

The company would take steps to provide better service to its customers. In return the customers must contribute in terms of profits and revenues to the company. There is a 'Quid Pro Quo' relationship as described earlier.

In case of Galaxy limited, the company could improve the employee satisfaction with better pay, training and growth opportunities. In turn, the employees must perform better to contribute to the company as a whole. Similarly, the drivers must be given better working conditions and in turn, they should contribute towards improving efficiency and on-time deliveries.

Performance Measure - Efficiency of Employees, Productivity, On Time deliveries by Truck drivers.

Strategies

In the strategies facet of the Prism, the organisation should identify those strategies which the organisation would adopt to ensure that -

- The wants and needs of the stakeholders are satisfied
- The organisation own requirements are satisfied by the stakeholders.

After the company identifies strategies, the performance measures must be put in place to confirm that the strategies are working. The various aspects to be considered appropriate communication of strategies, implementation of strategies by managers and continuous evaluation of appropriateness of strategies.

Galaxy limited might come out with a strategy of to retain employees by means of better pay and growth opportunities within the company. This strategy can be called successful if the higher pay ensures that employees turnover is reduced. As a strategy, the company can start to hire drivers on the payrolls of the company.

Performance Measure - Number of employees leaving the organisation after getting pay hike, Efficiency of deliveries after Truck drivers are put on employment of company.

Processes

After identifying the strategies, organisations need to find out if they have the correct business processes to support the strategy. The various business processes can have sub-processes. Each process will have a process owner who is responsible for functioning of the process.

The organisations must develop measures to evaluate the how well the processes are working. The management must be careful to evaluate most important processes instead of evaluating all the processes. Porter's Value Chain analysis can be used to identify and evaluate various processes in the organisation.

Galaxy limited could devise a recruitment process which results in transparency in hiring and pay of employees. The process could be owned by the Human Resources Manager. The working condition of drivers can be improved by providing structured training and working conditions.

Capabilities

Capabilities refers to the resources, practices, technology and infrastructure required for a particular process to work. The company must have right capabilities in order to support the processes. The company must identify performance measures to set how well the capabilities are being performed.

While Galaxy limited might choose to increase the salaries of employees, an important question to answer is whether the company has financial capability to do so.

Conclusion

The facets of Performance Prism are interlinked and must support each other. The company must first identify the stakeholder wants and what the company wants from those stakeholders. The required strategies for these are identified and the processes to achieve the strategy followed by identifying the capabilities to perform these processes.

12. Triple Bottom Line [Category A]

CAREGIVER LTD. is a multi-specialty hospital in a mid-sized town. A 300+ bedded facility offers treatment across all medical disciplines of Cardiac, Oncology (Medical, Surgical and Radiotherapy), Neurosciences, Urology, Nephrology, Kidney Transplant, Aesthetics and Reconstructive Surgery, and other ancillary services. Most of the community members have their livelihood linked with the hospital. Many of them are directly employed at the hospital as doctors, nursing staff, lab technicians or as other support staff. While, others are indirectly related as suppliers of medical devices or drugs to the hospital, catering or housekeeping contractors etc. for the hospital. Hence, existence of the hospital is vital to the community. Growing awareness about sustainable business prompted the management to identify areas that can help the hospital operate in a sustainable manner that would be mutually beneficial to the organization as well as the town that depends on it. Therefore, it has identified the initiatives that have been put in place to create a sustainable business. Information captured from various departments are being considered to prepare the Triple Bottom Line (TBL) report that is for the consumption both to internal and external stakeholders.

Required

IDENTIFY, which of the following aspects need to be reported in the TBL report and under which of the three categories. Provide reasons for classifying the aspect under a specific category, if applicable.

a) Medical staff conduct charity camps every month. Open to all members of the community, who are provided with consultation free of charge.
b) Prompt and accurate tax payments based on records maintained without errors or fraud.
c) Caregiver, with the help of traffic police, has implemented a "green corridor" for ambulances that carry donor organs for transplantation. Organs harvested from the donor at one hospital can reach another hospital with the recipient patient at the earliest.
d) Medical waste is discarded at a landfill in a nearby dumpsite. Some of the waste are not bio-degradable.
e) During review of the supplier for housekeeping service, it was observed that the service provider resorted to child labor to keep cost of operations lower.
f) Training and professional development programs doctors and nurses.
g) Lab reports are being made available online within the hospital computer system. This would reduce printing costs and storage space needed to maintain older records.
h) Caregiver has a good track record of having no medical negligence litigation cases filed against it.
i) The hospital is planning to market medical check-up packages so that facilities in its outpatient department can be utilized better.
j) The number of inpatient hospital deaths decreased 8%, from 776 in 2016 to 715 in 2017.

Assume all aspects are material enough to be reported in the TBL report.

Answer:

Aspects that need to be reported in the TBL report:

S.N.	Aspect	Category on the TBL Report
(i)	Medical staff conduct charity camps every month. Open to all members of the community, who are provided with consultation free of charge.	**Social bottom line**, as it benefits the local community.
(ii)	Prompt and accurate tax payments based on records maintained without errors or fraud.	**Economic bottom line**, since tax payments impact an organization's bottom line and money flow.

(iii)	Caregiver, with the help of traffic police, has implemented a "green corridor" for ambulances that carry donor organs for transplantation. Organs harvested from the donor at one hospital can reach another hospital with the recipient patient at the earliest.	**Social bottom line,** since green corridor would unable the ambulance to transport harvested organs between the hospitals at the earliest this would be beneficial for patients in need of critical care.
(iv)	Medical waste is discarded at a landfill in a nearby dumpsite. Some of the waste are not bio-degradable.	**Environmental bottom line**, as it affects the ecological surroundings of the town.
(v)	During review of the supplier for housekeeping service, it was observed that the service provider resorted to child labor to keep cost of operations lower.	**Social bottom line**, since employing child labor leads to exploitation of children within the community.
(vi)	Training and professional development programs doctors and nurses.	**Social bottom line**, since it contributes towards employee development.
(vii)	Lab reports are being made available online within the hospital computer system. This would reduce printing costs and storage space needed to maintain older records.	**Environmental bottom line**, since paper, cartridge and storage requirement would be lower. This preserves environmental resources.
(viii)	Caregiver has a good track record of having no medical negligence litigation cases filed against it.	**Social bottom line**, since this is an indicator of the quality of services provided to patients.
(ix)	The hospital is planning to market 'medical check-up packages' so that facilities in its outpatient department can be utilized better.	Not relevant to TBL report. This is a marketing strategy to improve profitability.
(x)	The number of inpatient hospital deaths decreased 8%, from 776 in 2016 to 715 in 2017.	**Social bottom line**, since hospital mortality rate measures the clinical quality.

Part III – Balanced Scorecard

13. Balanced Scorecard of Resort [Category A]

"Hard Rock Coconut" is an exclusive resort located in a famous Island of Pacific Ocean that vows to isolate its guests from the hustle and bustle of everyday life. Its leading principle is "all contemporary amenity wrapped in old-world charisma". Each of the resort's 18 villas has a separate theme like Castle, Majestic, Ambassador, Royal Chateau, Coconut, Lemon, Balinese etc and guests often ask for a specific villa when they make reservations. Villas are Ideal for families or friends travelling together and these villas feature luxurious accommodation spanning two floors. Since it is located within a 300-acre estate on white sand beach, the resort offers its guests a wide variety of outdoor activities such as horseback riding, hiking, diving, snorkeling, sailing, golf and so on. Guests could also while away the day relaxing in the pool and availing themselves of the resort's world-famous spa "Hard Coco Spa". The dining room, which only has three tables for the public, is acceptable proud of its 4-star rating.

Required

Develop a Balanced Scorecard for "Hard Rock Coconut". It is sufficient to give two measures in each of the four perspectives.

Answer:

Balanced Scorecard of Hard Rock Coconut:

Financial Perspective	Economic value added Revenue per Villa
Customer Perspective	% of repeat customers

	Number of customer complaints
Internal Business Perspective	Service rating of Spa Staff hours per guest % cost spent on maintenance Travel guide, rank for restaurant
Innovation and learning	Employee retention Number of new services offered

14. Balanced Scorecard for Super Market [Category A]

ABC Ltd. has supermarkets located in most towns and cities. Over the last few years, profits have fallen. ABC Ltd. has recognized that customer care has been paid insufficient attention. ABC Ltd. has now realized the importance of the customer experience at its supermarkets.

ABC Ltd. has introduced a loyalty card scheme that rewards customers with discount vouchers based on their spend and buying patterns at supermarkets in an attempt to earn the loyalty of its customers.

The management of ABC Ltd. is considering the introduction of a Balanced Scorecard approach to manage the performance of its stores.

Required

Recommend an objective and a suitable performance measure for each of three non-financial perspectives of a Balanced Scorecard that ABC Ltd. could use to support its new strategy of improving the customer experience. You should state three perspectives, an objective and a performance measure for each one of the three perspectives.

Answer:

Balanced scorecard for super market:

Perspective	Objective	Performance Measure
Customer Perspective	Increasing the customer loyalty	Percentage of customers using loyalty cards
	Retaining the existing customers	No of discount vouchers redeemed
Internal business perspective	For customers to pay for goods in a reasonable time	Time spent by customers in queuing to pay for products at a checkout
	Paying proper attention to the customers and their product enquiries	Time spent by customers care executives in handling customer queries
	Provide necessary support to the existing loyal customers	No of times home delivery made
Learning and growth perspective	To have qualified staffs able to meet the needs of the customer	No of staff training days
	Adding new products for new segments	No of schemes launched

15. Balanced Scorecard for Bank [Category A]

Your Bank Ltd., was established on the 30th September, 1940 under the provisions of Cooperative Societies Act by the eminent professionals to encourage self-help, thrift, cooperation among members. Bank was issued Banking License under Banking Regulation Act, 1949 on October 25, 1986 to carry out the Banking Business within the national capital and since then the Bank has been growing continuously. At present, Bank has large number of membership of individuals from different sections. The Bank has 12 branches in the NCT of Delhi. Bank offers 'traditional counter service'. Opening hours are designed to coincide with local market days.

Board of Directors were worried from growing popularity of new style banks. These banks offer diverse range of services such as direct access to executive management, a single point of contact to coordinate all banking needs, appointment banking to save time, free online banking services 24/7, free unlimited ATM access etc.

It has now been decided that the bank will focus on "What Customers Want" and will use a balanced scorecard to achieve this goal.

Required

Produce, for each of the three non-financial perspectives of a 'Balanced Scorecard', an objective and a performance measure that the bank could use with appropriate reason.

Answer:

Perspective	Objective	Performance Measure	Reason
Internal business perspective	Cross-sell products	Products purchased per customer	Cross-selling, or encouragement customers to purchase additional products e.g. insurance, forex etc. is a measure of customer satisfaction. Only if a service is perceived as highly satisfactory the service would be repeated/ additional products or services would be accepted
Learning and growth perspective	Increase the Number of New Products or Services Sold	Number of Customers Buying the New Products/ New Services	Long term financial success requires bank to create new products / services (e.g. internet banking, ATM access) that will meet emerging needs of current / future customers such as 24/7 banking
Customer perspective	Increase Customer Loyalty	Number of Accounts Closed or Closure Request Received	Customer loyalty describes the extent to which bank maintains durable relations to its customers. The share of existing customers should have a high importance as it indicates about image and reputation. Closure request is not a good sign for bank. Bank should investigate reasons for the same and take appropriate actions to improve services offered to retain customers

16. Balanced scorecard and benchmarking– hospital [Category A]

Healthcare hospital provides medical care to patients to all strata of the society at nominal cost. Hospital has been operating for the last 15 years. It gets grant from the government that helps it sustain its operations. Each year an annual report is submitted to the officials in the health ministry that is in charge of giving out grants to hospitals. Each year over the last 15 years, grants given to the hospital has been increasing. This increment was found necessary to meet the increase in operational costs due to inflation. While operations have been moderately successful in the recent years, the grants committee is of the opinion that the hospital can manage its funds better.

To benchmark performance, performance of Healthcare hospital is being compared with the performance of another government funded hospital within the same city, Lifeline hospital. Both hospitals have similar scale of operations and get the same amount of grant. Given below are some of the parameters that are tracked at both hospitals:

Operational parameters	Healthcare hospital		Lifeline hospital
	Budget	Actual	Actual
Total inpatients	1,10,000	96,000	1,00,000
Delay in admission due to unavailability of beds			
Number of inpatients waiting for more than 1 week	1,100	2,880	500
Number of inpatients waiting for more than 2 weeks	-	960	-
Total outpatients	90,000	95,000	93,000
Delay in appointment due to unavailability of medical staff			
Number of outpatients waiting for more than 1 week	900	1,900	465
Number of outpatients waiting for more than 2 weeks	-	475	-
Number of emergency admissions	400	600	500
Delay in providing medical care to emergency admissions	-	5	-
Number of medical staff shortages (positions not filled for more than one month)	3	5	1
Cancelled or delayed operations (due to non-clinical reasons)	5	20	6
Number of complaints received related to medical care	500	1,350	600
Number of complaints resolved within 15 days	500	1,080	550

Number of deaths post operation (all inpatients)	4,400	2,880	2,000
Number of medical negligence case that the hospital lost	2	5	-
Number of errors in prescription of drugs	15	45	10
Number of infection outbreaks within the hospital	-	2	-
Bed occupancy rate	90%	85%	94%
Average patient stay (days)	4	6	5
Operating theatre utilization rate	95%	90%	95%
Revenue including government grant (in crores)	15	13	16
Operating expenses (in crores)	12	12	12
ROI	8%	5%	9%
Staff Training sessions (hours)	500	500	600
Research publications	5	3	6

- Both hospitals have 50 wards with 10 beds in each ward.
- Each hospital has 50 doctors from various specialties and 75 nurses.
- Both hospitals were open all days of the year.

Required

(i) The grants committee wants to ANALYZE performance of both hospitals with respect to:

- Access to services
- Clinical performance
- Efficiency of operations
- Financial Management
- Innovations

(ii) While preparing the balanced scorecard, how will you CATEGORIZE the above performance measures?

Answer:

(i) Analysis of Performance with respect to:

Access to Services

Access to services is an indicator of whether patients are able to get medical care when they need it. Better access to medical service will improve chances of recovery for the patients. Given the information in the problem, this can be assessed using the following parameters:

(a) Delay in admission to inpatients due to unavailability of beds.
(b) Delay in appointments to outpatients due to unavailability of medical staff.
(c) Delay in providing medical care for emergency admission.
(d) Number of medical staff shortages.
(e) Cancelled or delayed operations.

The hospital should aim at reducing the delay and shortages in order to provide patients with better access to medical services.

(a) Delay in admission to inpatients due to unavailability of beds:

As per the hospitals' policy, patients who need admission have to be accommodated within 1 week to get access to services. Any delay beyond this period is tracked by their information system. For delays, due to unavailability of beds, the hospitals are tracking two time lags, delay by more than a week and delay by more than 2 weeks. Unavailability of beds shows that there are constraints in the capacity of patients to whom the hospital can provide service.

Operational Parameters	Healthcare Hospital		Lifeline Hospital
	Budget	Actual	Actual
Total inpatients	1,10,000	96,000	1,00,000
Delay in admission due to unavailability of beds			
Number of inpatients waiting for more than 1 week	1,100	2,880	500
Number of inpatients waiting for more than 2 weeks	-	960	-
Percentage of inpatients denied access to service			
by more than 1 week	1.00%	3.00%	0.50%

by more than 2 weeks	0.00%	1.00%	0.00%

As can be seen, Healthcare hospital has a target to provide admission within a week to 99% of inpatients, delay beyond a week may happen only in 1% of cases. Delay beyond 2 weeks should not occur. However, actual performance indicates that Healthcare hospital could provide admission within a week only to 96% of inpatients. There has been a time lag of more than a week in providing admission to 3% of the inpatients. This is already 2% more than the target. Further, time lag beyond 2 weeks in providing admission has occurred in 1% of inpatients. Therefore, 4% of the inpatients had to wait for more than a week, in some cases more than 2 weeks, to get admission. In contrast at Lifeline hospital, only 0.5% of inpatient faced time lag of more than a week in getting admission to the hospital. There were no instances where patients requiring admission had to wait more than 2 weeks.

This shows that Lifeline hospital provides better access to services as compared to Healthcare hospital.

(b) Delay in getting appointment due to unavailability of medical staff:

Operational Parameters	Healthcare Hospital		Lifeline Hospital
	Budget	Actual	Actual
Total outpatients	90,000	95,000	93,000
Delay in appointment due to unavailability of medical staff			
Number of inpatients waiting for more than 1 week	900	1,900	465
Number of inpatients waiting for more than 2 weeks	-	475	-
Percentage of inpatients denied access to service			
by more than 1 week	1.00%	2.00%	0.50%
by more than 2 weeks	0.00%	0.50%	0.00%

As per the hospitals' policy, outpatients should be able to get appointment within a week to meet the medical staff. Delay beyond a week is tracked by the hospital 's information system as delay beyond a week and delay beyond two weeks. Healthcare hospital targets to provide appointments to meet medical staff within 1 week to 99% of the outpatients. Delays due to unavailability of medical staff can occur only in 1% of the cases. However, actual appointment schedule indicates that 2% of the outpatients had to wait for more than 1 week and 0.5% of the outpatients had to wait for more than 2 weeks to meet the doctor. This, indicates that Healthcare hospital has not been able to meet its target. To improve performance, the reason for unavailability of medical staff has to be understood. It might indicate that more hiring is needed or high medical staff turnover. In comparison, Lifeline hospital has provided better services to outpatients, only 0.5% of the patients had to wait beyond a week to get appointment with the doctor This shows that Lifeline hospital provides better access to services as compared to Healthcare hospital.

(c) Delay in providing medical care to emergency admission patients:

In the case of Healthcare hospital, there were 5 instances when medical care could not be provided to emergency admission patients immediately. The hospital aims never to have such instances however this target has not been met. In case of emergencies, medical care is required urgently, any delay may impact recovery of the patient. Reasons for the delay in providing medical care to such patients have to be investigated. Lifeline hospital has been able to provide medical care immediately to all its emergency admission patients. This shows that Lifeline hospital provides better access to services as compared to Healthcare hospital.

(d) Medical staff shortages:

The hospital should have enough doctors and nursing staff at any point in time to be able to provide good quality of medical care to patients. If there are vacancies, the existing staff have to bear extra patient load. This could lead to delays, some of which have been outline above. This results in patients getting lesser access to medical services when they need it. Healthcare hospital has 5 medical staff vacancies that have been vacant for more than a month, as compared to the target of 3. There are lesser resources available to provide patient care. In comparison, Lifeline hospital has only 1 position that was vacant for more than a month. This shows that Lifeline hospital provides better access to services as compared to Healthcare hospital.

(e) Cancelled or delayed operations due to non-clinical reasons:

When operations are cancelled or delayed are cancelled due to non-clinical reasons, it indicates that there

are administrative issues that deny patients access to medical care. Possible reasons could be unavailability of operation theaters, unavailability of medical staff or unavailability of required instruments or medicines. Compared to an expected 5 such instances, the actual cancellations or delays have been 20 in the case of Healthcare hospital. This is a huge variation that needs to be investigated. Given in the problem that operation theaters are used only to 90% of their availability. Possibly cancellations are not due to unavailability of operation theaters. It could be due to medical staff shortage or unavailability of instruments. Reasons have to be investigated to take appropriate action. Comparatively, such instances are fewer in the case of Lifeline hospital.

Clinical Performance:

Clinical performance can be evaluated by looking at the quality of actual work performed. The parameters to look at are:

Operational Parameters	Healthcare Hospital		Lifeline Hospital
	Budget	Actual	Actual
Number of complaints received related to medical care	500	1,350	600
Number of complaints resolved within 15 days	500	1,080	550
Number of deaths post operation (all inpatients)	4,400	2,880	2,000
Number of medical negligence case that the hospital lost	2	5	-
Number of errors in prescription of drugs	15	45	10
Number of infection outbreaks within the hospital	-	2	-

(a) Number of complaints received related to medical care:

As can be seen from the table, the number of complaints received by Healthcare hospital is more than twice the expected volume. Only 80% of these have been resolved within the time frame of 15 days. Comparatively, Lifeline hospital gets fewer complaints also the complaint resolution rate within the given framework is much higher at 92%.

(b) Number of deaths post operation:

The actual deaths post operation are much lesser. While this is a good indication of quality, the objective of the hospital should be to keep this as low as possible. Lifeline hospital has a lower mortality than Healthcare. Good quality medical care can contribute towards preventing deaths post operation.

(c) Number of medical negligence case that the hospital has lost:

The fact that the hospital has lost a case of medical negligence shows that the quality of clinical care provided is questionable. In this case of Healthcare hospital, the number of such cases lost is 5. This is in excess of an expected loss of 2 cases. This indicates that quality of clinical care is found wanting at Healthcare hospital. Lifeline hospital has not lost any case of medical negligence implying that quality of medical care is better than Healthcare.

(d) Errors in prescription of drugs:

Prescription of drugs to cure an aliment should always be accurate. Any errors could be disastrous to the patient's health. Compared to the expectation, Healthcare has three times the number of prescription errors. This shows that medical staff have been negligent in providing their service. Again, Lifeline hospital has a better record comparatively.

(e) Infection outbreak in hospital premises:

Outbreak of infection within hospital premises indicates that proper standards of hygiene are not being maintained at Healthcare hospital.

Efficiency of Operations

Operating efficiency can be assessed using the following parameters:

Operational Parameters	Healthcare Hospital		Lifeline Hospital
	Budget	Actual	Actual
Bed occupancy rate	90%	85%	94%
Average patient stay (days)	4	6	5
Operating theatre utilization rate	95%	90%	95%

(a) Bed occupancy rate:

Bed occupancy is a factor that is dependent on the number of inpatient admissions. While this factor cannot be controlled by Healthcare, it is important to track this ratio to look at capacity utilization. The bed occupancy rate is lower than the expected rate. If this persists over a longer period, the hospital may want to explore the option of scaling down the number of wards and beds. The space freed up can be utilized for some other productive purpose. However, as explained in point (a) above, 4% of the inpatients at Healthcare hospital are being denied admission due to unavailability of beds. This is a contradiction that needs to be investigated. Possible reasons could be administrative ones like inability to get the room and bed on time once the previous patient vacates. Else there may be mis-communication between the department discharging patients and the department admitting patients. Bed occupancy may not be tracked on real time basis due to which these delays in admission have occurred. Lifeline hospital has an occupancy of 94% that shows that it has just the sufficient number of beds to meet demand.

(b) Average patient stay (days) in the hospital:

On an average a patient is staying in the hospital for 2 days more than the target of 4 days. While this factor is dependent on the type of ailment, lower the patient stay the higher can be the bed occupancy rate. That means more patients can utilize the same resources if patient stay is shorter. This may be needed when there is a constraint on the beds available, which is not the scenario in the current case. However, before taking action to improve bed occupancy rate, a hospital should ensure that quality of medical care given is not compromised. In the given problem, bed occupancy is only 90% at Healthcare hospital. Therefore, the hospital can afford to have longer patient stay. Lifeline hospital has 1 lesser patient stay day, only marginally different from Healthcare's record. In both cases, since there is no constraint on bed occupancy, higher average patient stay can be managed without any constraint.

(c) Operating theater utilization rate:

Utilization of operating theater is subject to the nature of treatment, something that cannot be controlled by a hospital. However, it is necessary to track this parameter since it shows whether the facilities that are currently in place are sufficient and are utilized properly. Again, at 90% Healthcare hospital has a lower operating theater utilization rate compared to the expected usage. If this continues in the long run, the number of operating theaters can be reduced to make resources available for other uses. Lifeline hospital has a higher utilization rate at 95%, indicating more efficient use of resource.

(d) Medical staff shortage:

Medical staff is the most important resource at a hospital. Higher vacancies could imply higher staff turnover. A possible reason could be dis-satisfaction with the employer. Healthcare should understand the reason for have 5 positions that it has not been able to fill in within 30 days. Since this reduces the number of staff available, efficiency of the hospital will suffer. Comparatively, Lifeline makes better use of its medical staff since only one position was vacant for more than a month.

Financial Management

Healthcare hospital has an actual surplus of Rs.1 crore compared to a budget of Rs.3 crores. (Surplus = Revenue – Operating expense). ROI of 5% is below the target of 8%. The grants committee feels that there is a wastage of funds at the hospital. Therefore, areas of wastage should be identified such that operating expenses can be controlled better. Lifeline hospital has a surplus of Rs.4 crores. Since there are other hospitals like Lifeline that are vying for grant, Healthcare has to make itself competitive in this respect. Therefore, it has to be more efficient, effective and economical in its operations.

Innovations

Research publications indicate that newer discoveries have been made in fields that can further the horizons of knowledge. Therefore, research publications are an important indicator of innovation. While staff training is not directly related to innovations, they do keep the experts up to date in their subject area of expertise.

(ii) Performance Measures Categorized into the Balance Scorecard

- Customer Perspective would include availability of service measures and clinical performance measures.

- Internal Processes Perspective would include measures used to determine efficiency of operations.
- Financial Perspective would include details of the surplus generated and ROI.
- Learning and Growth Perspective would include staff trainings and research publications.

Combined with other parameters that the grant committee finds important the balanced scorecard can benchmark the hospital's performance with its own targets and the performance of Lifeline hospital. Decision to extend grants and its quantum can be decided on this basis.

17. Balanced Scorecard – Fitness Company [Category B]

Fitness Solution is a family owned fitness club, founded in 2010 by Peter and Albert with traditional style equipment. Club commenced operations in February 2011 within a shopping mall so that members after working out, can conveniently shop, dine, pick up their children from enrichment classes or go to the cinema.

Peter and Albert, the owners, pride themselves for providing a customized / tailored program by taking into account a person's medical history, present fitness level, fitness goals, fitness interests and offer many other small amenities that might be difficult to get in a larger Fitness Centre. They believe –

"Each individual is unique and requires a specialized program plan which should be customized and tailored to his/her needs."

They have a number of loyal members even though they offer the traditional style equipment.

Peter and Albert take care of most of the routine operations, along with a small permanent staff, and temporary staff.

Required

(i) Identify at least three 'Critical Success Factors' for Fitness Solution.

(ii) Construct a 'Balance Scorecard' for Fitness Solution. (2 measures for each of the 4 perspectives are sufficient)

Answer:

Part one:

Fitness solution's main critical success factors are:

- Developing and maintaining a high level of customer satisfaction.
- Offering facilities that are not much below that offered by competition.
- Keeping a tight cap on costs as there is considerable competitive pressure in this industry and entry barriers are not high.

Part two:

Following is a possible balanced scorecard of the company:

Financial Perspective	Operating expenses relative to budget Cash flow Total daily operating revenue
Customer Perspective	Turnover rate among members Customer satisfaction rate
Internal business Perspective	Number of employee complaints Number of equipments not available on average day (due to maintenance)
Innovation and Learning	Number of new equipment put into service Number of staff participating in training courses

18. Balanced Scorecard [Category A]

Fair Limited manufactures and sells motor vehicles in India and different parts of the world. The company has its head office in New Delhi and three regional offices. The manufacturing plants are situated in Pune and Bhubaneshwar. The company has over 10,000 employees who are paid a fixed salary and a performance related pay (PRP).

The PRP is determined using the financial performance as a measure. The performance of departments which are profit centers is based upon the revenues and profits the departments generate. The performance of cost centers is based upon the cost savings against the budget.

Of late, the company has identified critical issues with the motor vehicles manufactured and sold in the market. In the last one year, itself, the company has recalled more than 2 lakh vehicles owing to quality

issues like faulty gearbox, issues with axle, braking systems etc. The company was also penalized for selling vehicles which does not meet the emission norms.

The board of directors carried out an internal review of these frequent recalls and issues with the vehicles. In most of the cases, it appeared that the recall of vehicles was on account of lower quality of material and parts used. A couple of critical quality and emission checks were ignored to dispatch more vehicles in the limited time, leading to higher sales and profits.

The board is concerned with the reputational risk with the issue related with recalls. The company was consumer's most trusted brand for last three years in a row. It is unlikely to win the award this year due to negative feedback from customers. The board wants to win the trust of the customers back and be profitable as well.

Required
You are the advisor to the board. The board seeks your advice on the following aspects:
(i) Advantages and disadvantages of using financial measure as a performance measure.
(ii) SUGGEST an alternative performance measure which includes non-financial measures as well.
(iii) IDENTIFY 2 critical success factors and 2 Key Performance Indicators for the performance measure chosen in (ii).

Answer:

What is the issue?

Fair limited is into manufacturing of motor vehicles. The company has used financial measures for performance. Of late, the company has faced quality related issues leading to vehicle recalls. The company has also been penalized for violating emission norms. Since the company has been using financial measures only, it appears that non-financial aspects related to quality have been ignored. The company has adopted the principle of profit at any cost which can be seen from use of low quality materials and parts as well as skipping key quality checks.

Financial Performance Measure

Financial performance measures focus on financial results or aspects. These measures focus on the profits made by a business or a unit of business. They also include costs saved against budgets. Various financial performance indicators include – growth in revenue, profitability, variance from budget, Return on Capital Employed etc.

In the case of Fair limited, the performance of employees is done on the basis of financial performance indicator. When performance is evaluated on financial parameters, the employees and managers tend to focus only on profitability in anticipation of higher bonuses and pays.

The problems related to quality issues in vehicles produced by Fair limited might be linked to the use of financial performance measure. Low quality parts are used to save costs and improve profitability. The quality checks prior to sales were also skipped to sell more vehicles with limited resources. This is an apparent case of compromise in quality for seeking higher profits and revenues. In light of above, the advantages and disadvantages of financial performance measures are given below.

Advantages

- Focus on financial objectives and is linked to the overall objective of wealth creation of shareholders.
- Such measures are objective.
- Quantification of results is possible.
- The measures are comparable across companies of a particular industry.
- The framework to measure financial performance is established in most of the cases.

Disadvantages

- Focus on short term profits and Ignores long term sustainable growth. As can be seen in the case of fair limited, the company has compromised quality for short term profits. This is harmful to the company in the longer run.

- This measure can be distorted by inflation. A 5% growth in sales might be good but if the inflation is 6%, the real growth is negative.
- Financial information might be manipulated to show a better performance.

Non-financial measures:

Non-financial performance measures use measures other than financial to measure performance of employees and departments. The advantages of non-financial measures are

- Non-financial measures help business to measures every area whether financial or nonfinancial. Financial measure would not be able to suitably measure areas like performance of IT department.
- It focuses on qualitative aspects as well.
- These measures take a long-term view unlike financial measures where employees tend to take a short term view.

The disadvantages of Non-Financial measures are:

- These require huge amount of information to measure each area of performance and might lead to shift of focus from core goals and values.
- These can be subjective as non-financial measures cannot be generally quantified.
- Non-financial measures like measures of quality are difficult to measure.

Balanced Scorecard

An alternative performance measure which focuses on both financial and non-financial measures is the Balanced Scorecard. It outlines four key areas in which company and divisional performance should be measured to focus on both the short and long term needs of the 242rganization. The key idea is that managers are to be appraised on a variety of measures which include non-financial measures so that their focus is both long and short term.

As discussed earlier, it appears that managers at Fair limited have ignored long term sustainable growth and qualitative factors and focused on short term profits and sales. This is one of the key disadvantages of a financial measure of performance. The company can start measuring performance both on financial as well as non-financial aspects. This would ensure that employees are not short sighted on profits alone.
The four areas or perspectives in a Balanced Scorecard are –

- **Financial Perspective** Financial perspective focuses on financial performance of the business and divisions. The various financial measures used by companies are profitability, revenue growth, cost control etc. This is currently being used in Fair limited to measure performance.
- **Customer Perspective** This perspective views organizational performance from the point of view the customer or other key stakeholders that the organization is designed to serve. These could include measures like customer satisfaction index, percentage of returns, percentage of goods delivered on time etc.
- **Internal Business Perspective** This perspective views organizational performance through the lenses of the quality and efficiency related to product or services or other key business processes. The measures under internal business perspective could be number of defective products produced, production performance per unit of time etc.
- **Training and Development/ Learning and Growth Perspective** This perspective views organizational performance through the lenses of human capital, infrastructure, technology, culture and other capacities that are key to breakthrough performance. The key measures could be number of new products produced, amount invested in training and development etc.

In each category/Perspective, the organisation must follow through from the business strategy, to ensure they are focused on the long-term direction of the business. Clear objectives should be set under each category according the SMART criteria (Specific, Measurable, Achievable, Relevant and Time-bound), measured at the end of the period, and lessons learnt from actual results to help to improve performance in future periods and keep the organisation on track to achieve its strategic goals.

Applying Balanced Scorecard to Fair Limited

The issues related to quality have arisen at Fair Limited as the managers and divisions focused on profits at the cost of quality. The recall of vehicles was primarily on account of use of substandard parts. The

company should consider using non-financial measures as well as a performance measure. Balance scorecard can be effective tool to apply financial and nonfinancial measure.

The company must take steps to put focus on quality related aspects as well as financial aspects. A proper application of various Key Performance Indicators under the respective Critical Success Factors can help the company overcome the current issue.

Critical success factor (CSF) is a management term for an element that is necessary for an organization or project to achieve its mission. It is a critical factor or activity required for ensuring the success of a company or an organization. These are the key areas in which the organisation has to do well if they are to remain competitive and profitable. The critical success factors have to be linked with the overall strategy of the organisation.

Key Performance Indicators (KPIs) are the ways in which the organisation's performance for the CSF can be measured. It is a measurable value that demonstrates how effectively a company is achieving key business objectives. Organizations use KPIs to evaluate their success at reaching targets.

The Critical Success Factors and Corresponding KPIs for Fair limited for each of the perspective in the balanced scorecard is given below:

Perspective	Critical Success Factors	Key Performance Indicator
Financial	❖ Be the most profitable company in motor vehicle industry ❖ Become the No.1 company by in terms of market share in five years	❖ Profitability ratios ❖ Revenue growth ❖ Variance to budget ❖ Number of vehicles sold
Customer	❖ Be the No.1 choice of customers ❖ Implement zero recall policy	❖ Number of vehicles sold vis-à-vis those sold by competitors ❖ Number of recalls of vehicles ❖ On-time delivery of vehicles
Internal Business	❖ Total Quality Management ❖ Zero Idle Time at Factory	❖ Number of defective cars produced ❖ Number of cars returned by customers as faulty ❖ Number of hours spent in waiting by labour at assembly line
Training and Development	❖ Updo Date Technology used in manufacturing facilities ❖ Skill development for labour and supervisors	❖ Amount spent in research and development year on year ❖ Number of training hours undergone by workers and supervisor ❖ Number of new model of vehicles launched

19. Balanced Scorecard (Category A – RTP Nov 2019)

B. Steels is a leading manufacturer of flat and long products and have state-of the-art plants. These plants manufacture value added products covering entire steel value chain right from coal mining to manufacturing Pig Iron, Billets, HR Coils, Black Pipe/GI Pipe, Cable Tapes etc. conforming to international standards. The rock-solid foundation combined with nonstop upgradation and innovation has enabled the B. Steels to surpass its goals constantly. Its vision and values for sustainable growth is balancing economic prosperity and social equality while caring for the planet. It is preparing its balanced scorecard for the year 2018-19. It has identified the following specific objectives for the four perspectives

Improve post-sales service	Improve employee morale	Improve employee job satisfaction
Increase gross margin	Increase number of customers	Increase profitability of core product line
Increase plant safety	Increase customer retention	

B. Steels has collected Key Performance Indicators (KPIs) to measure progress towards achieving its specific objectives. The KPIs and corresponding data collected for the year 2018-19 are as follows

Key performance indicator	Goal	Actual
Average replacement time (number of days)	2	1.5
Gross margin growth percentage	15%	16%
Number of customers	15,000	15,600
Number of plant accidents	0	2
Percentage of repeat customers	83%	81%
Core product line profit as a percentage of core-product line sales	5%	4.4%
Employee turnover rate (number of employees leaving/ Average number of total employees)	2%	3%
Employees satisfaction rating (1-5, with 1 being the most satisfied)	1	1.5

For preparation of Balanced Scorecard report, the following format has been developed:

B. Steels Balanced Scorecard Report For the year ended March 31, 2019					
Perspective	**Objective**	**KPI**	**Goal**	**Actual**	**Goal Achieved (Yes or No)**
Financial	X	X	X	X	X
Customer	X	X	X	X	X
Internal business perspective	X	X	X	X	X
Learning and Growth	X	X	X	X	X

Required:

(i) Prepare a balanced scorecard report using the above-mentioned format. Place objective under the appropriate perspective heading in the report. Select a KPI from the list of KPIs that would be appropriate to measure progress towards each objective

(ii) B. Steels desires to integrate sustainability and corporate social responsibility related KPIs in their balance scorecard to adhere vision and values. ADVISE B. Steels, using TBL framework.

Answer:

B. Steels Balanced Scorecard Report For the year ended March 31, 2019					
Perspective	**Objective**	**KPI**	**Goal**	**Actual**	**Goal Achieved (Yes or No)**
Financial	Increase gross margin	Gross Margin Growth Percentage	15%	16%	Yes
	Increase Profitability of Core Product Line	Core product line profit as a percentage of core product line sales	5%	4.4%	No
Customer	Increase number of customers	Number of customers	15,000	15,600	Yes
	Increase customer retention	Percentage of repeat customers	83%	81%	No
Internal business perspective	Improve post sales service	Average replacement time (number of days)	2.0	1.5	Yes
	Increase plant safety	Number of Plant Accidents	0	2	No
Learning and Growth	Improve employee job satisfaction	Employees satisfaction rating (1-5, with 1 being the most satisfied)	1	1.2	No
	Improve employee morale	Employee turnover rate (Number of employees leaving/ Average number of total employees)	2%	3%	No

(ii) **"Triple Bottom Line" concept encourages companies to measure not only their financial profits, but also the impact that its operations have on the society and environment. Therefore, this framework**

measures the full cost of doing business by measuring the following bottom lines (i) Profit (ii) People and (iii) Planet.

Diminishing non-renewable resources have forced businesses to focus on sustainable manufacturing. This term refers to managing manufacturing processes such that they minimize any negative impact on the environment by conserving energy and natural resources. In many instances, improved operational efficiency not only reduces waste (thereby costs) but also improves product safety, it strengthens the brand's reputation and builds public's trust about the company. As a long- term strategy, this improves business viability and provides a competitive edge to the company. **This concept is the "Planet Bottom Line" within the Triple Bottom Line framework**. Metrics on the following aspects may be investigated to find out the environment impact of business operations:

- Material consumption
- Energy consumption
- Water utilization
- Emissions, treatment of effluents and waste (include emissions affecting air, water, and land)
- Fuel consumption by tracking freight and transportation costs
- Land utilization
- Recyclability and disposal of product

Corporate Social Responsibility" enables the company to become conscious of the impact its operations has on the society. CSR programs, through philanthropy and volunteer efforts can forge a stronger bond between itself, its employees, and the wider community. Again, this improves both the brand image as well as builds public's trust about the company. **This concept is the "People Bottom Line" of the Triple Bottom Line framework**. Metrics on the following aspects maybe investigated to find out the social impact of business operations:

- Work place environment and labour relations
- Occupational health and safety, accident rates
- Human rights practices – child labour, employee work-place security policies
- Training and education
- Equal opportunity employer – diversity of workforce and opportunities available for employees' growth
- Suppliers – local sourcing versus sourcing from external markets
- Philanthropy and volunteer programs organized
- Product safety in terms of customer health and safety
- Pricing of essential products to enable wider reach within the society
- Transparent and ethical business practices

B. Steels can study these aspects, determine the relevant metrics, and prepare periodic KPI reports that can help in measuring responsibilities towards sustainability and social impact.

20. Balanced Scorecard (Category A – May 2020 RTP):

In 2009, Luxo had monopoly in the eyewear market of America, but the problem with the company was that it was selling variety of eyewear, by putting a big price on it. At present, there is almost nothing that you can't buy online, but at that time there were limited things that you could order online. In 2009, Arby Signer Inc. launched a website to sell eyeglasses online. Selling eyewear online and competing with Luxo was a challenge for Arby. Within just 4 years Arby break the monopoly of Luxo and capture the major market of America. People find it really convenient to buy sunglasses and glasses online and get delivery at doorstep. Following the footstep of Luxo, Arby eliminated the middleman from the manufacturing process, launched its own optical lab to have its own manufacturing process. The range of products/services offered by Arby which make different from Luxo include easy buying process, delivery at door step, stylish glasses, customize eyewear glasses, products was sold on the site at very affordable, with a starting range of just $95 etc

Mission, Vision & Objectives

Mission	"Improving people's lives with our health care products in a socially cognizant way"
Vision	"To be a trusted health care partner"

Objectives	"To offer people designer eyewear at a revolutionary price"

As a mission- based brand, Arby needed a way to instill their team of employees with a passion for the mission. Arby let their employee know 'what they value' and 'what the employee should value' in 'who they are'. This is important to setting up 'what they do' and 'why they do it' as a core foundation of their brand story. Arby also contributes in the philanthropic work, it inspires the people with its mission. For every pair of glasses customer pay, Arby donates a pair of glasses to needy person. In December 2019, Arby reported the donation of 9,60,000 pairs of eyeglasses. The company also claims to be 90% carbon neutral.

Extracts from the Balanced Scorecard:

Performance Measure	**2019 Actual**	**2019 Target**
Financial Perspective		
Return on capital employed (ROCE)	13%	14%
Net income	$ 95 million	$ 89 million
Customer perspective		
Number of first-time buyers	1,20,000	1,00,000
Customer retention ratio	78%	75%
Number of complaints (per 1,000 customers)	1.5	2
Number of glasses donated to needy people	9,60,000	9,00,000
Internal Processes Perspective		
Number of business processes re-engineered	110	100
Number of new services made available through online application	2	4
Incidences of fraud on customers' accounts (per 1,000 customers)	3	10
Total CO2 emissions (tons)	850	1,100
Learning and Growth		
Number of employees trained to instruct retailers	1,000	1,050
Number of hours (paid for) used to support social plans	10,200	10,000
Number of trainee positions from rural areas	189	200

Other Information
Arby Signer has recently invested heavily in IT security to prevent fraud.

Required
EXAMINE the performance of The Arby Signer in 2019.
Answer:
The balanced scorecard approach looks both financial performance and non-financial performance. In order to gain competitive advantage, organizations have to be conscious of the needs and convenience of their customers. The Arby signer has a vision and strategy which goes far beyond just making money. They want to help the community and give something back to customers also. Hence, performance measures which address whether the Arby is being successful in pursuing their vision has been incorporated in Balanced Scorecard. The performance of the Arby will be considered under each of the titles used in the balanced scorecard:

Financial Perspective:
The Arby has had a year of diverse achievements when looking at the extent to which it has met its financial targets. **Its ROCE shows how efficiently it has used its assets to generate profit for the business**. The target of ROCE for the year was 14% but it has only achieved 13% return. The Arby's Net Income, however, was in fact $6 million higher than its target, which is good. **The most likely reason for the under target ROCE is possibly the investment which Arby has made in IT security.** Whilst this may have reduced ROCE, this investment is essentially a good idea as it helps Arby to pursue its mission and will keep customers happy.

Customer Perspective:

- Regarding its customers, Arby's performance is better in the current year. **It has not just exceeded its target sale to first time buyers by 20,000 but also improved its customer retention ratio**, which is good for company to pursue its vision of being a trusted healthcare partner.

- Customers complaints **has reduced from 2 complaints to 1.5 complaints for every 1,000 customers**, the exact reason is not clear but it might be because of improved processes and team efforts of employees.
- **Also, the number of glasses donated exceeded the target**. It shows that company has exceeded its target of helping people which is good for the company's reputation.

Internal Processes Perspective:

- **Number of business processes within Arby re-engineered has exceeded the target**, which is very good and the impact of which may be reflected in the lowering of level of customer complaints. Likewise, the investment to improve IT security has been a great success, with only three incidences of fraud per 1,000 customers reported compared to the target of 10. However, only two new services have been made available via online application, instead of the target of four, which is unsatisfactory. But fortunately, its CO2 emission is below to the target level.

Learning and Growth Perspective:

- **The Arby has succeeded to train its employees to instruct retailers**. However, the number of employees trained to instruct retailers are comparatively lesser than targeted, shortfall in training of employees to give instruction to retailers may have an impact on the Arby's failure to meet its target of market expansion.
- **Number of hours (paid for) used to support social plans are comparatively higher, it results in additional costs which could have contributed to the fact that the Arby did not quite meet its target for ROCE**. Further, company has not met aim for helping the rural area as targeted. This may be because the number of candidates applying from these areas was not as high as planned and this situation is beyond companies control.
- In general, the Arby Signer had a successful year, meeting many of its targets.

Part IV – Benchmarking

21. Benchmarking [Category A]

PHL, South Asia's premier express air and integrated transportation & distribution firm, offers a wide range of innovative supply chain services including Express Distribution, 3PL and Consulting. PHL offers innovative logistics solutions to its customers, enabling them to focus on their core competencies. The firm adds maximum value to businesses at every level, right from providing world-class warehousing support to ensuring time-definite deliveries of goods anywhere in Country 'X'. The following information is available:

(1) Each warehouse of PHL is solely responsible for all customers within a specified area. It collects couriers from customers residing within ambit of its own area for delivery both within the specific area covered by the warehouse and elsewhere in India.

(2) After collections of couriers, a warehouse forward them for delivery outside its own area to the warehouses from which the deliveries are to be made to the customers.

(3) Therefore, each warehouse must integrate its deliveries to customers to include: (i) couriers that it has collected within its own area; and (ii) couriers that are transferred to it from other warehouses for delivery to customers in its area.

(4) Each warehouse's revenue is based on the invoice value of all couriers collected from customers in its area, irrespective of the location of the ultimate dist ribution warehouse.

(5) Each warehouse costs consist its own operating costs plus some allocated proportion including centralised administration services (i.e. salary, legal & professional fees etc.) and distribution centre costs.

(6) The management team and all employees of each warehouse are paid incentives which remains payable quarterly. The bonus is based on the achievement of a series of target values by each warehouse.

(7) Internal benchmarking is used at PHL as to provide sets of absolute standards that all warehouses are expected to achieve.

(8) The Annexure exhibit the target values and the actual values achieved for each of a sample group of four warehouses situated in City SG, City HK, City NY, and City NZ. The target values consist of: (i) Warehouse revenue and profitability; (ii) Courier delivery services and customer care; and (iii) Credit period control and administrative efficiency. Incentives are based on a points system. It is also used as a stimulus for each warehouse improving the operational effectiveness. One point is awarded in case where the target value for each item in the Annexure is either achieved/ exceeded, and a zero point where the target is not achieved.

Annexure:

Revenues and profitability:

Particulars	Revenues (Rs. Million)		Profit (Rs. Million)	
	Target	Actual	Target	Actual
Company overall	300	260	45	48
Warehouse				
City SG	24.00	22.50	3.60	3.45
City HK	21.00	27.00	3.15	3.60
City NY	18.00	21.00	2.70	3.30
City NZ	27.00	33.00	4.05	4.20

In order to calculate points of each warehouse, actual profit as a % of actual revenue must exceed the target profit as a % of target revenue.

Courier Delivery Services and Customer Care

Particulars	Target %	Actual			
		SG %	HK %	NY %	NZ %
Measure (% of total):					
Late collection of couriers	3.00	2.85	3.15	2.70	3.60
Misdirected couriers	6.00	6.30	5.85	4.95	7.65
Delayed response to complaints	1.50	1.05	1.35	1.20	1.80
Delays due to vehicle breakdown	1.50	1.65	2.10	0.45	3.00
Measure (% of revenue):					
Lost items	1.50	0.90	1.35	1.20	2.85
Damaged items	3.00	2.25	3.60	2.25	2.70

Credit Control and Administration Efficiency

Particulars	Target %	Actual			
		SG %	HK %	NY %	NZ %
Average debtor weeks	5.50	5.80	4.90	5.10	6.20
Debtors more than 60 days (% of total)	5.00	?	?	?	?
Invoice queries (% of total)	5.00	1.50	1.40	0.80	2.70
Credit notes as a % of revenue	0.50	?	?	?	?

Other Information

('000)

Particulars	SG	HK	NY	NZ
Debtor Aging Analysis (extract)				
Less than 30 days	1,950.00	2,250.00	1,770.00	3,000.00
31–60 days	481.50	199.50	229.50	828.00
Value of Credit Notes raised during the period	67.50	54.00	42.00	198.00

Note: PHL operates all year round.

Required

Prepare a report for the directors of PHL.

(i) ANALYSE the comparative performance of the four warehouses.

(ii) ASSESSE PHL from perspective of financial performance, service quality, resource utilisation, flexibility, innovation, and competitiveness; and
(iii) EVALUATE the performance measurement system at PHL.

Answer:

To: The Directors of PHL
From: Management Accountant
Subject: Warehouse Performance
Date: 11th May 2019

(i) NY has achieved the best performance with (12) points. SG and HK have given a reasonable level of performance with (8) points each. NZ is under performed earning only (4) out of the twelve points.

NY is the only warehouse which has achieved both increased revenue and increased profit over targets.

In the courier delivery services and customer care, NY has achieved all (6) of the target standards, SG (4); HK (3). The data of NZ indicates, the need for investigation due to achievement of only (1) out of six targets.

In respect of the credit control and administrative efficiency, HK and NY have achieved all (4) standards and SG has achieved (3) of the four standards. Once again, NZ is the 'bad performer' and achieved only (2) of the four standards.

(Refer points table)

(ii) The terms mentioned in the question might be seen as representative of the dimensions of performance. The analysis of dimensions may be translated into results and determinants.

Results are the outcome of decisions and actions taken by management in the past. Measurement of the results may be done by focusing on financial performance and competitiveness. Financial performance may be measured in terms of revenue and profit as shown in the points table. The points system shows which warehouses have achieved or exceeded the target. Besides, liquidity is another criterion for the measurement of financial performance. The total points in table showed that HK and NY warehouses appear to be the best performer in aspects of credit control. Competitiveness may be assessed in terms of sales growth or in terms of market share or increase in customers etc.

The determinants are the factors which may be seen to contribute to the achievement of the results. In other words, Determinants refer to the forward-looking dimensions of Fitzgerald and Moon model, for example- what areas of future performance are most important for PHL to achieve positive financial and competitive results? Quality, resource utilization, flexibility and innovation are the determinants of future success and they are also the contributors to the achievement of competitiveness and financial performance.

In PHL a main quality issue seems to be courier delivery services and customer care. Points table shows that the NZ warehouse has a major problem in this area and achieved only (1) point out of the six available.

Resource utilisation for PHL is critical to its financial success and may be measured by effective and efficient use of drivers, vehicles, and financial resources. To some extent, such measurement can be seen in the data relating to courier delivery services and customer care. For example, the reason of late collection of couriers from customers may be a shortage of vehicles and/or drivers. Such shortages might be due to sickness, staff shortage, problems of vehicle availability, vehicle maintenance etc.

Flexibility may be an issue like varied range of service as to meet different segment of customer is unavailable. Possibly, a short-term sub-contracting of vehicles or collections or deliveries may help in overcoming late collection problems.

The points table i.e. 'target vs actual' may be considered as an example of innovation by PHL. This gives a comprehensive set of measures providing an incentive for improvement at all warehouses. The points table may demonstrate the extent of achievement or non-achievement of PHL strategies for success. For instance

– the firm may have a customer care commitment policy which identifies factors that should be achieved on a continual basis. For example, timely collection of couriers, misdirected couriers re-delivered at no extra charge, prompt responses to customer claims and compensation for customers.

(iii) The performance measurement system used by PHL is simple to use. However, it may be looked upon measuring the right things since the specific measures used in points table encompass a range of dimensions designed to focus the organization on factors essential for PHL's success and not restricted to traditional financial measures.

At PHL, internal benchmarking has been used to provide sets of absolute standards that all warehouses are expected to achieve. This will help to ensure a continuous focus upon the adoption of 'best practice' at all warehouses. Benchmarks on delivery performance give importance to quality of service whereas benchmarks on profitability i.e. target profits focus solely upon profitability.

Incentive schemes have been used at PHL, linking the achievement of firm targets with rewards. It might happen that the profit incentive would act as a booster to each warehouse management team. However, what is required for the prosperity of PHL is a focus of management on the determinants of success rather than the results of success.

Workings:

Warehouse points table for the year ended March 31, 2019

Particulars	SG	HK	NY	NZ
Revenue	0	1	1	1
Profit (see note below)	1	0	1	0
Total points earned (A)	**1**	**1**	**2**	**1**
Ranking	**II**	**II**	**I**	**II**
Courier Delivery Services and Customer Care				
Late collection of couriers	1	0	1	0
Misdirected couriers	0	1	1	0
Delayed response to complaints	1	1	1	0
Vehicle breakdown delays	0	0	1	0
Lost items	1	1	1	0
Damaged items	1	0	1	1
Total points earned (B)	**4**	**3**	**6**	**1**
Ranking	**II**	**III**	**I**	**IV**
Credit Control and Administrative Efficiency				
Average Debtor weeks	0	1	1	0
Debtors more than 60 days	1	1	1	1
Invoice queries (% of total)	1	1	1	1
Credit notes (% of revenue)	1	1	1	0
Total Points earned ©	**3**	**4**	**4**	**2**
Ranking	**II**	**I**	**I**	**III**
Total Points (A+B+C)	**8**	**8**	**12**	**4**

(a) Profit Points Calculation

Actual Results e.g. SG = 3.45/22.50 = 15.3% (1 point); HK = 3.60/ 27.00 = 13.3% (0 point)

(b) Debtors more than 60 days (% of total)

Particulars	**SG**	**HK**	**NY**	**NZ**
Revenue ('000)	22,500	27,000	21,000	33,000
Debtor weeks	5.80	4.90	5.10	6.20
∴ Debtors (A)	2,510	2,544	2,060	3,935
Less than 30 days (B)	(1,950)	(2,250)	(1,770)	(3,000)
31 – 60 days ©	(481.50)	(199.50)	(229.50)	(828.00)
More than 60 days (A – B – C)	78.50	94.50	60.50	107.00
Debtors in more than 60 days (% of total)	3.13	3.71	2.94	2.72

(c) Value of credit notes raised as a % of revenue e.g. SG = Rs.67,500/ Rs.2,25,00,000 = 0.30%

Part V – Performance Measurement in the not for profit sector

22. Performance measurement in not for profit sector [Category B]

The town of Silver Sands is located along the coast of the Caribbean Sea. Known for its beautiful coastline and pleasant weather, the town attracts a lot of tourists from all around the world. The town has two beaches that are maintained by the local government and can be used by the general public. In order to preserve the natural ecosystem, other beaches on the coastline are not accessible to the general public. Tourism is the main source of livelihood for its residents. Consequently, cleanliness of beaches is of paramount importance in order to sustain and develop this industry.

The local government has recently employed a contractor to clean up the beaches using beach cleaning machines. The contractor has been selected through a competitive tendering / bidding process. The contractor uses sand cleaning machines that are pulled by tractors. Sand is scooped onto a conveyor or screening belt. It is either raked through (combed using prongs) or sifted through (filtered), in order to separate the waste from the sand. The cleaned sand is left behind on the beach while the waste is removed. Majority of the litter comprises of plastic waste (bags, bottles etc.) while some portion also includes sea weed, glass, aluminum cans, paper, timber, and cardboard. A detailed log is kept by the contractor about the stretch of beach that has been cleaned, time taken for the clean-up, number of tractors used etc. This log is also checked and signed by a local government official. This record is used to process payments at the end of the month.

In addition to contracting with the vendor to clean machines, the local government has also placed bins at various locations on the beach for the public to dispose their waste. The town's municipality workers clean these bins every morning. Again, detailed logs of the man power and other resources employed is kept by the responsible department. In addition, the government has opened a mobile messaging system, whereby the public can message the government department if they find litter anywhere in the beach. Depending on whether it is from overflowing bins or buried debris in the sand, the municipality workers or the contractor will take action to clear it within 24 hours. A detailed log of these operations is also maintained. Patrons can also suggest measures for improving cleanliness on the beaches.

Due to its importance to the economy, the local government has allotted substantial budget for these operations. At the same time, it is essential to know if this is sufficient for the purpose of keeping the beaches clean. Therefore, the government wants to assess whether the town is getting "good value for money" from this expenditure. The "value for money" concept can be looked at from three perspectives: (i) economy, (ii) efficiency and (iii) effectiveness. The Internal Audit (IA) department that has been requested to undertake this study, has requested for guidelines on whether the audit should focus on economy and efficiency of the beach cleaning operations or on effectiveness of the same. Economy and efficiency audit assess whether the same level of service can be procured at lower cost or resources while effectiveness audit assess whether better service can be procured at same cost.

Depending on the outcome of the audits, if required, policy decisions like requesting for additional funding from the state government, alternate policy measures like levying penalty for littering etc. can be taken.

Required

Prepare a letter addressed to the IA department.

(i) RECOMMEND guidelines to assess economy and efficiency of beach cleaning operations.

(ii) RECOMMEND guidelines to assess effectiveness of beach cleaning operations.

(iii) IDENTIFY challenges involved in assessment of effectiveness?

(iv) RECOMMEND general guidelines, how the audit team may conclude the audit based on the combined outcomes of economy, efficiency, and effectiveness?

Answer:

Date 14- Oct -2018

Dear Sirs,

Re: The economy, efficiency and effectiveness of beach cleaning activities

(i) Economy and efficiency audit of an operation focuses on the consumption of resources and the output achieved. Economy assesses the financial aspects of the activity i.e. are the objectives of the activity being achieved at reasonable cost? Efficiency assesses the volume of input consumed to derive the desired output i.e. are the resources and funds being consumed to get maximum output?

To look at Economy of Operations, cleaning expenses need to be bifurcated into payments made to the

contractor and the expenses of emptying waste from bins. Any further subcategories of these expenses, like labour, material, disposal van expenses etc. also need to be collated from the accounting or cost records. These then have to be compared to the budgets that were approved by the government of Silver Sands. The competitive tendering process can be reviewed to ensure that the contractor getting the order is offering the required quality of service at the lowest price. If the quality of cleaning has been achieved, by staying within budget, the operation is economical. However, if the actuals exceed the budget, the government has to compare them with cost of similar cleaning activities carried by neighbouring towns. On comparison, if Silver Sands operations are expensive compared to other towns, it indicates that not only are the operations uneconomical they may not be efficient either.

Efficiency of Operations can be determined by checking the log records maintained for beach cleaning by the contractor and municipality workers. These would have detailed of activities carried out and the resources utilized for each of them. For each of these services (beach cleaning and emptying out bins), the cost drivers can be identified and certain metrics can be developed for analysis. For example, the cost of running the tractors can be divided by the total number of tractors operated to get the cost of operations per tractor or alternatively, by the kilometres of beach cleaned to arrive at a tractor-kilometre rate. While analysing these activities, certain operational considerations have to be given. For example, certain stretches of the beaches may take more time or resources to clean due to issues like rocks or soft sand. Therefore, if resources for operations disproportionate for certain parts of the beaches, the cost of maintaining those stretches need to be worked out. Data to get this information will depend on the extent of detailed maintained in the logs. This information has to be tracked over some period of time in order to understand trends in operations and related expenses.

The data collected from the mobile messaging system should also be investigated. How often and in what stretches of the beach are complaints frequent or maximum? Reasons for these lapses need to be taken from the contractor (for beach cleaning operation) and the concerned department (for emptying bins) in order to find out whether resources are being employed properly. On this basis, deviations and exceptions should be investigated. The local government can then decide if there can be alternate sites along the coastline that may be more economical and efficient to operate.

(ii) **An audit about Effectiveness of Operations would focus how the actual cleanliness of beaches compares with the desired level as laid out in the policy initiative.** To assess whether performance has been met, clear guidelines and metrics have to be defined during policy implementation.

To begin with, it should be clear as to what constitutes litter. From an operational angle, it would be difficult to clean out every bit of paper lying on the beach. However, it is possible to pick up every soft drink aluminum can. Hence, the government authorities must be clear on what constitutes litter? Which are the refuse that must be cleared within exception (example food refuse, animal droppings, glass bottles, tin cans, trash bins etc.) and tolerance level for certain other types of litter (e.g. Paper, seaweed etc.) that may get left behind even after cleaning. Quantity of waste collected would be the indicator to make the above assessment. **Certain other parameters like safety standards can also be defined. Safety problems could be cuts from sharp objects like glass, incidents of vector borne diseases in the area or health problems from polluted sea water. Assessment has to be made whether these standards have been met.**

For this, the primary source of information about cleanliness would be feedback from the beach patrons. These could be in the form of complaints received directly or those through the mobile messaging system would provide data to work out the metrics. This would be an indicator of "customer satisfaction". Other inputs could also be the suggestions given by the patrons about ways to improve cleanliness on the beach.

Observation by making surprise visits to inspect the beaches immediately after the cleaning operations would also provide sufficient evidence about the effectiveness of operations.

(iii) Challenges Involved in assessment of effectiveness would be:
(a) Defining standards about what constitutes litter and acceptable level of cleanliness? These are subjective guidelines, the perception of which may differ from person to person.

(b) Beach patrons also play an important role in making this initiative effective. There has to be a conscious civic sense of duty not to litter, failing which this initiative will most likely be ineffective. Therefore, while measuring performance for effectiveness, collection of more litter does not necessarily indicate effective operations. More litter requires more cleaning and more resources, therefore is actually not a positive indicator of effectiveness. On the contrary, in the long run, lesser litter collected to maintain desired level of cleanliness would be a good indicator of effectiveness.

(iv) The outcome of the audits can indicate achievement any or none of the three parameters of economy, efficiency and effectiveness of the beach cleaning operation. To form an integrated conclusion based on the different outcomes of individual audits, the audit team may consider the following guidelines:

(a) Has the objective of the cleaning operation been achieved as per the guidelines in the relevant policy? i.e. have the operations been effective?

(b) If the answer to (a) is yes, are the expenses within budget. If so, then the operations are economical and efficient. Given that the operations have been effective at the same time economy and efficiency have been achieved, the team can conclude that the cleaning operations policy has been a success. A cost-over run can also be justified if the operations have been effective. In that case, the audit team has to conclude whether all expenses incurred are indeed justified and that the resources have been put to the best possible use. If not, can the operations be made more economical or efficient?

(c) If the answer to (a) is no, the operation has not been effective, then is the difference from the target marginal or huge? If the operations have not been entirely effective, but only by a marginal gap say 95% success, then analysis of expenses can be made similar to the point (b) mentioned above. However, if the operations have been ineffective to a larger extent, then the cleaning drive initiative has been ineffective. The government has to look at alternate solutions of tackling the problem. These could include imposing heavy penalty for littering, requesting for more funding from the state government to employ better resources etc.

Therefore, it can be seen that achievement of one objective does not automatically lead to achievement of other objectives. A holistic approach would be needed to draw conclusions about the performance of the cleaning operations.

Should you have any further queries, please do not hesitate to ask.
Yours Faithfully
Management Accountant

23. Performance measurement for not for profit company [Category A]

West Coast community operates Homelessness Services (HS) on a not-for-profit basis as a local solution to local housing needs. The primary objective is to meet the accommodation needs of persons within its locality targeting those living in the low/middle income groups and senior citizens. Accommodation is basically furnished; it consists of a small house, with kitchen, bathroom, bedroom/(s), and a sitting room. HS manages 450 such houses across various localities. Exclusive Services (ES) is a profit-seeking organisation which provides rented accommodation to the public. ES manages 200 such houses across localities similar to HS' operations.

Income and Expenditure accounts for the year ended 31st March 2018 were as follows:

	HS (Rs.**)**	**ES (**Rs.**)**
Rent Received	1,02,98,600	1,09,98,000
Less:		
Employee Costs	24,00,000	38,00,000
Planned Maintenance and Substantial Repairs	34,19,500	10,41,000
Running Repairs	23,91,600	6,38,000

Miscellaneous Operating Costs	15,27,500	11,75,000
Insurance, Property Taxes, and Interest etc.	13,15,500	18,75,000
Operating (Deficit)/ Surplus	(7,55,500)	24,69,000

Operating Information in respect of the year ended 31st March 2018 was as follows:

House and rental information:

Size of House	Number of Houses		Rent per Week (Rs.)	
	HS	ES	HS	ES
1 Bedroom +	40	20	400	750
2 Bedrooms +	80	40	450	800
3 Bedrooms +	250	140	500	1,175
4 Bedrooms +	80	Nil	700	N.A.

HS had certain houses that were unoccupied during part of the year. The rents lost as a consequence of unoccupied properties amounted to Rs.18,17,400. ES did not have any unoccupied houses at any time during the year.

Employees were paid as follows:

Number of Staff		Salary per Staff Member (Rs.) per annum	
HS	ES	HS	ES
1	2	3,00,000	5,00,000
2	2	2,50,000	3,00,000
4	11	2,00,000	2,00,000
8	-	1,00,000	-

Planned maintenance and substantial repairs undertaken:

Nature of Work	Number of Houses		Cost per House (Rs.)	
	HS	ES	HS	ES
Miscellaneous Building Work	10	-	12,500	-
Sanitary Fittings (Kitchen + Bathroom) [all are the same size]	45	5	26,100	52,200
AC Upgrades/ Replacements	8	-	15,000	-
Replacement of Wooden Structure for 3-Bedroomed Houses	50	13	40,000	60,000

Running Repairs Information:

Classification of Repair	Number of Repair Undertaken		Total Cost (Rs.)
	HS	ES	HS
Emergency	480	160	6,72,000
Urgent	990	376	11,28,000
Non-urgent	560	102	5,91,600

Each repair undertaken by ES costs the same irrespective of the classification of repair.

Required

(i) Critically EVALUATE how the management of Homelessness Services could measure the 'Value for Money' of its service provision during the year ended 31 March 2018.

(ii) IDENTIFY, 2 performance measures in relation to Flexibility and Service Quality (dimensions of performance measurement).

(iii) ANALYSE, 3 performance measures relating to 'Cost and Efficiency' that could be utilised by the management of Homelessness Services when comparing its operating performance against that achieved by Exclusive Services.

Answer:

(i) For commercial enterprises, generating profits is a very important objective. Likewise, not-for profit enterprises have certain cultural, social or educational objectives for which they are created. Regardless of the type of organization, it is important to know whether the internal operations meet certain performance benchmarks, that will ensure that the organization achieves its objectives in a better manner. Moreover, even if the organization does not operate for profits, it is important for it to be "cost effective". Resources (including money) should be used optimally to achieve intended outcomes. For example, HS can use this benchmarking tool to look into the following questions:

(a) **Does the organization function in an efficient and cost effective manner?**
(b) **Does the estate management make best use of the buildings to achieve the objectives of the organization?**
(c) **Does the estate management function manage upkeep of buildings in terms of repairs and improvements in an effective manner?**
(d) **Are the tenants satisfied with the service provided by the estate management and the suitability of the accommodation for their needs?**

"Value for Money (VFM)" is an assessment made based on the criteria of economy, efficiency and effectiveness.

Economy *involves minimising resource consumption while meeting specified requirements of quality and quantity.* Minimize the cost of resources / required inputs (implies to spend less) while ensuring that the desired quality of service is achieved. For HS, inputs could be purchases made for maintenance and repair work like sanitary fittings, AC, wooden structure for the houses etc., while resources could be the labour employed to carry out these services. HS should aim at purchasing required quality of inputs at the least possible price. Skilled labour needed for this job should be procured at the lowest pay scale possible. Procuring these at lower cost leads to savings for HS. At the same time, HS should ensure that cost cutting / saving does not come at the cost of quality. Lower quality, implies inferior service levels, which ultimately will compromise HS' social commitment to provide quality housing to needy members of its community.

Efficiency involves *maximising the ratio between resources (input) and the output of goods, services or other results.* The focus of efficiency is on the process of rendering service. The objective of efficient operations is to maximize output using minimum resources. Improved productivity means that resources procured are used in an optimal way (implies spending well).

In the case of HS, one of the resources is the labour employed for repair and maintenance work. Efficiency (productivity) measured would be the relationship between the employees available and the repair work performed by them. If the pool of employees do more repair work than the benchmark set, productivity is higher. This also closely ties up with economy (cost) of operations. If the given pool of employees (resources), who are paid optimum salary (cost), cater to more repair and maintenance work, economy of operations is achieved due to higher productivity of operations. In case these activities are outsourced, efficiency and economy can be achieved by calling for tenders. Select the tender that provides maximum work for least cost. In addition, HS may explore options for efficiencies from business process improvements, shared services as well as further efficiencies with in assets management.

Effectiveness involves *ensuring that the outcome achieves the desired policy aims and objectives*. Have the objectives been achieved, how does the impact of the actual output / service compare with its intended impact? (implies to spend money wisely to achieve desired objectives). In the case of HS, effectiveness could be assessed based on the following questions

(a) Are the housing needs of the targeted community members met?
(b) Are the tenants satisfied with the accommodation?
(c) Given its social cause, are the staff friendly, courteous and hospitable to the customers?

(d) Do the housing accommodations comply with safety standards and other legal requirements?

Each measure is inter linked with the other. For example, HS has replaced sanitary fittings in the kitchen and bathroom in 45 houses for Rs.26,100 each, costing a total of Rs.11,74,500. Compared to ES that has spent Rs.52,200 on each house for sanitary fitting replacement. For the cost of Rs. 11,74,500 ES could have replaced fittings in only 22 houses (Rs.11,74,500 / 52,000) as compared to HS' ability to replace fittings in 45 houses. Therefore, HS' decision has been economical, getting more work done for same cost. At the same time, this does not indicate whether the fittings replaced by HS are of similar or better quality as compared to ES. ES could have used better quality fittings that last longer, enhance customer experience, safety etc. The spending by ES could have been more effective than HS because it helps achieve the desired objective of customer satisfaction, safety and lesser running cost for maintenance. Therefore, to achieve economy, HS may have compromised on effectiveness.

Benchmarking is a good method of measuring performance it enables a comparison of the process, costs etc. with those of a close competitor. Services will be expected to use benchmarking information to learn from best practice, change procedures and processes to achieve enhanced methods of working, and reduce unnecessary expenditure. However, benchmarking of performance against ES is not ideal. The performance of HS can be better measured by adopting *benchmarking against similar charities* whose primary objective is the provision of accommodation to the communities in which they operate.

Thus, HS must have permanent membership of the House Benchmarking Organisations, which helps social housing property-owners to compare the costs of service delivery, resources, and key performance indicators across all areas of the business. For example, the management of HS can enquire about a norm in respect of the repair charges, sanitary charges or wood structure replacement charges etc. of similar non-profit seeking organisations.

Further, benchmarking should be conducted annually to analyse all areas of the business and is used to identify high performing, low cost services. Using the annual benchmarking exercise results, the HS can plan to target those areas that are low performing and high cost.

Overall, HS should have strong commitment to value for money, which needs to be reflected in the business plan and in service-delivery plans. By applying these principles HS would be able to achieve the optimum utilisation of resources, which will in turn lead to extra capacity and allow HS to provide better services.

(ii) The Building Block Model proposed by Fitzgerald and Moon, gives six dimensions of performance measurement including service quality and flexibility.

Service Quality

Service quality is the measurement of how well a delivered service conforms to the customer's expectations. As a not for profit organization, HS provides housing services to cater to the needs of lower and middle income groups as well as senior citizens in the local community. Although service is provided at a concessional rate compared to its commercial peer ES, quality of HS' service needs to be judged based on certain parameters that were promised by the organization to its tenants. These could be used as parameters to assess service quality. Some of them could be:

- **Behaviour, attitude, proactivity of staff employed by HS.**
- **Quality of basic amenities provided.**
- **Availability of on-site service for the residents**
- **Safety within and around the residential unit**

Data for assessment of quality can be collected from feedback of tenants, analysing the number and nature of complaints made by tenants, tenant retention rate/loyalty etc. Feedback form tenants can be taken on specific issues or could be general in nature.

Flexibility

Flexibility is the ability of the organization to adapt to customers' requirements. This can be measured through service delivery time, promptness in responding to customer requests, ability of employees to perform different kinds of work etc. In the case of HS, the following performance measures can be used to assess the flexibility:

- **The average waiting time for a tenant for a house to become available**. Lower the wait time better the flexibility as it indicates that there are sufficient housing units available for rental accommodation.
- Following change in requirements, ability to meet the tenant's request for another house of a different size. This indicates whether the range of housing units offered is sufficient (flexible) to cater to the tenants' changing demand.
- Waiting time for undertaking repairs of an emergency nature, once notified by a tenant. Lower the waiting time during emergencies indicates the availability of appropriate personnel to carry of the repairs on short notice.

(iii) The management of HS could use the following performance measures.

An organization should aim at achieving results with maximum efficiency at the least possible cost. Efficiency measures the relationship between the input resources utilized and the output service achieved. Few of the measures that HS could use to compare performance with ES are:

The Average Employee Cost *per week per house*

Here, the resource (input) are the employees, which is 15 in case of both HS and ES. The employees at HS cater to 450 houses as compared to 200 houses catered by ES. Therefore, HS is more efficient as compared to ES. Likewise, cost of resources to HS is the employee cost, for which the pay structure and remuneration policies are different in both the organizations. HS has the ability to hire most of its resource at an annual salary of Rs.100,000, which is the least level in the pay structure. Comparatively, ES also hires cheaper labour but at a slightly higher pay level of Rs.200,000 annual salary. Therefore, the total cost of labour is higher by Rs.14,00,000 (58%) for ES as compared to HS.

To compare the figures on a common factor, the employee cost can be calculated per week per house.

	HS	ES
The Average Employee Cost *per week per house* [Rs.24,00,000^/ (450@ × 52)] and [Rs.38,00,000^/ (200@ × 52)] ^ Employee cost from the income and expenditure table @ Number of houses (given): HS = 450; ES = 200	Rs. 102.56	Rs. 365.38

The average employee cost per week per house of ES is Rs.365.38 (2.46 times) more than of HS. It can be concluded that HS is both efficient, in terms of being able to cater more houses with same number of employees, as well as cost effective due to the use of cheaper labour.

The Average Day to Day Repair Cost per week per house

Here, the resource (input) is measured in terms of the cost spent on repairs to maintain the rental houses. Running repairs are generally do not add much value to the rental houses. Therefore, lesser the repairs, higher the efficiency. From the income and expenditure table, it can be seen that HS has spent Rs.23,91,600 as running repair cost for 450 houses versus ES that has spent Rs. 6,38,000 for 200 houses. To compare them on a common factor, the average repair cost per week per house has been calculated.

	HS	ES
The Average Day-to-Day Repair Cost *per week per house* [Rs.23,91,600^/ (450@ × 52)] and [Rs.6,38,000^/ (200@ × 52)] ^ Running repair cost from the income and expenditure table @ Number of houses (given): HS = 450; ES = 200	Rs. 102.21	Rs. 61.35

- The average day to day repair cost per week per house for ES is Rs.40.86 less than that of HS (-40%). This may be due to the fewer repairs required and the fact that there is no extra cost required for emergency and urgent repairs. The cost of repairs whether emergency, urgent or non-urgent to ES is the same, Rs. 1,000 [Rs.6,38,000/ (160 + 376 + 102)] whereas the cost of emergency repairs to HS is Rs. 1,400 (Rs. 6,72,000/480), urgent Rs. 1,139 (Rs. 11,28,000/990) and for non-urgent repairs it is Rs. 1,056 (Rs.5,91,600/560).
- ES's low cost of repairs (which is identical for all types of repairs – emergency, urgent and nonurgent) may have been achieved through entering into a *contractual agreement for repairs*. HS should also think of entering into such contracts in order to save money.

Percentage of Rent Lost

Occupancy of rental houses indicate whether the capacity (in terms of houses rented) is being optimally utilized. Lesser the vacancy better the efficiency in terms of capacity utilization. This represents opportunity cost of not letting out the property.

	HS	ES
Percentage of Rent Lost (= Rent Lost / Gross Rent) [(Rs.18,17,400/ Rs.1,21,16,000] Gross Rent = Rent Earned + Rent Lost = Rs.1,02,98,600 + Rs.18,17,400 = Rs.1,21,16,000	15%	---

- ES did not have any unoccupied properties at any time during the year; it has 100% occupancy. This shows that ES's properties are in high demand. On the other hand, HS has lost rent worth Rs. 18,17,400 through un occupied properties; this is about 15% of the gross rent receivable.
- The management of HS should identify the reasons why the houses remained unoccupied when the occupancy rate is 100% for an organisation like ES, a peer organisation should be used to benchmark the performance.

Balanced scorecard

Business	Financial	Customer	Internal business	Innovation
Resort	❖ Economic value added ❖ Revenue per villa	❖ % of repeat customers ❖ Number of customer complaints	❖ Service rating of spa ❖ Staff hours per guest ❖ % of cost spent on maintenance ❖ Travel guide ❖ Rank for restaurant	❖ Employee retention ❖ Number of new services offered
Super market	❖	❖ % of customers using loyalty cards ❖ No of discount vouchers redeemed	❖ Time spent by customers in billing section ❖ Time spent by customer care executives in handling customer queries ❖ No of times home delivery made	❖ No of training days ❖ No of schemes launched
Bank	❖	❖ No of accounts closed or closure requests received	❖ Cross-sell products	❖ Number of customers buying the new products/new services
Credit card company	❖ Increase market share ❖ Reduce debt ❖ Increase % fee	❖ Focus on large spenders ❖ Issue more cards	❖ Increased marketing spends ❖ Achieve economies of scale ❖ Offer more products	❖ Improve staff training ❖ Outsource IT jobs ❖ Acquire other companies
Fitness centre	❖ Operating expenses ❖ Cash flow ❖ Operating revenues	❖ Turnover rate among members ❖ Customer satisfaction rate	❖ Number of employee complaints ❖ Number of equipment not available on	❖ Number of new equipment put into service ❖ Number of staff participating in training course

Business	Financial	Customer	Internal business	Innovation
			average day due to maintenance	
Library	❖	❖ No of new books added to the library within a specified period	❖ Time taken in obtaining new books (recognizing demand, identifying source, negotiating price and placing order)	❖
Flight	❖ To use fewer planes to transport customers ❖ Revenue per plane seat	❖ On-time arrival of flights ❖ Number of flights cancelled	❖ Turnaround time on the ground ❖ Improve the cleanliness ❖ Develop online booking system	❖ Employee absentee rate ❖ Ground crew training on cleaning and refueling procedures
Broadcaster	❖ % increase in total revenues ❖ % increase in operating profit	❖ Sales to new customers ❖ Customer churn rate	❖ Number of broadband contracts cancelled ❖ % of customer requests that are handled with a single call	❖ Number of training hours per employee ❖ % decrease in staff turnover

Chapter 9 – Divisional Transfer Pricing

Transfer pricing:

- Transfer pricing refers to the price charged by one division to another division. Divisions either could be departments within a company or a group companies of a parent organization
- Transfer pricing serves the following utilities:
  - Performance evaluation
  - Employee engagement and compensation
  - Resource allocation
  - Taxation and profit remittance

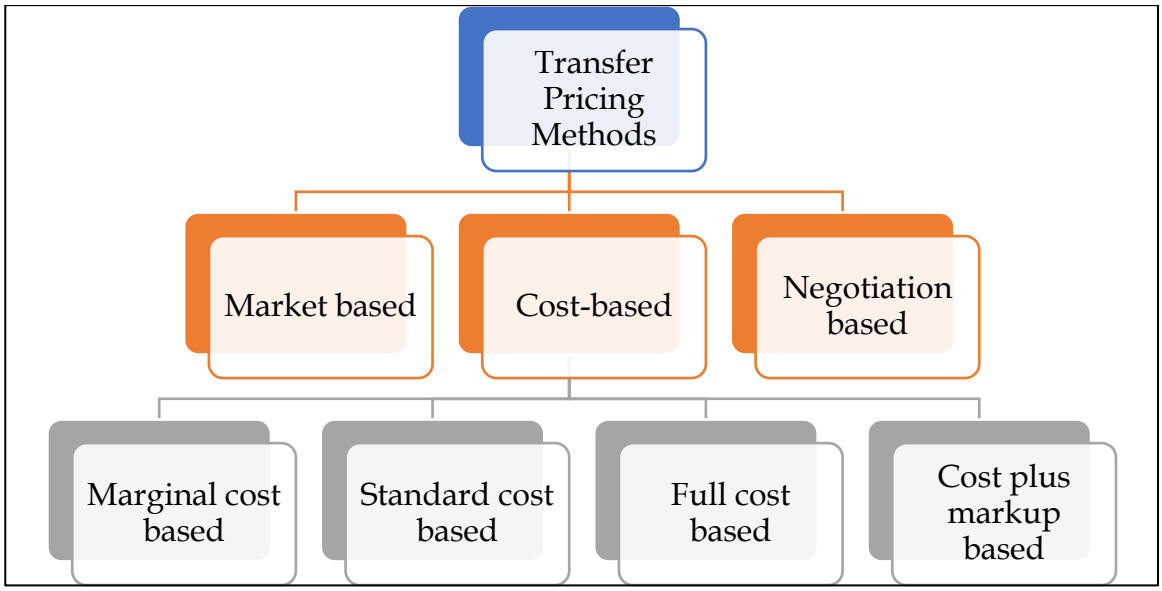
Transfer Pricing and Fair Value:

- Transfer Pricing is often associated with the term "arms-length" price. This implies that the price for inter-divisional transfer has to be fair and competent enough as if dealing with a third party
- Application of concept of arms-length price is more from taxation perspective
- Transfer pricing is revenue from one division and is a cost for other division. The companies should fix the transfer price in such a way that it is a good-deal for both divisions. Hence fair value depends on how each division finds the price compatible with its profit targets

Examples:

Division A produces goods at a cost of Rs.10 p.u. and transfers the goods to Division B which has additional costs of Rs.5 p.u. Division B sells externally at Rs.16 p.u. The company has a policy of setting transfer prices at cost + 20%.

- Profit of each division and the overall profit the company made.
- Write a brief analysis of the results.



Market based transfer price:

- Transfer price is based on market price of good or services adjusted for any costs that can be saved by internal transfer
- **Advantages:**
  - Unbiased,
  - Less ambiguous and cannot be manipulated as compared to cost-plus method and
  - Divisional performance can be measured objectively
- Disadvantages:
  - Market Price may not be completely unbiased due to distress sale scenario or manipulative pricing strategies,
  - Not suitable when market prices have wide fluctuation
  - Not suitable for intermediate goods

Shared profit relative to cost based transfer price:

- Shared profit relative to cost method is an alternative to market price method. In this method the profit of the organization is split on the basis of the amount of value addition by the processes
- Transfer Price = Cost of division + Profit based on value addition
- Profit of supplying division = (Cost of supplying division / Total costs) * Profit of company

Cost based transfer price:

- Cost based pricing models are based on internal cost records of the company. This method can be used when the information on market price is unavailable or if the management wants to benchmark division's performance based on cost targets
- Cost based transfer price may consider variable cost, standard cost, full cost and full cost plus mark-up
- **Advantages:**
  - Performance can be benchmarked against internal cost targets
  - Information is more readily available as compared to market price
- **Disadvantages:**
  - Cost basis on which transfer price is to be fixed can be subjective
  - Since cost is passed on to the next division, there will be little incentive for the supplying division to reduce costs

Method	Basis	Advantages	Disadvantages
Marginal cost based transfer price	TP is calculated based on margin cost (additional cost)	Useful when supplying division has spare capacity	No fixed cost or mark-up is allowed and hence supplying division will not any incentive to do transfer
Standard cost based transfer price	TP is recorded based on pre-determined cost	Performance evaluation can be done against budgeted cost targets	Profit performance measurement is centralized and hence cannot be measured for individual divisions
Full cost based transfer price	TP is based on full cost of goods which will also include fixed costs	Full cost of goods is transferred and hence supplying division will not show loss	No mark-up is charged and hence supplying division will not have any incentive to do transfer as the transfer will not add to profit
Cost plus a mark-up based transfer price	TP is based on full cost plus mark-up. Mark-up can be a percent of cost or capital employed	Supplying division makes profit and hence this addresses the disincentive problem of supplying division	Under this method TP may be nearer to the market price. However there are cost savings on internal transfer and the same should be factored in while fixing TP

Negotiation based transfer price:

- Under this method managers of supplying and receiving division independently negotiate and arrive at a mutually agreeable transfer price
- **Advantage:** Managers are given full autonomy to decide whether to purchase from its sister unit or source from external market
- **Disadvantage:** Information on external market price, cost price , terms of trade etc. is required to negotiate a reasonable price

Transfer Pricing and Goal Congruence:

- Internal transfer pricing develops a competitive setting for managers of each division, it is possible that they may operate in the best interest of individual performance. This can lead to sub-optimal capacity utilization of resources
- Transfer pricing policy may be established to promote goal congruence and the same is presented below:

Minimum Transfer Price	❖ Additional outlay cost per unit + Opportunity cost per unit

(determined by supplying division)	❖ Additional outlay cost = Marginal cost + Any additional costs incurred by the supplying division ❖ Opportunity cost = Benefit foregone
Maximum Transfer Price (determined by receiving division)	❖ Lower of Net Marginal Revenue and external purchase price (adjusted for saving/increase in costs) ❖ Net Marginal Revenue = Marginal revenue – Marginal cost of purchasing division

Transfer Pricing Decision under different circumstances:

Supplying division has excess capacity	❖ Minimum Transfer Price = Marginal cost per unit ❖ Maximum Transfer Price = Lower of Net Marginal Revenue and external purchase price
Supplying division operating at full capacity	❖ Minimum Transfer Price = Marginal cost per unit + Opportunity cost per unit ❖ Maximum Transfer Price = Lower of Net Marginal Revenue and external purchase price

Proposal for resolving transfer pricing conflict:

Conflict of interest between interests of individual divisions and the company can also be addressed by following the following systems for transfer pricing:

- **Dual Rate Transfer Pricing System:** Supplying division can record transfer price by including a normal profit margin whereas purchasing division will record the same at cost. This will allow for better evaluation of each division's performance and can promote goal congruence. However this can complicate the accounting records and it will lead to scenario of showing artificial profits which can be used only for internal evaluation
- **Two part transfer pricing system:** Under this method transfer price is equal to marginal cost of production + Lump-sum charge (two parts to pricing). Under this method, supplying division will be able to recover entire marginal cost and the lump-sum portion will contribute to recovery of fixed cost. Similarly the purchasing division can purchase the goods at a lower rate compared to the market price

International Transfer Pricing:

- Transactions between divisions of multi-national companies can involve transfer of goods, provision of services or use of intangible assets involving royalty payments
- Taxation, profit repatriation and transfer prices are critical considerations to the senior management of multi-national companies
- Multi-national organizations try to maximize profits by using transfer pricing as a tool to reduce the tax impact on earnings.
- Where, the supplying division is in a country with higher tax rate, the transfer price will be set lower in-order to reflect higher earnings (resulting from lower purchase cost) in the purchasing division, which has a lower tax rate.
- Likewise, supply from lower tax rate countries may be priced higher, in order to reflect higher earnings for that unit, thereby reducing the tax impact
- Furthermore profits can also be impacted by currency movements. A multinational company might be keen to set transfer prices in a currency such that any currency losses arise in the subsidiary in the high-tax country, and currency profits arise in the country with the lower tax rate if it is fairly - certain about exchange rate movement in the future

Practical problems/ case studies/ important questions:

1. **Transfer pricing on opportunity cost basis [Category A – Nov 2015 RTP]**

Division Z is a profit center which produces four products A, B, C and D. Each product is sold in the external market also. Data for the period is:

	A	B	C	D
Market price per unit (Rs.)	150	146	140	130
Variable cost of pdn. Per unit (Rs.)	130	100	90	85

Labour hours required per unit	3	4	2	3

Product D can be transferred to division Y, but the maximum quantity that may be required for transfer is 2,500 units of D.

The maximum sales in the external market are:

A	2800 units
B	2500 units
C	2300 Units
D	1600 Units

Division Y can purchase the same product at a price of Rs. 125 per unit from outside instead of receiving transfer of product D from Division Z. What should be the transfer price for each unit for 2,500 units of D, if the total labour hours available in division Z are 20,000 hours?

Answer:

WN 1: Statement of ranking:

Particulars	**A**	**B**	**C**	**D**
Selling Price	150	146	140	130
Less: Variable cost	130	100	90	85
Contribution	20	46	50	45
No of hours	3	4	2	3
Contribution per hour	6.67	11.5	25	15
Rank	IV	III	I	II

WN 2: Statement of allocation:

- Division Z has 20,000 hours for allocation. The same would not be sufficient for meeting external demand and hence allocation will be done as per statement of ranking
- Division Y has asked for 2,500 units and the same would consume 7,500 hours. We would now prepare statement of allocation for 20,000 hours and statement of allocation for 12,500 hours. The difference in contribution between these two statements would give the opportunity cost for transfer

Statement of allocation for 20,000 hours:

Product	**Units**	**Hours per unit**	**Hours consumed**	**Total contribution**
C	2,300	2	4,600	1,15,000
D	1,600	3	4,800	72,000
B	2,500	4	10,000	1,15,000
A	200	3	600	4,000
Total			**20,000**	**3,06,000**

Statement of allocation for 12,500 hours:

Product	**Units**	**Hours Per Unit**	**Hours Consumed**	**Total Contribution**
C	2,300	2	4,600	1,15,000
D	1,600	3	4,800	72,000
B	775	4	3,100	35,650
Total			**12,500**	**2,22,650**

- Opportunity cost for transfer = 3,06,000 -2,22,650 = 83,350
- Opportunity cost per unit = 83,350/2,500 = Rs.33.34 per unit

WN 3: Fixation of transfer price

Minimum Transfer Price	VC + OC	85 + 33.34	Rs.118.34 per unit
Maximum Transfer Price	Outside purchase price ± change in cost		Rs.125 per unit

2. Transfer pricing (Category A – Nov 2019 RTP)

A manufacturer has two divisions, Division A and Division B. Division B produces components that are used by both Division A as well as external customers. Division A gets its entire requirement for the component from Division B. The annual production capacity of Division B is 100,000 units. The division operates at full capacity, with no inventory at the beginning and end of the year. It sells its components to

external customers at ₹4,000 per unit. Variable cost of production for the component is ₹2,750. Internally, it transfers it components to Division A factoring any opportunity cost in the form of lost sales. Total sales of Division B were ₹36 crores, of which sales to external customers was ₹20 crores.

As per company policy, demand from Division A has priority over external customers. This year, there was an additional demand from external customers for 18,000 components. However, since Division B operated at full capacity, this demand was not catered to.

Required

(i) ANALYZE the Sales in terms of ₹ and units made by Division B to both external and internal customers.
(ii) RECOMMEND the transfer pricing range that would promote goal congruence between Divisions A and B.
(iii) DISCUSS the effect of changes in external demand on the transfer price for the company, assuming the current policy continues.

Answer:

(i) Sales Analysis of Division B

Particulars	Calculation	Amount
Value of sales		**36,00,00,000**
External sales		20,00,00,000
External selling price		4,000
External units sold	**20,00,00,000/4,000**	**50,000**
Total capacity		1,00,000
Internal transfer	1,00,000 – 50,000	50,000
Transfer price	(36 crores – 20 crores)/50,000	3,200

Note: How transfer price of 3,200 has been fixed?

Transfer Price	$\frac{\textbf{Variable cost + Opporunity cost}}{\textbf{Units transferred}}$	$\frac{(50{,}000 \times 2{,}750) + (18{,}000 \times 1{,}250)}{50{,}000}$	3,200

- Division B loses external demand of 18,000 units and hence opportunity cost has been calculated only for 18,000 units

(ii) Transfer Price Range for Divisions A and B

- Division A procures its entire demand of 50,000 units from Division B. Out of this, 18,000 units at market price of ₹4,000 per unit while 32,000 units are procured at a lower rate of ₹2,750 per unit. **Had Division A procured 32,000 units from the market, the additional cost of procurement would be ₹4 crores {(External price of ₹4,000 per unit less internal transfer price at variable cost of ₹2,750 per unit) ×32,000 units}.** Only Division A currently enjoys this benefit of lower procurement cost. Financials of Division B show no profit from such internal transfers. This may skew the performance assessment of the divisions, if it is based primarily on financial metrics of each division. In order, promote goal congruence, some portion of this benefit can be shared with Division B.
- Division B will at the minimum want to recover its variable cost of ₹2,750 per unit, while Division A will be ready to pay only up to external market price of ₹4,000 per unit. **Therefore, transfer price range can be set between ₹2,750 - ₹4,000 per unit. Division A enjoys lower procurement rate while Division B financial reflect some benefit of transferring components internally to Division A.**

(iii) Impact of External Demand on Transfer Price

- As per the company's transfer pricing policy, Division B gives priority to demand from Division A. The division has a production capacity of 100,000 units annually. If there is no external market for Division B's components, then transfer price for the entire internal transfer would be the variable cost of ₹2,750 per unit plus portion of the fixed cost (if any). This is the minimum cost that Division B would like to recover from Division A.
- **When there is an external market, transfer price would depend on whether Division B had to incur any opportunity in the form of lost sales.** When total demand (internal and external) is within production capacity of 100,000 units, the entire demand can be met. There would be no lost sales for Division B, no opportunity cost. Therefore, transfer price for the entire internal transfer would be the variable cost of ₹2,750 per unit. This is the minimum cost that Division B would like to recover from Division A.

- **When there is an external market, such that total demand (internal and external) is more than production capacity of 100,000 units, due to priority given to internal transfer, some portion of the external demand might not be met.** This would be lost sales for Division B, opportunity cost would be the contribution lost from such sales at ₹1,250 per unit. This opportunity cost would be passed onto Division A. **As explained in part (ii) above, transfer price range will be from ₹2,750 - ₹4,000 per unit. More lost sales for Division B would keep the average transfer price higher towards ₹4,000 per unit. Lesser lost sales for Division B would keep the average transfer price towards the lower bound of ₹2,750 per unit. Therefore, the proportion of external demand that could not be catered to, would determine the average transfer price. Higher the demand from external customers would drive up the average transfer price within the company.**

3. Transfer Pricing [Category A]

A company has two divisions A and B, making products A and B respectively. One unit of A is an input for each unit of B. B has a production capacity of 45,000 units and ready market. Other information available regarding Division A are:

Capacity (production units)	50,000
Maximum External Sales	30,000
Fixed Cost upto 30,000 units. Beyond 30,000 units- It increases by 50,000 for every additional 10,000 units	430,000
Variable Manufacturing Cost p.u.	55
Variable Selling Cost p.u. (external sales)	10
Variable Selling Cost p.u. (special order/ transfer to B)	5
Selling Price p.u. (external market)	80
Selling Price (special sales)	70

B can buy the input A from outside at a slightly incomplete stage at ₹45 p.u. and will incur subcontracting charges of ₹30 p.u. to match it to the stage at which it receives goods from Division A. Division B is willing to pay a maximum of ₹75 p.u. if Division A supplies its entire demand of 45,000 units. If Division A supplies lesser quantity, Division B is willing to pay only ₹70 p.u.

Division A has also received a special order for 15,000 units which it needs to either accept in full or reject. Division A may choose to avoid variable selling cost of ₹5 p.u. on transfer to B or special order, by incurring a fixed overhead of ₹50,000 p.a. instead.

(i) What is the best strategy for Division A? Show the profitability of that option.

(ii) What will the range of transfer price be under if the best strategy is chosen?

Answer:

(i) What is the best strategy for Division A?

With a production capacity of 50,000 units, Division A has to find an optimum mix of sales between external sales, internal transfer to Division B and special order. Division B requires 45,000 units. Division A can supply the entire 45,000 units to Division B for which transfer price is Rs.75 p.u. or can supply lower quantity for which transfer price is Rs.70 p.u.

As production increases, certain cost components would also change. Changes to cost of production and selling expenses are discussed below.

1) Selling expenses:

It is given that for special orders or internal transfers, Division A can either bear a variable selling cost of Rs.5 p.u. or choose to incur a fixed cost of Rs.50,000 p.a.

Working out the indifference point, the selling cost will be the same at 10,000 units (at what point will No. of units × Rs.5 = Rs.50,000; No. of units = 10,000). For any transfer or sale below 10,000 units, it makes sense

to bear the variable cost of Rs.5 p.u. Over 10,000 units it makes sense to bear the fixed cost of Rs.50,000.

Even If Division A chooses to cater entirely to external sales of 30,000 units, the balance 20,000 units will be used to cater to either the special order or as internal transfer to Division B or can even be both (special order 15,000 units and internal transfer 5,000 units). Since in any case sale will be more than 10,000 units, Division A can opt to bear the fixed cost of Rs.50,000.

2) Since A is working at full capacity i.e. 30,000 units are produced. Fixed cost is Rs.430,000 that would increase by Rs.50,000 for every extra 10,000 units produced over 30,000 units. Hence total fixed cost will be 530,000.

To arrive at the optimum mix, Division A will calculate the contribution received per unit under the various options.

Statement of contribution per unit:

Particulars	External Sale Upto 30,000 units	Special Order 15,000 units	Transfer to B < 45,000 units	Transfer to B 45,000 units
Selling Price	80	70	70	75
Less: Variable manufacturing cost	55	55	55	55
Less: Variable selling & distribution OH	10	0	0	0
Contribution	**15**	**15**	**15**	**20**

Hence, transfer to division B of 45,000 units yields the highest contribution. This leaves a balance capacity of 5,000 units with Division A, whose maximum capacity is given to be 50,000 units. This is insufficient to meet the special order of 15,000 units. Hence, Division A will utilize the balance 5,000 units to cater to external sales. Therefore, the optimum production mix would be: Transfer to Division B 45,000 units and external sales 5,000 units.

Profitability statement of Division A

Particulars	Amount
Contribution from	
(a) Transfer to Division B (45,000 units × Rs.20)	9,00,000
(b) External Sales (net of selling expense) (5,000 units × Rs.15)	75,000
Total contribution from sales (A)	**9,75,000**
Manufacturing Fixed Cost	5,30,000
Selling Fixed Cost	50,000
Total Fixed Costs (B)	**5,80,000**
Profit earned (A-B)	**3,95,000**

(ii) Range of transfer price under the best strategy.

Fixation of minimum transfer price (Division A Point of View):

- Division A will opt for external sales of 30,000 units and special order of 15,000 units in case transfer does not happen
- Normal sales will give contribution of Rs.15 per unit whereas special sales also provide contribution of Rs.15 per unit
- If the company opts for transfer of 45,000 units then usage of capacity is as under
  - 45,000 units for transfer and
  - Balance 5,000 units of external sales
- **Opportunity cost due to transfer:**
  - Company will have to lose special sales of 15,000 units and normal sales of 25,000 units
  - Total opportunity cost = (15,000 x 15) + (25,000 x 15) = Rs.6,00,000
- **Minimum Transfer Price = 55 + (6,00,000/45,000) = 55 + 13.33 = Rs.68.33**

Maximum Transfer Price Division B is willing to pay (given) = Rs.75 This would be range in which Transfer

Price will be negotiated.

4. Transfer pricing under different scenarios [Category A]

Centurion Co. operates a Pulp Division that manufactures Wood Pulp for use in production of various paper goods. The following information are available:

Particulars	Amount
Selling Price	210
Less: Variable Expenses	126
Contribution	84
Less: Fixed Expenses (based on a capacity of 1,00,000 kgs per year)	54
Net Income	30

Centurion Co. has just acquired a small company that manufacturers paper cartons. This company will be treated as a division of Centurion with full profit responsibility. The newly formed Carton Division is currently purchasing 10,000 kgs of pulp per year from supplier at a cost of Rs.210 per kg less a 10% quantity discount. Centurion's President is anxious that the Carton Division begins purchasing its pulp from the Pulp Division if an acceptable transfer price can be worked out.

Situation I

If the Pulp Division is in a position to sell all of its pulp to outside customers at the normal price of Rs.210 per kg, will the Managers of the Carton and Pulp Division agree to transfer 10,000 kgs of pulp next year at a determined price? EXPLAIN with reasons.

Situation II

Assuming that the Pulp Division is currently, selling only 60,000 kgs of pulp each year to outside customers at the stated price of Rs.210 per kg will the Managers agree to a mutually acceptable transfer price for 10,000 kgs of pulp in next year? EXPLAIN with reasons.

Situation III

If the outside supplier of the Carton Division reduces its price to Rs.177 per kg, will the Pulp Division meet this price? EXPLAIN. If the Pulp Division does not meet the price of Rs.177 per kg, what will be the effects on profits of the company as a whole?

Answer:

WN 1: Analysis of situation 1:

- **Minimum transfer price:** Pulp division has been currently selling its products to outside customers at price of Rs.210 per kg. There is no idle capacity available. Hence it will lose Rs.84 per unit transferred to carton division. Minimum transfer price = Variable cost + Opportunity cost; Minimum transfer price = 126 + 84 = Rs.210 per kg
- **Maximum transfer price:** Maximum transfer price is calculated from carton division point of view. Carton division would not be willing to pay anything more than its outside purchase price. Carton division has been buying wood pulp at Rs.189 per kg and hence the maximum transfer price can be Rs.189 per kg
- **Conclusion:** The requirements of the two divisions are incompatible. The Carton Division won't pay more than Rs.189 and the Pulp Division will not accept less than Rs.210. Thus, there can be no mutually agreeable transfer price and no transfer will take place

WN 2: Analysis of situation II

- **Minimum transfer price:** Pulp division has demand for only 60,000 kgs and hence it has idle capacity of 40,000 kgs. Carton division has requested for 10,000 kgs of wood pulp. Hence there is no opportunity cost in transfer. Minimum transfer price = Variable cost + Opportunity cost; Minimum transfer price = 126 + 0 = Rs.126 per kg
- **Maximum transfer price:** Maximum transfer price is calculated from carton division point of view. Carton division would not be willing to pay anything more than its outside purchase price. Carton division has been buying wood pulp at Rs.189 per kg and hence the maximum transfer price can be Rs.189 per kg
- **Conclusion:** Transfer will happen in this scenario and the ideal transfer price range is Rs.126 to Rs.189 per kg

WN 3: Analysis of situation III:

- Scenario remains same as situation II and hence Rs.177 is an ideal transfer price as it falls within the range of Rs.126 to Rs.189 per kg
- If the Pulp Division does not meet the Rs.177 price, it will lose Rs.5,10,000 in potential profits. Loss in profits = 10,000 x (177 – 126) = Rs.5,10,000

5. Pricing decision [Category A – May 2018 RTP]

Eastern Company Ltd. has two Divisions namely Casnub Bogie Division (CBD) and Wagon Division (WD). CBD manufactures Casnub Bogies and WD manufactures BOBN type of Wagons. To manufacture a Wagon WD needs four Casnub Bogies. CBD is the only manufacturer of the Casnub Bogies and supplies both WD and outside customers. Details of CBD and WD for the coming financial year 2014-15 are as follows:

	CBD	WD
Fixed costs (Rs.)	9,20,20,000	16,45,36,000
Variable cost per unit (Rs.)	2,20,000	4,80,000 *
Capacity per month (units)	320	12

* excluding transfer costs

Market research has indicated that the demands in the market for Eastern Company Ltd.'s products at different quotations are as follows-

For Casnub Bogies: Quotation price of Rs.3,20,000 no tender will be awarded, but demand will increase by 30 Casnub Bogies with every Rs.10,000 reduction in the unit quotation price below Rs.3,20,000.

For Wagons: Quotation price of Rs.17,10,000 no tender will be awarded, but the demand for Wagons will be increased by two Wagons with every Rs.50,000 reduction in the unit quotation price below Rs.17,10,000.

Required

- Calculate the unit quotation price of the Wagon that will maximise Eastern Company Ltd.'s profit for the financial year 2014-15.
- Calculate the unit quotation price of the Wagon that is likely to emerge if the divisional managers of CBD and WD both set quotation prices calculated to maximise divisional profit from sales to outside customers and the transfer price is set at market selling (quotation) price.

[Note: If P = a – bQ then MR = a – 2bQ]

WN 1: Calculation of optimum sale price of Wagons if transfer price is fixed at variable cost:

Price at which no sale will happen	17,10,000
Price equation (a -bQ)	17,10,000 – (50,000Q/2)
Marginal Revenue (a-2bQ)	17,10,000-50,000Q
Marginal Cost	13,60,000 [4,80,000 + 2,20,000x4]
Optimum quantity (arrived by equating MR with MC)	7 17,10,000 – 50,000Q = 13,60,000 3,50,000 = 50,000Q Q = 7
Optimum Price (arrived by substituting in price equation	15,35,000 Price = 17,10,000 – 25,000(7)

WN 2: Calculation of optimum sale price of Casnub bogies:

Price at which no sale will happen	3,20,000
Price equation (a -bQ)	3,20,000-(10,000Q/30)
Marginal Revenue (a-2bQ)	3,20,000-(20,000Q/30)
Marginal Cost	2,20,000
Optimum quantity (arrived by equating MR with MC)	150 3,20,000-(20,000Q/30) = 2,20,000 1,00,000 = 20,000Q/30 Q = 150

Optimum Price (arrived by substituting in price equation	2,70,000 Price = 3,20,000 – 10,000(150)/30

WN 3: Calculation of optimum sale price of Wagons if transfer price is fixed at Market Price:

Price at which no sale will happen	17,10,000
Price equation (a -bQ)	17,10,000 – (50,000Q/2)
Marginal Revenue (a-2bQ)	17,10,000-50,000Q
Marginal Cost	15,60,000 [4,80,000 + 2,70,000x4]
Optimum quantity (arrived by equating MR with MC)	3 17,10,000 – 50,000Q = 15,60,000 1,50,000 = 50,000Q Q = 3
Optimum Price (arrived by substituting in price equation	16,35,000 Price = 17,10,000 – 25,000(3)

6. Issues in fixing transfer price [Category A]

Global Multinational Ltd. (GML) has two Divisions 'Dx' and 'Dz' with full profit responsibility. The Division 'Dx' produces Component 'X' which it sells to 'outside' customers only. The Division 'Dz' produces a product called the 'Z' which incorporates Component 'X' in its design. 'Dz' Division is currently purchasing required units of Component 'X' per year from an outside supplier at market price. New CEO for Indian Operations has explored that 'Dx' Division has enough capacity to meet entire requirements of Division 'Dz' and accordingly he requires internal transfer between the divisions at marginal cost from the overall company's perspective.

Manager of Division 'Dx' claims that transfer at marginal cost are unsuitable for performance evaluation since they don't provide an incentive to the division to transfer goods internally. He stressed that transfer price should be 'Cost plus a Mark-Up'.

New CEO worries that transfer price suggested by the manager of Division 'Dx' will not induce managers of both Divisions to make optimum decisions.

You are requested to help him out of the problem.

Answer:

To overcome the optimum decision making and performance evaluation conflicts that can occur with marginal cost-based transfer pricing following methods has been proposed:

Dual Rate Transfer Pricing System

"With a 'Dual Rate Transfer Pricing System' the 'Receiving Division' is charged with marginal cost of the intermediate product and 'Supplying Division' is credited with full cost per unit plus a profit margin".

Accordingly Division 'Dx' should be allowed to record the transactions at full cost per unit plus a profit margin. On the other hand Division 'Dz' may be charged only marginal cost. Any inter divisional profits can be eliminated by accounting adjustment.

Impact:

- Division 'Dx' will earn a profit on inter-division transfers.
- Division 'Dz' can chose the output level at which the marginal cost of the product 'X' is equal to the net marginal revenue of the product 'Z'

Two Part Transfer Pricing System

"The 'Two Part Transfer Pricing System' involves transfers being made at the marginal cost per unit of output of the 'Supplying Division' plus a lump-sum fixed fee charged by the 'Supplying Division' to the 'Receiving Division' for the use of the capacity allocated to the intermediate product."

Accordingly Division 'Dx' can transfer its products to Division 'Dz' at marginal cost per unit and a lump-sum fixed fee.

Impact:

- ❖ 'Two Part Transfer Pricing System' will inspire the Division 'Dz' to choose the optimal output level.

This pricing system also enable the Division 'Dx' to obtain a profit on inter-division transfer.

7. Transfer Pricing [Category A – May 2018(exam)]

GL Ltd. is a multiproduct manufacturing concern functioning with four divisions. The Electrical Division of the company is producing many electrical products including electrical switches. The division functions at its maximum capacity sells its switches in the open market at Rs.25 each. The variable cost per switch to the division is Rs.16.

The Household Division, another division of GL Limited, functioning at 70% capacity asked the Electrical Division to supply 5000 switches per month at the rate of Rs.18 each to fit in night lamps produced by it. The total cost per night lamp is being estimated as below:

Particulars	Amount
Component purchased from outside suppliers	Rs.50.00
Switch if purchased internally	Rs.18.00
Other variable cost	Rs.40.00
Fixed overheads	Rs.21.00
Total cost per night lamp	Rs.129.00

The Household Division is marketing night lamps at a price of Rs.130 each, with a very small margin, as it is doing business in a very competitive environment. Any increase in price made by the division will push out the division from the market. Therefore, the division can not pay anything more to switches if they are supplied by the Electrical Division. Further, the manager of the division informed that it is very much essential to keep on the market share for night lamps by the Household Division to retain the experience workers of the division. The company is using Return on investments (ROI) as a scale to measure the divisional performances and also marginal costing approach for decision making.

Required:

(i) Would you recommend the supply of switches to Household Division by Electrical Division at a price of Rs.18 each? Substantiate your recommendation with suitable reasons

(ii) Analyze whether it would be beneficial to the company as a whole the supply of switches to Household Division at a unit price of Rs.18 by Electrical Division

(iii) Do you feel that the Divisional managers should accept the inter-divisional transfers in principle? If yes, what should be the range of transfer price?

(iv) Suggest the steps to be taken by the chief executive of the company to change the attitude of divisional heads if they are against the inter-division transfers.

Answer:

(i) Electrical Division is operating at full capacity and selling its switches in the open market at Rs.25 each. Therefore, it can transfer its production internally by giving up equal number of units saleable in the open market. In this situation, transfer price should be based on variable cost plus opportunity cost {Rs.16 + (Rs.25 - Rs.16)} = Rs.25/-.

As the price quoted by Household Division Rs.18 is less than the transfer price based on opportunity cost, the Electrical Division should not accept internal transfer. Fur ther, the company is measuring divisional performances based on ROI. Therefore, transferring for a price which is less than the minimum price would affect the return on investments and divisional performance severely.

(ii) In the total cost per night lamp, the Fixed Overheads being a fixed cost is not relevant for decision making. Similarly, the variable cost of switch (Rs.16 p.u.) included in the cost of night lamp is also irrelevant as it is common for both internal and external transfers. The only relevant cost is the loss of revenue when units are transferred internally.

Accordingly, the benefit from internal transfer would be {Rs.130 - (Rs.50 + Rs.40) - Rs.25) =Rs.15/- on each unit sale on night lamp. Therefore, it is beneficial to the company as a whole to the extent of Rs.15 per unit of night lamp sold.

Hence, internal transfer is profitable to the company as a whole. Further, Household Division is operating at 70% capacity and has experienced workers which may be utilized for other divisions requirements if any and based on contribution earned fixed cost could be minimized due to large scale of production.

(iii) Internal transfer pricing develops a competitive setting for managers of each division, it is possible that they may operate in the best interest of their individual performance. This can lead to sub-optimal utilization of resources. In such cases, transfer pricing policy may be established to promote goal congruence. The market price of Rs.25 per switch leaves Electrical Division in an identical position to sale outside. Thus, Rs.25 is top of the price range. Division Household will not pay to Electrical Division anything above (Rs.130 - Rs.50 - Rs.40) = Rs.40/-. The net benefit from each unit of night lamp sold internally is Rs.15. Thus, any transfer price within the range of Rs.25 to Rs.40 per unit will benefit both divisions. Divisional Managers should accept the inter divisional transfers in principle when the transfer price is within the above range.

(iv) Transfer at marginal cost are unsuitable for performance evaluation since they do not provide an incentive for the supplying division to transfer goods and services internally. This is because they do not contain a profit margin for the supplying division. Chief Executive's intervention may be necessary to instruct the supplying division to meet the receiving division's demand at the marginal cost of the transfers. Thus, divisional autonomy will be undermined. Transferring at cost plus a mark-up creates the opposite conflict. Here the transfer price meets the performance evaluation requirement but will not induce managers to make optimal decisions.

To resolve the above conflicts the following transfer pricing methods have been suggested:

Dual Rate Transfer Pricing System

The supplying division records transfer price by including a normal profit margin thereby showing reasonable revenue. The purchasing division records transfer price at marginal cost thereby recording purchases at minimum cost. This allows for better evaluation of each division's performance. It also improves co-operation between divisions, promoting goal congruence and reduction of sub-optimization of resources.

Two Part Transfer Pricing System

This pricing system is again aimed at resolving problems related to distortions caused by the full cost based transfer price.

Here, transfer price = marginal cost of production + a lump-sum charge (two part to pricing).

While marginal cost ensures recovery of additional cost of production related to the goods transferred, lump-sum charge enables the recovery of some portion of the fixed cost of the supplying division. Therefore, while the supplying division can show better profitability, the purchasing division can purchase the goods at lower rate compared to the market price

8. Transfer Pricing (NOV 2019 EXAM):

APC Ltd. has two divisions- Division X and Division Y with full profit responsibility. Division X produces components 'Gex' which is supplied to both division Y and external customers. Division Y produces a product called 'Gextin' which incorporates component 'Gex'. For one unit of 'Gextin' two units of component 'Gex' and other materials are used. Till date, Division Y has always bought component 'Gex' from division X at Rs. 50 per unit since the lowest price at which the component 'Gex' could have been bought by Division Y was Rs. 52 per unit. Division X charges the same price for component 'Gex' to both division Y and external customers. However, it does not incur selling and distribution costs when transferring internally. Division Y has received a proposal from a new supplier who has offered to supply component 'Gex' for Rs. 47 per unit at least for the next three years. Manager of Division Y requests the manager of Division X to supply component 'Gex' at or below, Rs. 47 per unit. Manager of Division X is. not ready to reduce the transfer price since the divisional performance evaluation is done based on profit margin ratio of the division

The following additional information is made available to you:

Particulars	Component 'GEX'	Product 'GEXTIN'
Selling Price	50	180
Less: Variable costs		
Direct material		
Component GEX	0	100
Other materials	12	22
Direct Labour	16	13
Manufacturing Overhead	2	5
Selling and Distribution Costs	4	2
Contribution per unit	34	38
Annual fixed costs	40,00,000	20,00,000
Annual external demand	3,00,000	1,20,000
Capacity of Plant	5,00,000	1,50,000

Required:

- CALCULATE the present profit of each division and the company as a whole.
- ANALYSE the impact on the total annual profits of each division and the company as a whole if Division Y accepts the offer of the new supplier.
- In the changed scenario, DISCUSS why the top management should intervene and advise a suitable transfer price for component 'Gex' for resolving transfer pricing conflict which promotes goal congruence through efficient performance of the concerned division.

Answer:

WN 1: Computation of present profit:

Particulars	Division X			Division Y	Total
	Internal	External	Total		
Selling Price	50	50	-	180	-
Variable cost per unit	30	34	-	142	-
Contribution per unit	20	16	-	38	-
Number of units	2,40,000	2,60,000	5,00,000	1,20,000	-
Total contribution	**48,00,000**	**41,60,000**	**89,60,000**	**45,60,000**	**1,35,20,000**
Less: Fixed cost			-40,00,000	-20,00,000	-60,00,000
Profit			**49,60,000**	**25,60,000**	**75,20,000**

Note:

- Division Y produces 1,20,000 units of Gextin. Each component of Gextin requires 2 components of Gex that it currently procures from Division X. Therefore, it procures 2,40,000 units of Gex from Division X annually.
- Division X has an overall capacity of 5,00,000 units annually to produce Gex. Of this it produces 2,40,000 units for Division Y, which it must first cater to. The remaining 2,60,000 units of Gex is sold to external customers

WN 2: Revised profit if offer from external supplier is accepted:

Particulars	Division X			Division Y	Total
	Internal	External	Total		
Selling Price	-	50	-	180	-
Variable cost per unit	-	34	-	139	-
Contribution per unit	-	16	-	44	-
Number of units	-	3,00,000	3,00,000	1,20,000	-
Total contribution	**-**	**48,00,000**	**48,00,000**	**52,80,000**	**1,00,80,000**
Less: Fixed cost			-40,00,000	-20,00,000	-60,00,000
Profit			**8,00,000**	**32,80,000**	**40,80,000**

Analysis:

Impact on company:

Overall profitability of APC Ltd. reduces from Rs.75,20,000 per annum to Rs.40,80,000 per annum. The reduction in profit is therefore Rs.34,40,000 per annum. Reasons are:

- The cost of manufacturing Gex is only Rs.30 per unit while Division Y is procuring this at Rs.47 per unit from an external supplier. Annually this results in a loss of Rs.40,80,000 (240,000 units of Gex×Rs.17 per unit).
- Since Division X no longer makes Gex for internal sales, it can ramp up its external sales to meet the full annual demand of 300,000 units. This results in extra external sales of 40,000 units annually. Each unit gives a contribution of Rs.16 per unit. Therefore, additional contribution from sale of 40,000 units of Gex to external customers is Rs.640,000 per annum.
- Therefore, netting both (a) and (b) above, the net loss to the company is Rs.34,40,000 per annum.

Impact on Division Y:

Impact on profit of Division Y, increase from Rs.25,60,000 per annum to Rs.32,80,000 per annum that is Rs.7,20,000 per annum increase. This is due to the savings in procurement cost of Gex for Division Y. Instead of procuring Gex at Rs.50 per unit Division Y proposes to buy it at Rs.47 per unit externally. For its annual demand of 2,40,000 units of Gex, it translates to savings of Rs.7,20,000 annually in procurement cost for Division Y.

Impact on Division X:

Impact on profit of Division X, reduction from Rs.49,60,000 per annum to Rs.8,00,000 per annum. A substantial reduction of Rs.41,60,000 in its divisional profit per year. Division X earns a contribution of Rs.20 per unit of Gex from its internal transfer to Division Y. (Selling price Rs.50 per unit less variable cost of manufacturing Rs.30 per unit). If Division Y procures Gex externally, this would result in an annual loss of Rs.48,00,000 in contribution for Division X (240,000 units ×Rs.20 per unit). However, due to additional external sales of 40,000 units of Gex, Division X can earn an additional contribution of Rs.6,40,000 per year (40,000 units of Gex × Rs.16 contribution per unit of external sale). Offsetting, this results in a lower contribution of Rs.41,60,000 per annum for Division X.

This also results in excess capacity of 2,00,000 units per annum in Division X.

WN 3: Fixation of suitable transfer price:

APC Ltd. can suffer a loss of Rs.34,40,000 per annum if Division Y decides to procure Gex from the external supplier. It costs on Rs.30 per unit to manufacture Gex internally as compared to Rs.47 per unit that Division Y is willing to pay to the external supplier. However, Division X is unwilling to reduce the price from Rs.50 per unit since divisional performance is done based on the profit margin ratio of the division. Therefore, the management of the company has to step in to promote goal congruence. If Division Y buys GEX from the external supplier, not only is it costly for the company, it also results in a lot of unused capacity lying idle in Division X.

In the current scenario, one possible way of arriving at an acceptable transfer price range could be:

Minimum Transfer Price (Division X):

Division X is currently working at full capacity of 5,00,000 units per annum. Of this production, 2,40,000 units is supplied internally to Division Y while the balance is supplied to external market. The marginal cost of production of Gex is Rs.30 per unit. If this were sold externally, it would earn a contribution of Rs.16 per unit. Therefore, the minimum transfer price the Division X would demand = marginal cost of production per unit + opportunity cost per unit = Rs.30 + Rs.16 = Rs.46 per unit of Gex.

Maximum Transfer Price (Division Y):

Division Y will be willing to pay the lower of net marginal revenue or the external buyin price.

- The Net Marginal Revenue per unit of Gextin = Selling price per Gextin – (marginal cost for Division Y other than the cost of Gex) = Rs.180 - Rs.42 = Rs.138 per unit of Gextin. This translates

that Division Y will be willing to pay upto Rs.69 per unit of Gex, that it can incur without incurring a divisional loss. Meanwhile, the external buy-in price is Rs.47 per unit.

- Therefore, the maximum price Division Y will be willing to pay = lower of Net Marginal Revenue or external buy-in price = lower of Rs.69 or Rs.47 per unit of Gex. Therefore, Division Y will be willing to pay maximum Rs.47 per unit of Gex to Division X.

Final transfer price range:

Therefore, the transfer price range can be set between Rs.46 - Rs.47 per unit of Gex. Division X would then have to compete with the external supplier to retain its internal sales. This would promote more efficient working between Division X and Y. By selling it at Rs.46 per unit, the contribution of Division X would be maintained at Rs.16 per unit. **For Division Y. the procurement of Gex at Rs.46 per unit would be beneficial since it is lower than the external market price. If transfer price set at external market rate Rs.47 per unit, Division Y would still be able to improve its profit margin as compared to the original transfer price of Rs.50 per unit.**

Given that the marginal cost of manufacturing Gex is only Rs.30 per unit, the management has to ensure that production of Gex is made in-house. Performance measure at a divisional level should then not be restricted to financial performance alone (full profit responsibility) and should be accordingly modified to include nonfinancial / operational measures as well.

Chapter 10 – Strategic Analysis of Operating Income

Profitability Analysis

- Porter in its generic strategy theory has suggested that a firm can **survive profitably in the long term** if it chooses its **generic strategy according to the environment** in which it operates
- A firm would be profitable if it is either a **cost leader** or if it produces its products with some peculiar features which make it different from others.
- To achieve its objectives, it has to put some **performance measurement mechanism** into place so that any deviation can be measured and corrective action can be taken.
- Profitability Analysis can be useful to **measure the performance of a firm against the acceptable standards**.
- Profitability can be analysed as per the requirement of the management, to assist them to identify the critical success factors and to take appropriate decisions.

Strategic Profitability Analysis:

- Operating Profit of a firm is affected by various components which are responsible for changes in the revenue and costs.
- A change in the profit may be due to **revenue or costs or both the factors**.
- For analyzing operating income, we spread our analysis into three main areas or components which are
  - Growth Component
  - Price Recovery Component and
  - Productivity Component.
- **Growth Component** measures the change in **the quantity of output sold**. The growth component of the change in the operating income measures the increase/ decrease in revenue and in costs due to selling more/ less quantity units from the previous period.
- **Price Recovery Component** of change in operating income measures the changes in the revenue and costs solely **due to changes in prices**.
- **Productivity Component** measures the change in the operating income due to changes in the **product mix and/ or yield of inputs** as compared with the last year. This component uses current year's prices of input to measure the changes in costs only.

Profitability Analysis through ABC:

- A well designed and implemented ABC system is a powerful aid to management evaluation and decision making, thereby improving organizational performance.
- In service sector, direct costs are generally low and overheads tend not to be volume related or capable of being easily attributed to product/ service/ customer being supplied.
- In this situation, ABC, with its emphasis on activities and their cost drivers, helps cost to identify more easily and managed more effectively.
- In addition, because the resource consumption by different products, customers or segments of the business is more accurately measured, activity-based profitability analysis is likely to provide more useful information to management.

Direct Product Profitability (DPP):

- A firm which has a portfolio of profitable products enjoys high profitability. However, it is very important to know the relative profitability of an individual product so that management can concentrate on the profitable products and weed out the loss-making products from the products' portfolio.
- Direct Product Profitability is one among the various analytical methods which analyse the profitability for each product or segment of products separately.
- DPP is generally used in the retail trade to determine profitability from an individual product.
- CIMA describe DPP "used primarily within the retail sector, DPP involves the attribution of both the purchase price and other indirect costs (for example distribution, warehousing and retailing) to each product line. Thus, a net profit, as opposed to a gross profit, can be identified for each product. The cost attribution process utilizes a variety of measures (for example

warehousing space and transport time) to reflect the resource consumption of individual products."

Benefits of DPP

- Better cost analysis.
- Better pricing decisions.
- Better management of stores and warehouse space.
- The rationalisation of product ranges.

Direct Product Profitability Statement

- Retail organisations traditionally deducted the bought in cost of goods from the selling price to give a gross margin. A method was needed which relates the indirect costs to the goods according to the way the goods uses or creates these costs.
- Indirect costs, for DPP may be analysed into basic cost categories as follows:
  - Overhead Cost: This is incurred through an activity that is not directly linked to a particular product.
  - Volume Related Cost: The cost is incurred in relation to the space occupied by products. This includes storage and transport costs.
  - Product Batch Cost: This cost is often a time-based cost. If product items (that is a number of identical products which are handled together as a batch) are stocked on shelves a labour time cost is incurred.
  - Inventory Financing Costs: This is the cost of tying up money in stock and is the cost of the product multiplied by interest rate per day or per week.

Customer Profitability Analysis

- In many organisations it is just as important to cost customers as it is to cost products. Different customers or groups of customers differ in their profitability.
- This is a relatively new technique that ABC makes possible because it creates cost pools for activities.
- Customers use some activities but not all, and different groups of customers have different 'activity profiles'. Service organisations, such as a bank or a hotel, in particular need to cost customers.

Benefits of Customer Profitability Analysis

- It helps the supplier to identify which customers are eroding overall profitability and which customers are contributing to it.
- It can help to provide a basis for constructive dialogue between buyer and seller to improve margins.

ABC in Advanced Manufacturing Environment:

- Now a days organizations are adopting just in time manufacturing approach and implementing advanced manufacturing technology. Organization must improve value received by their customers while increasing their own profits simultaneously.
- ABC supports the continuous improvement process by allowing management to gain new insights into activity performance, by focusing attention on the sources of demand for activities and by permitting management to create a behavioral incentive to improve one or more aspects of manufacturing.
- Better assessment of cost behavior, increased accuracy in product costing and an attempt to achieve continuous cost improvement are all critical for advanced manufacturing environment.
- In advanced manufacturing environment, where support function overheads constitute a large share of total costs, ABC provides more realistic and accurate product costing, as traditional volume based costing system does not take into account the Non-unit Level Overhead Costs such as Setup Cost, Inspection Cost, and Material Handling Cost etc.
- Cost Analysis under ABC system shows that while these costs are largely fixed with respect to sales volume, but they are not fixed to other appropriate cost drivers.

- The concepts underlying a relevant costing analysis continue to be completely valid in an advanced manufacturing setting and in a situation where activity based costing is used.

Activity Based Cost Management (ABM):

- The term Activity based management (ABM) is used to describe the Cost Management application of ABC. The use of ABC as a costing tool to manage costs at activity level is known as Activity Based Cost Management (ABM).
- ABM is a discipline that focuses on the efficient and effective management of activities as the route to continuously improving the value received by customers.
- ABM utilizes cost information gathered through ABC. Through various different types of analysis, ABM manages activities rather than resources. It determines what drives the activities of the organisation and how these activities can be improved to increase the profitability.
- Consortium for Advanced Management International (CAM) defines ABM as "adds a dynamic, continuous improvement dimension to the more static ABC model". CAM-1 defines ABM as: "A discipline that focuses on the management of activities as the route to improving the value received by the customer and the profit achieved by providing this value. This discipline includes cost driver analysis, activity analysis, and performance measurement. Activity-Based Management draws on Activity-Based Costing as its major source of information."
- ABM involves the following:
  - Cost Driver Analysis
  - Activity Analysis
  - Performance Analysis

Cost Driver Analysis

- The factors that cause activities to be performed need to be identified in order to manage activity costs. Cost driver analysis identifies these causal factors.
- For Example, a cost driver analysis study might determine that slow processing of customer invoices results largely from lack of training of the customer invoice associates. This lack of training is thus a cost driver of the customer invoice processing activity. The tangible cost savings and intangible benefits from the customer invoice processing improvements should be compared with both the tangible and intangible costs of the new training program in a cost-benefit analysis.
- The hypothetical customer invoice processing example shows that the identification and analysis of cost drivers (causal factors) is a necessary first step toward improving the cost-effectiveness of activities and cost management through ABM.

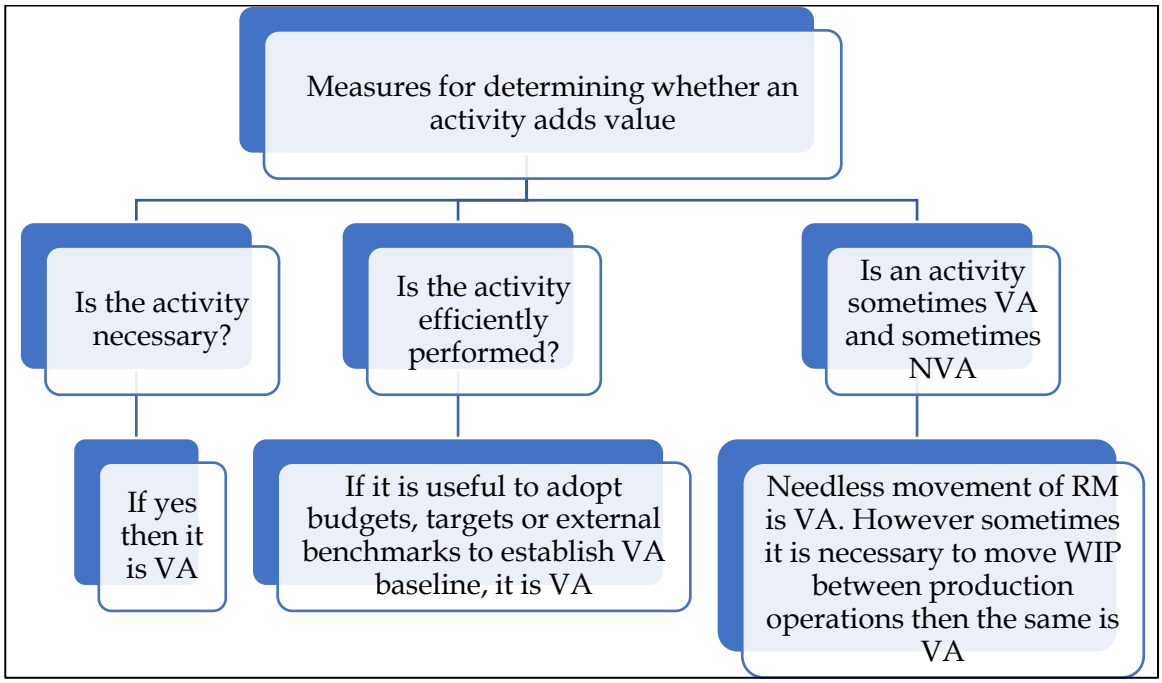
Activity Analysis

- Activity analysis, defined in above section, identifies the activities of an organisation and the activity centres (or activity cost pools) that should be used in an ABC system.
- Activity analysis also identifies Value Added (VA) and Non- Value Added (NVA) activities. The degree to which activities are grouped together into activity centres depends on the costs and benefits of the alternatives.

Performance Analysis

- Performance analysis involves the identification of appropriate measures to report the performance of activity centres or other organisational units, consistent with each unit's goals and objectives.
- Performance analysis aims to identify the best ways to measure the performance of factors that are important to organisations in order to stimulate continuous improvement .

Value Added (VA) Activities / Non-Value Added (NVA) Activities



- ABM classifies each activity within a process as value-added activities or non-value added activities.
- **Value-Added Activities:** The VA activities are those activities which are indispensable in order to complete the process. The customers are usually willing to pay (in some way) for these services.
- **Non-Value-Added Activities:** The NVA activity represents work that is not valued by the external or internal customer. NVA activities do not improve the quality or function of a product or service, but they can adversely affect costs and prices. Non-Value Added activities create waste, result in delay of some sort, add costs to the products or services and for which the customer is not willing to pay.

Ways in which time is spent in manufacturing process:

Process Time	The time during which a product is undergoing conversion activity
Inspection Time	The amount of time spent confirming that the product is of high quality
Move Time	The time spent moving raw materials, WIP or finished goods between operations
Waiting Time	The amount of time that raw material or WIP spend waiting for the next operation
Storage Time	The time during which materials, partially completed units, or finished goods are held in stock before further processing or shipment
Delivery cycle time	It is the average time between receipt of customer order and delivery of the goods
Manufacturing cycle time	It is the total amount of production time required per unit
Velocity	Velocity is defined as the number of units produced in a given time
Manufacturing cycle efficiency	Processing Time / (Processing Time + Inspection Time + Waiting Time + Move Time)

Business Applications of ABM

- The goal of the ABCM is to make customer needs to be satisfied while making fewer demands for resources.

- Current research suggests that customers have perceived needs in four areas, all of which must be satisfied simultaneously. The customers require- lower costs, higher quality, faster response time & greater innovation.
- To satisfy these needs ABM currently being used for a variety of business applications such as
  - Cost Reduction
  - Activity Based Budgeting
  - Business Process Re-engineering (BPR)
  - Benchmarking
  - Performance measurement

Cost Reduction:

- ABM helps the organisation to identify costs against activities and to find opportunities to streamline or reduce the costs or eliminate the entire activity, especially if there is no value added.
- It is particularly useful in identifying and quantifying process waste and providing vehicle for continuous process improvement through continuous cost reduction.

Activity Based Budgeting (ABB):

- ABB analyse the resource input or cost for each activity. It provides a framework for estimating the amount of resources required in accordance with the budgeted level of activity.
- Actual results can be compared with budgeted results to highlight both in financial and non-financial terms those activities with major discrepancies from budget for potential reduction in supply of resources.
- It is a planning and control system which seeks to support the objectives of continuous improvement.
- It means planning and controlling the expected activities of the organization to derive a cost-effective budget that meet forecast workload and agreed strategic goals.
- The three key elements of activity based budgeting are as follows:
  - Type of work to be done
  - Quantity of work to be done
  - Cost of work to be done

Business Process Re-engineering:

- Business Process Re-engineering involves examining business processes and making substantial changes to how organisation currently operates.
- ABM is a powerful tool for measuring business performance, determining the cost of business output and is used as a means of identifying opportunities to improve process efficiency and effectiveness. A business process consists of linked set of activities.

Benchmarking

- Benchmarking is a process of comparing of ABC derived activity costs of one segment of company with those of other segments. It requires uniformity in the definition of activities and measurement of their costs.

Performance Measurement:

- Many organisations are now focusing on activity performance as a means of facing competitors and managing costs by monitoring the efficiency and effectiveness of activities.
- Activity performance measures consist of measures relating to costs, time, quality and innovation.

Steps for Implementing ABM

1	Decide what are the organisation's most important issues and what types of information would be required to address those issues.
2	Top Management support is cited to identify critical information needs.
3	Incorporate ABC methods into organization's financial reporting process.

4	Implementation team should be represented by the people who will be actual users of the ABM information.
5	The existing information system should easily support input requirements.
6	If integrating ABC into the main cost reporting system is not feasible, consider developing a separate ABC system.
7	Implement ABM at a high level in order to get concepts across.

Benefits of Activity Based Cost Management

- Provision of excellent basis and focus for cost reduction.
- Provides operational management with a clear view of HOW to implement an Activity Based Budget?
- Provision of clear understanding of the underlying causes of business processing costs.
- Provision of excellent basis for effectiveness of management decision making.
- Identification of key process waste elements, permit management prioritisation and leverage of key resources.

Difference between ABC and ABM :

- The ABC refers to the technique for determining the cost of activities and the output that those activities produce. It is the logical distribution of overhead i.e. overhead should be distributed on the consumption of resources consumed by goods and services. The aim of ABC is to generate improved cost data for use in managing a company's activities.
- The ABM is a much broader concept. It refers to the management philosophy that focuses on the planning, execution and measurement of activities as the key to competitive advantage .

ACTIVITY BASED BUDGETING (ABB)

- Activity Based Budgeting is a process of planning and controlling the expected activities for the organisation to derive a cost-effective budget that meets forecast workload and agreed strategic goals.
- An activity based budget is a quantitative expression of the expected activities of the firm, reflecting management 's forecast of workload and financial and non-financial requirements to meet agreed strategic goals and planned changes to improve performance.
- Thus, the key elements of ABB are:
  - Type of work/activity to be performed;
  - Quantity of work/activity to be performed; and
  - Cost of work/activity to be performed.
- ABB is a technique for enhancing the accuracy of financial forecasts and increasing management understanding. When automated, ABB can rapidly and accurately produce financial plans and models based on varying levels of volume assumptions.
- Traditional, functional- based budgeting is concerned with budgeting the costs of resources associated with organizational units, such as departments and plants. Firms that have implemented an activity-based costing system may also wish to install an activity-based budgeting system.
- An activity-based budgetary approach can be used to emphasize cost reduction through the elimination of wasteful activities and improving the efficiency of necessary activities
- As with traditional, functional-based budgeting, ABB begins with sales and production budgets. Direct materials and direct labor budgets also are compatible with an ABC framework because these production inputs are directly traceable to the individual products. The major differences between functional and activity-based budgeting are found within the overhead and selling and administration categories. In a functional- based approach, budgets within these categories typically are detailed by cost elements. These cost elements are classified as variable or fixed, using production or sales output measures as the basis for determining cost behavior. ABB, on the other hand, identifies the overhead, selling, and administrative activities and then builds a budget for each activity, based on the resources needed to provide the required activity output levels. Costs are classified as variable or fixed with respect to the activity output measure.

Activity Flexible Budgeting

- Activity flexible budgeting is the prediction of what activity costs will be as activity output changes.
- Variance analysis within an activity framework makes it possible to improve traditional budgetary performance reporting. It also enhances the ability to manage activities.
- Activity flexible budgets differ from traditional flexible budgets because the cost formulas are based on the activity drivers for the respective activities rather than being based only on a single unit-based driver, such as direct labor hours.

ABC – A Decision-Making Tool:

- **Complement to TQM:** ABC is a complement to total quality management (TQM). It provides quantitative data that can track the financial impact of improvements implemented as part of the TQM initiative.
- **Significant advantage for wholesale distributors:** Wholesale distributors can gain significant advantage in the decision-making process through implementation of ABC concepts. The expansion of line offerings has brought about difficult decisions for the distributor. ABC models the costs back to the activity. The burden created by the new product is correctly reflected. This allows the existing merits while leaving the new line to justify itself.
- **Facility and resource expansion:** Other decisions that can be assisted by ABC include facility and resource expansion. Often the basis for relocation or opening of a new distribution center is based on cost associations. Reduction in freight or other logistics costs can offset the expense of the new facility, staff or equipment. When the numbers used are enterprise-based, the return might not develop as expected. The ABC model can identify the specific cost elements being targeted, providing a much clearer picture from which management can act.
- **Decision support for Human Resources:** Where activity, and therefore cost, can be associated to an individual, new levels of financial performance can be determined. This might be appropriate in cases of branch management or sales. Adding or deleting resource slots can be determined based on costs of activities as well. The added data provided through ABC can present a number of options, including outsourcing, productivity improvements through automation, and a determination of employee/revenue ratios.
- **Cost plus markup method:** Companies who wish to determine price based on cost plus markup basis find ABC method of costing very relevant and are able to determine competitive prices for their products.

Basic understanding of ABC System:

In an ABC system the costs are initially allocated to the various activities and thereafter based on activity cost drivers the same are allocated to the cost objects.

For example: Rent of the factory would be allocated to the various activities such as stores department, purchasing department etc. Thereafter the stores department costs would get allocated to the various products (Cost objects) based on the number of stores requisition of each of the materials handled.

ABC System vs Traditional system:

Example: A company incurs total overheads of Rs.2,00,000 and manufacture two products A and B. The total machine hours used by A are 5000 and by B is 15000 hours.

Traditional system:

In the traditional system the costs are allocated based on machine hours and a total of Rs.50000 and Rs.150000 is allocated for product A and B respectively.

ABC System:

In the ABC system the total overheads are subdivided into various major activities and based on the cost driver the costs are allocated to the products.

The amount of Rs.2,00,000 can be divided into the following in an ABC System:

- Machine running activity : Rs.1,20,000 ~ Allocated based on machine hours
- Machine set up costs : Rs.40,000 ~ Allocated based on setup hours ; Machine setup hours for A was 4000 and for B was 1000

- Inspection costs of Rs.40,000 ~ Allocated based on inspection time ; Inspection time for A was 2000 hours and for B was 3000 hours.

Step 1: Calculation of cost driver rate:

Activity	Total cost	Cost driver name	Cost driver quantity	Cost driver rate
Machine Running	1,20,000	Machine hours	20000 hours	Rs.6
Machine setup	40000	Setup time	5000 hours	Rs.8
Inspection costs	40000	Inspection time	5000 hours	Rs.8

Step 2: Apportionment of OH

Activity	Product A		Product B	
	CDQ	Amount	CDQ	Amount
Machine Running	5000	30000	15000	90000
Set-up	4000	32000	1000	8000
Inspection time	2000	16000	3000	24000
Total OH allocated		78000		120000

Overview of practical problems/ case studies/ important questions:

- Part I – Growth Productivity and Price Recovery Variances
- Part II – Activity Based Costing
- Part III – Direct Product Profitability / Customer Profitability Analysis
- Part IV – Activity Based Budgeting

Part I – Growth Productivity and Price Recovery Variances

1. Growth productivity – price recovery [Category A – May 2015 RTP]

Kitchen King Company makes a high-end kitchen range hood 'Maharaja'. The company presents the data for the year 2003 and 2004:

		2003	2004
1.	Units or maharaja produced and sold	40,000	42,000
2.	Selling Price per unit in Rs.	1,000	1,100
3.	Total Direct Material (Square feet)	1,20,000	1,23,000
4.	Direct material cost per square feet in Rs.	100	110
5.	Manufacturing Capacity (in units)	50,000	50,000
6.	Total Conversion cost in Rs.	1,00,00,000	1,10,00,000
7.	Conversion cost per unit of capacity (6)/(5)	200	220
8.	Selling and customer service capacity	300 customer	290 customer
9.	Total selling and customer service cost in Rs.	72,00,000	72,50,000
10.	Cost per customer of selling and customer service capacity (9)/(8)	24,000	25,000

Kitchen King produces no defective units, but it reduces direct material used per unit in 2004. Conversion cost in each year depends on production capacity defined in terms of Maharaja units that can be produced. Selling and Customer service cost depends on the number of customers that the selling and service functions are designed to support. Kitchen King has 230 customers in 2003 and 250 customers in 2004. You are required to calculate the growth, price-recovery and productivity components that explain the change in operating income from 2003 to 2004

WN 1: Computation of operating income of 2003 and 2004:

(in '000s)

Particulars	2003	2004
Sales	40,000 [40,000 x 1,000]	46,200 [42,000 x 1,100]
Less: Material Cost	12,000 [1,20,000 x 100]	13,530 [1,23,000 x 110]
Less: Conversion cost	10,000	11,000

Less: Selling and customer service capacity cost	7,200	7,250
Profit	10,800	14,420

WN 2: Computation of sales variances:

BP x BQ	BP x AQ	AP x AQ
1,000 x 40,000	1,000 x 42,000	1,100 x 42,000
40,000	**42,000**	**46,200**

Variances:

Sales Price Variance (Price recovery)	BP x AQ – AP x AQ	42,000 – 46,200	4,200 F
Sales volume Variance (Activity)	BP x BQ – BP x AQ	40,000 – 42,000	2,000 F

WN 3: Computation of Material variances (Price recovery and Productivity Component):

SP x SQ	SP x AQ	AP x AQ
100 x 1,26,000	100 x 1,23,000	110 x 1,23,000
12,600	**12,300**	**13,530**

Computation of Standard Quantity:

SQ	AO x (Input/Output)	42,000 x (3/1)	1,26,000

Variances:

Material Price Variance (Price recovery)	SP x AQ – AP x AQ	12,300 – 13,530	1,230 A
Material Usage variance (Productivity)	SP x SQ – SP x AQ	12,600 – 12,300	300 F
Material variance (Growth)	Bud cost – Std cost	(100 x 1,20,000) – (100 x 1,26,000)	600 A

WN 4: Computation of conversion cost variances:

- Conversion cost is a fixed expenditure as the same is dependent on manufacturing capacity
- There has been no increase in capacity and hence there is no growth component
- Conversion cost (price recovery) variance = Cost of 2003 – cost of 2004
- Conversion cost (price recovery) variance = 10,000 – 11,000 = 1,000A

WN 5: Computation of selling and customer service cost variances:

- Selling and customer service cost is a fixed expenditure as the same is dependent on customer service capacity
- There has been no increase in capacity and hence there is no growth component
- The company had capacity of 300 customers in 2003 and incurred Rs.72,00,000. Now the customer service capacity has been revised to 290 customers and hence the expenditure should have reduced to Rs.69,60,000
- Customer service (price recovery) variance = Revised cost of 2003 – Cost of 2004
- Customer service (price recovery) variance = 69,60,000 – 72,50,000 = 2,90,000A
- **Productivity component:** The company has closed part of the capacity which was not utilized by it. This would be regarded as productivity measure and hence the company would have saved Rs.2,40,000 because of closure of part capacity. Hence customer service (productivity) variance is Rs.2,40,000 F

WN 6: Reconciliation of Operating Income:

(in '000s)

Particulars	2003	Growth	Productivity	Price recovery	2004
Sales	40,000	2,000 F	0	4,200 F	46200
Material cost	12,000	600 A	300 F	1,230 A	13,530
Conversion cost	10,000	0	0	1,000 A	11,000
Selling and customer service	7,200	0	240 F	290 A	7,250
Profit	10,800	1,400 F	540 F	1,680 F	14,420

Part II – Activity Based Costing

2. Developing ABC System [Category A – Nov 2014(exam)]

Chicago Manufacturing Co. (CMC) manufactures several product of varying levels of designs and models. It uses a single overhead recovery rate based on direct labour hours. The Overheads incurred by the CMC in the half of the year are as under:

	Rs.
Machine Operation Expenses	10,12,500
Machine Maintenance Expenses	1,87,500
Salaries of technical staff	6,37,500
Wages and salaries of stores staff	2,62,500

During this period, CMC introduced activity based costing system and the following significant activities were identified:

- Receiving materials and components
- Set up of machines for production runs
- Quality inspection

It is determined that:

- The machine operation and machine maintenance expenses should be apportioned between stores and production activity in 20:80 ratio
- The technical staff salaries should be apportioned between machine maintenance, set-up and quality inspection in 30:40:30 ratio

The Consumption of activities during the period under review are use under:

- Direct labour hours worked 40,000
- Direct wage rate Rs. 6 per hour
- Production set-up 2,040
- Material and component consignments from received from suppliers 1,960
- Number of quality inspections carried out 1,280

The data relation to two product manufactured by the CMC during period are as under:

	Product P	Product Q
Direct Material costs (Rs.)	6,000	4,000
Direct labour hours	960	100
No of production runs	36	24
Direct material consignments received	48	52
Number of quality inspections done	30	10
Quantity products (units)	15,000	5,000

A potential customer has approached CMC for the supply of 24,000 units of components K to be delivered in lots of 3,000 units per quarter. The job will involve an initial design cost of Rs. 60,000 and the manufacture will involve the following per quarter:

Direct material costs	Rs. 12,000
Direct labour hours	300
Production runs	6
Inspections	24
Number of consignments of Direct materials to be received	20

CMC desires a mark up to 25% on cost.

Required:

- Calculate the cost of product P and Q based on the existing system of single overhead recovery rate.
- Determine the cost of product P and Q using activity based costing system
- Compute the sales value per quarter of component K using activity based costing system.

Answer:

WN 1: Calculation of Overhead absorption rate under traditional system:

Particulars	Amount
Budgeted overheads (10,12,500 + 1,87,500 + 6,37,500 + 2,62,500)	21,00,000
Suitable base	Direct labour hours
Budgeted suitable base	40,000 hours

OAR (Budgeted overheads/budgeted suitable base)	Rs.52.5/labour hour

WN 2: Calculation of cost/unit under traditional system:

Particulars	Product P	Product Q
Direct material cost	6,000	4,000
Direct labour cost (No of hours * Rs.6/hour)	5,760	600
Overheads (No of labour hours * Rs.52.5/hour)	50,400	5,250
Total cost	**62,160**	**9,850**
Number of units	15,000	5,000
Cost/unit	**4.144**	**1.97**

WN 3: Calculation of cost driver rate under ABC system:

Particulars	Receiving components	Set-up of machines	Quality Inspection
Machine operation	2,02,500	8,10,000	
Machine maintenance	37,500	1,50,000	
Technical staff:			
Amount apportioned to machine maintenance (30% distributed in 20:80)	38,250	1,53,000	
Amount apportioned to set-up and quality inspection		2,55,000	1,91,250
Wages and salaries to store staff	2,62,500		
Total cost of activity	**5,40,750**	**13,68,000**	**1,91,250**
Cost driver name	Number of receipts	Number of set-up	Number of inspection
Cost driver quantity	1,960	2,040	1,280
Cost driver rate	**275.89**	**670.59**	**149.41**

WN 4: Calculation of overheads under ABC:

Particulars	Product P		Product Q		Product K	
	CDQ	Amount	CDQ	Amount	CDQ	Amount
Receiving components	48	13,243	52	14,346	20	5,518
Set-up of machines	36	24,141	24	16,094	6	4,024
Number of inspection	30	4,482	10	1,494	24	3,586
Total cost		**41,866**		**31,934**		**13,128**

WN 5: Calculation of cost per unit of P and Q under ABC

Particulars	Product P	Product Q
Direct material cost	6,000	4,000
Direct labour cost (No of hours * Rs.6/hour)	5,760	600
Overheads (WN 4)	**41,866**	**31,934**
Total cost	**53,626**	**36,534**
Number of units	15,000	5,000
Cost/unit	**3.58**	**7.31**

WN 6: Calculation of sales value per quarter of component K:

Particulars	Product P
Direct material cost	12,000
Direct labour cost (No of hours * Rs.6/hour)	1,800
Overheads (WN 4)	**13,128**
Design cost (Rs.60,000/8 quarters)	7,500
Total cost	**34,428**
Add: Mark up (25% of cost)	8,607
Total sales value	**43,035**
Selling price per unit (43,035/3,000 units)	**14.35**

3. ABC Versus Traditional Costing [Category B]

The following information provides details of costs, volume & cost drivers for a particular period in respect of ABC Limited for Product X, Y and Z

Particulars	Product X	Product Y	Product Z	Total
Production and sales (units)	30,000	20,000	8,000	
Raw material usage (units)	5	5	11	
Direct Material Cost (Rs.)	25	20	11	12,38,000
Direct Labour Hours	1.33	2	1	88,000
Machine Hours	1.33	1	2	76,000
Direct Labour Cost (Rs.)	8	12	6	
Number of production runs	3	7	20	30
Number of deliveries	9	3	20	32
Number of receipts	15	35	220	270
Number of production orders	15	10	25	60

The company operates a just-in-time inventory policy, and receives each component once per production run. The overhead costs of the company are as under:

Set-up cost	30,000
Machines	7,60,000
Receiving	4,35,000
Packing	2,50,000
Engineering	3,73,000
Total cost	18,48,000

In the past the company has allocated overheads to products on the basis of direct labour hours. However, the majority of overheads are related to machine hours rather than direct labour hours. The company has recently redesigned its cost system by recovering overheads using two volume related bases: machine hours and a materials handling overhead rate for recovering overheads of the receiving department. Both the current and the previous cost system reported low profit margins for product X, which is the company's highest-selling product. The management accountant has recently attended a conference on activity-based costing, and the overhead costs for the last period have been analysed by the major activities in order to compute activity-based costs.

From the above information you are required to:

- Compute the product costs using a traditional volume-related costing system based on the assumption that:
  - All overheads are recovered on the basis of direct labour hours (i.e. the company's past product costing system);
  - The overheads of the receiving department are recovered by a materials handling overhead rate and the remaining overheads are recovered using a machine hour rate (i.e. the company current costing system).
- Compute product costs using an activity-based costing system.

Answer:

WN 1: Computation of OAR under past product costing and current costing system:

Particulars		**Current system**	
	Past system	**Receiving**	**Others**
Budgeted OH	18,48,000	4,35,000	14,13,000
Suitable base	DLH	DMC	MH
Budgeted suitable base	88,000	12,38,000	76,000
OAR	21 per DLH	35.14% of DMC	18.5921 per MH

WN 2: Calculation of cost per unit under past system:

Particulars	**Product X**	**Product Y**	**Product Z**
Direct Material	25	20	11
Direct Labour	8	12	6

Overheads (21 per DLH)	28	42	21
Cost per unit	**61**	**74**	**38**

WN 3: Calculation of cost per unit under current costing system:

Particulars	**Product X**	**Product Y**	**Product Z**
Direct Material	25.00	20.00	11.00
Direct Labour	8.00	12.00	6.00
Overheads			
Receiving dept (35.14 % of DM)	8.79	7.03	3.87
Others (18.5921 per MH)	24.79	18.59	37.18
Cost per unit	66.57	57.62	58.05

WN 4: Calculation of cost driver rate under ABC:

Activity	**Total cost**	**CDN**	**CDQ**	**CDR**
Set-up	30,000	No of production runs	30	1,000
Machines	7,60,000	Machine hours	76,000	10
Receiving	4,35,000	No of receipts	270	1,611.11
Packing	2,50,000	No of deliveries	32	7,812.50
Engineering	3,73,000	No of production orders	50	7,460

WN 5: Apportionment of OH under ABC:

	Product X		**Product Y**		**Product Z**	
Particulars	**CDQ**	**Amount**	**CDQ**	**Amount**	**CDQ**	**Amount**
Set-up	3	3,000	7	7,000	20	20,000
Machines	40,000	4,00,000	20,000	2,00,000	16,000	1,60,000
Receiving	15	24,167	35	56,389	220	3,54,444
Packing	9	70,313	3	23,438	20	1,56,250
Engineering	15	1,11,900	10	74,600	25	1,86,500
Total OH		**6,09,380**		**3,61,427**		**8,77,194**
No of units		30,000		20,000		8,000
Overheads per unit		**20.31**		**18.07**		**109.65**

WN 6: Computation of cost per unit under ABC:

Particulars	**Product X**	**Product Y**	**Product Z**
Direct Material	25	20	11
Direct Labour	8	12	6
Overheads (WN 5)	20.31	18.07	109.65
Cost per unit	**53.31**	**50.07**	**126.65**

4. Value added versus Non-value added Time [Category B – Nov 2016 RTP]

Queenstown Furniture (QF) manufactures high-quality wooden doors within the forests of Queenstown since 1952. Management is having emphasize on creativity, engineering, innovation and experience to provide customers with the door they desire, whether it is a standard design or a one-of-a-kind custom door. The following information pertains to operations during April:

Processing time	9.0 hrs.*	Waiting time	6.0 hrs.*
Inspection time	1.5 hr.*	Move time	7.5 hrs.*
Units per batch	60 units		

(*) average time per batch

Required

Compute the following operational measures:

(i) Average non-value-added time per batch
(ii) Average value added time per batch
(iii) Manufacturing cycle efficiency
(iv) Manufacturing cycle time

Answer:

Non-value-added Time	Waiting Time + Inspection Time + Move Time	6 + 1.5 + 7.5	15 hours
Value-added Time	Processing Time		9 hours
Manufacturing cycle Efficiency	$\frac{\text{Value added Time}}{\text{Total Time}}$	$\frac{9}{15+9}$	37.5%
Manufacturing Cycle Time	$\frac{\text{Total Production Time}}{\text{Units per batch}}$	$\frac{24 \text{ hours}}{60 \text{ units}}$	0.40 hours per unit

5. Activity Based Costing System (Category A – May 2019(exam):

PCL Limited specializes in servers for e-commerce and ERP applications. The company's original job costing system has two direct cost categories – direct materials and direct labour. Overhead is allocated to jobs at the single rate of Rs.90 per direct labour hour. Recently, the company designed an activity-based costing (ABC) system with five activities.

The ABC system retains the current system's two direct cost categories. The budgeted overhead costs for each activity are as follows:

Activity	Allocation base	Cost Driver Rate
Material Handling	No of parts	3.40
Machine setup	No. of setups	2000.00
Assembling	Assembly hours	320.00
Quality control	Tests run	250.00
Shipping	No. of shipments	6000.00

PCL Limited has been awarded two new contracts earmarked as Job 201 and Job 202. Budgeted data relating to these two jobs are as follows:

Particulars	Job No.201	Job No.202
No. of parts	15,000	2,000
No. of setups	6	4
No of assembling hours	1,500	200
Quality control test runs	210	25
No of shipments	1	1
No of output units	100	10
Total direct labour hours	8000	600
Direct material cost	8,60,000	1,30,000
Direct Labour cost	6,40,000	50,000

Required:

i. Calculate the product cost per unit for each job under traditional job costing system
ii. Calculate the product cost per unit for each job under ABC
iii. State which costing system more accurately assigns to job the costs of the resources consumed to produce them
iv. A company has offered to PCL Limited to produce both jobs for Rs.21,600 per output unit. PCL Limited may buy from the outside company Job 201 only, Job 202 only or both jobs. Advise the course of action that the mangers will take to get more income if they base their decision on:
    a. Traditional costing system
    b. ABC System

Part 1:

Computation of cost per unit under traditional costing system:

Particulars	Job No.201	Job No.202
Direct material cost	8,60,000	1,30,000

Direct Labour cost	6,40,000	50,000
Overheads (90 per hour)	7,20,000	54,000
Total cost	**22,20,000**	**2,34,000**
No of units	100	10
Cost per unit	**22,200**	**23,400**

Part 2:

Computation of cost per unit under Activity Based Costing:

Particulars	**Job No.201**	**Job No.202**
Direct material cost	8,60,000	1,30,000
Direct Labour cost	6,40,000	50,000
Overheads:		
Material Handling	51,000	6,800
Machine setup	12,000	8,000
Assembling	4,80,000	64,000
Quality control	52,500	6,250
Shipping	6,000	6,000
Total cost	**21,01,500**	**2,71,050**
No of units	100	10
Cost per unit	**21,015**	**27,105**

Part 3:

Activity based costing approach ensures greater accuracy by using multiple cost drivers and determines areas generating the greatest profit or loss

Part 4:

Action under Traditional Costing System:

- **Job No.201:** The cost of manufacture is Rs.22,200 per unit whereas the cost of purchase is Rs.21,600 per unit. The manager would go ahead with outsourcing decision for Job No.201
- **Job No.202:** The cost of manufacture is Rs.23,400 per unit whereas the cost of purchase is Rs.21,600 per unit. The manager would go ahead with outsourcing decision for Job No.202

Action under Activity based costing system:

- **Job No.201:** The cost of manufacture is Rs.21,015 per unit whereas the cost of purchase is Rs.21,600 per unit. The manager will not agree for outsourcing and would continue to manufacture the product inhouse
- **Job No.202:** The cost of manufacture is Rs.27,015 per unit whereas the cost of purchase is Rs.21,600 per unit. The manager would go ahead with outsourcing decision for Job No.202

Part III – Direct Product Profitability / Customer Profitability Analysis

6. Direct Product Profitability [Category A]

XYZ Ornamental Company has been a name to count on for quality and service. It has been designing wide range of ornamental products for more than two decades using the highest quality standard. Such quality is achieved through years of experience and the integrity that is maintained by its employees. They are known for their perfection. VGG approached XYZ to make inquiry of two products. The two products are indoor fountain known as 'The Star' and a large gnome known as 'Dwarfs' for garden. Mr. Bob, the management accountant of XYZ, has estimated the variable costs per unit of 'The Star' and 'Dwarfs' as being Rs.622.50 and Rs.103.75 respectively. He estimated his calculations based on the following information:

(1) Products Data

	The Star	**Dwarfs**	**Other products**
Production/Sales (units)	10,000	20,000	80,000
Total Direct Material Costs	22,50,000	7,50,000	60,00,000
Total Direct Labour Costs	15,00,000	5,00,000	60,00,000

(2) Total variable overheads for XYZ are Rs.120,00,000 out of which 30% belong to the procurement, warehousing and use of direct materials. While all other variable overheads are related to direct labour
(3) XYZ presently allocate variable overheads into products units using percentage of total direct material cost and total direct labour cost.
(4) VGG is willing to purchase 'The Star' at Rs.740 per unit and 'Dwarfs' at Rs.151 per unit.
(5) XYZ will not accept any work yielding an estimated contribution to sales ratio less than 28%.
The directors of XYZ are considering switching to an activity-based costing system and recently appointed a management consultants firm to undertake an in-depth review of existing operations. As result of that review, the consultants concluded that estimated relevant cost drivers for material and labour related overhead costs attributable to 'The Star' and 'Dwarfs' are as follows:

	The Star	Dwarfs	Other products
Direct Material Related Overheads: (The volume of raw materials held to facilitate production of each product is the cost driver.)			
Material Ratio per product unit	5	8	5
Direct Labour related overheads: (The number of labour operations performed is the cost driver.)			
Labour Operations per product unit	7	6	5

Required
(i) Give a financial ANALYSIS of the decision strategy which XYZ may implement about the manufacture of each product using the unit cost information available.
(ii) DISCUSS whether activity-based management should be adopted in companies like XYZ.

Answer:

(i) Analysis:

The product costs per unit along with the respective contribution per unit may be calculated either by employing an ABC approach or alternatively by using the existing basis for the allocation of variable overhead cost.

The current scenario of product costing suggests that 'Dwarfs' should be produced as per the request of VGG because the contribution to sales ratio is 31.29%. However, the current scenario of product costing also suggests that XYZ should not undertake production of 'The Star' at a selling price of Rs.740 per unit since the estimated contribution to sales ratio is 15.88% is lower than the desired contribution to sales ratio of 28%.

Activity based costing approach ensures greater accuracy by using multiple cost drivers and determines areas generating the greatest profit or loss. Table [(d)] shows how much the contribution to sales (%) for each product changes when the overhead allocation method changes to ABC. As shown in Table, contribution to sales ratio on 'The Star' increased to 31.87% from 15.88% while contribution to sales ratio on 'Dwarfs' reduced from 31.87% to - 29.23%.

Thus, XYZ should opt to produce 'The Star' for VGG as contribution to sales ratio is 31.87 which is higher than the desired one.

(ii) The term Activity based management (ABM) is used to describe the cost management application of ABC. The use of ABC as a costing tool to manage costs at activity level is known as Activity Based Cost Management (ABM). ABM is a discipline that focuses on the efficient and effective management of activities as the route to continuously improving the value received by customers and to improve strategic and operational decisions in an organisation. Kaplan and Cooper divide ABM into Operational and Strategic.

Operational ABM covers the actions that increase efficiency, lower cost (i.e. reduce the cost driver rate of activities) and lead to higher revenue through better resources utilisation- in short, the action required to do things right. In other words, it is all about 'doing things right', using ABC information to improve efficiency. It also helps in identifying and improving value added activities and removing non-value added activities as to reduce cost without distorting product value.

Strategic ABM is about 'doing the right things'. It uses ABC information to determine which products is to be manufactured and which activities is to be used. XYZ can also use this for customer profitability analysis, identifying that which customers are the most profitable and focusing on them more.

A risk with ABM is that some activities have an implicit value are not reflected in a financial value added to any product. For example, a good and pleasant work ing environment can attract and retain the best human resources, but might not be identified as value added activities in operational ABM.

ABM provides managers an understanding of costs and helps teams to make certain decisions that benefit the whole organizations and not just their own activities .

Therefore, some companies like XYZ may adopt ABM to improve their operations and obtain useful activity information.

Working Notes:

a) Computation of Direct Material and Direct Labour cost per unit

Particulars	Direct Material		Direct Labour	
	The Star	Dwarfs	The Star	Dwarfs
Total Costs	22,50,000	7,50,000	15,00,000	5,00,000
Production units	10,000	20,000	10,000	20,000
Cost per unit	225.00	37.50	150.00	25.00

b) Analysis of variable Overheads:

Material related:

- 30 percent of the variable overheads is material related and the recovery rate for the same is based on volume handled

Particulars	Calculation	Amount
Budgeted Overheads	30% of Rs.1,20,00,000	36,00,000
Suitable base		Volume of material handled
Budgeted suitable base	(10,000 x 5) + (20,000 x 8) + (80,000 x 5)	6,10,000
Overhead recovery rate	36,00,000/6,10,000	Rs.5.90 per unit
Overhead for Star	5 x 5.90	29.50 per unit
Overhead for Dwarf	8 x 5.90	47.20 per unit

Labour related:

- 70 percent of the variable overheads is material related and the recovery rate for the same is based on labour operations

Particulars	Calculation	Amount
Budgeted Overheads	70% of Rs.1,20,00,000	84,00,000
Suitable base		Number of labour operations performed
Budgeted suitable base	(10,000 x 7) + (20,000 x 6) + (80,000 x 5)	5,90,000
Overhead recovery rate	84,00,000/5,90,000	Rs.14.24 per operation
Overhead for Star	7 x 14.24	99.68 per unit
Overhead for Dwarf	6 x 14.24	85.33 per unit

c) Comparison of cost statement under ABC and Traditional System:

Particulars	The Star		Dwarfs	
	Current	ABC	Current	ABC
Selling Price	740.00	740.00	151.00	151.00
Direct Material cost	(225.00)	(225.00)	(37.50)	(37.50)
Direct Labour cost	(150.00)	(150.00)	(25.00)	(25.00)
Variable OH cost				

Material related (Note 1)	(90.00)	(29.50)	(15.00)	(47.20)
Labour related (Note 2)	(157.50)	(99.68)	(26.25)	(85.44)
Contribution	117.50	235.82	47.25	(44.13)
Contribution to Sales (%)	**15.88**	**31.87**	**31.29**	**(29.23)**

Note:

1) Under existing system material related OH are driven by material cost. The overall overheads were Rs.36,00,000 and the material cost was Rs.90,00,000. The material related OH under current system is 40 percent of material cost

2) Under existing system labour related OH are driven by labour cost. The overall overheads were Rs.84,00,000 and the labour cost was Rs.80,00,000. The labour related OH under current system is 105 percent of material cost

7. Customer profitability statement [Category A]

Bookmark LLP is a publishing firm that started operations very recently. The firm has published "Advanced Learner's Dictionary" this first year, that have been sold to 3 distributors PER, MGH and WLY. The firm's financials reflect profits in its first year of operations. The management is pleased with the results. However, they are interested in finding out how profitable each customer is. This would help them formulate their sales strategy.

Particulars	PER	MGH	WLY
Sales units p.a.	1,000	950	1,250
Sale price (gross)	250	250	250
Payment terms	3/10 net 30	net 30	3/10 net 30
Sales returns	0.5%	0%	10%
Delivery terms	FOB destination	FOB destination	FOB shipping point

In order to get market share, PER and WLY have been extended credit terms to avail discount if payment is made within 10 days. Customer MGH does not have much bargaining power and hence has been allowed only 30 days' credit period without any benefit of availing discount for early payment. Both PER and WLY have made payments within 10 days to avail of the discount extended. On the cost front, variable cost of goods sold is Rs.150 per unit. Key metrics of customer assignable marketing, administrative and distribution costs are as below:

Activity	Activity Driver	No. of Units of Activity Driver			Cost Driver Rate (Rs.)
		PER	MGH	WLY	
Order taking and processing	# of orders	4	2	15	300
Expedited / rush orders	# of orders	1	-	5	250
Delivery costs	# distance in km.	100	50	-	80
Sale return processing	# of returns	1	-	8	150
Billing cost	# of invoices	4	2	15	50
Customer visit	# of visits	1	-	5	800
Inventory carrying cost *	# 1 per unit	1,000	950	1,250	10

** Assume no opening and closing stock*

Fixed cost that are not assignable to any customer is Rs.1,00,000 p.a.

Required

(i) PREPARE the customer wise profitability statement as also the overall profitability statement of Bookmark LLP.

(ii) RECOMMEND a strategy for Bookmark LLP regarding its customers.

Answer:

(i) Customer Wise Profitability Statement and Overall Profitability Statement

SN.	Particulars	PER	MGH	WLY	Total Rs.
A	Sales (net proceeds) –Table 1	241,288	237,500	272,812	751,600
B	Variable Cost of Goods Sold @150 p.u.	1,50,000	1,42,500	1,87,500	4,80,000
C	*Assignable- Marketing and Administration Cost* - Table 2				
	• Order Taking and Processing	1,200	600	4,500	6,300
	• Sale Return Processing	150	-	1,200	1,350
	• Billing Cost	200	100	750	1,050
	• Customer Visit	800	-	4,000	4,800
	Total Assignable Marketing and Administration Cost	2,350	700	10,450	13,500
D	*Assignable- Distribution Cost* - Table 2				
	• Expedited / Rush Orders	250	-	1,250	1,500
	• Delivery Costs	8,000	4,000	-	12,000
	• Inventory Carrying Cost	10,000	9,500	12,500	32,000
	Total Assignable Distribution Cost	18,250	13,500	13,750	45,500
E	*Non- Assignable Fixed Cost*	-	-	-	100,000
F	Total Costs (B+C+D+E)	170,600	156,700	211,700	639,000
G	Net Profit (Step A - F)	70,688	80,800	61,112	112,600
H	Profit % of Sales (G / A)	29%	34%	22%	15%

Note: It is assumed that goods returned due to sales returns cannot be sold again. Hence the purchase cost has been considered for gross sale units.

Workings

Table 1: Customer Sales Analysis - Revenue Analysis

All figures in Rs.

Particulars	PER	MGH	WLY	Total Rs.

Sales {Sale Units × Sale Price (gross)}	2,50,000	2,37,500	3,12,500	8,00,000
Less: Sale Return (Step 1 × Return%)	1,250	-	31,250	32,500
Net Sales	2,48,750	2,37,500	2,81,250	7,67,500
Less: Cash Discount	7,462	-	8,438	15,900
Net Proceeds	2,41,288	2,37,500	2,72,812	7,51,600
Final Collections vs Original Sale	97%	100%	87%	94%

Table 2: Assignable Marketing, Administrative and Distribution Costs

All figures in Rs.

Particulars	PER	MGH	WLY	Total
Order Taking and Processing (# of orders × cost per order)	1,200	600	4,500	6,300
Expedited / Rush Orders (# of orders × cost per order)	250	-	1,250	1,500
Delivery Costs (Distance in km. × cost per km)	8,000	4,000	-	12,000
Sale Return Processing (# of returns × cost per return)	150	-	1,200	1,350
Billing Cost (# of invoices × cost per invoice)	200	100	750	1,050
Customer Visit (#of customer visits × cost per visit)	800	-	4,000	4,800
Inventory Carrying Cost (# of units × inventory carrying cost p.u.)	10,000	9,500	12,500	32,000

(ii) Customer strategy: It can be seen that Bookmark LLP has an overall profit of Rs.112,600 or 15% of sales. While the performance is good, the firm's management has to analyze customer wise profitability.

(a) WLY is the largest customer in terms of units sold. However, Table 1 above shows that sale returns at 10%, which is unusually large compared to other customers. Bookmark LLP has to investigate why the returns are of such large quantity. Possibly, there could be communication gap between the firm and WLY. Possible non-conformity in goods delivered has resulted in returns. Only 87% of the original sale value is being collected. The root cause of the problem has to be identified and rectified. This will also reduce the sale return processing costs.

(b) WLY has placed many rush orders, which requires Bookmark LLP to ship these orders immediately, using costlier means of transportation. Currently, there is no charge for shipping rush orders. In order to deter WLY from repeatedly placing rush orders, Bookmark LLP can charge the customer for shipping such orders beyond a threshold number of orders. Say rush orders beyond 2 orders will be charged to the customer.

(c) WLY has placed 15 orders for 1,250 units. Comparatively, PER and MGH placed 4 and 2 orders for approximately 1,000 units each. WLY can be requested to place fewer orders with larger quantity per order, in order to optimize ordering cost.

(d) Being the largest customer, WLY has 5 sale visits from Bookmark LLP, which is more than the other 2 customers. Priced at Rs.800 per visit, this very costly. At the same time, WLY is yielding the least profit. Therefore, Bookmark LLP should reassess if resources can be reallocated to the other two more profitable customers. That may encourage more sales from higher yielding customers.

(e) Since WLY seems to need more hand-holding in terms of more sales visits as well as higher rush orders, Bookmark LLP may assess if it wants to discontinue or reduce business. Alternatively, it may reassign these resources towards existing or newer customers to get better profitability. However, if WLY can be migrated to a higher profitability, Bookmark LLP need not lose out its market share.

(f) Customer MGH is the most profitable yielding 34% return over sales, although in terms of 'Advanced Learner's Dictionary' ordered, it is the smallest of the three. Bookmark LLP can assess if it can extend some discount, in order to encourage more sales. Currently, Customer MGH does not get any discount.

(g) Bookmark LLP can assign more sales visits to Customer PER and MGH to encourage them purchase more as well as provide high quality customer service.

8. Customer profitability Analysis (Category A – May 2020 RTP):

Jawahar Stationary Mart (JSM) is located in centre of city "X" and popular for wide range of stationary products at competitive rate. Box files and cobra files are among the major product of JSM. JSM clients majorly, include medium and large corporate offices apart from reasonable base of retail clients. Mr. Ronit who done his masters in operations and marketing, recently join the family business (JSM). Mr. Ronit during first week itself, identify there are regular complaints from corporate clients regarding 'delivery of items, which are different from what is ordered' and 'for not meeting the requirements'. Mr. Ronit understands consumer behavior is very critical in nature, if understood well and used through-out the business operation; then can be key success factors. Hence with intent to establishing the integrated relations with customers at JSM, Mr. Ronit advise marketing team to start recording the date regarding customer in systemic manner and reporting of same.

Following is information regarding five major customers, who are regularly orders printed cobra files (Product code – J-Cobra 10) from JSM.

Particulars	A	B	C	D	E
No of units sold	6,000	8,000	10,000	7,000	8,000
Margin per unit	6	7.5	7	8	10
No of purchase orders	10	30	25	20	10
No of deliveries	3	4	6	4	5
Kilometres per delivery	100	185	50	250	50

Cost of processing the order is INRs 2,000 per order and cost of handling material is INR 0.15 per item, whereas transport cost is 3 per kilometer for delivery of goods. 3 rushed deliveries made to 'B', cost for rush delivery is INRs 800 per delivery.

Required:

i. ANALYZE customer profitability for JSM.

ii. EXPLAIN three fundamental aspects of CRM to facilitate building relationship with profitable customer/(s).

Answer:

Statement showing profitability of the customer:

Particulars	A	B	C	D	E
Margin (No of units sold x margin per unit)	36,000	60,000	70,000	56,000	80,000
Customer attributable costs:					
Cost of processing purchase order (no of orders x cost of processing the order)	20,000	60,000	50,000	40,000	20,000
Product handling cost (no of units sold x cost of handling per item)	900	1,200	1,500	1,050	1,200
Delivery cost (no of deliveries x km per delivery x cost per km)	900	2,220	900	3,000	750
Cost of rush deliveries (no of rush deliveries x cost per rush delivery)	-	2,400	-	-	-

Profit (or) loss	**14,200**	**-5,820**	**17,600**	**11,950**	**58,050**
Profit margin (%)	**39.44%**	**-9.70%**	**25.14%**	**21.34%**	**72.56%**

Analysis

- **From above, it can be concluded that customer A, C, and D are less profitable than customer E; whereas customer B is causing losses**. Customer B provides a positive operating margin but is unprofitable when customer attributable costs are considered. This is because customer B requires more sales orders than the other customers. In addition, the customer has rush delivery costs.
- **Although here proportion of 80:20 don't hold truth, but for JSM; major portion of profit (around 60%) coming from customer E only, therefore, customer E is critical to JSM**. Special attention can then be given to enhancing the relationships with the customer E to ensure that customer E cannot migrate to other competitors. In addition, greater emphasis can be given to attract new customers that have the same attributes as the most profitable customer E.
- **Further, there is no point in serving customer B, but instead of refusing to trade with customer B, if possible; it may be better to turn it into profitable customer.** Customer B can be made profitable if action is taken to convince the customer B to place a smaller number of larger quantity orders and avoid rush deliveries. If customer B cannot be convinced to change its buying behavior, selling prices should be increased to cover the extra resources consumed.

Fundamental aspects of CRM:

Supply chain management is the technique to integrate the supplier, manufacturing, store, and distribution function efficiently; in order to procure, produce and distribute at/in right time, quantity and place respectively. For effective distribution, CRM can be enabling tool. **CRM is an integrated approach to manage and coordinate customer interactions to identifying, acquiring, and retaining customers**. CRM enables businesses to understand and retain customers (through better customer experience) apart from attracting new customer, in order to increase profitably and decrease customer management costs. CRM system, comprises following three fundamental aspects to facilitate building relationship with profitable customers –

- **Operative CRM** takes care of individual transactions and is used by operational team. **Interactions by customers are kept in the data base and are used later by the service, sales, and marketing team for operational decisions**. In JSM, the staff who is responsible to deal with customer must be given access to customer's details including all the information of activities performed earlier. This will enhance the JSMs' staff's efficiency to deal with customer-facing processes in a better way.
- **Analytical CRM** analyses the data created on the operational side of the CRM effort for evaluation and prediction of customer behavior. **In JSM, analytical CRM can highlight the patterns in customers' behavior which will help sale team while pitching the product at JSM.**
- **Collaborative CRM** ensures that information about customer must flow seamlessly throughout the supply chain, majorly distribution channel; in form of collaborative effort by all associated department of JSM to increase the quality of services provided to customers. Increase in utility at customer end will result in increased loyalty. **Collaborative CRM comprises interactive technology like email, digital media to simplify the communications between customers and staff which would help in building relationships.**

Part IV – Activity Based Budgeting

9. Activity Based Budgeting [Category A]

6-Twelve is an Indian-Japanese international chain of convenience stores for food, snacks, hot and cold beverages is formulating its activity-based budget for January 2018. 6-Twelve has only three product types: Soft Drinks, Fresh Drinks and Ready to Eat Food. The budgeted data relating to three products are as under:

Activity and Driver	Cost Driver Rates		Jan 2019 Budgeted		
	2018	Jan 2019	Amount of Driver Used		
	Actual Rate	Budgeted Rate	Soft Drinks	Fresh Drinks	Ready to Eat Food
Ordering (per order)	5,000	4,500	16	20	16
Delivery (per delivery)	4,000	4,100	13	60	20
Shelf-stocking (per hour)	1,000	1,050	15	170	93

Customer support (per item sold)	10	9	4,500	34,600	10,500

6-Twelve has a continuous improvement system to budgeting monthly activity costs for each month of 2019. February's budgeted cost-driver rate is 0.996 times the budgeted January 2019 rate. March's budgeted cost-driver rate is 0.996 times the budgeted February 2019 rate and so on.

Required

(i) COMPUTE total budgeted cost for each activity in January 2019.

(ii) DISCUSS advantages might 6-Twelve gain by using an activity-based budgeting approach over, say, an approach that allocates the cost of these activities to products as a percentage of the cost of goods sold.

(iii) COMPUTE total budgeted cost for each activity in March 2019 if March 2019 has the same budgeted amount of cost-driver usage as January 2019.

(iv) STATE benefits of 6-Tweleve adopting a kaizen budgeting approach. IDENTIFY limitations?

Answer:

WN 1: Computation of budgeted cost for January 2019:

Activity	Soft Drinks	Fresh Drinks	Ready to Eat Food	Total
Ordering cost @ Rs.4,500 per order	72,000	90,000	72,000	2,34,000
Delivery cost @ Rs.4,100 per delivery	53,300	2,46,000	82,000	3,81,300
Shelf-stocking @ Rs.1,050 per hour	15,750	1,78,500	97,650	2,91,900
Customer support @ Rs.9 per item	40,500	3,11,400	94,500	4,46,400
Total Cost	**1,81,550**	**8,25,900**	**3,46,150**	**13,53,600**

WN 2: Advantages of Activity based budgeting approach:

An Activity Based Budgeting approach identifies how different products require different mixes of support activities. The relative percentage of how each product area uses the cost driver at each activity area is:

Activity	Soft Drinks	Fresh Drinks	Ready to Eat Food	Total
Ordering cost	30.77	38.46	30.77	100.0
Delivery cost	13.98	64.52	21.50	100.0
Shelf-stocking	5.40	61.15	33.45	100.0
Customer support	9.07	69.76	21.17	100.0

By identifying these differences, 6-Tweleve managers are better able to budget for different unit sales levels and different mixes of individual product-line items sold. Using a single cost driver such as 'Cost of Goods Sold' considers similarity in the use of indirect costs (support activities) across product lines which does not occur at 6-Twelve.

Other benefits cited by managers include:

(1) Better identification of resource needs.

(2) Clearer linking of costs with staff responsibilities, and

(3) Identification of budgetary slack.

WN 3: Computation of budgeted cost for March 2019:

Activity	January	February	March
Ordering cost	4,500	4,482	4,464.07
Delivery cost	4,100	4,083.60	4,067.27
Shelf-stocking	1,050	1,045.80	1,041.61
Customer support	9.00	8.96	8.93

These March 2019 rates can be used to compute the total budgeted cost for each activity area:

Activity	Soft Drinks	Fresh Drinks	Ready to Eat Food	Total
Ordering cost	71,425	89,281	71,425	2,32,131
Delivery cost	52,875	2,44,036	81,345	3,78,256
Shelf-stocking	15,624	1,77,073	96,870	2,89,567
Customer support	40,185	3,08,978	93,765	4,42,928
Total Cost	**1,80,109**	**8,19,368**	**3,43,405**	**13,42,882**

WN 4: Benefits and limitations of 6-Tweleve adopting a kaizen budgeting approach

A kaizen budgeting approach indicates management's commitment to organized cost reduction. Compare the budgeted costs from previous part.

Particulars	Ordering Cost	Delivery Cost	Shelf-stocking Cost	Customer Support Cost
Part (i)	2,34,000	3,81,300	2,91,900	4,46,400
Part (iv)	2,32,131	3,78,256	2,89,567	4,42,928

The kaizen budget number will show unfavorable variances for managers whose activities do not meet the required monthly cost reductions. This likely will put more pressure on managers to creatively seek out cost reductions by working 'better' within 6-Twelve.

One limitation of kaizen budgeting, as illustrated, is that it considers minor incremental improvements each month. It is possible that some cost improvements arise from irregular fluctuations in operating processes, supplier networks, or customer interactions. Companies need to highlight the importance of seeking these improvements as well as the minor incremental improvements

Chapter 11 – Budgetary Control

Budgetary Control:

- Budgetary Control is **"Systematic control of an organization's operations through establishment of standards and targets regarding income and expenditure, and a continuous monitoring and adjustment of performance against them.**"
- Budget is an estimation of revenues and expenses over a specified future period of time which needs to be compiled and re-evaluated on a periodic basis based on the needs of the organisation.
- **Budgetary Control is a process with the help of which, managers set financial and performance goals**, compare the actual results with the budgets, and adjust performance, as it is needed.

Pre-requisites of effective budgetary control:

- **Serious attitude** to the system is required
- **Clear demarcation** between areas of managerial responsibility
- **Reasonable budget** targets
- **Established data collection**, analysis and reporting techniques
- **Reports aimed at individual managers**, rather than general
- **Fairly short reporting periods**, typically a month
- **Timely variance** reports
- Action being taken to **get operations back under control** if they are shown to be out of control

Feedback control:

- Feedback as the name suggests is a reaction after an action has taken place. So, there has to be an error if we want to take corrective actions.
- **CIMA's official terminology defines feedback control as : 'Measurement of differences between planned outputs and actual outputs achieved, and the modification of subsequent action and/or plans to achieve future required results. Feedback control is an integral part of budgetary control and standard costing systems.'**
- Following are the various types of feedback:

Primary	❖ Could be reported to line management in **the form of control reports**, comparing actual and budgeted results. ❖ **If the variances are small or can be corrected easily then the information may not be feedback to anyone higher in the organization**
Secondary	❖ Where feedback is sent to a higher level in an organisation and can lead to a plan being reviewed and possibly changed. ❖ **For example, the revision of a budget after large variances were discovered due to price changes over time.**
Negative	❖ **Feedback taken to reverse a deviation from standard**. This could be by amending the inputs or process so that the system reverts to a steady state
Positive	❖ Taken to reinforce a deviation from standard. ❖ **The inputs or process would not be altered.**

- **Limitations:** It depends heavily **on success of error detection system**. Furthermore there may be a time lag between error detection, error confirmation and error revision during which actual results may change again

Control reports:

Control reports are feedback devices, but they are only part of the feedback system. A control report does not by itself cause a change in performance. A change results only when managers take actions that lead to change. Following are the guidelines for feedback management control report:

- Feedback report should disclose **both accomplishment and responsibility**
- Feedback reports should be **extracted promptly**
- Feedback reports should **disclose trends and relationships**
- Feedback reports should disclose **variations from standards**
- Feedback reports should be in **standardized format**

Feed-forward control:

- **According to the CIMA's Official Terminology, feed-forward control is defined as the 'forecasting of differences between actual and planned outcomes and the implementation of actions before the event, to avoid such differences.'**
- A feed-forward control system operates by comparing budgeted results against a forecast. Control action is triggered by differences between budgeted and forecasted results

Implementation of feed-forward control: Following are the guidelines for implementing an effective feed-forward control

- **Thorough planning and analysis** are required
- **Careful discrimination** must be applied in selecting input variables
- The feed-forward system must be **kept dynamic**
- A model of **control system** should be developed
- **Data on input variables** must be regularly collected and assessed
- Feed-forward control **requires action**

Limitations:

- **The feed-forward process is an evaluation process and is concerned with the estimates of uncertain future**. This problem of uncertainty is likely to limit application of the concept.
- Study of future is not well developed; neither are the tools that have potential for overcoming the problem of uncertainty

Behavioral aspects of budgetary control:

- **Behavioural aspects elucidate that many of the goals of budgeting are contradictory**. On the one side, we want to be able to fairly evaluate the performance of managers. **But we also want to motivate managers and therefore, even if managers are not involved in the process, managers may find the budget too challenging and therefore reduce their effort**. That in turn would distort any evaluation.
- **The participation of managers in setting targets for themselves tends to improve motivation and performance**. If, we want budgets to act as a way of communicating organisational goals. But the budget themselves may distort the goals as they will be very short term, be focused on cost reduction rather than, say, quality aspects, and they will solely focus on financial aspects of the organisation's goals.
- There is therefore a conflict between aiming to achieve financial control and communicating the organisation's goals.
- **Budget affects the approach and behaviour of managers and used to motivate the managers. Unrealistic demanding targets tend to affect manager's performance adversely. Allowing managers to set their own targets will introduce slack targets**

Effect of the budget difficulty on performance:

Budgets are used to measure the performance of the individual by comparing the actuals with flexed budget performance. Organization should try to find an optimum performance budget for better evaluation. "**Budget level that motivates the best level of performance may not be achievable. In contrast, the budget that is expected to be achieved motivates a lower level of performance as managers no longer aspire to meet the budget target.** However following challenges can come in during performance evaluation:

- **Budgets have no motivational effect unless they are accepted by the managers involved as their own personal targets.**
- **Up to the point where the budget is no longer accepted, the more demanding the target the better the results achieved.**
- Demanding budgets are seen as more relevant than less difficult targets, **but negative attitudes result if they are seen as too difficult**.
- **Acceptance of budgets is facilitated when good upward communication exists**. The use of departmental meeting was found helpful in encouraging managers to accept budget targets.
- Managers' reactions to budget targets were found affected both by their own personality and by more general cultural and organizational norms

Participation in budget setting process:

- There are two main approaches for preparing budget namely Top Down approach and Bottom Up approach

Top-Down Approach	Bottom-Up Approach
Budgets can be prepared centrally and subordinates have little influence on the target setting. This called top down budget or imposed style approach . The benefit of top down approach is that it can be produced quickly and involve less management time than other options. However, there are significant risk of inaccurate budgets being set that are also not acceptable to the subordinate managers	**Subordinate managers to participate in the preparation of their own budgets and then these budgets to be reviewed** by senior management. This is called bottom up approach (sometimes referred participative approach)
Preferable in the following scenarios: ❖ Where personality characteristics of the participants may **limit the benefits of participation** ❖ Where participation by itself **is not adequate in ensuring commitment to standards** and managers can significantly influence the results ❖ Where a **process is highly programmable and clear**, stable input-output relationships ❖ Where a firm has **large number of homogenous units and operating in a stable environment**	**Preferable in all scenarios except when top-down approach is preferred**

Styles of performance evaluation:

Performance evaluation (comparing actuals versus budgets) can be done in the following three styles:

- **Budget Constrained Style:** The evaluation is based upon the Cost centre head's ability continually to meet the budget on short term basis.
- **Profit Conscious Style:** Performance of the Cost Centre's head is linked to ability in increase the general effectiveness of his unit's operations in relation to the long- term goals of the organization
- **Non- Accounting Style:** Accounting data plays a relatively unimportant part in the supervisor's evaluation of the cost centre head's performance
- Summary of the three styles is provided in the below table:

	Budget constrained	Profit conscious	Non-accounting
Involvement with costs	High	High	Low
Job-related tension	High	Medium	Medium
Manipulation of accounting information	Extensive	Little	Little
Relations with superiors	Poor	Good	Good
Relations with colleagues	Poor	Good	Good

Limitations of Traditional Budgeting:

- Time-consuming and costly to put together
- Constrain responsiveness and flexibility
- Often a barrier to change
- Rarely strategically focused and are often contradictory
- Add little value, especially given the time required to prepare
- Concentrate on cost reduction and not on value creation
- Developed and updated too infrequently, usually annually
- Are based on unsupported assumptions and guesswork
- Reinforce departmental barriers rather than encourage knowledge sharing
- Make people feel undervalued.

Beyond Budgeting:

- Beyond budgeting came into picture due to the limitations of traditional budgeting
- **According to CIMA's Official Terminology- Beyond Budgeting is 'An idea that companies need to move beyond budgeting because of the inherent flaws in budgeting especially**

when used to set contracts. It is argued that a range of techniques, such as rolling forecasts and market related targets, can take the place of traditional budgeting.

- Beyond budgeting has the following two benefits:
  - It is a **more adaptive process** than traditional budgeting
  - It is a **decentralized process**, unlike traditional budgeting where leaders plan and control organizations centrally

Characteristics and suitability of beyond budgeting:

Characteristics	Suitability
❖ Rolling budgets may incorporate KPIs ❖ **Benchmarking** can be incorporated in budgets ❖ Focus of the **managers shift to improving future results** ❖ Allow operational managers **to react to the environment** ❖ Encourage a **culture of innovation** ❖ More **timely allocation** of resources	❖ Industries where **there is a rapid change in environment** (Flexible targets will be responsive to change) ❖ Industries **using management models such as TQM** (Continuous improvement will be the key) ❖ **Industries undergoing radical change e.g.BPR** (Budgets may be hard to achieve in such circumstances)

Benefits of Beyond Budgeting:

- Beyond budgeting helps managers to **work in coordination to beat competition**
- **Helps in motivating** individuals by defining clear responsibilities and challenges
- Eliminates **behavioral issues**
- Proper **delegation of authority** to operational managers
- **Operational managers do not restrict themselves to budget limits and focus on achieving key ratios**
- Establishes **customer-oriented teams**
- Creates information system which provides fast and open information

Beyond Budgeting – Principles for adaptive performance management:

Goals	Set aspirational goals aimed at continuous improvement, not fixed annual targets.
Rewards	Rewards are based on relative performance and not based on fixed annual targets
Planning	Make planning a continuous and inclusive process and not an annual event
Controls	Base controls are on relative KPIs and performance trends
Resources	Make resources available as needed and not annual budget allocations
Co-ordination	Co-ordinate cross-company interactions dynamically and not through annual planning cycles

Beyond Budgeting – Leadership Principles:

Customer	Focus everyone on improving customer outcomes, not on meeting internal targets.
Accountability	Create a network of teams accountable for results, not centralized hierarchies.
Performance	Champion success as winning in the marketplace, not on meeting internal targets.
Freedom to act	Give teams the freedom and capability to act, don't merely require adherence to plan.
Governance	Base governance on clear values and boundaries, not detailed rules and budgets.
Information	Promote open and shared information, don't restrict it to those who 'need to know'.

Implementation of Beyond Budgeting:

Step	Description
1	Define the case for change and provide an outline vision
2	Be prepared to convince the board
3	Get started
4	Design and implement new processes
5	Train and educate people
6	Rethink the role of finance
7	Change behavior – New processes and not management orders

8	Evaluate the benefits
9	Consolidate the gains

Traditional versus beyond budgeting:

	Traditional budgeting management model	Beyond budgeting management model
Targets	Incremental targets	Stretch goals
Rewards	Fixed incentives	Relative targets and rewards
Planning	Fixed annual plans	Continuous planning
Controls	Variance controls	KPI's & rolling forecasts
Resources	Pre-allocated resources	Resources on demand
Coordination	Central coordination	Dynamic coordination
Organizational culture	Central culture and focus on managing resources	Local control of plans/goals and focus on value creation

Overview of practical problems/ case studies/ important questions:

- Part I – Feedback and Feed Forward Control
- Part II – Budgetary Control – Behavioural issues
- Part III – Beyond Budgeting

Part I – Feedback and Feed Forward Control

1. Feed Forward and Feedback Control [Category A]

Real Petroleum Corporation manufactures lubricant oils for motor vehicles (two wheelers, four wheelers and heavy vehicles). The company offers lubricant oils in various packages ranging from a 100 ml pouch to a 200 litres drum. About 70% of lubricant sales comprise are made in the form of 900 ml 'cans'. The process of manufacturing and packaging lubricant oils are given below: − Base oil of required grade are imported from middle east.

- The base oil are blended with additives at the manufacturing plants at specified temperatures to produce lubricant oils.
- The oil is stored for a day to bring the temperature to normal.
- The plant has an automated bottling facility. The operator is required to preset the quantity and number of 'cans' to be filled in a computerised system. No manual intervention is required thereafter.
- The product is filled in 'cans' at the first stage of packaging with 900 ml of product.
- Caps are fixed on the 'cans' and sealed at the second stage of packaging.
- The product is weighed at third stage of packaging (a conversion factor is used to cover volume into weight) before the 'cans' are packed into a carton.

Any 'can' having lesser quantity of oil is removed before the 'cans' are packed into the cartons. The 'cans' which are short filled cannot be reused. Once the seal is broken, the 'can' is of no use. There is no process by which the oil in short filled 'can' could be reused. Hence the product is wasted.

The company is considering a proposal to add a component in its packaging unit to avoid losses arising out of quantity issues in packaging. The component will be installed after the first stage of packaging. The component will measure the volume of product and will forward the 'can' for capping and sealing only if the quantity in 'cans' is correct. In case the 'can' does not have required volume of product, the 'can' will be topped up with balance product before the capping and sealing process. The company will be able to achieve 0% wastage due to short filling after implementation of new system.

Required
Using the context of control systems, IDENTIFY and EXPLAIN the type of control which is existing in the company and the type of control which is proposed.

Answer:

What is Control?

Control is a management function of establishing benchmarks and comparing actual performance against the benchmarks and taking corrective actions. Control is required at all levels of organisation to ensure that the organisation achieves its intended objective. There are two types of control systems - Feedback Control and Feed-forward Control.

Feedback Control

Feedback Control is a control activity that takes place after a process is complete. It is also known as post action control. If any problem is identified after a process is complete, a corrective action is taken to rectify the problem. Feedback control provides information only after the process is complete and sometimes a significant time is lost to take corrective action. Feedback-based systems have the advantage of being simple and easy to implement.

Real Petroleum currently has a feedback control mechanism in place. The actual volume of the product is measured at the end of the packaging process. The current control process is that any 'can' which is short filled is not packed in the carton. This ensures that a lower quantity of product is not supplied into the market. The current control system, however leads to product losses as identification of short-filled 'cans' at the end of process is not useful to the production process. In case, there is a huge variation in the final packaging, the packaging system can be reviewed to ensure that such problems do not acquire in the future.

Feed-forward Control

Feed-forward Control is also referred to as a preventive control. The rationale behind feedforward control is to foresee potential problems and take corrective action to ensure that the final output is as expected. Feed-forward controls are desirable because they allow management to prevent problems rather than having to cure them later. Feed-forward control are costly to implement as it requires additional investment and resources. These are designed to detect deviation some standard or goal to allow correction to be made before a particular sequence of actions is completed

The proposed system in Real Petroleum is a Feed-forward control. In this case, any short filling is identified in the packaging process itself and corrective action is taken to ensure that the final packed 'can' has proper quantity of product. The new process is beneficial to the company as the wastage arising out of the packaging process can be avoided. The savings must be compared with the cost required to modify the packaging process before finalising on whether the new system should be implemented or not.

2. Feed forward and feedback control [Category B]

EW Partners, a leading strategy and management consulting firm is preparing its budgets for the year to 31 March 2019. One of partner 'W' is concerned about liquidity, he argued, that a firm with adequate liquidity has less risk of being unable to meet their liabilities than an illiquid one. Where a firm has adequate liquidity, there is also the possibility of enriched profitability through reduced interest outlay or increased interest income, together with greater financial flexibility to negotiate enhanced terms with suppliers and financiers or participate in new business opportunities. Accordingly, he desires to reduce the firm's CC to zero by 30 September 2018 and to have a positive cash balance of Rs.145,000 by the end of the year.

Required

COMPARE and CONTRAST, feedforward control and feedback control in context of the above information.

Answer:

In feed-forward control instead of actual results being compared against desired results, forecasts are made of what results are expected to be at some future time. If these expectations differ from what is desired, control actions are taken that will minimize these gaps.

In the scenario, EW Partners has following 2 expectations–

- the first of these is to reduce the CC to zero by 30 Sep 2018 and
- the second is to have a positive cash balance of Rs.145,000 by 31 March 2019.

Therefore, to achieve above expectations, a cash budget will be prepared based on various functional budgets showing cash inflows and outflows for each month so that the firm can identify its anticipated monthly cash balance. **This can then be compared with the firm's expectations to see if their cash balance**

objectives are being achieved. However, if the objectives are not met by these budgets, these budgets may need to be revised by changing the levels of activities. It is the process of feedforward control.

Feedback control involves monitoring results achieved against desired results and taking whatever corrective action is necessary if a deviation exists.

Thus, in the case of EW Partners, a comparison of the actual monthly cash balance can be made against the budgeted cash balance for that month. As with any budget and actual comparison there may be an adverse or favorable variance. If this is substantial, then further analysis may be needed to determine its reason. It may be that costs above budgets, cash receipts lower than expected or receivables took less time to pay than expected, or payables were paid later than expected. This comparison process is feedback control.

Conclusion

Feedforward control attempts to take corrective action before an event, whereas feedback control takes corrective action after the event.

3. Feedback/Feed Forward Control/Sales Budget/Marginal Costing (Category A – May 2019 (exam):

TSH Limited prepared its budget for the year 2019-2020. The purchase manager informed that the company will be able to purchase only 64,000 kg of material ZX-150 in the month of May 2019. All other resources will be fully available as budgeted. In the backdrop of this information, the management wants to revise its budget for May 2019 to maximize profit for the month. The following information is made available to you:

Particulars	Product A	Product B	Product C
Material ZX – 150 required per unit	12 kg	10 kg	7 kg
Direct labour required per unit	8 hours	10 hours	7 hours
	Rs. Per unit	Rs. Per unit	Rs. Per unit
Selling price per unit	2380	2200	1745
Cost of material – ZX	480	400	280
Other material	200	80	170
Direct labour cost	720	900	630
Variable overhead	200	250	175
Orders already accepted from customers for May 2019	320 units	750 units	980 units
Customer demand for delivery of product in May 2019 (including orders already accepted)	3300 units	2800 units	4400 units

Budgeted fixed overhead costs per month is Rs.22,50,000. Management decided to satisfy orders already accepted for delivery in May 2019 keeping in view of the above facts, otherwise financial and non-financial considerations would be significant.

Due to shortage of material ZX-150, the management has set the stock levels for May 2019 as follows:

Particulars	Opening stock	Closing stock
Material ZX-150	9,600 KG	3,100 KG
Product A	300 units	180 units
Product B	430 units	250 units
Product C	560 units	300 units

Required:

1. Identify and explain the type of control system that is involved in the management's decision to revise budget for May 2019, even after preparing budget for 2019-20 based on the information provided by the purchase manager
2. Prepare a production budget for May 2019 to maximize the profits of TSH Limited
3. Based on (ii) above, prepare a sales budget in units for May 2019
4. Using marginal costing, calculate the profit for May 2019 based on (iii) above

Answer:

Part 1:

- ❖ According to the CIMA's Official Terminology, feed-forward control is defined as the 'forecasting of differences between actual and planned outcomes and the implementation of actions before the event, to avoid such differences.'
- ❖ A feed-forward control system operates by comparing budgeted results against a forecast. Control action is triggered by differences between budgeted and forecasted results
- ❖ **The company has already prepared the budget for 2019-20. It plans to revise the budget for May 2019 by forecasting the expected difference between budgeted and actual performance. Therefore, the control system adopted by the company is a feed-forward control system**

Part 2:

WN 1: Computation of expected consumption of Raw Material ZX-150:

Particulars	Amount
Opening stock of ZX-150	9,600
Add: Purchase of ZX-150	64,000
Less: Closing stock of ZX-150	(3,100)
Consumption of ZX-150	**70,500**

WN 2: Computation of production to meet demand:

Minimum production to meet orders already accepted:

Particulars	Product A	Product B	Product C
Closing stock	180	250	300
Add: Minimum demand	320	750	980
Less: Opening stock	(300)	(430)	(560)
Minimum Production	**200**	**570**	**720**

Production to meet maximum demand:

Particulars	Product A	Product B	Product C
Closing stock	180	250	300
Add: Maximum demand	3,300	2,800	4,400
Less: Opening stock	(300)	(430)	(560)
Maximum Production	**3,180**	**2,620**	**4,140**
Discretionary production [Max – Min]	**2,980**	**2,050**	**3,420**

WN 3: Statement of ranking:

Particulars	Product A	Product B	Product C
Selling Price	2,380	2,200	1,745
Less: Variable cost	1,600	1,630	1,255
Contribution per unit	**780**	**570**	**490**
Material ZX-150 per unit	12	10	7
Contribution per unit of Material ZX-150	**65**	**57**	**70**
Ranking	**II**	**III**	**I**

WN 4: Statement of allocation (possible production)

Product	Units	RM consumed	Balance RM
A (Minimum production)	200	2,400	68,100
B (Minimum Production)	570	5,700	62,400
C (Minimum Production)	720	5,040	57,360
C (Discretionary Production)	3,420	23,940	33,420
A (Discretionary Production)	2,785	33,420	0

Part 3:

Sales Budget:

Particulars	Product A	Product B	Product C
Opening stock	300	430	560
Add: Production	2,985	570	4,140

Less: Closing stock	(180)	(250)	(300)
Sales	**3,105**	**750**	**4,400**

Part 4:

Profit statement under marginal costing:

Particulars	**Product A**	**Product B**	**Product C**	**Total**
Units sold	3,105	750	4,400	
Contribution per unit	780	570	490	
Total contribution	**24,21,900**	**4,27,500**	**21,56,000**	**50,05,400**
Less: Fixed Overheads				(22,50,000)
Profit				**27,55,400**

Part II – Budgetary Control – Behavioural issues

4. Budgeting and Behavioral issues [Category B]

"It's frustrating working with Denial. He's very dominant and expects everything to be done his way. We have done more and better work to get up to budget, and the minute we make it he tightens the budget on us. We can't work any faster and still maintain quality. We always seem to be interrupting the big jobs for all those small rush orders. The accountants seem to know everything that's happening in my department, sometimes even before I do. I thought all that budget and accounting stuff was supposed to help, but it just gets me into trouble. I'm trying to put out quality work; they're trying to save money. This is a dead end job. I don't see much of a future here." said Mr. Singh, manager of the machine shop of Global Mfg. Ltd. a UK based Company.

Mr. Singh had just attended the monthly performance evaluation meeting for plant department heads. These meetings had been held on the third Friday of each month since Mr. Denial, MBA from Manchester University, had joined the Indian operations a year earlier. Mr. Singh had just been given the worst evaluation he had ever received in his long career with Global Mfg. Ltd. He was the most respected of the experienced machinists in the company. Old Plant Manager had often stated that the company's success was due to the high quality of the work of machinists like Mr. Singh. He had been with Global Mfg. Ltd. for many years and was promoted to supervisor of the machine shop when the company expanded and moved to its present location. As supervisor, Mr. Singh stressed the importance of craftsmanship and told his workers that he wanted no careless work coming from his department.

When Mr. Denial became the plant manager, he directed that monthly performance comparisons be made between actual and budgeted costs for each department. The departmental budgets were intended to encourage the supervisors to reduce inefficiencies and to seek cost reduction opportunities. The company controller was instructed to have his staff 'tighten' the budget slightly whenever a department attained its budget in a given month; this was done to reinforce the plant supervisor's desire to reduce costs. Mr. Denial often stressed the importance of continued progress toward attaining the budget; he also made it know that he kept a file of these performance reports for future reference.

Required

Identify the problems which appear to exist in budgetary control system and explain how budgetary control system could be revised to improve the effectiveness.

Answer:

The budgetary control system appears to have several very important shortcomings which reduce its effectiveness and may in fact cause it to interfere with good performance. Some of the shortcomings are explained below.

- **Lack of Coordinated Goals:** Mr. Singh had been led to believe high quality output is the goal; it now appears low cost is the goal. He does not know what the goals are and thus cannot make decisions which lead toward reaching the goals.
- **Influences of Uncontrollable Factors:** The actual performance relative to budget is greatly influenced by uncontrollable factors i.e. rush orders. Thus, the variance reports serve little purpose for evaluation of performance.
- **The Short-Run Perspectives:** The monthly evaluation and the budget tightening on a monthly basis result in a very short-run perspective. This will result in inappropriate decisions.

The improvements in the budgetary control system must correct the deficiencies described above. Accordingly:

- Budgetary control system must more **clearly define the company's objectives.**
- Budgetary control system **must develop an accounting reporting system** which better matches controllable factors with supervisor responsibility and authority.
- **Establish budget values for appropriate time periods** which do not change monthly simply as a result of a change in the prior month's performance.

The entire company from top management down must be educated in sound budgetary procedures so that all parties will understand the total process and recognize the benefit to be gained.

5. Budgetary control [Category A]

History of the Company

Great Bus Tours Co. Ltd. (GBTCL) is an open top double-decker bus sightseeing company, particularly identified with its special red and cream-colored buses. It commenced operating in small town of Meghalaya in June 2011 with four buses and as of 2015 operated over 44 buses in north east region of India. GBTCL operates five routes with stops at tourist destinations. The company runs hop-on, hop-off bus tours of various hills, with one 24-hour ticket valid for unlimited journeys on the route. Budget Process/ Incentive Plan

As a part of management performance control and incentive scheme it has been following participative budgeting approach. In GBTCL, budgeting is a joint process in which functional divisions develop their plans in conformity with corporate goals for the next financial year. Based on these plans, divisions prepare functional budgets and send to the appropriate management for review and approval. The budgets after the incorporation of the feedback and suggestions received from the said management, are finalised for the implementation. Then, finalised budgets are used as yardstick for performance measurement. Comparing the actual performance with the yardstick, bonus and other performance related incentives are considered. The higher management believe that this performance control and incentive scheme is very helpful to measure the performance and fixing responsibilities for the responsibility centres.

Budgeted Income Statement

(Rs.'000)

Revenue	1,13,800
Less:	
Variable Costs-	
Direct Material (Fuel, Lubricants and Sundries)	13,600
Direct Labour	40,500
Variable Overheads	7,700
Fixed Costs-	
Operating Overheads (Buses, Garage, Salaries)	18,100
Marketing and Administration	10,700
Profit/ (Loss) before taxes	23,200

Tabel-1

Current Year's Income Statement

(Rs.'000)

Revenue	93,500
Less:	
Variable Costs:	
Direct Material (Fuel, Lubricants and Sundries)	19,600
Direct Labour	37,700
Variable Overheads	6,200

Fixed Costs:	
Operating Overheads (Buses, Garage, Salaries)	20,150
Marketing and Administration	10,100
Profit/ (Loss) before taxes	(250)

Tabel-2

Other Information

Surprisingly above given current year's actual results were not up to the mark. Actual results were clearly showing adverse performance in comparison with budgeted figures.

Managers of GBTCL were upset because they did not receive the bonus. Ms. Maggie, Tour Manager of Route No. 3, said –

"We lost 2 months revenue and fuel prices are almost doubled. We did our best but these circumstances were beyond our control and we should not penalize at all."

In support of her statement, Ms. Meggie provided following additional information –

(a) Rain is common in Northern Region. But, the past year set a record in numbers. In July the expected average was 1,577 mm and received was 1,810 mm, In August the expected average rain was 990 mm and actual received was 1,535 mm. Heavy rain in these two months disrupted normal life of the region.

(b) The fuel prices has risen almost continuously since last year due to surge in global crude prices.

(c) Additional operational expenses Rs.22,00,000 also incurred to remove the milky appearance and give the stainless a nice new look effected by heavy rain.

She claimed that –

"Revised budget with consideration of the above factors would give different results and lead to different conclusions"

Required

You are requested to analyse the tour manager's view.

Answer:

Analysis of Issue

It appears that GBTCL has been badly hit by the weather – high rain in July and August have led to a slump in business. Revenue have seen a fall of 18% over the budgeted figure. Direct Material (most of the fuel) is 21% of the Sales (compared to 12% of budgeted level) because of hike in fuel price. Variable Overheads are almost same. However, interestingly, there is a saving of Rs.1,50,000 in Operating Overheads as compared to the budgeted figure after catering additional Operational Expenses of Rs.22,00,000 (for removal of milky appearance etc.). Furthermore, there is reduction in Marketing & Administration Cost. The ratio of Salary to Sales rose to 40% in 2015 from 36% (as budgeted). This appears to be atypical. Instead, there should be a cut in this ratio due to slump in business.

Award of bonus in case of losses is not justified and managers should be held accountable for their operations. However, they should not be held accountable for the events beyond their control. A manager cannot control movements in fuel price, yet he/ she is supposed to have the most information and he/ she is expected to correctly forecast movements in the prices of fuel. Managers shouldn't be penalized for the uncontrollable events. Accordingly, in GBTCL, there should be revision in the budget to account uncontrollable events.

Revised budgeted income statement

Particulars	**Amount (in '000s)**
Revenues (Rs.1,13,800 * 10/12)	94,833
Less: Variable costs	
Direct Material (Fuel, Lubricants and sundries) [19,600 * 94,833] 93500	19,879
Direct Labour (40,500 * 10/12)	33,750
Variable overheads (7,700 * 10/12)	6,417
Fixed costs:	

Operating overheads (Buses, Garage and salaries) [18,100 + 2,200]	20,300
Marketing and Administration	10,700
Profit/Loss before taxes	3,787

- The Revised Profit Margin has come down to 4% as against the Target Profit Margin of 20%. This clearly indicates that the performance was benchmarked against the higher target. If original budget figure is used to measure the performance, it will punish employees for the reason which are beyond their control.
- **GBTCL is not too far away from Revised Profit Margin. Therefore, at least some bonus may be considered to be awarded to the employees which may create more employee loyalty and may be beneficial for long term.**
- **Further, continuous monitoring of Budget Performance (achievement/ failure) in GBTCL is essential to overcome this situation. This helps to identify where revisions are required in the budget to account changing conditions, errors, modification to company's plan etc**. Monitoring of Budget Performance should be the responsibility of the managers in GBTCL. The essence of the effective monitoring of Budget Performance is that the managers should provide accurate, relevant, actionable information on time to the appropriate management level so that budget can give a realistic target to measure the performance.
- It is also important to note that at the time of revising the budget, the primary budget as well as past information should not be ignored as they are the basis for preparing all budgets.

6. Budgetary Control [Category A]

CW is a retail company that operates five stores. Each store has a manager and there is also a General Manager who reports directly to the Board of directors of the company.

For many years the General Manager has set the budgets for each store and the store managers' performances have been measured against their respective budgets even though they did not actively participate in their preparation. If a store manager meets his budgeted target then he is financially rewarded for his performance.

The company has recently appointed a new Finance Director who has questioned this previous practice and suggested that each store manager should be involved in the preparation of their own budget. The General Manager is very concerned about this. She thinks that the store managers will overstate their costs and resource requirements in order to make it easier for them to achieve their budget targets.

- **Explain** the problems that could arise, for planning and decision making purposes within CW, if the store managers did overstate their budgeted costs and resource requirements.
- **Discuss** the behavioural issues that could arise if excess costs and resources are removed from the store managers' budgets.

Answer:

Problems due to budget over-estimation:

If the store managers overstate their budgeted costs and resource requirements then the following planning and decision making problems could arise within CW:

- It may cause CW to order excess items which would result in higher inventory holding costs as **the items remain unused, or result in inefficient handling / theft of items as the store managers** try to prove that their budget was correct and not draw attention to themselves by having favourable variances in their performance reports.
- It may cause CW to **recruit and train additional employees in order to meet the budgeted resource requirements**. This will lead to higher than necessary staff levels, higher payroll and employee costs and may lead to future redundancies or inefficient operations as the store managers try to prove that their budget was correct and not draw attention to themselves by having favourable variances in their performance reports.
- It may cause **CW to invest in new additional equipment which is not really needed and which would therefore be a drain on the cash resources of CW**. This could prevent them from investing in other areas of the business that would represent a more profitable use of the money available.
- It may cause **CW to borrow funds in order to fund the new capital investment or the additional working capital in the business**. This funding would not really be required but if taken would cause CW to incur additional financing costs.

Behavioural problems:

Behavioural problems could arise from the removal of the excess costs and resources from the managers' budgets if it is removed without agreement from the managers. There are two main difficulties here:

- If the manager agrees that the excess can be removed this is an admission that their original budget was wrong and **as a result their integrity as a manager is questioned**. They are vulnerable to the accusation that they do not understand their own store and as a result their ability to be a manager is also questioned.
- **If the excesses are removed without the manager's agreement** then there is the risk that the manager will disown their budget and as a result **they will not be motivated towards achieving it**. They may even take operational decisions that lead to adverse variances when measured against the amended budget to try to ensure that the performance reports show that their original budget was correct.

7. Budgetary control [Category A]

A college is preparing its budget for 2012. In previous years the director of the college has prepared the college budget without the participation of senior staff and presented it to the college board for approval. Last year the college board criticised the director over the lack of participation of his senior staff in the preparation of the budget for 2011 and requested that for the 2012 budget the senior staff were to be involved.

Discuss the potential advantages and disadvantages to the college of involving the senior staff in the budget preparation process.

Answer:

There are potential advantages and disadvantages of the involvement of staff in the preparation of the budget.

Potential advantages include:

- Involvement would encourage **senior staff to be motivated** to achieve the target because they would take ownership of it as their budget.
- Senior staff may **have a better knowledge** of individual courses and how they may be delivered more efficiently and cost effectively. They would also have a better understanding of how to attract more students to the course thus increasing its profitability. This would improve the accuracy of the budget.
- Senior staff would feel **that they are being respected** for the value that their experience brings to the running of the college.

Potential disadvantages include:

- Senior staff may be **excellent academically but could lack the knowledge and skills** required to formulate their budget and to work together to form the budget for the college overall.
- Senior staff may **spend a great deal of time arguing with each other** (and with the college director) as to how to measure the benefits of a particular course and how the cost / benefit analysis of each course should be compared.
- Senior staff may agree among themselves **to include unnecessary expenditure (budgetary slack)** so that it is easier for them to achieve the cost targets they have set.
- Senior staff **may underestimate the expected revenue** in order to make their final target more achievable.
- The participative process can be **very time consuming**, thus delaying the availability of the budget for the forthcoming year.

8. Participative budgeting [Category A]

Established in the year 1997, Excellent Woodcraft Private Limited (EWPL) is one of the distinguished manufacturers and suppliers of an unlimited array of Wooden Furniture Items. Product compilation comprises of Modular Furniture, Workstations, and Cafeteria Furniture. Moreover, it is also engaged in presenting Furniture Services that include Interior Fit Out, Office Interiors and Corporate Interior Designing. Since inception, it has strived to proffer an excellent blend of optimum quality and price, and successfully established the company as the preferred choice of customers in the past years. This is the reason that its products and services are applauded in the industry for its flawlessness.

At EWPL, a world-class infrastructure is set up with different types of latest technology based machines and equipment, which provide great support in hassle-free production and storage of the proffered assortment. Besides the spacious workspace, it has recruited a team of skilled and experienced professionals, who are magnificently trained to understand and meet the diverse client requirements within the committed time period. It aims to attain complete client satisfaction and put in its best efforts to achieve the same by offering outstanding product range & feasible services.

EWPL's Budgeting Process for Sales

1) Each salesgirl makes a customer-wise listing of sales for the last few years. Based on this information and her knowledge about customer's requirements, she determines an overall sales goal.
2) The sale manager, W Robert, gathers all this information and modifies it a bit. Particularly, W looks at variance in sales growth and modifies low projections to be in line with the average. He, of course, discusses this correction with the concerned salesgirl. The usual approach is to hold up the other forecasts and attribute lack of sales growth to lower talent.
3) W then meets with J Donald, Managing Director. By this time, J already back out of his sales expectations for next year based on his desired profit. J discusses the overall target with the W. The usual result is a 7% to 10% increase in projected sales, which the W allocates among the salesgirls based on their past performance.
4) Of course, J desires that the W discuss and negotiate any alteration with the sales force. He believes that with appropriate logics, not high but attainable targets for his sales team can be met.

Required

(i) DISCUSS the participative nature of the sales budgeting process at EWPL.
(ii) ADVISE on best approach from EWPL's perspective that may be adopted.

Answer:

(i) In participative budgeting, subordinate managers create their own budget and these budgets are reviewed by senior management. **Such budget communicates a sense of responsibility to subordinate managers and fosters creativity**. This is also called bottom up approach (sometime referred as participative approach).

As the subordinate manager creates the budget, it might be possible that the budget's goals become the **manager's personal goal**, **resulting in greater goal congruence**. In addition to the behavioural benefits, participative budgeting also has the advantage of involving individuals whose knowledge of local conditions may enhance the entire planning process.

The participative budget described here appears participative in name only. In virtually every instance, the participative input is subject to oversight and discussion by sales manager. Some amount of revision is also common. However, excessive and arbitrary review that substitutes a top-down target for a bottom-up estimate makes a deceit process. Such a gutting appears to be the case in EWPL. **J's statement indicates a very autocratic style. The revision process also seems to be arbitrary and capricious**. There is little incentive for the salesgirls to spend much time and effort in projecting the true expected sales because they know that the target would be revised again and J's estimate will prevail. This situation creates an interesting discussion about the costs and benefits of participative budgeting and gives rise to game playing and slack.

(ii) In top down approach, **budget figures will be imposed on sales personnel by senior management and sales personnel will have a very little participation in the budget process**. Such budget will not interest them since it ignores their involvement altogether. **While in bottom up approach, each sales person will prepare their own budget**. These budgets will be combined and reviewed by seniors with adjustment being made to coordinate the needs and goals of overall company. Proponents of this approach is that salespersons have the best information of customer's requirements, therefore they are in the best position in setting the sales goal of the company. More importantly, salespersons who have role in setting these goals are more motivated to achieve these goals. **However, this approach is time-intensive and very costly when compared with top down approach.** In order to achieve personal goals, participants may also engage in politics that create budgetary slack and other problems in the budget system.

Since both top down and bottom up approaches are legitimate approaches, so EWPL can use combination of both. Seniors know the strategic direction of the company and the important external factors that affect it, so they might prepare a set of planning guidelines for the salesgirls. These guidelines may include forecast of key economic variables and their potential impact on the EWPL, plans for introducing and advertising a new product and some broad sales targets etc. With these guidelines, salesgirls might prepare their individual budget. These budgets need to be reviewed to validate the uniformity with the EWPL's objectives. After review, if changes are to be made, the same should be discussed with salesgirls involved.

Part III – Beyond Budgeting

9. Case study on beyond budgeting [Category A]

The Board of Directors meeting of Kyoto Motors Ltd., a car manufacturing company is to be scheduled to be held in another ten days. One of the items, as per agenda, to be discussed in the meeting is the present budgeting system of the company. Your organisation is at present, using budgets for control which are prepared mostly on traditional basis. The CEO of your company wants to propose to the Board to use Beyond Budgeting instead of traditional budgeting in the company on experimental basis. Therefore, you, the Management Accountant has been asked by your CEO to explore the possibilities of introducing Beyond Budgeting (BB) system in the company.

Required

Specifically, you are required to PREPARE notes to your CEO to be used for his presentation at the meeting on:

(i) the major limitations of traditional budgets
(ii) the advantages available in Beyond Budgeting.
(iii) the nature of Beyond Budgeting.
(iv) the benefits that can be enjoyed from Beyond Budgeting.
(v) the suitability of Beyond Budgeting to the company.

Answer:

(i) Limitations of Traditional Budgets

- Time-consuming and costly to put together.
- Constrain responsiveness and flexibility.
- Often a barrier to change.
- Rarely strategically focused and are often contradictory.
- Add little value, especially given the time required to prepare.
- Concentrate on cost reduction and not on value creation.
- Developed and updated too infrequently, usually annually.
- Are based on unsupported assumptions and guesswork.
- Reinforce departmental barriers rather than encourage knowledge sharing.
- Make people feel undervalued.

(ii) Advantages of Beyond Budgeting (BB)

BB identifies its two main advantages.

- It is a more adaptive process than traditional budgeting.
- It is a decentralised process, unlike traditional budgeting where leaders plan and control organisations centrally.

(iii) Nature of 'Beyond Budgeting'

- Budgeting is evolving, rather than becoming obsolete- it depends on trust and transparency.
- Shift from the top-down, centralised process to a more participative, bottom-up exercise in many firms.
- It highlights the level of improvement that can be achieved even with relatively simple modifications and a great deal of trust.
- Budgeting has changed, the change has been neither dramatic nor radical. Instead, incremental improvements, with traditional budgets being supplemented by new tools and techniques.
- Forecasting in fact is more important.

(iv) Benefits of the 'Beyond Budgeting' Model

- Beyond budgeting helps managers to work in coordination to beat the competition. Internal rivalry between managers is reduced as target shifts to competitors.
- Helps in motivating individuals by defining clear responsibilities and challenges.
- It eliminates some behavioural issues by making rewards team-based.
- Proper delegation of authority to operational managers who are close to the concerned action and can react quickly.
- Operational managers do not restrict themselves to budget limits and focus on achieving key ratios.
- It establishes customer-orientated teams.
- It creates information systems which provide fast and open information throughout the organization

(v) Suitability of Beyond Budgeting to the Company

Since Kyoto Motors Ltd. is a car manufacturing company and presently adopting Traditional Costing system. **Moreover, Automobile industry goes through rapid changes in its business environment. So, the company can definitely use Beyond Budgeting to improve the control system and beat the competition. Beyond Budgeting lies an agile, holistic approach based on self-organisation. This will also help the managers to work in close coordination with each other with motivation which in turn will beat the competition.**

Chapter 12 – Standard Costing

Planning and Operational Variances:

- When the current environmental conditions are different from the anticipated environmental conditions (prevailing at the time of setting standard or plans) the use of routine analysis of variance for measuring managerial performance is not desirable / suitable.
- The variance analysis can be useful for measuring managerial performance if the variances computed are determined on the basis of revised targets / standards based on current actual environmental conditions.
- A Planning Variance simply compares a revised standard to the original standard.
- An Operational Variance simply compares the actual results against the revised amount.
- Operating Variances would be calculated after the planning variances have been established and are thus a realistic way of assessing performance.
- **The difference between the original and revised budget is called as PLANNING variances and the difference between the revised and actual is called as OPERATING variances.**
- The responsibility should be fixed only for the operating variances.
- **While calculating planning variances, standard means original budget and actual means revised budget; For operating variances standard means revised budget and actual means actual performances**

Market Size and Market Share Variance:

- The conventional Sales Volume Variance reports the difference between actual and budgeted sales valued at the standard price per unit. The variance just indicates whether sales volume is greater or less than expected. It does not indicate how will sales management has performed. In order to assess the performance of sales management, market conditions prevailing during the period should be taken into consideration.
- Accordingly, the sales volume variance can be sub-divided into a planning variance (market size variance) and operational variance (market share variance).
- Market size variance measures the impact on the quantity sold due to change in the market size. It is similar to planning variance.
- Market share variance measures the impact on the quantity sold due to change in the company's share in the overall market. It is similar to operating variance

Types of problems for market size and share variance:

- Single FG
- Multiple FG

Scenario 1: Single FG:

Computation table:

BP x BQ	BP x NBQ	BP x AQ	AP x AQ

Note: Budgeted quantity (BQ) is prepared based on original market size whereas New Budgeted Quantity (NBQ) is prepared based on revised market size

Formulae:

Total Sales Variance	(BP x BQ) – (AP x AQ)	Col 1 – Col 4
Sales Price Variance	(BP x AQ) – (AP x AQ)	Col 3 – Col 4
Sales volume variance	(BP x BQ) – (BP x AQ)	Col 1 – Col 3
Market size variance	(BP x BQ) – (BP x NBQ)	Col 1 – Col 2
Market share variance	(BP x NBQ) – (BP x AQ)	Col 2 – Col 3

Scenario 2: Multiple FG:

Computation table:

BP x BQ	BP x NBQ	BP x RBQ	BP x AQ	AP x AQ

Note: Budgeted quantity (BQ) is prepared based on original market size whereas New Budgeted Quantity (NBQ) is prepared based on revised market size

Formulae:

Total Sales Variance	(BP x BQ) – (AP x AQ)	Col 1 – Col 5
Sales Price Variance	(BP x AQ) – (AP x AQ)	Col 4 – Col 5
Sales volume variance	(BP x BQ) – (BP x AQ)	Col 1 – Col 4
Sales Mix Variance	(BP x RBQ) – (BP x AQ)	Col 3 – Col 4
Sales quantity variance	(BP x BQ) – (BP x RBQ)	Col 1 – Col 3
Market Size Variance	(BP x BQ) – (BP x NBQ)	Col 1 – Col 2
Market share variance	(BP x NBQ) – (BP x RBQ)	Col 2 – Col 3

Note: Positive answer would indicate adverse variances while negative answer would indicate favorable variances

Variance Analysis in Activity Based Costing:

- Variance analysis can be applied to activity costs (such as setup costs, product testing, quality testing etc.) to gain understanding into why actual activity costs vary from activity costs in the static budget or in the flexible budget.
- Interpreting cost variances for different activities requires understanding whether the costs are output unit-level, batch level, product sustaining, or facility sustaining costs .
- The price variance is the difference between standard price and actual price for the actual quantity of input used for each cost driver.
- The efficiency variance measures the difference between the actual amount of cost driver units used, and the standard allowed to make the output. We multiply the difference in quantities by the standard price per cost driver to get the rupee value of the variance
- ABC approach is based on the assumption that the overheads are basically variable (but variable with the delivery numbers and not the units output).
- The efficiency variance reports the cost impact of undertaking more or less activities than standard, and the expenditure variance reports cost impact of paying more or less than standard for the actual activities undertaken.

Learning Curve – Impact on Variances:

- Learning curve is a geometrical progression, which reveals that there is steadily decreasing cost for the accomplishment of a given repetitive operation, as the identical operation is increasingly repeated.
- The amount of decrease will be less and less with each successive unit produced. As more units are produced, people involved in production become more efficient than before.
- **Each additional unit takes less time to produce. The amount of improvement or experience gained is reflected in a decrease in man-hours or cost.**
- Where learning takes place with a regular pattern it is important to take account of reduction in a labour hours and cost per unitRs..
- In less-automated processes, however, where learning curves do occur, it is important to take the resulting decline in labour hours and costs into account in setting standards, determining prices, planning production, or setting up work schedules.
- With the help of the learning curve theory the standard time of any batch or unit can be computed then compare the actual data with the standard and compute the variances.

Relevant cost approach to variance analysis:

- Traditional approach to variance analysis is to compute variances based on total actual cost for production inputs and total standard cost applied to the production output. This is ambiguous, when inputs are limited. Failure to use limited inputs properly leads not only to increased acquisition cost but also to a lost contribution. Therefore, it is necessary to consider the lost contribution in variance analysis. When this approach is used, price or expenditure variances are not affected.

Variance analysis and throughput accounting:

- A system based on constraint management will likely show very odd results under a variance reporting system.
- For example, when a terminal upstream from the constrained resource runs out of work, a manager functioning under throughput accounting system will shut it down in order to avoid the formation of an unnecessary level of work-in-process inventory. However, this will result into a negative labor efficiency variance, since the terminal's staff is not actively producing anything.
- **Throughput accounting does use variance analysis, but not the ones used by a traditional system.** Instead, its main emphasis is on tracking variations in the size of the inventory buffer placed before the constrained resource, to confirm that the constraint is never halted due to an inventory shortage.

Variance Analysis in Advanced Manufacturing Environment/high technology firms:

- The variance analysis generally applies to all types of organizations; however, high-technology firms apply the model somewhat differently. Now much of electronic industry is highly automated.
- A large part of manufacturing process is computerized. In the high-technology environment that is emerging, many costs that once were largely variable have become fixed, most becoming committed fixed cost.
- Some high technology manufacturing organizations have found that the two largest variable costs involve materials and power to operate machines. In these companies, the emphasis of variance analysis is placed on direct materials and variable manufacturing overhead.
- Much of the manufacturing labour consists of highly skilled experts/ operators/ programmers are largely committed cost. Firms don't want to take risk losing such highly trained personnel even during an economic downturn. The result is less direct labour and more overhead. For these firms labour variances may no longer be meaningful because direct labour is a committed cost, not a cost expected to vary with output.

Standard costing in service sector:

- Standard Costing can be equally applicable for various types of industries for example accountants, solicitors, dentists, hairdressers, transport companies and hotels.
- Service industries comprise a wide range of different businesses that differ in size and types of service provided.
- Standard costing and variance analysis is more tough to apply to service sector organizations as major portion of their cost is comprised of overhead expenses rather than production expenses.
- While traditional variance analysis of overheads does not deliver very useful information for overheads control purposes, application of activity based costing can provide an effective basis for variance analysis of overheads in service sector organizations although this may need significant time and effort in the implementation of a MIS.

Standard costing in Public sector:

- In order to cost control in public sector (e.g. street cleaning refuse disposal and so on), regular variance analysis is required.
- Actual unit costs should be calculated on a monthly basis and compared with estimated unit cost.
- To achieve this comparison, information needs to be maintained about the unit of service adopted. For example, statistics would be maintained on the number of visits made and the number of hours worked.
- In this example, time recording may be beneficial in providing the detailed information necessary for variance analysis. Actual monthly costs should be taken from the organisation's financial management system and each month financial reports should be produced which offer an accurate image of budgeted vs actual expenditure.
- These reports are must for budgetary control. Actual expenditure reported on financial systems may require some modification to take account of:
    - Trade Payables (services used but bills unpaid)

- Accruals (services used but bills yet to be received)
- Timing Differences (some costs are not incurred evenly over the year)

Factors to be considered when investigating variances:

- **Size:** A standard is seen as an average of the estimates and therefore small variations seen from the standard should be ignored and not investigated further. In addition organizations can establish limits and the variances seen beyond those limits should be undertaken for further investigation.
- **Type of Variance :** Adverse variance is given more importance by the organization over favorable variances seen with regards to the estimates.
- **Cost:** The costs associated with the undertaking of the investigation should be lower than the benefits associated with the investigation of variances for the organization to undertaken the said investigation.
- **Pattern in variance :** The variances need to be monitored over a period of time and if the variance of a particular cost is seen to be worsening over time then in that case the investigation in relation to the variance needs to be undertaken.
- **Budgetary process:** In case the budgetary process is uncontrollable and unrealistic then in that case the investigation should be re-evaluating the budgetary process rather than undertaking investigation of the variances.

Methods used for investigating variance:

- **Simple Rule of Thumb Model:** It is based on arbitrary criteria such as investigating if the absolute size of a variance is greater than a certain amount or if the ratio of the variance to the total cost exceeds some predetermined percentage. They are based on managerial judgement and do not consider statistical significance.
- **Statistical Decision Model:** For the statistical models, two mutually exclusive states are possible. First assumes that the system is 'In Control' and a variance is simply due to random fluctuations around the expected outcome. The second possible state is that the system is in some way 'Out of Control' and corrective action can be taken to remedy the situation. An investigation is undertaken when the probability that an observation comes from an 'In-Control' distribution falls below some arbitrarily determined probability level.
- **Statistical Control Charts:** Statistical quality control is used mainly for monitoring and maintaining of the quality of products and services, but within a standard costing framework, statistical control charts can be used to monitor accounting variances. For example, labour usage could be plotted on a control chart on an hourly basis for each project. This process would consist of sampling the output from a project and plotting on the chart the mean usage of resources per unit for the sample output.

Possible interdependence between variances: It is a term used to express the way in which the cause of one variance may be wholly or partially explained by the cause of another variance. For control purposes, it might therefore be essential to look at several variances together and not in isolation. Some examples of interdependence of variances are listed below

- **Use of cheaper material which is poorer quality**, the material price variance will be favourable, but this can cause more wastage of materials leading to adverse usage variance.
- **Using more skilled labour to do the work** will result in an adverse labour rate variance, but productivity might be higher as a result due to experienced labour.
- **Changing the composition of a team** might result in a cheaper labour mix (favourable mix variance) but lower productivity (adverse yield variance).
- **Workers trying to improve productivity** (favourable efficiency variance) in order to get bonus (adverse rate variance) might use materials wastefully in order to save time (adverse materials usage).
- **Cutting sales prices** (adverse sales price variance) might result in higher sales demand from customers (favourable sales volume variance).
- Similarly, favourable sales price variance may result in adverse sales volume variance

Causes of variances:

Material Price Variance

- Might be caused due to the use of a different supplier.
- Order size can result in variance.
- Any form of unexpected increase in buying costs such as higher delivery charges.
- Efficiency or inefficiency associated with the buying procedure adopted.
- Lack of appropriate inventory control can result in emergency purchase of material resulting in adverse variance.

Material Usage Variance

- Purchase of inferior quality material.
- Implementation of better quality control.
- Increased efficiency in production can help in bringing down wastage rate.
- Changes made in the material mix.
- Careless way of handling material by production department.
- Change in method of production/ design.
- Pilferage of material from the production department.
- Poor inspection.

Labour Rate Variance

- Unexpected increase in the pay rate of labour.
- Level of experience of the labour can impact the direct cost of labour.
- Payment of bonuses added to the direct labour costs.
- Change in the composition of the workforce can impact direct labour costs.

Labour Efficiency Variance

- Improvement in work or productivity efficiency.
- Workforce mix can have an impact upon labour efficiency levels.
- Industrial action in relation to workforce.
- Poor supervision of the workforce.
- Learning curve effect upon the labour efficiency levels.
- Resource shortages causing an unexpected delay and lowering of labour efficiency levels.
- Using inferior quality of material.
- Introduction of new machinery resulting in improvement of labour productivity levels.

Overhead Variances

- Fixed Overhead Expenditure Variance (adverse) are caused by spending in excess of the budget.
- Fixed Overhead Volume Variance is caused by changes in production volume.
- Variable Overhead Expenditure Variance are often caused by changes in machine running costs.
- Variable Overhead Efficiency Variances- Causes are similar to those for a direct labour efficiency variance.

Sales Price Variance

- Higher discounts given to customers in order to encourage bulk purchases.
- The effect of low price offers during a marketing campaign.
- Poor performance by sales personnel.
- Market conditions or economic conditions forcing changes in prices across the industry.

Sales Volume Variance

- Successful or unsuccessful direct selling efforts.
- Successful or unsuccessful marketing efforts (for example, the effects of an advertising campaign).
- Unexpected changes in customer preferences and buying patterns.
- Failure to satisfy demand due to production difficulties.
- Higher demand due to a cut in selling prices, or lower demand due to an increase in sales prices.

Reporting of variances through variance reports:

Variance reports should give due regard to the following points :-

- The concerned executives should be informed about what the cost performance should have been.
- How close the actual cost performance is with reference to standard cost performance.
- The analysis and causes of variances.
- Reporting should be based on the principle of management by exception.
- The magnitude of variances should also be stated.

Behavioural issues:

- Variance analysis may encourage short-termism due to their inherent tendency towards short-term, quantified objectives and results.
- A negative perception of an organization's variance analysis process can also encourage other sub- optimal behaviour among employees such as attempts to include budget slacks.
- The behavioural issues connected with variance analysis could be managed by participating employees during budget setting so that they do not assess the procedure as biased. It is also vital for an organization's performance measurement system to be based on a extensive range of quantitative and qualitative measures so as to encourage management to adopt a long-term view that is aligned with an organization's strategic direction.

Standard costing in contemporary business environment: Standard costing is inappropriate in modern business environment due to the following:

- Products in these environments are non-standardized
- Variance reports may arrive too late to solve problems
- Standard costs become outdated quickly
- Variance analysis may not give enough detail
- Production is highly automated
- The emphasis is on continuous improvement so pre-set standards become less useful
- Modern environments often use ideal standards rather than current standards

Introduction:

1. Standard costing system reconciles budgeted profit and actual profit
2. Standard costing is also known as variance analysis because it analyzes the cost and sales variances into various components and fixes up the responsibility for variances
3. The variance is analyzed as:
    a. Sales Variances
    b. Cost variances
        i. Material cost variances
        ii. Labour cost variances
        iii. Overhead cost variances
            1. Variable overhead variances
            2. Fixed Overhead Variances
4. If a variance increases actual profit it is called "favorable" (F) and if it decreases actual profits it is called "adverse" (A)

Understanding different costs:

1. Budgeted cost refers to the cost to be incurred for the budgeted output
2. Standard cost refers to the allowable cost for the actual output. In short standard cost is nothing but budgeted cost flexed to actual output.
3. Actual cost refers to the cost incurred by the company in producing the output
4. Cost variance is the difference between standard cost and actual cost and not the budgeted and actual cost

Fill the following:

Budgeted output = 20000 units Standard cost p.u = 20 Actual output = 12000 units and Actual cost = 2,88,000

1. Budgeted cost = Rs.4,00,000 (20,000 units x Rs.20)
2. Actual cost = Rs.2,88,000
3. Standard cost = Rs.2,40,000 (12,000 units x Rs.20)
4. Cost variance = Rs.48,000 A (standard cost – Actual Cost)

Formulae for variances:

Students are requested to visit my youtube channel and go through this link to understand simple way to remember all formulae. Link for playlist containing all videos are http://bit.ly/2VwqOxy

Material Variances:

1. In order to compute the material variances we require the following information
    a. Standard Quantity – This is the budgeted quantity flexed for actual output
    b. Revised standard quantity – This is the total of the actual quantity apportioned in the standard mix. This is applicable only when there is more than one material
    c. Actual quantity – Actual quantity used and this is normally directly given in the problem
    d. Standard price – This is the budgeted price to be paid for procuring the material
    e. Actual price – This refers to the actual price paid for procuring the raw materials
2. The objective of variance analysis is to fix responsibility and take corrective action wherever required. They are attention seekers rather than the problem solvers
3. Material variances compute the difference between the standard material cost and the actual material cost and fix the responsibility for the variances. The variance can either occur on account of quantity or price variances

Types of problems under material variances:

- Single material
- Multiple material

Scenario 1: Single Material

Computation table

SP * SQ	SP * AQ	AP * AQ
Standard material cost		Actual Material cost

Formulae:

Material Cost Variance	(SP x SQ) – (AP x AQ)	Col 1 – Col 3
Material Price Variance	(SP x AQ) – (AP x AQ)	Col 2 – Col 3
Material Usage Variance	(SP x SQ) – (SP x AQ)	Col 1 – Col 2

Scenario 2: Multiple Materials:

Computation table:

SP * SQ	SP * RSQ	SP * AQ	AP * AQ
Standard material cost			Actual Material cost

Formulae:

Material Cost Variance	(SP x SQ) – (AP x AQ)	Col 1 – Col 4
Material Price Variance	(SP x AQ) – (AP x AQ)	Col 3 – Col 4
Material Usage Variance	(SP x SQ) – (SP x AQ)	Col 1 – Col 3
Material Mix Variance	(SP x RSQ) – (SP x AQ)	Col 2 – Col 3
Material Yield Variance	(SP x SQ) – (SP x RSQ)	Col 1 – Col 2

Labour Variances:

1. In order to compute the labour variances we require the following information
    a. Standard Hours – This is the budgeted hours flexed for actual output
    b. Revised standard hours – This is the total of the actual hours worked **(not actual hours paid)** apportioned in the standard mix. This is applicable only when there is more than one grade of labour

c. Actual hours worked – This refers to the number of hours actually worked. AHW = Actual hours paid – Idle time
d. Actual Hours paid – This refers to the number of hours for which the company is paying. Actual hours worked and actual hours paid are different only when there is idle time because idle time refer to hours paid but not worked
e. Standard rate – This is the budgeted rate to be paid to the labour
f. Actual rate – This refers to the actual rate paid for using the labour

2. Labour variances compute the difference between the standard labour cost and the actual labour cost and fix the responsibility for the variances. The variance can either occur on account of efficiency or rate variances

Different types of problems under labour variances:

- Single labour without idle time
- Single labour with idle time
- Multiple labour without idle time
- Multiple labour with idle time

Scenario 1: Single labour without idle time:

Computation table:

SR x SH	SR x AH	AR x AH

Formulae:

Labour cost variance	(SR x SH) – (AR x AH)	Col 1 – Col 3
Labour rate variance	(SR x AH) – (AR x AH)	Col 2 – Col 3
Labour efficiency variance	(SR x SH) – (SR x AH)	Col 1 – Col 2

Scenario 2: Single labour with idle time:

Computation table:

SR x SH	SR x AHW	SR x AHP	AR x AHP

Formulae:

Labour cost variance	(SR x SH) – (AR x AHP)	Col 1 – Col 4
Labour rate variance	(SR x AHP) – (AR x AHP)	Col 3 – Col 4
Labour efficiency variance	(SR x SH) – (SR x AHW)	Col 1 – Col 2
Labour idle time variance	(SR x AHW) – (SR x AHP)	Col 2 – Col 3

Scenario 3: Multiple labour without idle time:

Computation table:

SR x SH	SR x RSH	SR x AH	AR x AH

Formulae:

Labour cost variance	(SR x SH) – (AR x AH)	Col 1 – Col 4
Labour rate variance	(SR x AH) – (AR x AH)	Col 3 – Col 4
Labour efficiency variance	(SR x SH) – (SR x AH)	Col 1 – Col 3
Labour mix/gang variance	(SR x RSH) – (SR x AH)	Col 2 – Col 3
Labour sub-efficiency/yield variance	(SR x SH) – (SR x RSH)	Col 1 – Col 2

Scenario 4: Multiple labour with idle time:

Computation table:

SR x SH	SR x RSH	SR x AHW	SR x AHP	AR x AHP

Formulae:

Labour cost variance	(SR x SH) – (AR x AHP)	Col 1 – Col 5
Labour rate variance	(SR x AHP) – (AR x AHP)	Col 4 – Col 5
Labour idle time variance	(SR x AHW) – (SR x AHP)	Col 3 – Col 4
Labour efficiency variance	(SR x SH) – (SR x AHW)	Col 1 – Col 3
Labour mix/gang variance	(SR x RSH) – (SR x AHW)	Col 2 – Col 3

Labour sub-efficiency/yield variance	(SR x SH) – (SR x RSH)	Col 1 – Col 2

Variable overhead Variances:

1. In order to compute the Variable OH variances we require the following information
    a. Standard Hours – This is the budgeted hours flexed for actual output
    b. Actual Hours– This refers to the number of hours actually worked. It does not include idle time as it is assumed that the company does not incur variable overheads during idle time
    c. Standard rate per hour – This is the budgeted rate to be incurred every hour and is calculated by dividing the budgeted hours from budgeted variable overheads. {SR. per hour = Budgeted VOH / BH}
    d. Actual rate per hour – This refers to the actual rate incurred on variable overheads
2. VOH variances compute the difference between the standard VOH cost and the actual VOH cost and fix the responsibility for the variances. The variance can either occur on account of efficiency or rate variances

Computation table for VOH Variances:

SR * SH	SR * AH	AR * AH
Standard VOH cost		Actual VOH Cost

Conversion factor when information on output is given but hours not directly available:

- SR/per hour * SH = SR/per unit * AO
- SR/per hour * AH = SR/per unit * SO

Note:

- SR/per unit = Budgeted VOH / Budgeted units
- **Logic behind conversion:** The standard hours are always calculated with the help of the actual output and hence they standard hours are equated to actual output.

Formulae:

VOH Cost Variance	Standard VOH – Actual VOH	Col 1 – Col 3
VOH Expenditure variance	(SR x AH) – (AR x AH)	Col 2 – Col 3
VOH Efficiency Variance	(SR x SH) – (SR x AH)	Col 1 – Col 2

Fixed overhead Variances:

1. In order to compute the Fixed OH variances we require the following information
    a. Actual output or standard hours
    b. Actual Hours or standard output
    c. Standard rate per hour – This is the budgeted rate to be incurred every hour and is calculated by dividing the budgeted hours from budgeted variable overheads. {SR. per hour = Budgeted FOH / BH}
    d. Actual rate per hour – This refers to the actual rate incurred on fixed overheads
    e. Possible Hours = Budgeted hours x (Actual days/Budgeted days)

Different types of problems under FOH variances:

- ❖ FOH variances without calendar variance
- ❖ FOH variances with calendar variance

Scenario 1: FOH variances without calendar variance

Computation table:

SR x SH	SR x AH	SR x BH	AFOH

Formulae:

FOH Cost Variance	SR x SH – AFOH	Col 1 – Col 4
FOH Expenditure Variance	(SR x BH) – AFOH	Col 3 – Col 4
FOH Volume Variance	(SR x SH) – (SR x BH)	Col 1 – Col 3

FOH efficiency variance	(SR x SH) – (SR x AH)	Col 1 – Col 2
FOH capacity variance	(SR x AH) – (SR x BH)	Col 2 – Col 3

Scenario 2: FOH variances with calendar variance

Computation table:

SR x SH	SR x AH	SR x PH	SR x BH	AFOH

Note: FOH variances will have same conversion factors as in VOH variances

Formulae:

FOH Cost Variance	SR x SH – AFOH	Col 1 – Col 5
FOH Expenditure Variance	(SR x BH) – AFOH	Col 4 – Col 5
FOH Volume Variance	(SR x SH) – (SR x BH)	Col 1 – Col 4
FOH efficiency variance	(SR x SH) – (SR x AH)	Col 1 – Col 2
FOH capacity variance	(SR x AH) – (SR x PH)	Col 2 – Col 3
FOH calendar variance	(SR x PH) – (SR x BH)	Col 3 – Col 4

Sales Variances:

1. In order to compute the sales variances we require the following information
    a. Budgeted Quantity – This is the budgeted quantity expected to be sold at the beginning of the period
    b. Revised budgeted quantity – This is the total of the actual quantity apportioned in the budgeted mix. This is applicable only when there is more than one material
    c. Actual quantity – Actual quantity sold and this is normally directly given in the problem
    d. Budgeted price – This is the price at which the product was expected to be sold at the beginning of the period
    e. Actual price – This refers to the price at which the products are actually sold.

Types of problems under sales variances:

- Single FG
- Multiple FG

Scenario 1: Single FG:

Computation table:

BP * BQ	BP * AQ	AP * AQ
Budgeted sales		Actual sales

Formulae:

Total Sales Variance	(BP x BQ) – (AP x AQ)	Col 1 – Col 3
Sales Price Variance	(BP x AQ) – (AP x AQ)	Col 2 – Col 3
Sales volume variance	(BP x BQ) – (BP x AQ)	Col 1 – Col 2

Scenario 2: Multiple FG:

Computation table:

BP * BQ	BP * RBQ	BP * AQ	AP * AQ
Budgeted sales			Actual sales

Formulae:

Total Sales Variance	(BP x BQ) – (AP x AQ)	Col 1 – Col 4
Sales Price Variance	(BP x AQ) – (AP x AQ)	Col 3 – Col 4
Sales volume variance	(BP x BQ) – (BP x AQ)	Col 1 – Col 3
Sales Mix Variance	(BP x RBQ) – (BP x AQ)	Col 2 – Col 3
Sales quantity variance	(BP x BQ) – (BP x RBQ)	Col 1 – Col 2

Margin approach:

The above indicated method is called as total approach which finds out the impact on the topline and margin approach is used to find the impact on the bottom-line. Here BP is replaced with BM and AP is replaced with AM and the calculation for BM and AM is provided below:

- Absorption costing: BM = Budgeted Price – Budgeted Cost & AM = Actual Price– Budgeted Cost (not actual cost)
- Marginal costing: BM = Budgeted Price – Budgeted Variable Cost & AM = Actual Price – Budgeted Variable Cost (not actual VC)

Note: Positive answer would indicate adverse variances and negative answer would indicate favorable variances in case of sales variances

Marginal Costing vs. absorption costing:

1. Stocks are valued at cost and those costs that are considered for stock valuation are called product costs and others are called period costs.
2. Period costs expires fully in the current accounting period whereas product cost expires only to the extent of COGS; and remains unexpired to the extent of closing stock (i.e.) credited in this year's account and carried forward to the next year
3. All non-manufacturing costs are period costs and in marginal costing system fixed manufacturing costs is also called period costs.
4. In Marginal costing system stock is valued at variable manufacturing cost whereas in absorption costing system, stock is valued at full manufacturing cost (including fixed manufacturing cost)
5. For calculating fixed cost per unit absorption costing system uses pre-determined rates or standard rates. Pre-determined rate / unit = BFO/BO. For denominator consider normal activity or capacity. In absence of details use 100% capacity as denominator
6. Due to use of pre-determined rates the fixed OH charged to cost or production will be AO*SR. This is called absorbed OH.
7. When the actual OH is different from absorbed OH we would have under/over absorption which needs to be adjusted while calculating absorption costing profit.
8. In absence of info we can assume BFOH to be same as AFOH.

Income statement under marginal costing:

Particulars		Amount
Sales		XXX
Less: Variable manufacturing cost of goods sold:		
- Opening stock (VMC)	XXX	
- Add: Variable cost of production	XXX	
- Less: Closing stock (VMC)	(XXX)	(XXX)
Gross contribution		XXX
Less: Variable administration and selling OH		(XXX)
Contribution		XXX
Less: Fixed manufacturing, admin & selling exp		(XXX)
Profit		XXX

Income statement under absorption costing:

Particulars		Amount
Sales		XXX
Less: COGS		
- Opening stock (FMC)	XXX	
- Add: Cost of production	XXX	
- Less: Closing stock (FMC)	(XXX)	(XXX)
Gross Profit		XXX
Less: Admin & selling exp		(XXX)
Less: Under/over absorption of OH		(XXX)
Profit		XXX

Reconciliation:

1. Reconciliation statement in prepared in order to reconcile the budgeted profit as against the actual profit earned by the company
2. Following are the various approaches for profit reconciliation:
    a. Budgeted profit to actual profit – Absorption costing system
    b. Standard profit to actual profit – Absorption costing system
    c. Budgeted profit to actual profit – Marginal costing system
    d. Standard profit to actual profit – Marginal costing system
3. **FOH volume variance will not appear in reconciliation under marginal costing approach (Approach 3 and Approach 4)**
4. **Sales volume variance will not appear in reconciliation under standard to actual profit (Approach 2 and Approach 4)**

Reconciliation statement under various approaches:

Budgeted profit to actual profit – Absorption costing system

Particulars	**Amount Favorable variance**	**Amount Adverse variance**	**Amount**
Budgeted profit			XXX
Material price variance	XXX	XXX	
Material mix variance	XXX	XXX	
Material yield variance	XXX	XXX	
Labour rate variance	XXX	XXX	
Labour mix variance	XXX	XXX	
Labour revised eff. Variance	XXX	XXX	
VO Expenditure variance	XXX	XXX	
VO Efficiency variance	XXX	XXX	
FO Expenditure variance	XXX	XXX	
FO Capacity variance	XXX	XXX	
FO calendar variance	XXX	XXX	
FO Efficiency variance	XXX	XXX	
Sales Margin price variance	XXX	XXX	
Sales Margin qty variance	XXX	XXX	
Sales Margin mix variance	XXX	XXX	
Actual profit			XXX

Standard profit to actual profit – Absorption costing system

Particulars	**Amount Favorable variance**	**Amount Adverse variance**	**Amount**
Budgeted profit			XXX
Less: Sales volume variance			XXX
Standard profit			XXX
Material price variance	XXX	XXX	
Material mix variance	XXX	XXX	
Material yield variance	XXX	XXX	
Labour rate variance	XXX	XXX	
Labour mix variance	XXX	XXX	
Labour revised eff. Variance	XXX	XXX	
VO Expenditure variance	XXX	XXX	
VO Efficiency variance	XXX	XXX	
FO Expenditure variance	XXX	XXX	
FO Capacity variance	XXX	XXX	
FO calendar variance	XXX	XXX	
FO Efficiency variance	XXX	XXX	
Sales Margin price variance	XXX	XXX	
Sales Margin qty variance	**NA**	**NA**	
Sales Margin mix variance	**NA**	**NA**	

Actual profit			XXX

Budgeted profit to actual profit – Marginal costing system

Particulars	Amount Favorable variance	Amount Adverse variance	Amount
Budgeted profit			XXX
Material price variance	XXX	XXX	
Material mix variance	XXX	XXX	
Material yield variance	XXX	XXX	
Labour rate variance	XXX	XXX	
Labour mix variance	XXX	XXX	
Labour revised eff. Variance	XXX	XXX	
VO Expenditure variance	XXX	XXX	
VO Efficiency variance	XXX	XXX	
FO Expenditure variance	XXX	XXX	
FO Capacity variance	**NA**	**NA**	
FO calendar variance	**NA**	**NA**	
FO Efficiency variance	**NA**	**NA**	
Sales Margin price variance	XXX	XXX	
Sales Margin qty variance	XXX	XXX	
Sales Margin mix variance	XXX	XXX	
Actual profit			XXX

Standard profit to actual profit – Marginal costing system

Particulars	Amount Favorable variance	Amount Adverse variance	Amount
Budgeted profit			XXX
Less: Sales volume variance			XXX
Standard profit			XXX
Material price variance	XXX	XXX	
Material mix variance	XXX	XXX	
Material yield variance	XXX	XXX	
Labour rate variance	XXX	XXX	
Labour mix variance	XXX	XXX	
Labour revised eff. Variance	XXX	XXX	
VO Expenditure variance	XXX	XXX	
VO Efficiency variance	XXX	XXX	
FO Expenditure variance	XXX	XXX	
FO Capacity variance	**NA**	**NA**	
FO calendar variance	**NA**	**NA**	
FO Efficiency variance	**NA**	**NA**	
Sales Margin price variance	XXX	XXX	
Sales Margin qty variance	**NA**	**NA**	
Sales Margin mix variance	**NA**	**NA**	
Actual profit			XXX

Few equations between various variances:

1. **Absorption costing approach:** Sales Margin volume variance = Total sales volume variance * NP Ratio
2. **Marginal costing approach:** Sales margin volume variance = Total sales volume variance * PVR
3. **Marginal costing approach:** Sales margin volume variance = Sales margin volume variance under absorption costing + FOH Volume variance
4. Budgeted profit under absorption costing = Budgeted units x Budgeted profit per unit
5. Standard profit under absorption costing = Actual units x Budgeted profit per unit

6. Budgeted profit under marginal costing = (Budgeted units x Budgeted cont. per unit) – (Budgeted Fixed Overheads)
7. Standard profit under marginal costing = (Actual units x Budgeted cont. per unit) – (Budgeted Fixed overheads)

Overview of practical problems/ case studies/ important questions:

- Part I – Cost and Sales Variances
- Part II – Variances with equivalent units
- Part III – Reconciliation of cost and profits
- Part IV – Market Size and Share Variances
- Part V – Reverse Working Problems
- Part VI – Planning and operating variances
- Part VII – ABC and variance analysis
- Part VIII – Relevant costing approach to variance analysis

Part I – Cost and sales variances

1. **Material variances – Multiple materials [Category A]**

The standard quantity of material required is 4 kgs. per unit of actual output. The relevant figures are as under:

Material	A	B	C	D
Standard mix %	30%	40%	20%	10%
Price per kg. (Rs.)	1.25	1.5	3.5	3
Actual qty. used (Kg.)	1,180	1,580	830	440
Actual price per kg. (Rs)	1.3	1.8	3.4	3
Actual output: 1,000				

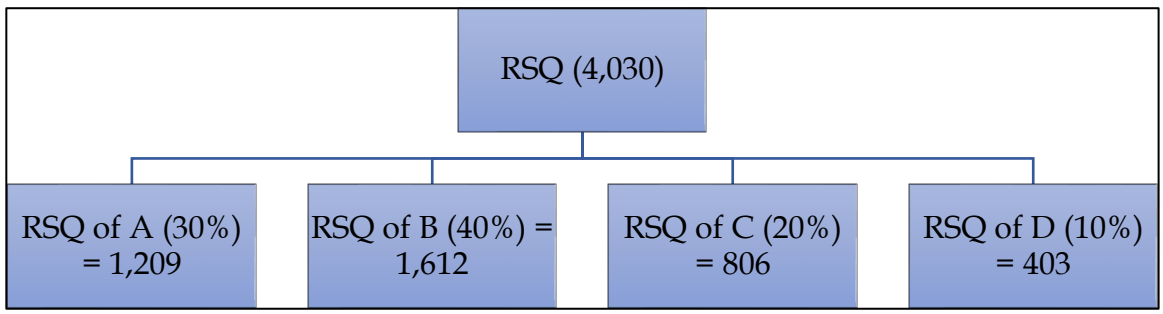
Calculate price variance, mix variance, sub-usage variance and total material cost variance

Calculation of material variances:

Material	SP * SQ	SP * RSQ	SP * AQ	AP * AQ
A	1.25 * 1,200	1.25 * 1,209	1.25 * 1,180	1.30 * 1,180
B	1.50 * 1,600	1.50 * 1,612	1.50 * 1,580	1.80 * 1,580
C	3.50 * 800	3.50 * 806	3.50 * 830	3.40 * 830
D	3.00 * 400	3.00 * 403	3.00 * 440	3.00 * 440
Total	**7,900**	**7,959.25**	**8,070**	**8,520**

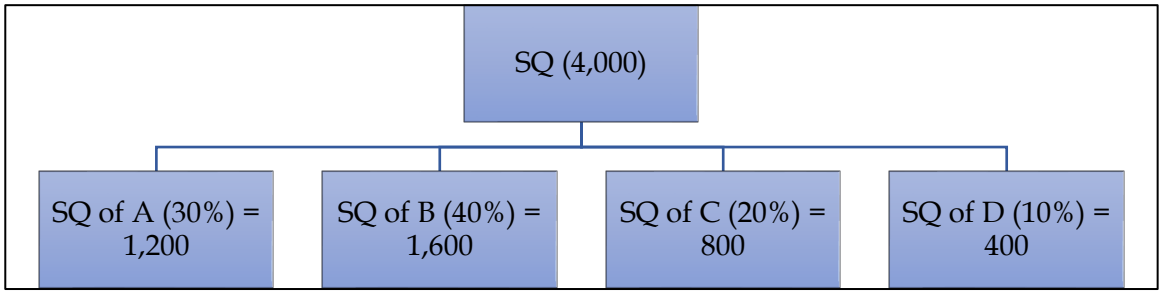
Note 1: Calculation of RSQ:

- RSQ is the total of actual quantity(AQ) in standard mix
- Total of AQ = 1,180 + 1,580 + 830 + 440 = 4,030

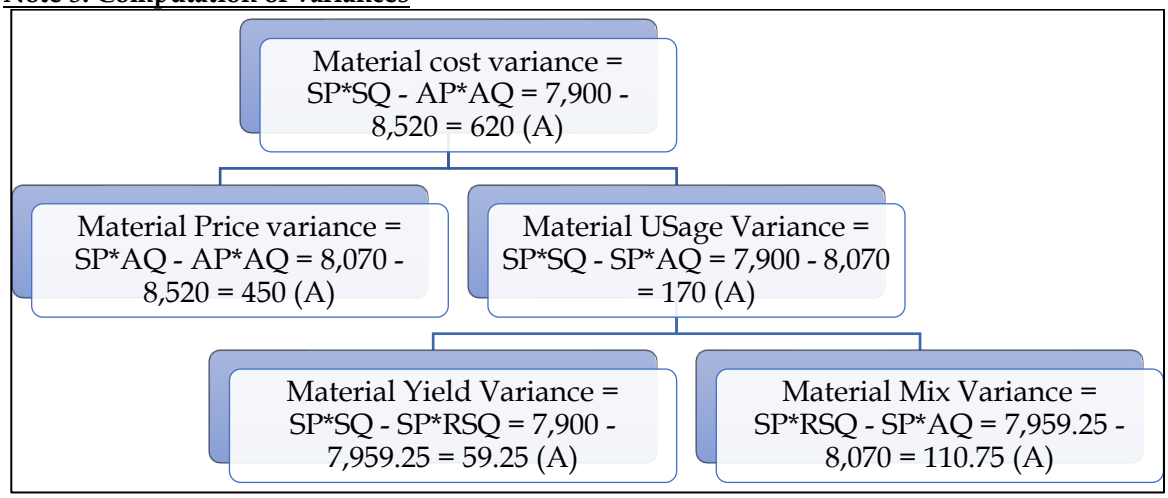


Note 2: Calculation of SQ:

- Standard quantity refers to the quantity to be used for producing actual output
- SQ = Actual output * (Input/Output)
- SQ = 1,000 units * (4 Kg/1 unit) = 4,000 Kgs



Note 3: Computation of variances



2. Material variances [Category A]:

Aquatic Feed (AF) is the leading manufacturer of fish and other sea animal feed. AF has made its credit pioneering effort and service for over one decade in development of culture, processing and exports with its state-of-art fish feed and processing plants. Hallmark of AF is constant upgradation of aquaculture technology bringing latest developments in the field to the doorstep of the Indian aquaculture farmer. It stands as a leading provider of high quality feed, best technical support to the farmer and caters to the quality standards of global customers.

One of its fish feed product is "B" which is produced by mixing and heating three ingredients: B1, B2 and B3. It uses a standard costing system to monitor its costs.

The standard material cost for 100 Kg. of "B" is as follows:

Ingredients	Standard Quantity (kg.)	Cost per Kg.	Cost per 100 kg. of B
B1	42	3	126
B2	62	6	372
B3	21	2	42
Total	**125**		**540**

Notes

- B1, B2 and B3 are agricultural products. Their quality and price change significantly every year. Standard prices are determined at the average market price over the last three years. AF has a purchasing manager responsible for purchasing and pricing.
- The standard mix is decided by the Managing Partner having 15 years' rich experience in aquaculture field. The last time this was done at time of launching the "B" that was six years back. The standard mix has not been changed since.
- Mixing and heating process are subject to some evaporation loss.

In current month 4,605 Kg. of "B" was produced, using the following ingredients:

Ingredients	Actual Quantity (kg.)	Cost per Kg.	Cost per 100 kg. of B
B1	2,202	2.80	6,165.60
B2	2,502	7	17,514
B3	921	2	1,842
Total	**5,625**		**25,521.60**

At every month end, the production manager receives a statement from the Managing Partner. This statement contains material price and usage variances for the month and no other feedback on the efficiency of the processes is provided.

Required

EVALUATE the performance measurement system in AF.

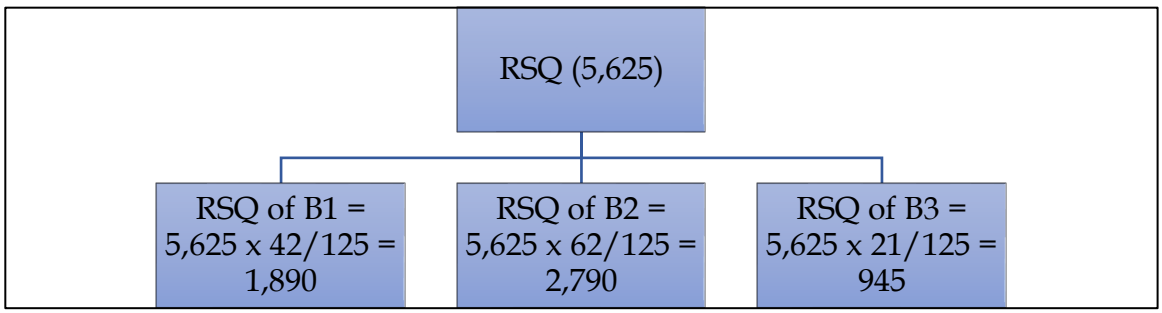
Answer:

WN 1: Computation of material variances:

Material	SP * SQ	SP * RSQ	SP * AQ	AP * AQ
B1	3 x 1,934	3 x 1,890	3 x 2,202	2.8 x 2,202
B2	6 x 2,855	6 x 2,790	6 x 2,502	7 x 2,502
B3	2 x 967	2 x 945	2 x 921	2 x 921
Total	**24,866**	**24,300**	**23,460**	**25,521.60**

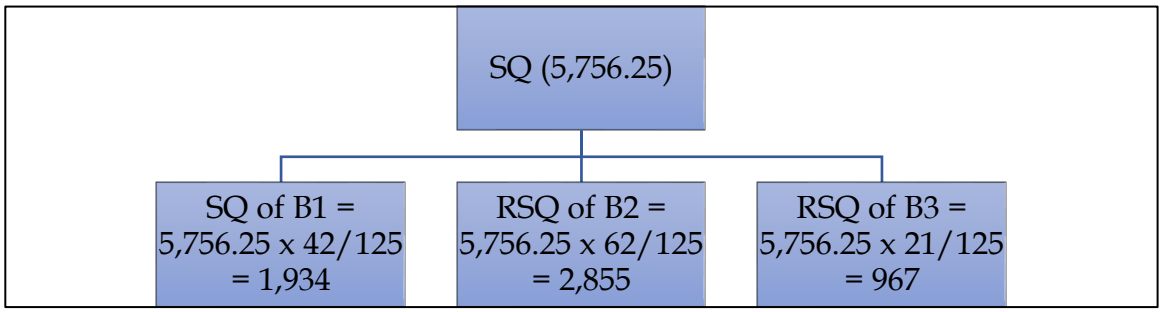
Note 1: Calculation of RSQ:

- RSQ is the total of actual quantity(AQ) in standard mix
- Total of AQ = 2,202 + 2,502 + 921 = 5,625

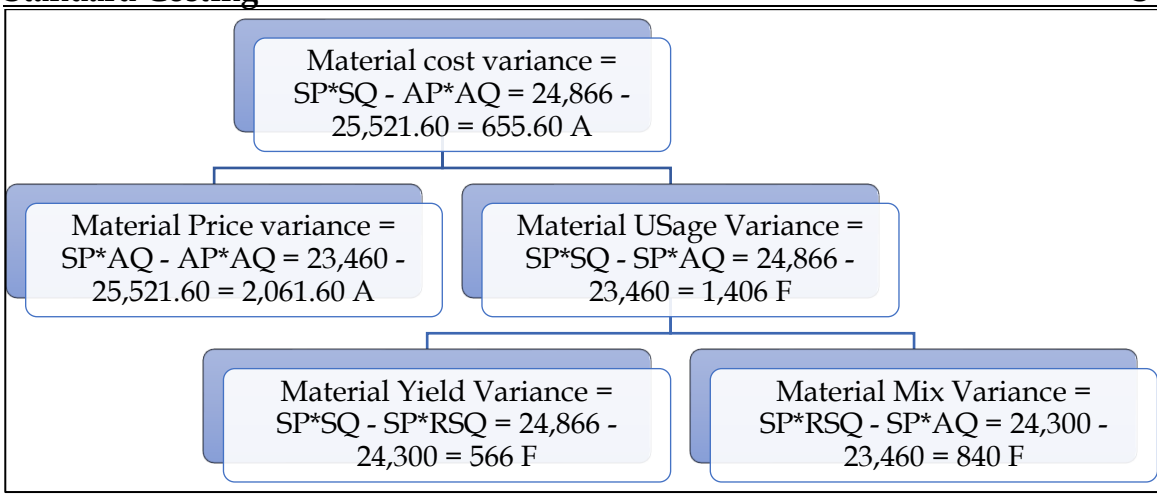


Note 2: Calculation of SQ:

- Standard quantity refers to the quantity to be used for producing actual output
- SQ = Actual output x (Input/Output)
- SQ = 4,605 units x (125/100) = 5,756.25



Note 3: Computation of variances



Comments:

The statement reported, ₹2,062 adverse material price variance. **The responsibility for controlling the materials price variance is usually the purchasing manager's. Undoubtedly, in current scenario, the price of materials is largely beyond his or her control; however, the price variance can be influenced by such factors as quality, quantity discounts, distance of supplier's location, and so on**. These factors are often under the control of the purchase manager. The production manager is responsible for material usage and cannot be held responsible for the material price variance.

Since total usage variance reported, ₹1,406 favourable, production manager could assume good performance. However, if usage variance is considered in more detail, through the mix and yield calculations, it can be observed that variance was driven by a change in the mix and by using a mix of ingredients which was different from standard, it has resulted in a saving of ₹840; Similarly, it has led to a favourable yield. **It is worthwhile to note that changing the mix could impact the product quality and sales as well, however, no information has been given about this. Prices and quality of three agriculture ingredients are changing significantly every year. Using ex ante prices and usage standards can implicit an outdated view of variances**. Failing to separate variances caused by uncontrollable factors and planning errors from variances caused by controllable factors can be demoralizing for the managers. In addition, managers are not involved in setting the standard mix and the same has not been changed for six years despite continuous changes in the quality and prices of the ingredients. This can also mislead the managers i.e. to carryout control activities which are based on the outdated standards.

Furthermore, a true image is missing in relation to managers' performance as statement does not include any feedback or comments on the variances. Even no follow up is being taken on the same.

Overall, it appears that AF is not having comprehensive performance measurement system and this could adversely impact the firm in long run.

3. **Multiple labour with idle time [Category A]**

Following information is given regarding standard composition and standard rates of a gang of workers:

Standard Composition	Standard Hourly Rate
10 Men	62.50
5 women	40.00
5 boys	35.00

According to the given specifications, a week consists of 40 hours and standard output for a week is 1000 units. In a particular week, gang consisted of 13 men, 4 women, 3 boys and actual wages were paid as follows:

Men @ Re.60 per hour Women @ Re.42.50 per hour
Boys @ Re.32.50 per hour

Two hours were lost in the week due to abnormal idle time. Actual production was 960 units in the week. Calculate labour variances.

Answer:

Computation of labour variances:

Labour	SR x SH	SR x RSH	SR x AHW	SR x AHP	AR x AHP
Men	62.50 x 384	62.50 x 380	62.50 x 494	62.50 x 520	60 x 520
Women	40.00 x 192	40.00 x 190	40.00 x 152	40.00 x 160	42.50 x 160
Boys	35.00 x 192	35.00 x 190	35.00 x 114	35.00 x 120	32.50 x 120
Total	**38,400**	**38,000**	**40,945**	**43,100**	**41,900**

Note 1: Computation of AHP:

- AHP = Number of employees x Hours paid per week
- AHP for Men = 13 employees x 40 hours = 520 hours
- AHP for women = 4 employees x 40 hours = 160 hours
- AHP for boys = 3 employees x 40 hours = 120 hours

Note 2: Computation of AHW:

- AHW = Number of employees x Hours worked per week
- AHW for Men = 13 employees x 38 hours = 494 hours
- AHW for women = 4 employees x 38 hours = 152 hours
- AHW for boys = 3 employees x 38 hours = 114 hours

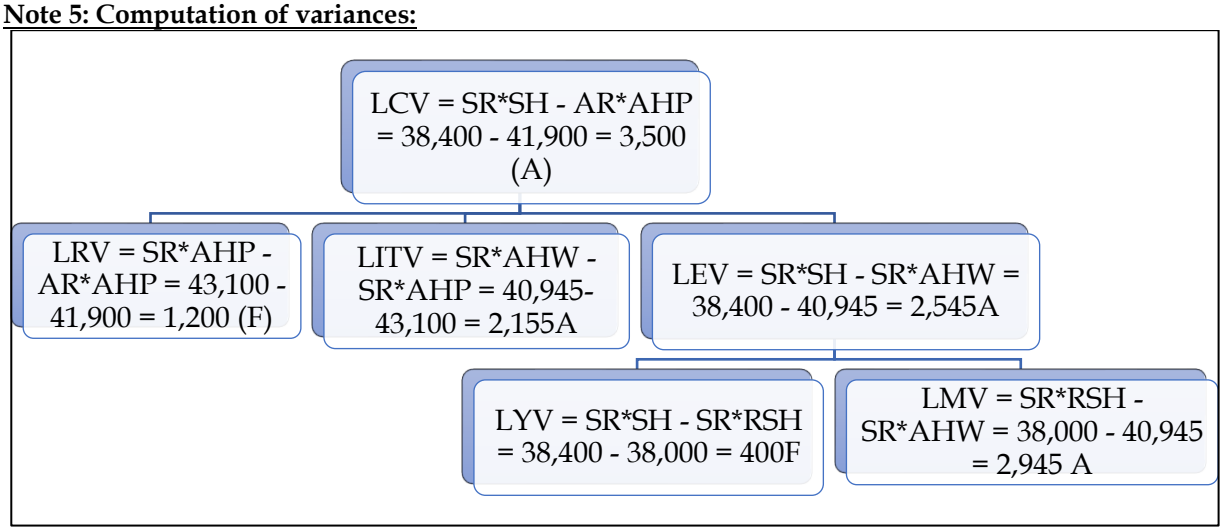
Note 3: Computation of RSH:

- Total of AHW = (494 + 152 + 114) = 760 hours. AHW needs to be distributed in the standard mix of 10:5:5
- RSH for Men = 760 x (10/20) = 380 hours
- RSH for Women = 760 x (5/20) = 190 hours
- RSH for Boys = 760 x (5/20) = 190 hours

Note 4: Computation of SH:

- **Standard composition:** The company needs to produce 1,000 units by employing 800 hours (40 hours x 20 employees). Hence it needs to produce output of 1,000 units with input of 800 hours
- Standard Hours = Actual Output x (Input/Output)
- Standard Hours = 960 units x (800/1,000) = 768 hours. Standard hours of 768 needs to be distributed in standard mix of 10:5:5 to get individual SH
- SH for Men = 768 hours x (10/20) = 384 hours
- SH for Women = 768 hours x (5/20) = 192 hours
- SH for Boys = 768 hours x (5/20) = 192 hours

Note 5: Computation of variances:



Note: LCV = Labour Cost Variance; LRV = Labour Rate Variance; LITV = Labour Idle Time Variance; LYV = Labour Yield Variance; LMV = Labour Mix Variance

4. Basic VOH variances computation [Category A]

XYZ company has established the following standards for variable factory overhead:

a. Standard hours per unit : Rs.6
b. Variable overhead per hour : Rs.2

The actual data for the month are as follows:

a. Actual variable overheads incurred Rs.2,00,000
b. Actual output (units) 20,000
c. Actual hours worked 1,12,000

Calculate variable overhead variances

Answer:

Computation table:

SR X SH (or) **SR X AO**	**SR X AH** (or) SR X SO	AR X AH (or) **AVOH**
12 x 20,000	2 x 1,12,000	2,00,000
2,40,000	2,24,000	2,00,000

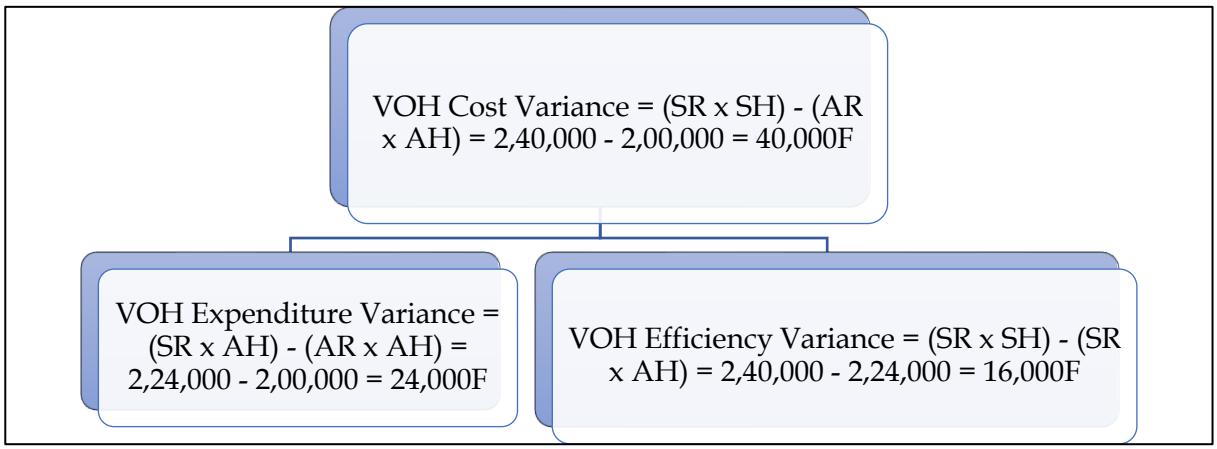
Note:

- For VOH variances we have conversion factors and we can use any of the factor for calculating variances. For instance, the first column can either be Standard rate per hour x standard hours (or) Standard rate per unit x Actual output
- We have used the factor which is in bold in the above table. First column is of SR per unit (12) x AO (20,000 units)
- Second column is of SR per hour (2) x AH (1,12,000)
- Third column is of Actual Variable overhead of Rs.2,00,000

Note 1: Computation of Standard Rate:

- Standard rate per hour = Rs.2
- Standard rate per unit = RS.2 x 6 hours per unit = Rs.12 per unit

Note 2: Computation of variances:



5. **Basic FOH variances [Category A]**

Cost data given:

Budgeted Data		**Actual Data**	
Hours for the period	2,400	Hours worked	2,500
No of days	25	Days worked	27
Fixed Overhead	1,200	Overhead	1,300
Production	1,500	Production	1,600

Calculate fixed overhead variances

Answer:

Computation of variances:

- This question has information on both budgeted and actual days and hence we can also calculate calendar variance

Computation table:

SR X SH (OR)	**SR X AH** (OR)	**SR X PH** (OR)	SR X BH (OR)	AFOH

SR X AO	SR X SO	PFOH	SR X BO (OR) BFOH	
0.8 x 1,600	0.5 x 2,500	0.5 x 2,592	1,200	1,300
1,280	**1,250**	**1,296**	**1,200**	**1,300**

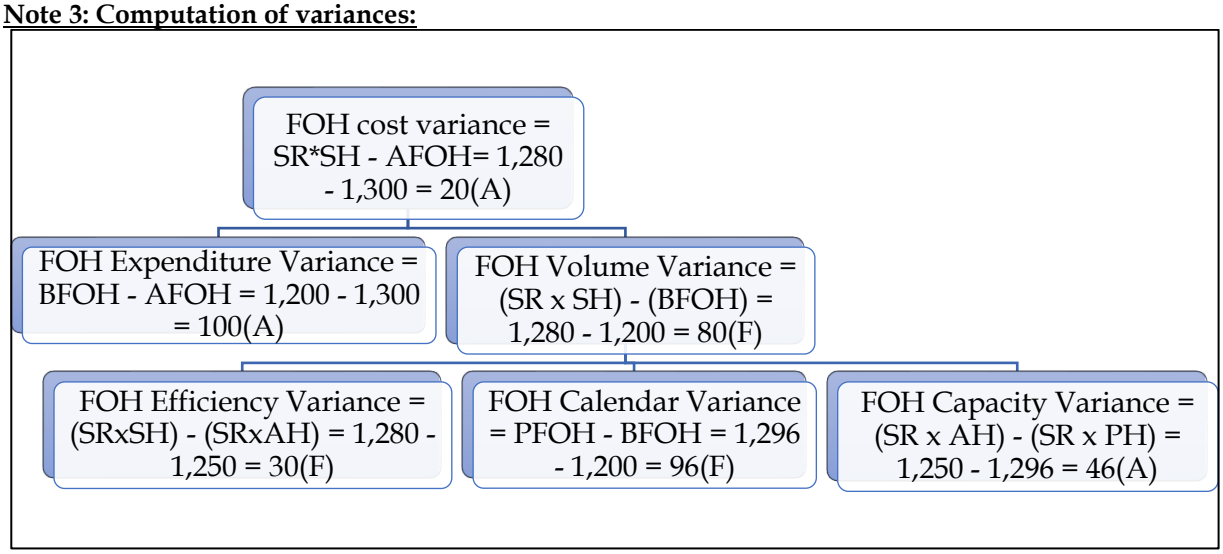
Note 1: Computation of SR:

- SR/unit = BFOH/Budgeted Output = 1,200/1,500 = Rs.0.8 per unit
- SR/hour = BFOH/Budgeted hours = 1,200/2,400 = Rs.0.5 per hour

Note 2: Computation of PH

- The company plans to work for 2,400 hours in 25 days. The company has actually worked for 27 days and hence possible hours is **2,592 hours (2,400/25 days x 27 days)**

Note 3: Computation of variances:



6. Overhead variances [Category B]

Apple Ltd., is following three variances method to analyse and understand production overhead variances. The three variances for a particular year were reported as given below:

- Production overhead expenditure variance = 94,000 A
- Production overhead volume variance = 1,00,000 F
- Production overhead efficiency variance = 48,000 F

The other particulars furnished from the records of the company are :

- Standard machine hours for the year = 11,500
- Closing balance in the production overhead control account = Rs.18,00,000
- Fixed overhead rate per hour = Rs.125
- Variable overhead rate per hour = Rs.80

Required

COMPUTE the following by considering the additional information also :
(i) Actual machine hours
(ii) Budgeted machine hours
(iii) Total Fixed Production Overhead amount
(iv) Applied Production Overhead amount

Additional Information

- Expenditure variance was computed totally for fixed and variable overheads.
- Volume variance is applicable to fixed overhead only.
- Efficiency variance is applicable only to variable overhead and fixed overhead efficiency variance was already included in volume variance.

Note 1: Computation of Actual Machine hours:

- VOH Efficiency Variance = (SR x SH) – (SR x AH)
- 48,000 = (80 x 11,500) – (80AH)
- 48,000 = 9,20,000 – 80AH
- 80AH = 8,72,000
- AH = 8,72,000/80 = 10,900 hours

Note 2: Computation of Budgeted Machine hours:

- FOH Volume Variance = (SR x SH) – (SR x BH)
- 1,00,000 = (11,500 x 125) - (125BH)
- 1,00,000 = 14,37,500 – 125BH
- 125BH = 13,37,500
- BH = 10,700 hours

Note 3: Computation of total fixed production overhead:

- It is assumed that the question has asked for budgeted fixed production overhead. Actual fixed production overhead cannot be calculated due to lack of information
- **BFOH = SR x BH = 125 x 10,700 = 13,37,500**

Note 4: Computation of applied overheads

- Applied manufacturing overheads is basically overheads recovered
- Overheads recovered = SR x SH
- **Overheads recovered = (125+80) x 11,500 = Rs.23,57,500**

Note: Alternate solutions exist depending on assumption

7. **Sales variances – Both approaches [Category A]**

A company actually sold 8000 units of A and 10000 units of B at Rs.12 and Rs.16 per unit respectively against a budgeted sale of 6000 units of A at Rs.14 per unit and 9000 units of B at Rs.13 per unit. The standard costs of A and B are Rs.8 and Rs.10 per unit respectively and the corresponding actual costs are Rs.5.50 and Rs.14.50 per unit. Moreover the standard variable costs are Rs.7 & Rs.9 for A and B and the actual variable costs are Rs.5 & Rs.14 respectively. Compute sales variances under all approaches.

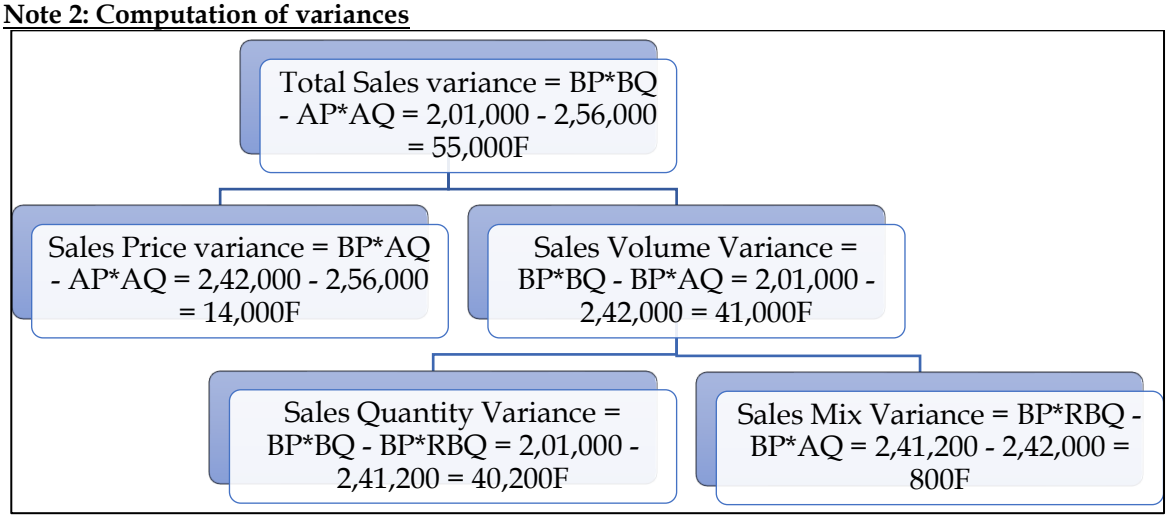
WN 1: Computation of sales variances under total approach:

Product	BP x BQ	BP x RBQ	BP x AQ	AP * AQ
A	14 x 6,000	14 x 7,200	14 x 8,000	12 x 8,000
B	13 x 9,000	13 x 10,800	13 x 10,000	16 x 10,000
Total	**2,01,000**	**2,41,200**	**2,42,000**	**2,56,000**

Note 1: Calculation of RBQ:

- Total of AQ = 8,000 + 10,000 = 18,000
- AQ needs to be split in the ratio of 6:9 to compute RBQ
- RBQ of A = 18,000 x (6/15) = 7,200 units
- RBQ of B = 18,000 x (9/15) = 10,800 units

Note 2: Computation of variances



Note: In case of sales variances, positive answer would indicate adverse variance and negative answer would indicate favorable variance

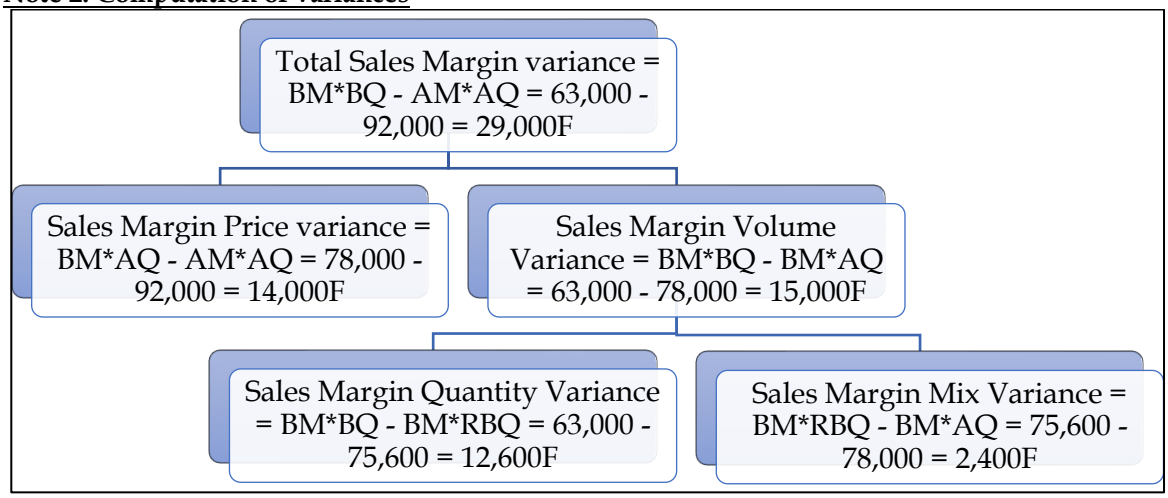
WN 2: Computation of sales variances under Margin Approach (Absorption Costing):

Product	BM x BQ	BM x RBQ	BM x AQ	AM * AQ
A	6 x 6,000	6 x 7,200	6 x 8,000	4 x 8,000
B	3 x 9,000	3 x 10,800	3 x 10,000	6 x 10,000
Total	**63,000**	**75,600**	**78,000**	**92,000**

Note 1: Calculation of BM and AM:

- BM = Budgeted Price – Budgeted Cost
- BM of A = 14 – 8 = Rs.6 per unit
- BM of B = 13 – 10 = Rs.3 per unit
- **AM = Actual Price – Budgeted Cost**
- AM of A = 12 – 8 = Rs.4 per unit
- AM of B = 16 – 10 = Rs.6 per unit

Note 2: Computation of variances



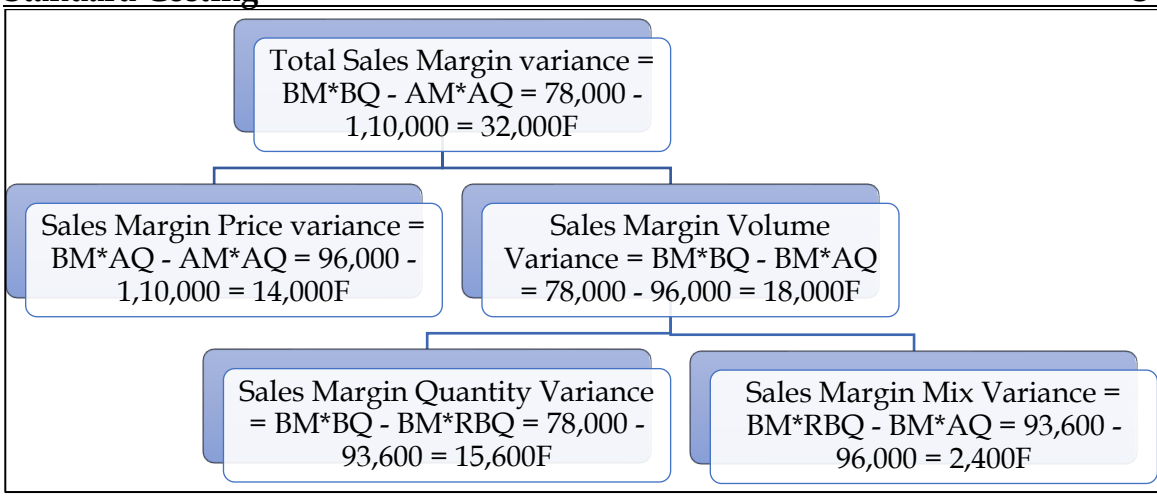
WN 3: Computation of sales variances under Margin Approach (Marginal Costing):

Product	BM x BQ	BM x RBQ	BM x AQ	AM * AQ
A	7 x 6,000	7 x 7,200	7 x 8,000	5 x 8,000
B	4 x 9,000	4 x 10,800	4 x 10,000	7 x 10,000
Total	**78,000**	**93,600**	**96,000**	**1,10,000**

Note 1: Calculation of BM and AM:

- BM = Budgeted Price – Budgeted Variable Cost
- BM of A = 14 – 7 = Rs.7 per unit
- BM of B = 13 – 9 = Rs.4 per unit
- **AM = Actual Price – Budgeted Variable Cost**
- AM of A = 12 – 7 = Rs.5 per unit
- AM of B = 16 – 9 = Rs.7 per unit

Note 2: Computation of variances



8. Critical Success Factors [Category A]

Natural Spices manufactures and distributes high-quality spices to gourmet food shops and top quality restaurants. Gourmet and high-end restaurants pride themselves on using the freshest, highest-quality ingredients.

Natural Spices has set up five state of the art plants for meeting the ever growing demand. The firm procures raw material directly from the centers of produce to maintain uniform taste and quality. The raw material is first cleaned, dried and tested with the help of special machines. It is then carefully grounded into the finished product passing through various stages and packaged at the firm's ultraclean factory before being dispatched to customers.

The following variances pertain to last week of operations, arose as a consequence of management's decision to lower prices to increase volume.

Sales Volume Variance	18,000 (F)
Sales Price Variance	14,000 (A)
Purchase Price Variance	10,000 (F)
Labour Efficiency Variance	11,200 (F)
Fixed Cost Expenditure Variance	4,400 (F)

Required

(i) Identify the 'Critical Success Factors' for Natural Spices.

(ii) Evaluate the management's decision with the 'Overall Corporate Strategy' and 'Critical Success Factors'.

Answer:

Part one:

Gourmet and high-end restaurants recognises Natural Spices on the basis of its high quality of spices. Therefore, quality is most critical success factor of Natural Spices. There are other factors which cannot be ignored such as price, delivery options, attractive packing etc. But all are secondary to the quality.

Part two:

Deliberate action of cutting price to increase sales volume indicates that firm is intending to expand its market to retail market and street shops which is price sensitive.

Purchase Price Variance is clearly indicating that firm has purchased raw material at lower price which may be due to buying of lower quality of material. Similarly positive Efficiency Variance is indicating cost cutting and stretching resources.

It appears that firm is intending to expand its market to retail market and street shops by not only reducing the price but also compromising its quality which is opposing its current strategy of high quality .

Management should monitor the trends of variances on regular basis and take appropriate action in case of evidence of permanent decline in quality. Here, customer feedback is also very important.

9. Interpretation of variances [Category A]

NZSCO Ltd. uses standard costing system for manufacturing its single product 'ANZ'. Standard Cost Card per unit is as follows:

	(Rs.)
Direct Material (1 kg per unit)	20
Direct Labour (6 hrs @ Rs. 8 per hour)	48
Variable Overheads	24

Actual and Budgeted Activity Levels in units for the month of Feb'18 are:

	Budget	Actual
Production	50,000	52,000

Actual Variable Costs for the month of Feb'18 are given as under:

Direct Material	10,65,600
Direct Labour (3,00,000 hrs)	24,42,000
Variable Overheads	12,28,000

Required

INTERPRET Direct Labour Rate and Efficiency Variances.

Answer:

INTERPRETATION

Direct Labour Rate Variance:

Adverse Labour Rate Variance indicates that the labour rate per hour paid is more than the set standard. The reason may include among other things such as:

(1) While setting standard, the current/ future market conditions like pending labour negotiation/ cases, has not been considered (or predicted) correctly.
(2) The labour may have been told that their wage rate will be raised or bonus will be paid if they work efficiently.

Direct Labour Efficiency Variance:

It indicates that the workers has produced actual production quantity in less time than the time allowed. The reason for favourable labour efficiency variance may include among the other things as follows:

(1) While setting standard, workers efficiency could not be estimated properly, this may happen due to non-observance of time and motion study.
(2) The workers may be new in the factory, hence, efficiency could not be predicated properly.
(3) The foreman or personnel manager responsible for labour efficiency, while providing his/ her input at the time of budget/ standard, has adopted conservative approach.
(4) The increase in the labour rate might have encouraged the labours to do work more efficiently.

In this particular case it may have happened that since labour payment has been increased labour efficiency has also been increased. In a nutshell because of additional labour rate (Adverse), labour efficiency has gone up (Favourable)

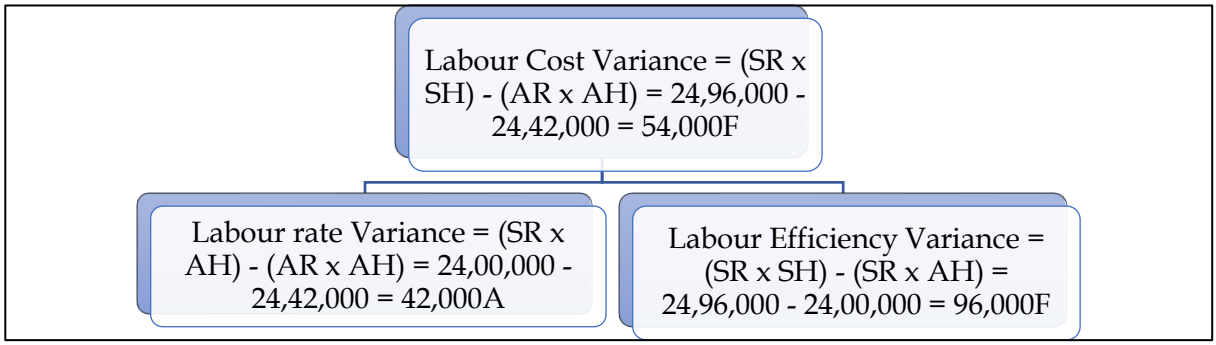
Computation of labour variances:

SR X SH	SR X AH	AR X AH
8 x 3,12,000	8 x 3,00,000	24,42,000
24,96,000	24,00,000	24,42,000

Note 1: Computation of SH:

- The company needs 6 hours to produce one unit and hence the input: output ratio is 6:1
- SH = AO x (input/output) = 52,000 x (6/1) = 3,12,000 hours

Note 1: Computation of variances:



10. Interpretation of variances [Category A]

Queensland Chemicals (QC) manufactures high-quality chemicals C-1, C-2 and C-3. Extracts from the budget for last year are given below:

	C-1	C-2	C-3
Sales Quantity (kg)	1,000	3,250	750
	₹/ kg	₹/ kg	₹/ kg
Average Selling Price	17,600	2,560	22,400
Direct Material (C_2H_6O) Cost	8,000	1,280	9,600
Direct Labour Cost	3,200	480	4,800
Variable Overhead Cost	320	48	480

The budgeted direct labour cost per hour was ₹160.

Actual results for last year were as follows:

	C-1	C-2	C-3
Sales Quantity (units)	900	3,875	975
	₹/ kg	₹/ kg	₹/ kg
Average Selling Price	19,200	2,480	20,000
Direct Material(C_2H_6O) Cost	8,800	1,200	10,400
Direct Labour Cost	3,600	480	4,800
Variable Overhead Cost	480	64	640

The actual direct labour cost per hour was ₹150. Actual variable overhead cost per direct labour hour was ₹20. QC follows just in time system for purchasing and production and does not hold any inventory.

Required

INTERPRET the Sales Mix Variance and Sales Quantity variance in terms of contribution.

Answer:

Variance Interpretation

The sales quantity variance and the sales mix variance describe how the sales volume contribution variance has been affected by a change in the total quantity of sales and a change in the relative mix of products sold.

From the figures arrived for the sales quantity contribution variance, we can observe that the increase in total quantity sold would have gained an additional contribution of ₹21,24,600, if the actual sales volume had been in the budgeted sales proportion.

The sales mix contribution variance shows that the variation in the sales mix resulted in a curtailment in profit by ₹570,600. The change in the sales mix has resulted in a relatively higher proportion of sales of C-2 which is the chemical that earns the lowest contribution and a lower proportion of C-1 which earn a contribution significantly higher. The relative increase in the sale of C-3 however, which has the highest unit contribution, has partially offset the switch in mix to C-2.

Workings

Statement Showing Standard Contribution

	C-1 ₹/ kg	C-2 ₹/ kg	C-3 ₹/ kg
Average Selling Price	17,600	2,560	22,400
Direct Material (C_2H_6O) Cost	8,000	1,280	9,600
Direct Labour Cost	3,200	480	4,800
Variable Overhead Cost	320	48	480
Contribution	6,080	752	7,520

Computation of Sales Mix Variance and Sales Quantity Variance (Contribution Approach):

Product	BM x BQ	BM x RBQ	BM x AQ	AM * AQ
C-1	6,080 x 1,000	6,080 x 1,150	6,080 x 900	Not Needed
C-2	752 x 3,250	752 x 3,737.50	752 x 3,875	Not Needed
C-3	7,520 x 750	7,520 x 862.50	7,520 x 975	Not Needed
Total	**1,41,64,000**	**1,62,88,600**	**1,57,18,000**	**Not needed**

Note 1: Computation of RBQ:

- Total of AQ = 900 + 3,875 + 975 = 5,750
- RBQ of C-1 = 5,750 x (1,000/5,000) = 1,150
- RBQ of C-2 = 5,750 x (3,250/5,000) = 3,737.50
- RBQ of C-3 = 5,750 x (750/5,000) = 862.50

Note 2: Computation of variance:

- Sales Quantity Variance = (BM x BQ) – (BM x RBQ) = 1,41,64,000 – 1,62,88,600 = 21,24,600F
- Sales Mix Variance = (BM x RBQ) – (BM x AQ) = 1,62,88,600 – 1,57,18,000 = 5,70,600A

11. Reasons for adverse variances [Category A]

State the reasons for adverse sales and cost variances?

This is a very important question and can help in answering case studies on variances interpretation

Variances	Possible reason for adverse variances
Sales volume	❖ Poor performance by sales staff ❖ Deterioration in market conditions (either due to macro-economic (PEST analysis) factors, or changes in the industry environment (eg entry of new competitors) ❖ Deterioration in the company or brand's reputation, making a product less desirable to customers ❖ Sales price ❖ Lack of goods or services to sell as a result of a production problem
Sales Price	❖ Poor performance by sales staff ❖ Deterioration in market conditions (eg economic downturn) or in the industry environment (eg price wars)

Direct Material Usage	❖ Poor performance by production department staff, leading to high rates of scrap ❖ Substandard materials, leading to high rates of scrap ❖ Faulty machinery, causing high rates of scrap
Direct Materials Price	❖ Poor performance by the procurement department's staff (eg failing to negotiate discounts) ❖ Using higher-quality material than was planned ❖ Price increases by suppliers or other changes in market conditions (eg shortages of a material leading to price increases)
Direct labour efficiency	❖ Poor supervision ❖ Having to use less skilled workers than originally intended, meaning they take longer to do the work ❖ Low-grade materials, leading to high levels of scrap and wasted labour time Problems with a customer for whom a service is being rendered Problems with machinery, leading to labour time wasted ❖ Disruption of materials supply, leading to workers being unable to proceed with production
Direct labour rate	❖ Using more highly skilled labour, or higher grades of workers, than originally planned ❖ Change in labour market conditions (eg a shortage of labour, would mean that the rates being paid to recruit and retain labour would have to increase)
Fixed overhead spending	❖ Poor supervision of overheads ❖ General increase in costs of overheads not taken into account in the budge

Part II – Variances with Equivalent Units

12. WIP inventory and all variances [Category A]

An engineering company manufactures a single product whose standard cost structure is as follows:

Direct Material	2.4 kg at Rs.30 per kg	72.00
Direct labour	6 hours at Rs.4 per hour	24.00
Factory overheads	6 hours at Rs.0.75 per hour	4.50

The factory overhead is based on the following Flexible Budget:

Particulars	80%	90%	100%	110%
Production (units)	6,000	6,750	7,500	8,250
Overheads	29,250	31,500	33,750	36,000

Actual data for the month of December, 2013

Budgeted Production……. 7,500 units

Material used……19,240 kg. at Rs. 31 per kg.

Direct Labour…….46,830 hours at Rs. 4.20 per hour

Actual Factory Overhead…….. Rs. 36,340

Production completed……7,620 units

Details of Work-in-progress: Opening 120 units materials fully supplied, .50% converted Closing 100 units, materials fully supplied, 50% converted

Determine Material variances, Labour variances and Overhead variances:

WN 1: Computation of equivalent units:

		Materials		Labour		OH	
Particulars	**Units**	DOC	EU	DOC	EU	DOC	EU
Opening WIP	120	0	0	50%	60	50%	60
Units started and completed	7,500	100%	7,500	100%	7,500	100%	7,500
Closing WIP	100	100%	100	50%	50	50%	50
	7,720		7,600		7,610		7,610

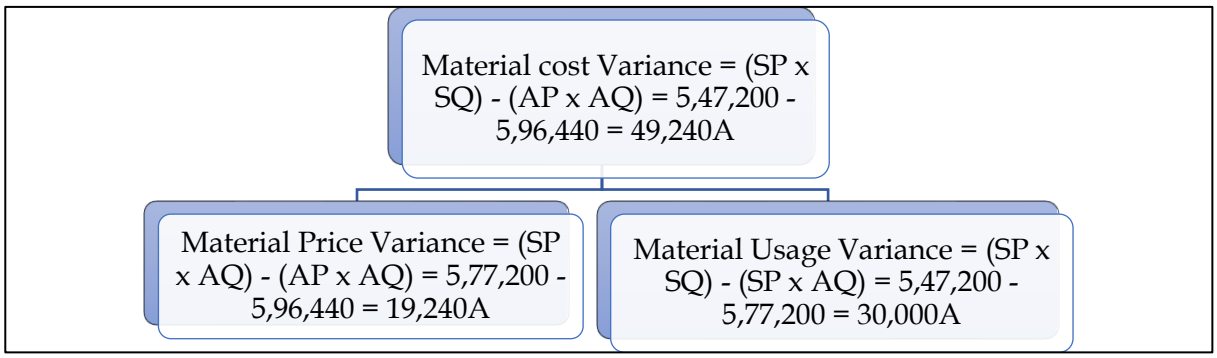
WN 2: Computation of material variances:

SP X SQ	SP X AQ	AP X AQ
30 x 18,240	30 x 19,240	31 x 19,240
5,47,200	**5,77,200**	**5,96,440**

Note 1: Computation of SQ:

- SQ = AO x (Input/Output)
- SQ = 7,600 x (2.4/1) = 18,240

Note 2: Computation of variances:



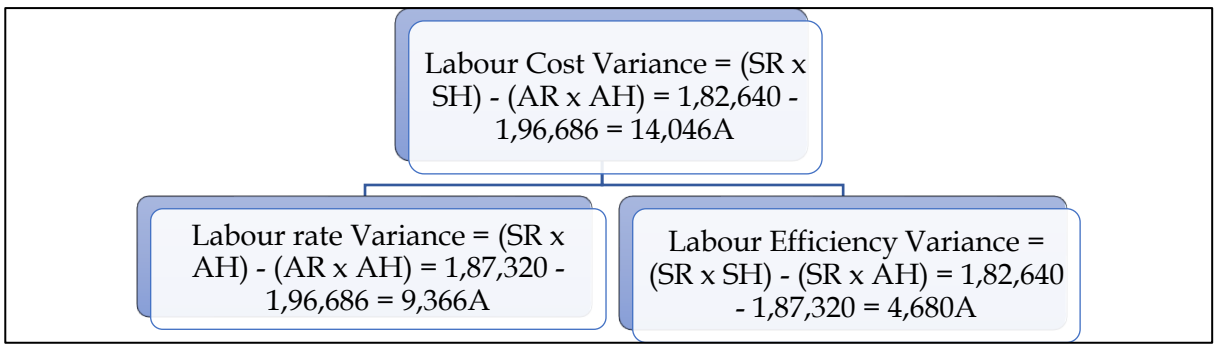
WN 3: Computation of labour variances:

SR X SH	SR X AH	AR X AH
4 x 45,660	4 x 46,830	4.2 x 46,830
1,82,640	1,87,320	1,96,686

Note 1: Computation of SH:

- SH = Actual Output x (Input/output)
- SH = 7,610 x (6/1) = 45,660

Note 1: Computation of variances:



WN 4: Computation of Overhead Variance:

- Break-up of actual overhead in terms of variable and fixed is not available and hence we cannot separately compute VOH and FOH variance
- OH cost Variance = OH recovered – OH incurred
- The company plans to operate at 7,500 units of activity and hence SR per unit is equal to Rs.4.5 per unit [33,750/7,500]
- OH Cost Variance = (4.5 x 7,610) – 36,340 = 34,245 – 36,340 = 2,095A

Part III – Reconciliation of cost and profits

13. Basic sum in reconciliation [Category A]

The budgeted production of a company is 20000 units per month. The standard cost sheet is as under:

Direct material	1.5 kgs @ Rs.6 per kg
Direct Labour	6 hours @ Rs.5 per hour
Variable overhead	6 hours @ Rs.4 per hour

Fixed overhead	Rs.3 per unit
Selling Price	Rs.72 per unit

The following are the actual details for a month:

Actual sales	18750 units
Actual production	18750 units
Direct material	29860 kgs @ Rs.5.25 per kg
Direct labour	118125 hours @ Rs.6 per hour
Fixed overhead	Rs.40000
Variable overhead	Rs.525000

You are required to calculate all variances and reconcile the actual profit from budgeted profit as well as from standard profit

Answer:

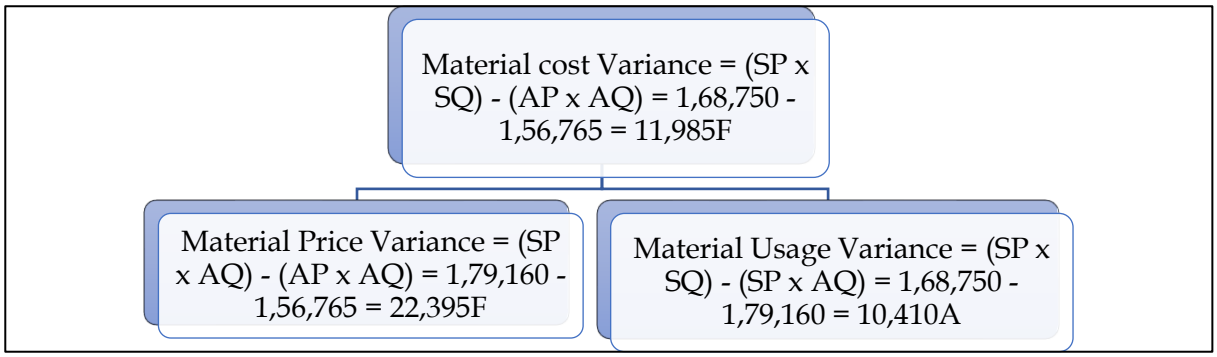
WN 1: Computation of material variances:

SP X SQ	SP X AQ	AP X AQ
6 x 28,125	6 x 29,860	5.25 x 29,860
1,68,750	**1,79,160**	**1,56,765**

Note 1: Computation of SQ:

- SQ = AO x (Input/Output)
- SQ = 18,750 x (1.5/1) = 28,125

Note 2: Computation of variances:



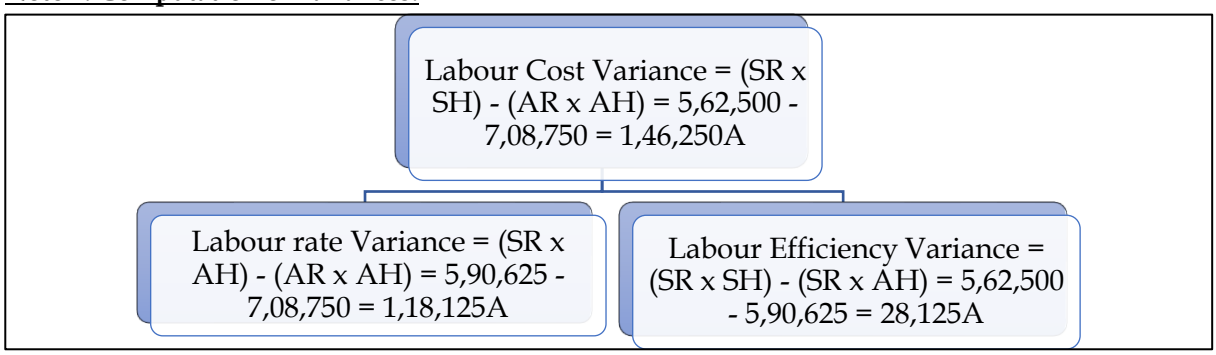
WN 2: Computation of Labour Variances:

SR X SH	SR X AH	AR X AH
5 x 1,12,500	5 x 1,18,125	6 x 1,18,125
5,62,500	5,90,625	7,08,750

Note 1: Computation of SH:

- SH = AO x (Input/Output)
- SH = 18,750 x (6/1) = 1,12,500

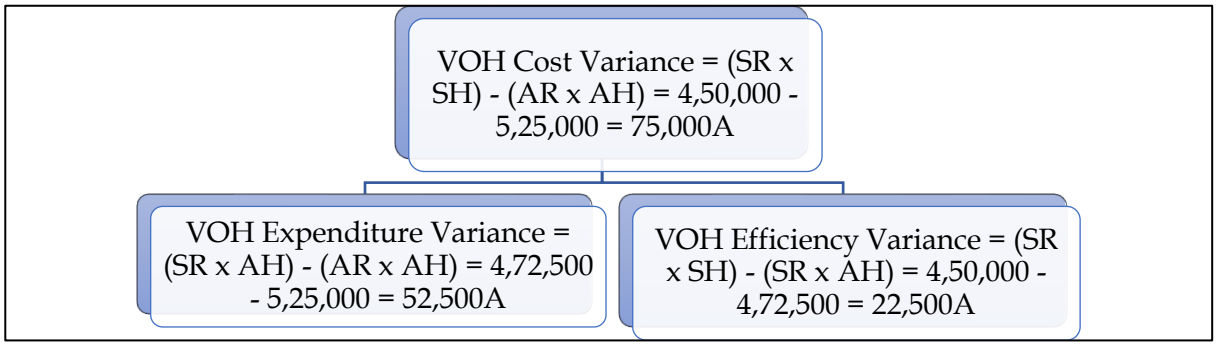
Note 2: Computation of variances:



WN 3: Computation of VOH Variances:

SR X SH (or) SR X AO	**SR X AH** (or) SR X SO	AR X AH (or) **AVOH**
4 x 1,12,500	4 x 1,18,125	5,25,000
4,50,000	4,72,500	5,25,000

Variance computation:



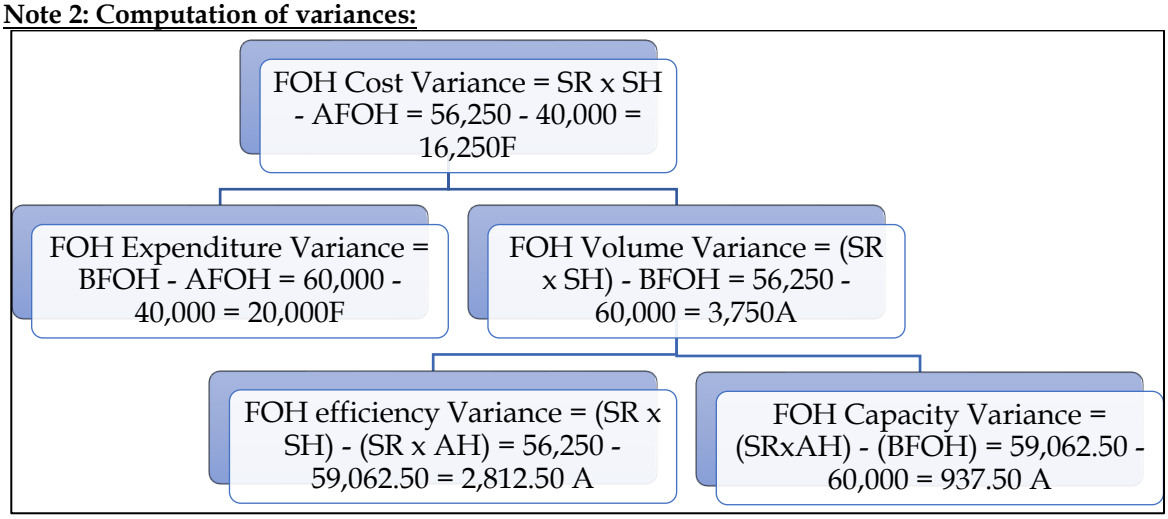
WN 4: Computation of FOH Variances:

SR X SH (OR) SR X AO	**SR X AH** (OR) SR X SO	SR X BH (OR) **SR X BO** (OR) BFOH	AFOH
0.5 x 1,12,500	0.5 x 1,18,125	20,000 x 3	40,000
56,250	**59,062.50**	**60,000**	**40,000**

Note 1: Computation of SR:

- Standard Rate per hour = Standard rate per unit/No of hours per unit = 3/6 = Rs.0.50

Note 2: Computation of variances:



WN 5: Computation of sales variances under Margin Approach (Absorption Costing):

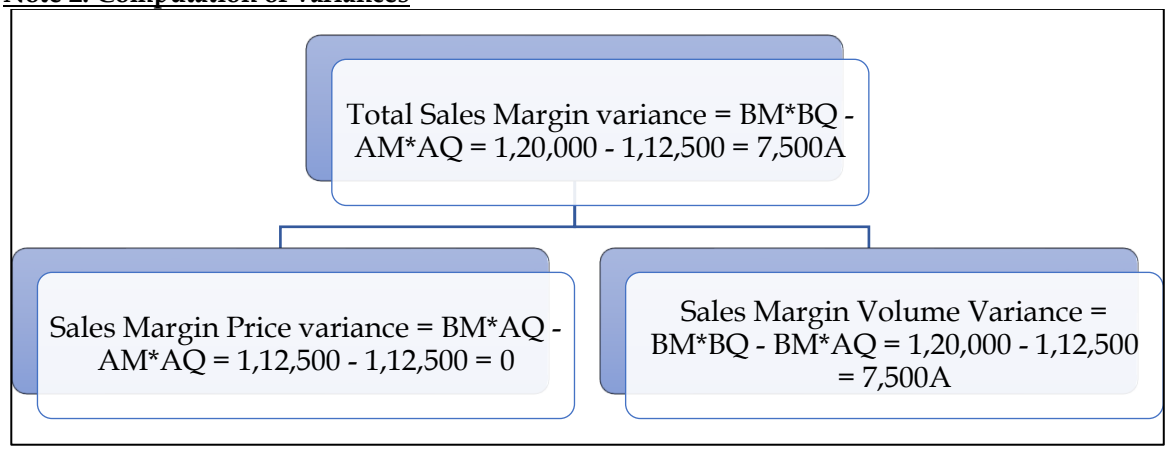
BM x BQ	**BM x AQ**	**AM * AQ**
6 x 20,000	6 x 18,750	6 x 18,750
1,20,000	**1,12,500**	**1,12,500**

Note 1: Calculation of BM and AM:

- BM = Budgeted Price – Budgeted Cost
- BM = 72 – [(1.5 x 6) + (6 x 5) + (6 x 4) +3)]

- BM = 72 – 66 = Rs.6 per unit
- AM = Actual Price – Budgeted Cost
- AM = 72 – 66 = Rs.6 per unit {Actual price taken same as budgeted price due to absence of information)

Note 2: Computation of variances



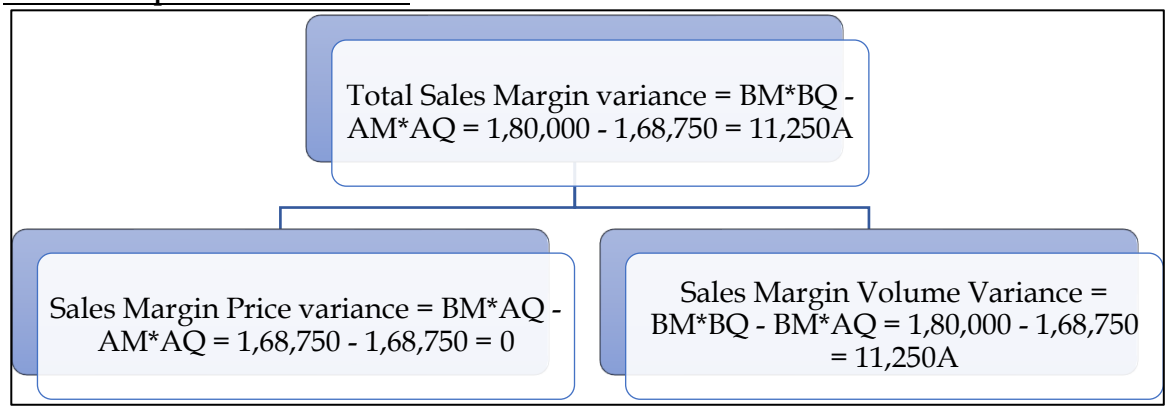
WN 6: Computation of sales variances under Margin Approach (Marginal Costing):

BM x BQ	BM x AQ	AM * AQ
9 x 20,000	9 x 18,750	9 x 18,750
1,80,000	**1,68,750**	**1,68,750**

Note 1: Calculation of BM and AM:

- BM = Budgeted Price – Budgeted Variable Cost
- BM = 72 – 63 = Rs.9 per unit
- **AM = Actual Price – Budgeted Variable Cost**
- AM = 72 – 63 = Rs.9 per unit

Note 2: Computation of variances



WN 7: Computation of Actual Profit:

Particulars	Calculation	Amount
Sales	18,750 x 72	13,50,000
Less: Material Cost	5.25 x 29,860	1,56,765
Less: Labour cost	6.00 x 1,18,125	7,08,750
Less: Variable Overheads		5,25,000
Less: Fixed Overheads		40,000
Actual Profit		(80,515)

WN 8: Computation of budgeted Profit and Standard Profit:

Particulars	Absorption costing	Marginal costing
Budgeted Profit	1,20,000 (20,000 x 6)	1,20,000 (20,000 x 9 – 60,000)

Standard Profit	1,12,500 (18,750 x 6)	1,08,750 (18,750 x 9 – 60,000)

WN 9: Reconciliation of budgeted and standard profit with actual profit:

Particulars	**Absorption costing**		**Marginal Costing**	
	Budgeted profit	**Standard Profit**	**Budgeted Profit**	**Standard Profit**
Budgeted profit/ Standard Profit	1,20,000	1,12,500	1,20,000	1,08,750
Add/Less:				
Material price variance	22,395	22,395	22,395	22,395
Material usage variance	-10,410	-10,410	-10,410	-10,410
Labour rate variance	-1,18,125	-1,18,125	-1,18,125	-1,18,125
Labour efficiency variance	-28,125	-28,125	-28,125	-28,125
VOH expenditure variance	-52,500	-52,500	-52,500	-52,500
VOH efficiency variance	-22,500	-22,500	-22,500	-22,500
FOH expenditure variance	20,000	20,000	20,000	20,000
FOH efficiency variance	-2,812.50	-2,812.50	NA	NA
FOH capacity variance	-937.50	-937.50	NA	NA
Sales margin volume variance	-7,500	NA	-11,250	NA
Sales margin price variance	0	0	0	0
Actual Profit	**-80,515**	**-80,515**	**-80,515**	**-80,515**

Part IV – Market Size and Share Variances

14. Market size and share variances [Category A]

Super computer manufactures and sells three related PC models:

1. PC — Sold mostly to college students
2. Portable PC— Smaller version of PC positioned as home computer
3. Super PC — Sold mostly to business executives

Budgeted and actual data for 1995 is as follows:

Budgets				
Product	Selling Price	Variable cost	Contribution per unit	Sales volume
PC	24000	14000	10000	7000
Portable PC	16000	10000	6000	1000
Super PC	100000	60000	40000	2000
				10000

Actuals				
Product	Selling Price	Variable cost	Contribution per unit	Sales volume
PC	22000	10000	12000	8250
Portable PC	13000	8000	5000	1650
Super PC	70000	50000	20000	1100
				11000

Super computers derived its total unit sales budget for 1995 from the internal management estimate of a 20% market share and an industry sales forecast by computer manufacturers association of 50,000 units. At the end of the year the association reported actual industry sales of 68,750 units.

Required:

a) Compute the individual product and total sales volume variance
b) Compute the total sales quantity variance
c) Compute the market size and market share variance
d) Compute the individual product and total sales mix variances
e) Comment on your results

Answer:

WN 1: Computation of sales variances:

- Sales variances can be computed under total approach or margin approach. In this question we are computing variances under margin approach

Product	BM x BQ	BM x NBQ	BM x RBQ	BM x AQ	AM x AQ
PC	10,000 x 7,000	10,000 x 9,625	10,000 x 7,700	10,000 x 8,250	8,000 x 8,250
Portable PC	6,000 x 1,000	6,000 x 1,375	6,000 x 1,100	6,000 x 1,650	3,000 x 1,650
Super PC	40,000 x 2,000	40,000 x 2,750	40,000 x 2,200	40,000 x 1,100	10,000 x 1,100
Total	**15,60,00,000**	**21,45,00,000**	**17,16,00,000**	**13,64,00,000**	**8,19,50,000**

Note 1: Computation of AM:

- AM = Actual Price – Budgeted Variable Cost
- AM of PC = 22,000 – 14,000 = 8,000
- AM of Portable PC = 13,000 – 10,000 = 3,000
- AM of Super PC = 70,000 – 60,000 = 10,000

Note 2: Computation of RBQ:

- Total of AQ = 8,250 + 1,650 + 1,100 = 11,000
- RBQ of PC = 11,000 x (7/10) = 7,700
- RBQ of Portable PC = 11,000 x (1/10) = 1,100
- RBQ of Super PC = 11,000 x (2/10) = 2,200

Note 3: Computation of New Budget Quantity (NBQ)

- The original budget was on a market size of 50,000 units. The revised market size is 68,750 units
- The market has grown by 37.5 percent and hence the BQ of every product needs to be increased by 37.5 percent to get the new budget quantity
- NBQ of PC = 7,000 + 37.5 percent = 9,625 units
- NBQ of Portable PC = 1,000 + 37.5 percent = 1,375 units
- NBQ of super PC = 2,000 + 37.5 percent = 2,750 units

Variances (product-wise and overall):

Product	Total	Price	Volume	Mix	Quantity
Formula	(BM x BQ) – (AM x AQ)	(BM x AQ) – (AM x AQ)	(BM x BQ) – (BM x AQ)	(BM x RBQ) – (BM x AQ)	(BM x BQ) – (BM x RBQ)
PC	40,00,000A	1,65,00,000A	1,25,00,000F	55,00,000F	70,00,000F
Portable PC	10,50,000A	49,50,000A	39,00,000F	33,00,000F	6,00,000F
Super PC	6,90,00,000A	3,30,00,000A	3,60,00,000A	4,40,00,000A	80,00,000F
Overall	**7,40,50,000A**	**5,44,50,000A**	**1,96,00,000A**	**3,52,00,000A**	**1,56,00,000F**

Computation of Market Size and Market Share Variance:

Market Size Variance:

- Market Size variance = (BM x BQ) – (BM x NBQ)
- Market size variance = 15,60,00,000 – 21,45,00,000 = 5,85,00,000F

Market Share Variance:

- Market Share Variance = (BM x NBQ) – (BM x RBQ)
- Market Share Variance = 21,45,00,000 – 17,16,00,000 = 4,29,00,000A

Comments:

- ❖ Favourable sales quantity variance of Rs.1.56 crores was because of growth in industry as a whole. However the firm could not retain the budgeted market share of 20%. As a result the benefit of increased market size i.e. Rs.5.85 crores is partly offset by loss due to fall in market share i.e. Rs.4.29 crores.
- ❖ Change in the product mix of the company had an impact of Rs.3.52 Crores.
- ❖ The company has also reduced its pricing and this had led to an impact of Rs.5.445 Crores. The company has reduced its price across all product ranges
- ❖ The overall profit of the company has been negatively impacted by Rs.7.405 Crores due to the above developments

15. Reconciliation with market size and share variances [Category A]

A company is planning to improve its profit level at least by 10% from the preliminary budget estimates of a profit of Rs.32,80,000 for the coming year. It has worked out the following profit improvement plan:

(i) In the year just concluded the sales of the company were 10% of the total market of 12,00,000 units. For the preparation of the original budget estimate, the same market demand and the same share of market for the company was envisaged. Now it has been estimated that the total market demand will increase by 18% and the company's market share will increase to 11% from the present level of 10%

(ii) The products are sold in two sizes – large and medium. The sales mix of each size was 50:50 so far. Now it is planned that the sales will be 40% of large and 60% of medium. The medium packs and large packs have a contribution of Rs.10 and Rs.8 per pack respectively. The budget proposes to raise the price in such a manner that the contribution per pack will increase by Rs.0.60 for each size

(iii) There will be an additional expenditure on sales promotion worth Rs.78,000

(iv) The company proposes to save Rs.9,000 by saving on interest cost in the coming year by better financial management

You are required to draw a profit improvement plan in financial terms and spelling out separately the effect of various factors on profit.

WN 1: Computation of sales variances (Margin Approach – Marginal Costing):

Product	BM x BQ	BM x NBQ	BM x RBQ	BM x AQ	AM x AQ
Large	8 x 60,000	8 x 70,800	8 x 77,880	8 x 62,304	8.60 x 62,304
Medium	10 x 60,000	10 x 70,800	10 x 77,880	10 x 93,456	10.60 x 93,456
Total	**10,80,000**	**12,74,400**	**14,01,840**	**14,32,992**	**15,26,448**

Note 1: Computation of BQ:

- ❖ Original market size = 12,00,000; Planned market share = 10%; Original units to be sold = 1,20,000 units. This needs to be split in the ratio of 1:1

Note 2: Computation of NBQ

- ❖ The original budget was on a market size of 12 lac units. The market has grown by 18 percent and hence the BQ of every product needs to be increased by 18 percent to get the new budget quantity
- ❖ NBQ of Large = 60,000 + 18% = 70,800; NBQ of medium = 60,000 + 18% = 70,800

Note 3: Computation of AQ:

- ❖ The revised market size is 14,16,000 units. The company has taken a market share of 11 percent and hence the quantity sold is 1,55,760 units
- ❖ 40 percent of sales is large = 1,55,760 x 40% = 62,304 units and balance 60 percent of sales is medium = 1,55,760 x 60% = 93,456 units

Note 4: Computation of RBQ:

- ❖ Total of AQ = 1,55,760
- ❖ RBQ of Large = 1,55,760 x (1/2) = 77,880 units
- ❖ RBQ of Medium = 1,55,760 x (1/2) = 77,880 units

Note 5: Computation of variances:

Sales Margin Mix variance	(BM x RBQ) – (BM x AQ)	14,01,840 – 14,32,992	31,152F

Market size variance	(BM x BQ) – (BM x NBQ)	10,80,000 – 12,74,400	1,94,400F
Market Share variance	(BM x NBQ) – (BM x AQ)	12,74,400 – 14,01,840	1,27,440F
Sales Margin Price Variance	(BM x AQ) – (AM x AQ)	14,32,992 – 15,26,448	93,456F

WN 2: Profit improvement plan:

Particulars	**Amount**
Favorable impact of Product Mix	31,152
Improvement in Market Size	1,94,400
Improvement in Market Share	1,27,440
Improvement in Price	93,456
Favorable impact of sales changes	**4,46,448**
Less: Additional sales promotion expenditure	(78,000)
Add: Savings in interest cost	9,000
Net improvement in Profit	**3,77,448**

16. Reconciliation with market size and share variances [Category A]

Established in the year 1999, FF Company is the pioneer of fast food in Southampton. It delivers a truly fresh, affordable, made to order sandwiches, burger, and other meal in a friendly and relaxed environment. The popularity of the sandwiches, burger etc. continued to grow over the decades but one thing remained the same and that was its core values and principles: - Always provide exceptional service to valued guests; - Provide the highest quality menu items at a price everyone can afford and enjoy; and - Keep operating costs low and ensure to have great systems in place and never stop improving.

It provides a comfortable place for people to unwind over interesting conversations. From the beginning, as it continues to grow, it is guided by passion for delighting customers by serving fresh, delicious food right in front of customer.

The performance report for FY 2018-19 was presented at the management committee meeting as follows:

Particulars	Budget	Actual	Variance
Sales / Production (units)	2,00,000	1,65,000	(35,000)
Sales (Rs.)	21,00,000	16,92,900	(4,07,100)
Less: Variable Costs (Rs.)	12,66,000	10,74,150	1,91,850
Less: Fixed Costs (Rs.)	3,15,000	3,30,000	(15,000)
Profit	5,19,000	2,88,750	(2,30,250)

The budgeted data shown in the table is based on the assumption that total market size would be 4,00,000 units but it turned out to be 3,75,000 units.

Further, the report also included customer's feedback and the majority of comments were regarding delay in service time. One of feedback was as follows: *"I ordered two burgers at 2:10 pm. After half an hour (30 minutes) of waiting I called the waiter and asked him what happened? he told me that he will check with kitchen. I got the order after 45 minutes of waiting, this cafe is not good in delivery time"*

The budgeted data shown in the table is based on the assumption that total market size would be 4,00,000 units.

Required

(i) PREPARE a reconciliation statement of budgeted profit to actual profit through marginal costing approach in as much detail as possible.

(ii) EXPLAIN the implications of the reconciliation statement.

(iii) Management is worried about customer's feedback. ADVISE measures to improve delivery service time.

WN 1: Computation of variable cost variance and fixed cost variance:

- Variable cost variance = Standard Variable cost – Actual variable cost
- Variable cost variance = (1,65,000 units x 6.33 per unit) – 10,74,150 = 29,700A
- Fixed cost variance = Budgeted fixed cost – Actual fixed cost

- Fixed cost variance = 3,15,000 – 3,30,000 = 15,000A

WN 2: Computation of sales variances under Margin Approach (Marginal Costing):

BM x BQ	BM x NBQ	BM x AQ	AM * AQ
4.17 x 2,00,000	4.17 x 1,87,500	4.17 x 1,65,000	3.93 x 1,65,000
8,34,000	**7,81,875**	**6,88,050**	**6,48,450**

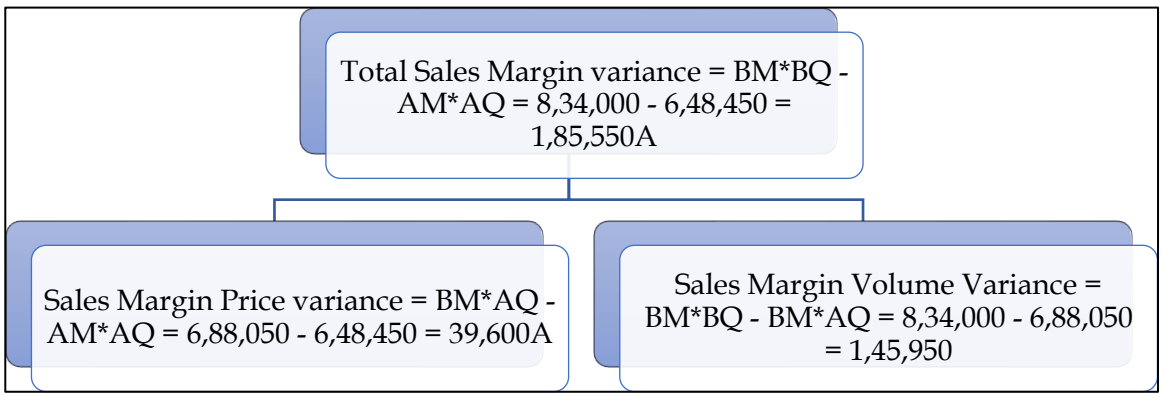
Note 1: Calculation of BM and AM:

- BM = Budgeted Price – Budgeted Variable Cost
- BM = (21,00,000/2,00,000) – (12,66,000/2,00,000) = 10.50 – 6.33 = 4.17 per unit
- AM = Actual Price – Budgeted variable cost
- AM = (16,92,900/1,65,000) – 6.33 = 10.26 – 6.33 = 3.93 per unit

Note 2: Computation of NBQ:

- The original market size was for 4,00,000 units and the revised market size is 3,75,000 units
- The market has de-grown by 6.25 percent and hence the BQ needs to be reduced by 6.25 percent to get NBQ
- NBQ = 2,00,000 – 6.25 percent = 1,87,500 units

Note 3: Computation of variances



Note 4: Computation of market size and share variance:

- Market size variance = (BM x BQ) – (BM x NBQ) = 8,34,000 – 7,81,875 = 52,125A
- Market share variance = (BM x NBQ) – (BM x AQ) = 7,81,875 – 6,88,050 = 93,825A

WN 3: Statement of Reconciliation:

Particulars	Amount
Budgeted Profit	5,19,000
Less: Market size variance	(52,125)
Less: Market share variance	(93,825)
Less: Sales price variance	(39,600)
Less: Variable cost variance	(29,700)
Less: Fixed Cost Variance	(15,000)
Actual Profit	2,88,750

(ii) Implications of Reconciliation Statement

In the revised statement, the sales volume variance has been detailed by the way of two variances i.e. planning and operational variances. **This kind of detailed information assists the company to check, which kind of variances are under the management control and which are not**. **FF has adverse volume contribution planning variance and the reason of could be the environmental/market changes, that was not anticipated at the time of budget preparation, so they are not under management control and hence, no one is responsible for this. On the other hand, the sales volume contribution operational variance was under control of the managers and they should be held responsible for the same. The reason of adverse sales volume contribution operational variance could be unsuccessful direct selling**

efforts/marketing efforts. FF has adverse sales price variance as well. It indicates that the burgers were sold for lower price than standard. The reason of this could be unforeseen market competitive price, tapping new market etc.

Further, revised reconciliation statement delivers little information about the variable cost and fixed cost variances. They both are adverse. Fixed cost consists of many items such as salaries, annual maintenance cost, rent and insurance etc. Often fixed cost items are not affected in short run in response to change in the level of activity, but they might change in response to other factors such as price. This may cause increase expenditure on fixed overheads. A meaningful analysis of fixed cost variance requires a line to line comparison of budgeted cost with actual cost.

In case of FF, the variable cost may be made up of large individual different items such as vegetables, gas, indirect labor, regular maintenance cost etc. Control of variable cost also requires line by line analysis for each individual item. The adverse variable cost variance simply reveals that FF incurred more on variable cost than expected. **However, it is necessary to take into consideration the causes of this adverse variance which is beyond the control of the management, for instance, the unusual price hike in vegetables in case of unseasonal rainfall.**

(iii) Measures to Improve Fast Food Delivery Service Time

Customers expect that their food order to be delivered quickly. **From customer's feedback in the question, it is evident that FF has a problem in food delivery, due to which, customers go unsatisfied**. The reason of late delivery could be non-availability of raw material on time or employees not working properly etc. The reason of employees not working properly could be job dissatisfaction which may be due to improper working conditions, low salary, or no reward for overtime etc.

In order to reduce delivery time, **raw material should be made available in stock based on daily requirement. FF may follow quantitative approach to inventory problems, which lays down clear guidelines that when to re-order or alert the management in exceptional situations.**

In addition, **FF must also address the issues related to employee and involve them in a loop**. FF could improve the employee satisfaction with proper working conditions, better pay, training, and growth opportunities.

Moreover, **it is important that customers should be informed about approximate delivery time since this will reduce customer's anxiety and will proactively reduce any complaints** over long waits for delivery of food. If unexpected delays occur, it is important to communicate with customers, apologies for the delay and inform them about the new approximate delivery time along with valid reason.

In addition to this**, FF can also introduce pagers or install electronic board displaying ticket number or self- serve kiosk allowing customers to roam around** or order in advance so that they do not have long waiting time

Part V – Reverse Working Problems

Part VI – Planning and Operating Variances

17. Planning and operating variances [Category A]

GRV is a chemical processing company that produces sprays used by farmers to protect their crops. One of these sprays 'Agrofresh' is made by using either chemical A or chemical B. To produce one litre of Agrofresh spray they have the option to use either 2.50 Kg of chemical A or 2.50 Kg of chemical B. During the financial year, the purchase department of GRV has planned to use chemical B as it appeared that it would be the cheaper of the two and their plans were based on a cost of chemical B of Rs. 1.50 per kg.

Due to subsequent market movement during the year the actual prices changed and if the concerned department had purchased efficiently, the cost would have been:

- Chemical A – Rs.2.25 per kg

- Chemical B – Rs.1.50 per kg

Production of Agrofresh spray was 1,000 units and the usage of chemical B was 2,700 kg at a cost of Rs. 6,480. You are the CEO of GRV and the Management Accountant has sent to you the following suggestions through e-mail:

"I feel that in our particular circumstances the traditional approach to variance analysis is of little use as for some of our products we can utilize one of several equally suitable chemicals and we always plan to use such chemical which will lead to cheapest production costs. However due to sharp market movements, we are frequently trapped by the sharp price changes which lead to the choice of expensive alternative at the end."

To check the reality in the content of the mail, your CEO asked you, the Cost Accountant of the company:
(i) to CALCULATE the material variances for Agrofresh by using Traditional Variance Analysis and Planning and Operational Variances
(ii) to ANALYSE how planning and operational variances approached the variances.
(iii) to ANALYSE how the advanced variances are useful to your organisation.

WN 1: Computation of variances are per traditional Approach:

SP x SQ	SP x AQ	AP x AQ
1.50 x 2,500	1.50 x 2,700	2.40 x 2,700
3,750	**4,050**	**6,480**

Note 1: Computation of SQ:

- SQ = AO x (Input/Output)
- SQ = 1,000 x (2.5/1) = 2,500 Kg

Note 2: Computation of variances:

- Material Price Variance = (SP x AQ) – (AP x AQ) = 4,050 – 6,480 = 2,430A
- Material Usage Variance = (SP x SQ) – (SP x AQ) = 3,750 – 4,050 = 300A
- Material Cost Variance = (SP x SQ) – (AP x AQ) = 3,750 – 6,480 = 2,730A

WN 2: Computation of Planning Variances:

SP x SQ	SP x AQ	AP x AQ
1.50 x 2,500	1.50 x 2,500	2.25 x 2,500
3,750	**3,750**	**5,625**

- There has been change in efficient price of raw material and the same stood now at Rs.2.25 per KG as compared to original plan of Rs.1.50 per Kg. There has been no change in consumption norms

Computation of variances:

- Material Price Variance = (SP x AQ) – (AP x AQ) = 3,750 – 5,625 = 1,875A
- Controllable Portion = (2 – 2.25) x 2,500 = 625A
- Uncontrollable Portion = (1.50 – 2) x 2,500 = 1,250A
- Planning variances are generally uncontrollable in nature. The company has been forced to pay Rs.2.25 per KG for PG as compared to original estimate of Rs.1.50 per KG. The company could have now shifted to Product PD and the effective price could have been restricted to 2 per KG
- Hence the increase from 1.50 to 2.00 per KG is uncontrollable in nature whereas increase from 2.00 to 2.25 per KG is controllable in nature

WN 3: Computation of operating variance:

SP x SQ	SP x AQ	AP x AQ
2.25 x 2,500	2.25 x 2,700	2.40 x 2,700
5,625	**6,075**	**6,480**

Variance calculation:

- Material Price Variance = (SP x AQ) – (AP x AQ) = 6,075 – 6,480 = 405A
- Material Usage Variance = (SP x SQ) – (SP x AQ) = 5,625 – 6,075 = 450A
- Material Cost Variance = (SP x SQ) – (AP x AQ) = 5,625 – 6,480 = 855A

Part (ii)

Traditional variance analysis is applied based on the assumption that whole of the variance is due to operational deficiencies and the planning associated with setting the original standard is perfectly correct. But this assumption is not practical. When the conditions are volatile and dynamic, traditional variances need to be analysed into planning and operational variances. **Planning variances try to explain the extent to which the original standard needs to be adjusted to reflect changes in operating conditions between the current situation and that imagined when the standard was originally derived**. Planning variances are generally not controllable and may need to revise to cater the changes due to environmental/ technological changes at a later stage. In certain situation planning variances can be considered controllable as well. Whereas operational variances explain the extent to which adjusted standards have been achieved. Operational variances are calculated after the planning variances have been established and are thus a realistic way of assessing performance. So, it Indicates a reality check of traditional variance analysis.

In GRV, as per traditional approach total variances are Rs. 29,920 (adverse), out of which Rs. 17,920 (adverse) accounts for total operational variance and Rs. 12,000 (adverse) is for total planning variance. It is necessary to analyse planning variances further. The planning variance of Rs. 12,000 (adverse) can be divided into an uncontrollable adverse variance of Rs. 4,800 and a controllable adverse variance of Rs. 7,200. Similarly, total operational variance can be sub classified as adverse price variance of Rs. 5,120 and adverse usage variance of Rs. 12,800. **This analysis gives a clearer indication of the inefficiency of the purchasing function by the concerned department. Performance of the staff of the purchasing department should be evaluated/rewarded/ based on variances which are controllable**. If an adverse uncontrollable variance of Rs. 4,800 is reported in the performance reports this is likely to lead to dysfunctional motivation effects to the purchase department.

(iii) In today's cutthroat competition **managers must react quickly and accurately to the changes in technology, price fluctuation, consumer tastes, laws and regulations, economic conditions, political conditions, and international conditions etc. which are changing rapidly and dramatically**. Accordingly, management accountant should be able to provide necessary inputs by a proper analysis of the things that pertains to his/her area like effect of changes in price. The unique features of advanced variance analysis are that, it considers different market conditions and changes in the dynamic environment.

Moreover, advanced variances classify variances into controllable and uncontrollable variances and helps the management to find out reasons for adverse variances so that corrective action can be taken. Similarly, if any adverse variances have arrived, because of changes in the market condition like inflation, it has to be differentiated from the other variances.

GRV is a type of organization where management of performance can be done only through advanced variance analysis. Advanced variance analysis of GRV shows that it has adverse planning variance as well as adverse operational variance. Further, the emergence of controllable and uncontrollable variances makes it a perfect case of advance variance analysis in GRV. In GRV, sharp price changes which lead to the choice of expensive alternative and efficiency of purchase department need to be analyzed, reported, and dealt separately by the joint effort of the management accountant and the top management. Hence, advanced variance analysis in GRV is an absolute necessity.

18. Planning and operating variances [Category A]

HDR Ltd produces units and incurs labour costs. A change in technology after the preparation of the budget resulted in a 25% increase in standard labour efficiency, such that it is now possible to produce 10 units instead of 8 units using 8 hours of labour- giving a revised standard labour requirement of 0.80 hours per unit. Details of actuals and budgeted for period XII are:

Grade	Original standards	Revised standards	Actual (1,100 units)
X	1,100 units x 1 hrs x Rs.10	1,100 units x 0.80 hrs x Rs.10	1,200 hrs x 8.50

Required

(i) CALCULATE the variances for 'X' by

(a) Traditional Variance Analysis; and

(b) An approach which distinguishes between Planning and Operational Variances.

(ii) COMMENT on the results.

Answer:

WN 1: Computation of variances are per traditional Approach:

SR x SH	SR x AH	AR x AH
10 x 1,100	10 x 1,200	8.5 x 1,200
11,000	**12,000**	**10,200**

Variance computation

- Labour rate variance = (SR x AH) – (AR x AH) = 12,000 – 10,200 = 1,800F
- Labour efficiency variance = (SR x SH) – (SR x AH) = 11,000 – 12,000 = 1,000A
- Labour cost variance = (SR x SH) – (AR x AH) = 11,000 – 10,200 = 800F

WN 2: Computation of Planning Variances:

SR x SH	SR x AH	AR x AH
10 x 1,100	10 x 880	10 x 880
11,000	**8,800**	**8,800**

Note 1: Computation of SQ:

- AH = BO x (Input/Output) (revised standard)
- AH = 1,100 x 0.8 = 880 hours

Note 2: Computation of variances:

- Labour rate variance = 0
- Labour efficiency variance = (SR x SH) – (SR x AH) = 11,000 – 8,800 = 2,200F
- Labour cost variance = (SR x SH) – (AR x AH) = 11,000 – 8,800 = 2,200F

WN 3: Computation of Operating Variances:

SR x SH	SR x AH	AR x AH
10 x 880	10 x 1,200	8.5 x 1,200
8,800	**12,000**	**10,200**

Variance Calculation:

- Labour rate variance = (SR x AH) – (AR x AH) = 12,000 – 10,200 = 1,800F
- Labour efficiency variance = (SR x SH) – (SR x AH) = 8,800 – 12,000 = 3,200A
- Labour cost variance = (SR x SH) – (AR x AH) = 8,800 – 10,200 = 1,400A

Comments:

In this case, the separation of the labour cost variance into operational and planning components shows a large problem in the area of labour efficiency than might otherwise have been indicated. The operational variances are based on the revised (ex post) standard and this gives a more meaningful performance benchmark than the original (ex-ante) standard

19. Planning and operating variances [Category A]

KONY Ltd., based in Kuala Lumpur, is the Malaysian subsidiary of Japan's NY corporation, headquartered in Tokyo. KONY's principal Malaysian businesses include marketing, sales, and after-sales service of electronic products & software exports products. KONY set up a new factory in Penang to manufacture and sell integrated circuit 'Q50X-N'. The first quarter's budgeted production and sales were 2,000 units. The budgeted sales price and standard costs for 'Q50X-N' were as follows:

Particulars	RM	RM
Standard Sales Price per unit		50
Standard Costs per unit		
Circuit X (10 units @ RM 2.5)	25	
Circuit Designers (6 hrs. @ RM 2)	12	(37)
Standard Contribution per unit		13

Actual results for the first quarter were as follows:

Particulars	RM '000	RM '000
Sales (2,000 units)		158
Production Costs (2,000 units)		
Circuit X (21,600 units)	97.20	

Circuit Designers (11,600 hours)	34.80	(132)
Actual Contribution (2,000 units)		26

The management accountant made the following observations on the actual results–

"In total, the performance agreed with budget; however, in every aspect other than volume, there were huge differences. Sales were made at what was supposed to be the highest feasible price, but we now feel that we could have sold for RM 82.50 with no adverse effect on volume. The Circuit X cost that was anticipated at the time the budget was prepared was RM 2.5 per unit. However, the general market price relating to efficient purchases of the Circuit X during the quarter was RM 4.25 per unit. Circuit designers have the responsibility of designing electronic circuits that make up electrical systems. Circuit Designer's costs rose dramatically with increased demand for the specialist skills required to produce the 'Q50X-N', and the general market rate was RM 3.125 per hour - although KONY always paid below the normal market rate whenever possible. In my opinion, it is not necessary to measure the first quarter's performance through variance analysis. Further, our operations are fully efficient as the final contribution is equal to the original budget."

Required

COMMENT on management accountant's view.

Answer:

As the management accountant states, and the analysis presents, the overall variance for the KONI is nil. The cumulative adverse variances exactly offset the favourable variances i.e. sales price variance and circuit designer's efficiency variance. However, this traditional analysis does not clearly show the efficiency with which the KONI operated during the quarter, as it is difficult to say whether some of the variances arose from the use of incorrect standards, or whether they were due to efficient or inefficient application of those standards.

In order to determine this, a revised ex post plan should be required, setting out the standards that, with hindsight, should have been in operation during the quarter. As seen from below working notes, on the cost side, the circuit designer's rate variance has changed from adverse to favourable, and the price variance for component X, while remaining adverse, is significantly reduced in comparison to that calculated under the traditional analysis; on the sales side, sales price variance, which was particularly large and favourable in the traditional analysis, is changed into an adverse variance in the revised approach, reflecting the fact that the KONI failed to sell at prices that were actually available in the market.

Further, variances arose from changes in factors external to the business, which might not have been known or acknowledged by standard-setters at the time of planning are beyond the control of the operational managers. The distinction between variances is necessary to gain a realistic measure of operational efficiency

WN 1: Computation of sales variances:

Planning Variance:

BP x BQ	BP x AQ	AP x AQ
50 x 2,000	50 x 2,000	82.50 x 2,000
1,00,000	1,00,000	1,65,000

- Sales Price variance = (BP x AQ) – (AP x AQ) = 1,00,000 – 1,65,000 = 65,000F
- Sales volume variance = 0
- Total Sales variance = 65,000F + 0 = 65,000F

Operating Variance:

BP x BQ	BP x AQ	AP x AQ
82.50 x 2,000	82.50 x 2,000	79 x 2,000
1,65,000	1,65,000	1,58,000

- Sales Price variance = (BP x AQ) – (AP x AQ) = 1,65,000 – 1,58,000 = 7,000A
- Sales volume variance = 0
- Total Sales variance = 7,000A + 0 = 7,000A

Traditional Approach:

BP x BQ	BP x AQ	AP x AQ
50 x 2,000	50 x 2,000	79 x 2,000
1,00,000	1,00,000	1,58,000

- Sales Price variance = (BP x AQ) – (AP x AQ) = 1,00,000 – 1,58,000 = 58,000F
- Sales volume variance = 0
- Total Sales variance = 58,000F + 0 = 58,000F

WN 2: Computation of Material Variances (Circuit X)

Planning Variance:

SP x SQ	SP x AQ	AP x AQ
2.5 x 20,000	2.5 x 20,000	4.25 x 20,000
50,000	50,000	85,000

- Material Price Variance = (SP x AQ) – (AP x AQ) = 50,000 – 85,000 = 35,000A
- Material Usage Variance = 0
- Material cost variance = 35,000A + 0 = 35,000A

Operating Variance:

SP x SQ	SP x AQ	AP x AQ
4.25 x 20,000	4.25 x 21,600	4.50 x 21,600
85,000	91,800	97,200

- Material Price Variance = (SP x AQ) – (AP x AQ) = 91,800 – 97,200 = 5,400A
- Material Usage Variance = (SP x SQ) – (SP x AQ) = 85,000 – 91,800 = 6,800A
- Material cost variance = 5,400A + 6,800A = 12,200A

Traditional Approach:

SP x SQ	SP x AQ	AP x AQ
2.5 x 20,000	2.5 x 21,600	4.50 x 21,600
50,000	54,000	97,200

- Material Price Variance = (SP x AQ) – (AP x AQ) = 54,000 – 97,200 = 43,200A
- Material Usage Variance = (SP x SQ) – (SP x AQ) = 50,000 – 54,000 = 4,000A
- Material cost variance = 4,000A + 43,200A = 47,200A

WN 3: Computation of Labour Variances (Circuit designer)

Planning Variance:

SR x SH	SR x AH	AR x AH
2 x 12,000	2 x 12,000	3.125 x 12,000
24,000	24,000	37,500

- Labour rate variance = (SR x AH) – (AR x AH) = 24,000 – 37,500 = 13,500A
- Labour efficiency variance = (SR x SH) – (SR x AH) = 24,000 – 24,000 = 0
- Labour cost variance = 13,500A + 0 = 13,500A

Operating Variance:

SR x SH	SR x AH	AR x AH
3.125 x 12,000	3.125 x 11,600	3 x 11,600
37,500	36,250	34,800

- Labour rate variance = (SR x AH) – (AR x AH) = 36,250 – 34,800 = 1,450F
- Labour efficiency variance = (SR x SH) – (SR x AH) = 37,500 – 36,250 = 1,250F
- Labour cost variance = 4,450F + 1,250F = 5,700F

Traditional Approach:

SR x SH	SR x AH	AR x AH
2 x 12,000	2 x 11,600	3 x 11,600
24,000	23,200	34,800

- Labour rate variance = (SR x AH) – (AR x AH) = 23,200 – 34,800 = 11,600A
- Labour efficiency variance = (SR x SH) – (SR x AH) = 24,000 – 23,200 = 800F

- Labour cost variance = 11,600A + 800F = 10,800A

WN 4: Summary of Traditional variances, Planning and Operating Variances:

Reconciliation under Traditional Approach:

Particulars	Amount
Budgeted Contribution	26,000
Add/Less:	
Sales Price Variance	58,000
Circuit X Price Variance	(43,200)
Circuit X Usage Variance	(4,000)
Circuit Designer's Rate Variance	(11,600)
Circuit Designer's efficiency variance	800
Actual Contribution	**26,000**

Summary of Planning Variance:

Particulars	Amount
Sales Price Variance	65,000F
Circuit X Price Variance	35,000A
Circuit Designer Rate Variance	13,500A
Total	**16,500F**

Summary of Operating Variance:

Particulars	Amount
Sales Price Variance	7,000A
Circuit X Price Variance	5,400A
Circuit X Usage Variance	6,800A
Circuit Designer Rate Variance	1,450F
Circuit Designer Efficiency variance	1,250F
Total	**16,500A**

20. Planning and operating variances [Category A]

T-tech is a Taiwan based firm, that designs, develops, and sells audio equipment. Founded in 1975 by Mr. Boss, firm sells its products throughout the world. T-tech is best known for its home audio systems and speakers, noise cancelling headphones, professional audio systems and automobile sound systems. Extracts from the budget are shown in the following table:

Home Audio System Division
Jan'2018

System	Sales (units)	Selling Price Rs.	Standard Cost (per System) Rs.
3,000 W PMPO	1,500	18,750	12,500
5,000 W PMPO	500	50,000	26,250

The Managing Director has sent you a copy of an email he received from the Sales Manager 'K'. The content of the email was as follows:

"We have had an outstanding month. There was an adverse Sales Price Variance on the 3,000 W PMPO Systems of Rs.22,50,000 but I compensated for that by raising the price of 5,000 W PMPO Systems. Unit sales of 3,000 W PMPO Systems were as expected but sales of the 5,000 W PMPOs were exceptional and gave a Sales Margin Volume Variance of Rs.23,75,000. I think I deserve a bonus!"

The managing Director has asked for your opinion on these figures. You got the following information:

Actual results for Jan' 2018 were:

System	Sales (units)	Selling Price Rs.
3,000 W PMPO	1,500	Rs.17,250

5,000 W PMPO	600	Rs.53,750

The total market demand for 3,000 W PMPO Systems was as budgeted but as a result of suppliers reducing the price of supporting UHD TV System the total market for 5,000 W PMPO Systems raised by 50% in Jan'2018.

The company had sufficient capacity to meet the revised market demand for 750 units of its 5,000 W PMPO Systems and therefore maintained its market share.

Required

(i) CALCULATE the following Operational Variances based on the revised market details:
- Sales Margin Mix Variance
- Sales Margin Volume Variance

(ii) COMMENT briefly on the measurement of the K's performance.

WN 1: Computation of Sales Margin Mix and Volume Variance:

System	BM x BQ	BM x NBQ	BM x RBQ	BM x AQ	AM x AQ
3000W PMPO	6,250 x 1,500	6,250 x 1,500	6,250 x 1,400	6,250 x 1,500	4,750 x 1,500
5000W PMPO	23,750 x 500	23,750 x 750	23,750 x 700	23,750 x 600	27,500 x 600
Total	**2,12,50,000**	**2,71,87,500**	**2,53,75,000**	**2,36,25,000**	**2,36,25,000**

Note 1: Computation of BM and AM:

- BM = Budgeted Price – Budgeted cost
- BM for 3000W PMPO = 18,750 – 12,500 = 6,250
- BM for 5000W PMPO = 50,000 – 26,250 = 23,750
- AM = Actual Price – Budgeted Cost
- AM for 3000W PMPO = 17,250 – 12,500 = 4,750
- AM for 5000W PMPO = 53,750 – 26,250 = 27,500

Note 2: Computation of NBQ:

- Market size of 5000W PMPO has grown by 50 percent and hence the new budget quantity of 5000W PMPO has been increased by 50 percent

Note 3: Computation of RBQ:

- Total of AQ = 1,500 + 600 = 2,100 units
- RBQ is the total of AQ in revised budgeted mix (1,500:750)
- RBQ of 3000W PMPO = 2,100 x (1,500/2,250) = 1,400 units
- RBQ of 5000W PMPO = 2,100 x (750/2,250) = 700 units

Note 4: Computation of variances

- **Sales Margin Mix Variance = (BM x RBQ) – (BM x AQ) =2,53,75,000 – 2,36,25,000 = 17,50,000A**
- **Sales Margin Volume Variance = (BM x NBQ) – (BM x AQ) = 2,71,87,500 – 2,36,25,000 = 35,62,500A**

Comments:

A Planning Variance simply compares a revised standard (that should or would have been used if planners had known in advance what was going to happen) to the original standard. A planning variance is considered as not to be controllable by management.

The market size is not within the control of the sales manager and therefore variances caused by changes in the market size would be regarded as planning variances.

However, variances caused by changes in the selling prices and consequently the selling price variances and market shares would be within the control of the sales manager and treated as operating variances.

The market size variance compares the original and revised market sizes. This is unchanged for 3,000 W PMPO Systems so the only variance that occurs relates to the 5,000 W PMPO Systems and is Rs.59,37,500 (F) [250 systems × Rs.23,750].

It is vital to make this distinction because as can be seen from the scenario the measurement of the 'K''s performance is incomplete if the revised market size is ignored.

The favourable volume variance of Rs.23,75,000 referred to in the 'K''s e-mail is made up of two elements, one of which, the market size, is a planning variance which is outside his control. It is this that has caused the overall volume variance to be favourable, and thus 'K' is not responsible for the overall favourable performance.

21. Budgetary control and Planning variances [Category A]

APZ has recently opened a fast-food restaurant in a small town. Fast-food restaurants are characterised by their quick food service. The fast-food restaurant market in the town is dominated by a small number of long established restaurants. APZ is seeking to grow its business and attract the town's residents with its burger meals.

The performance report for the first month of business is to be presented at the restaurant's monthly management meeting. A draft of the performance report for the first month of business is reproduced below:

	Budget	Actual	Variance
Sales (number of meals)	6,000	5,400	(600)
	$	$	$
Revenue	45,000	40,365	(4,635)
Variable costs	26,400	24,632	1,768
Fixed costs	5,250	4,950	300
Profit	13,350	10,783	(2,567)

The management accountant at APZ has realised that the size of the fast-food market that was used to derive the budget number of meals to be sold has been over-estimated. The management accountant has calculated the value of the sales volume contribution planning variance to be $2,480 adverse.

Required:

- **Prepare** a revised budget based on the new estimate of the market.
- **Prepare** a performance report for the month based on a flexed budget.
- **Explain** TWO non-financial measures that APZ could use to monitor the performance of the new fast-food restaurant

Answer:

WN 1: Computation of new estimate of the market:

- Contribution per unit = (45,000/6,000) – (26,400/6,000) = 7.5 – 4.4 = 3.1 per unit
- Sales volume contribution planning variance (Market size variance) = (BM x BQ) – (BM x NBQ)
- 2,480 = (3.1 x 6,000) – (3.1 x NBQ)
- 2,480 = 18,600 – 3.1NBQ
- 3.1NBQ = 16,120
- NBQ = 16,120/3.1 = 5,200 units

WN 2: Revised budget based on new estimate of market:

Particulars	Calculation	Amount
Sales	5,200 x 7.50	39,000
Variable cost	5,200 x 4.40	(22,880)
Fixed Cost		(5,250)
Profit		10,870

WN 3: Performance report based on flexible budget:

Particulars	Budget (5,400)	Actual (5,400)	Variance
Sales Revenues	40,500	40,365	135A
Variable Costs	23,760	24,632	872A
Fixed Cost	5,250	4,950	300F
Profit	11,490	10,783	707A

WN 4: Non-financial measures to measure performance:

- **Speed of food delivery:** Customers at fast food restaurants expect their food order to be served quickly. If APZ is to be successful, it must achieve fast food delivery. Therefore a measure of time from customer order to food service is a key metric to monitor in ascertaining the restaurant's success at this requirement.
- **Number of repeat customers:** APZ operates in a small town that offers a number of other choices of fast food restaurant to its residents. If APZ is to establish itself and grow market share, the restaurant needs to develop a loyal customer base. Number of repeat customers is a measure that could indicate the sustainability of the business and future financial success.

Part VII – ABC and variance analysis

22. Variance computation in ABC [Category A]

ABC Limited is a multiple product manufacturer. ABC produces the unit and all overheads are associated with the delivery of units to its customers.

Particulars	Budget	Actual
Overheads	4,000	3,900
Output (units)	2,000	2,100
Customer deliveries	20	19

Calculate efficiency and expenditure variance by adopting ABC approach

WN 1: Computation of variances:

- Computation table remains the same as that of variable OH when we compute variances under ABC approach
- SH and AH will get replaced with items like standard customer deliveries, actual customer deliveries, standard shipments, actual shipments etc

Standard Rate x Standard Deliveries	Standard Rate x Actual Deliveries	Actual Rate x Actual Deliveries
200 x 21	200 x 19	3,900
4,200	3,800	3,900

Note:

Computation of standard dispatches: ❖ 2,000 units = 20 customer deliveries ❖ 2,100 units = ? ❖ 2,100 units = 21 customer deliveries
Computation of standard rate per delivery: Standard rate per delivery = (Budgeted delivery cost/budgeted deliveries) Standard rate per delivery = (4,000/20) = Rs.200 per delivery
Expenditure variance = (SR x Actual Delivery) – (AR x Actual Delivery) Expenditure variance = (3,800 – 3,900) = 100 A
Efficiency variance = (SR x standard delivery) – (SR x Actual Delivery) Efficiency variance = 4,200 – 3,800 = 400F
Total Variance = (SR x Standard Delivery) – (AR x Actual Delivery) Total Variance = 4,200 – 3,900 = 300F

23. Activity Based Costing and Variance Analysis [Category A – May 2019(exam)]

Raju is Chief Financial Officer of Millets. com, an internet company that enables customer to order for delivery of different millets by accessing its website. Raju is concerned with the efficiency and effectiveness of the financial function. He collects the following information for three finance activities in 2018.

Rate per unit of cost driver:

Activity	Activity Level	Cost Driver	Static Budget Amount	Actual Amount
Receivables	Output unit	Remittance	6.39	7.50
Payables	Batch	Invoices	29.00	28.00
Travel expenses	Batch	Travel claims	76.00	74.00

The output measure is the number of deliveries which is the same as the number of remittances. The following additional information are also given

Particulars	Budget	Actual
Number of Deliveries	10,00,000	9,48,000
Delivery batch size	5	4.468
Travel expenses batch size	500	501.587

Required

CALCULATE the flexible budget variances for 2018 to:

(i) Receivable Activities

(ii) Payable Activities

(iii) Travel expense Activities (Ignore fractions in all calculations)

WN 1: Computation of variances of receivables activities:

Standard Rate x Standard Remittances	Actual Rate x Actual Remittances
6.39 x 9,48,000	7.50 x 9,48,000
60,57,720	**71,10,000**

Note: Standard Remittances and Actual Remittances are taken as same as there is no separate variable on which remittances will vary. 10,00,000 is budgeted remittances and the same cannot be taken for computing variances as the cost will be incurred only for 9,48,000 remittances

- Flexible budget variance = Standard Cost – Actual Cost
- Flexible budget variance = 60,57,720 – 71,10,000 = 10,52,280 (A)

WN 2: Computation of variances of Payable activities:

Standard Rate x Standard Batches	Actual Rate x Actual Batches
29.00 x 1,89,600	28.00 x 2,12,175
54,98,400	**59,40,900**

Note: Computation of standard batches and actual batches:

- Standard batches = Actual Deliveries/ standard batch size = 9,48,000 /5 = 1,89,600 batches
- Actual batches = Actual deliveries / actual batch size = 9,48,000/4.468 = 2,12,175 batches

Note: Computation of variances:

- Flexible budget variance = Standard Cost – Actual Cost
- Flexible budget variance = 54,98,400 – 59,40,900 = 4,42,500 (A)

WN 3: Computation of variances of Travel Expense activities:

Standard Rate x Standard Batches	Actual Rate x Actual Batches
76.00 x 1,896	74.00 x 1,890
1,44,096	**1,39,860**

Note: Computation of standard batches and actual batches:

- Standard batches = Actual Deliveries/ standard batch size = 9,48,000 /500 = 1,896 batches
- Actual batches = Actual deliveries / actual batch size = 9,48,000/501.587 = 1,890 batches

Note: Computation of variances:

- Flexible budget variance = Standard Cost – Actual Cost
- Flexible budget variance = 1,44,096 – 1,39,860 = 4,236 (F)

24. ABC and Variance Analysis (Category A – May 2019(exam):

GDR Limited produces a single product. It has recently automated part of its manufacturing plant and adopted Total Quality Management (TQM) and Just-in-Time (JIT) manufacturing system. No inventories are held for material as well as for finished product. The company currently uses standard absorption costing system. Following are data relating to fourth quarter of 2018-19:

Particulars	Budget	Actual
Production and sales	1,00,000 units	1,10,000 units
Direct Materials	2,00,000 kg @ Rs.15/kg	2,50,000 kg @ Rs.15.60/kg

Direct Labour hours	25,000 hours @ Rs.150/hour	23,000 hours @ Rs.150/hour
Fixed Production overhead	1,60,000	1,80,000

Production overheads are absorbed on the basis of Direct Labour Hours.

The CEO intends to introduce activity-based costing system along with TQM and JIT for better cost management. A committee has been formed for this purpose. The committee has further analyzed and classified the production overhead of fourth quarter as follows:

Particulars	**Budget**	**Actual**
Material Handling	48,000	62,000
Set-up	1,12,000	1,18,000
Activity		
Material handling (orders executed)	8,000	8,500
Set-up (production runs)	2,000	2,100

Revision of standards relating to fourth quarter are as follows:

Particulars	**Original standard**	**Revised standard**
Material content per unit	2 Kg	2.25 kg
Cost of material	Rs.15 per kg.	Rs.15.50 per kg.
Direct Labour hours	15 minutes	12 minutes

Required:

i. Calculate planning and operational variances relating to material price, material usage, labour efficiency and labour rate
ii. Calculate overhead expenditure and efficiency variance using activity based costing principles

Answer:

Part 1:

WN 1: Computation of Planning Variances - Material

SP X SQ	**SP X AQ**	**AP X AQ**
15 x 2,20,000	15 x 2,47,500	15.50 x 2,47,500
33,00,000	**37,12,500**	**38,36,250**

Note 1: Computation of SQ:

- SQ = AO x (Input/Output) (original standard)
- SQ = 1,10,000 x (2/1) = 2,20,000 KG

Note 2: Computation of AQ:

- AQ = AO x (Input/Output) (revised standard)
- SQ = 1,10,000 x (2.25/1) = 2,47,500 KG

Note 3: Computation of variances:

- Material cost variance = (SP x SQ) – (AP x AQ) = 33,00,000 – 38,36,250 = Rs.5,36,250 (A)
- Material Price Variance = (SP x AQ) – (AP x AQ) = 37,12,500 – 38,36,250 = Rs.1,23,750 (A)
- Material Usage Variance = (SP x SQ) – (SP x AQ) = 33,00,000 – 37,12,500 = Rs.4,12,500 (A)

WN 2: Computation of Operating Variances - Material

SP X SQ	**SP X AQ**	**AP X AQ**
15.50 x 2,47,500	15,50 x 2,50,000	15.60 x 2,50,000
38,36,250	**38,75,000**	**39,00,000**

Note 1: Computation of variances:

- Material cost variance = (SP x SQ) – (AP x AQ) = 38,36,250 – 39,00,000 = Rs.63,750 (A)
- Material Price Variance = (SP x AQ) – (AP x AQ) = 38,75,000 – 39,00,000 = Rs.25,000 (A)
- Material Usage Variance = (SP x SQ) – (SP x AQ) = 38,36,250 – 38,75,000 = Rs.38,750 (A)

WN 3: Computation of Planning Variances - Labour

SR x SH	**SR x AH**	**AR x AH**
150 x 27,500	150 x 22,000	150 x 22,000

41,25,000	**33,00,000**	**33,00,000**

Note 1: Computation of SH:

- SH = AO x (Input/output) (original standard)
- SH = 1,10,000 x (15 mins/1) = 16,50,000 minutes (or) 27,500 hours

Note 2: Computation of AH:

- AH = AO x (Input/output) (revised standard)
- AH = 1,10,000 x (12 mins/1) = 13,20,000 minutes (or) 22,000 hours

Note 3: Computation of variances:

- Labour rate variance = 0
- Labour efficiency variance = (SR x SH) – (SR x AH) = 41,25,000 – 33,00,000 = 8,25,000 F
- Labour cost variance = (SR x SH) – (AR x AH) = 41,25,000 – 33,00,000 = 8,25,000 F

WN 4: Computation of Operating Variances:

SR x SH	SR x AH	AR x AH
150 x 22,000	150 x 23,000	150 x 23,000
33,00,000	**34,50,000**	**34,50,000**

Variance Calculation:

- Labour rate variance = 0
- Labour efficiency variance = (SR x SH) – (SR x AH) = 33,00,000 – 34,50,000 = 1,50,000 (A)
- Labour cost variance = (SR x SH) – (AR x AH) = 33,00,000 – 34,50,000 = 1,50,000 (A)

Part 2:

Material Handling variances:

Standard Rate x Standard Orders	Standard Rate x Actual Orders	Actual Rate x Actual Orders
6 x 8,800	6 x 8,500	62,000
52,800	51,000	62,000

Note:

Computation of standard orders:

- 1,00,000 units = 8,000 orders
- 1,10,000 units = ?
- 1,10,000 units = 8,800 orders

Computation of standard rate per order:

Standard rate per order = (Budgeted cost /budgeted orders)
Standard rate per order = (48,000/8,000) = Rs.6 per order

Expenditure variance = (SR x Actual orders) – (AR x Actual orders)
Expenditure variance = (51,000 – 62,000) = 11,000 (A)

Efficiency variance = (SR x standard orders) – (SR x Actual orders)
Efficiency variance = 52,800 – 51,000 = 1,800 (F)

Set-up cost variances:

Standard Rate x Standard production runs	Standard Rate x Actual production runs	Actual Rate x Actual production runs
56 x 2,200	56 x 2,100	1,18,000
1,23,200	1,17,600	1,18,000

Note:

Computation of standard production runs:

- 1,00,000 units = 2,000 production runs
- 1,10,000 units = ?
- 1,10,000 units = 2,200 production runs

Computation of standard rate per production runs:

Standard rate per production run = (Budgeted cost /budgeted production runs)
Standard rate per production run = (1,12,000/2,000) = Rs.56 per production run

Expenditure variance = (SR x Actual production runs) – (AR x Actual production run) Expenditure variance = (1,17,600 – 1,18,000) = 400 (A)
Efficiency variance = (SR x standard production runs) – (SR x Actual production runs) Efficiency variance = 1,23,200 – 1,17,600 = 5,600 (F)

Overall variances:

- Expenditure variance = 11,000 (A) + 400 (A) = 11,400 (A)
- Efficiency variance = 1,800 (F) + 5,600 (F) = 7,400 (F)

Part VIII – Relevant costing approach to variance analysis

25. Relevant costing approach to variance analysis [Category A – May 2018(exam)]

Trident Toys Limited manufactures a single product and the standard cost system is followed. Standard cost per unit is worked out as follows:

Particulars	Amount
Materials (10 Kgs. @ Rs.4 per Kg)	40
Labour (8 hours @ Rs.8 per hour)	64
Variable overheads (8 hours @ Rs.3 per hour)	24
Fixed overheads (8 hours @ Rs.3 per hour)	24
Standard profit	56

Overheads are allocated on the basis of direct labour hours. In the month of April 2018, there was no difference between the budgeted and actual selling price and there were no opening or closing stock during the period.

The other details for the month of April 2018 are as under:

Particulars	Budgeted	Actual
Production and Sales	2000 units	1800 units
Direct materials	20000 Kgs. @ Rs.4 per Kg	20000 Kgs. @ Rs.4 per Kg
Direct Labour	16000 Hrs. @Rs.8 per Hr	14800 Hrs @ Rs.8 per Hr
Variable overheads	Rs.48,000	Rs.44,400
Fixed overheads	Rs.48,000	Rs.48,000

Required:

(i) Reconcile the budgeted and actual profit with the help of variances according to each of the following method:
   a. The conventional method
   b. The relevant cost method assuming that
      i. Materials are scarce and are restricted to supply of 20,000 Kgs. for the period
      ii. Labour hours are limited and available hours are only 16,000 hours for the period
      iii. There are no scarce inputs

(ii) Comment on efficiency and responsibility of the sales manager for not using scarce resources

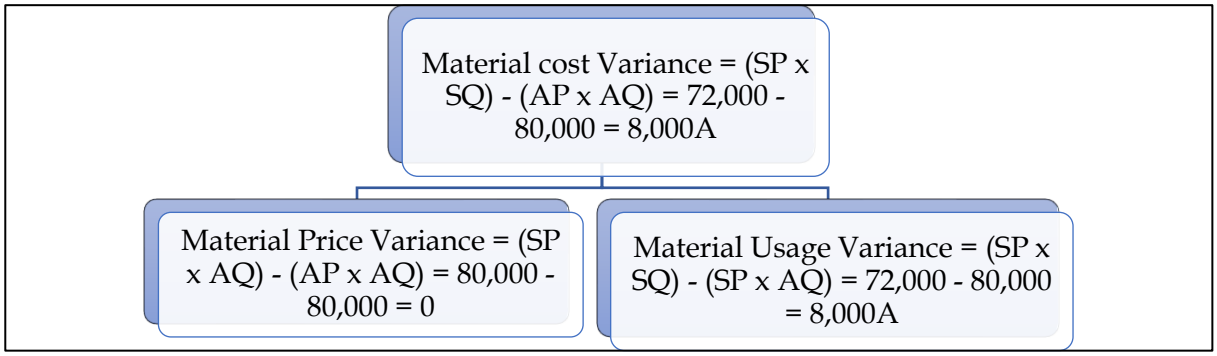
WN 1 Calculation of material variances:

SP X SQ	SP X AQ	AP X AQ
4 x 18,000	4 x 20,000	4 x 20,000
72,000	**80,000**	**80,000**

Note 1: Computation of SQ:

- SQ = AO x (Input/Output)
- SQ = 1,800 x (10/1) = 18,000 KG

Note 2: Computation of variances:



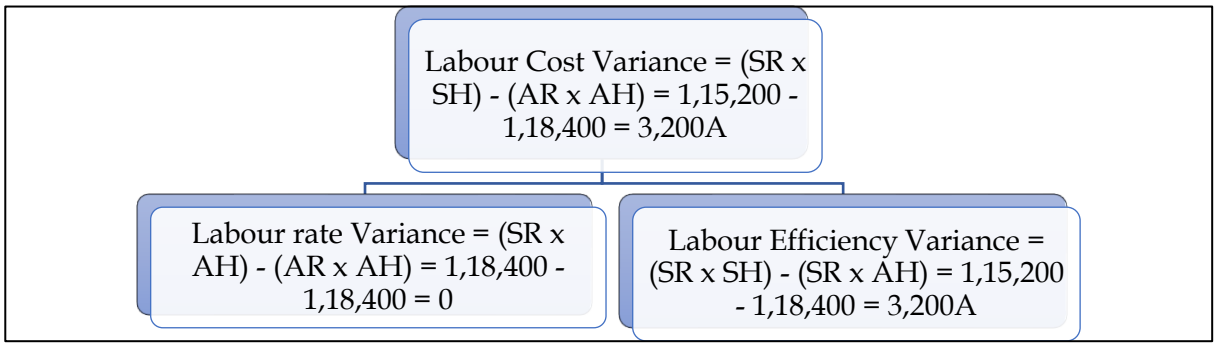
WN 2: Computation of Labour Variances:

SR X SH	SR X AH	AR X AH
8 x 14,400	8 x 14,800	8 x 14,800
1,15,200	1,18,400	1,18,400

Note 1: Computation of SH:

- SH = AO x (Input/Output)
- SH = 1,800 x (8/1) = 14,400 hours

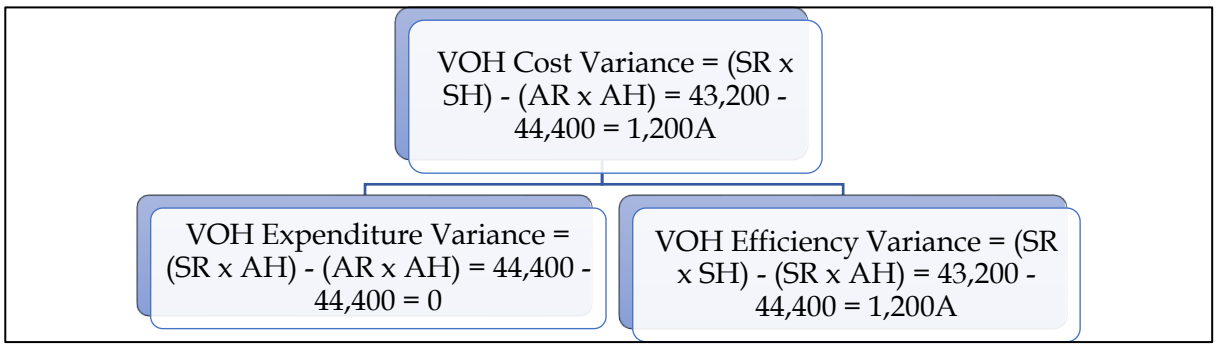
Note 2: Computation of variances:



WN 3: Computation of VOH Variances:

SR X SH (or) SR X AO	SR X AH (or) SR X SO	AR X AH (or) AVOH
3 x 14,400	3 x 14,800	3 x 14,800
43,200	44,400	44,400

Note 1: Variance computation:

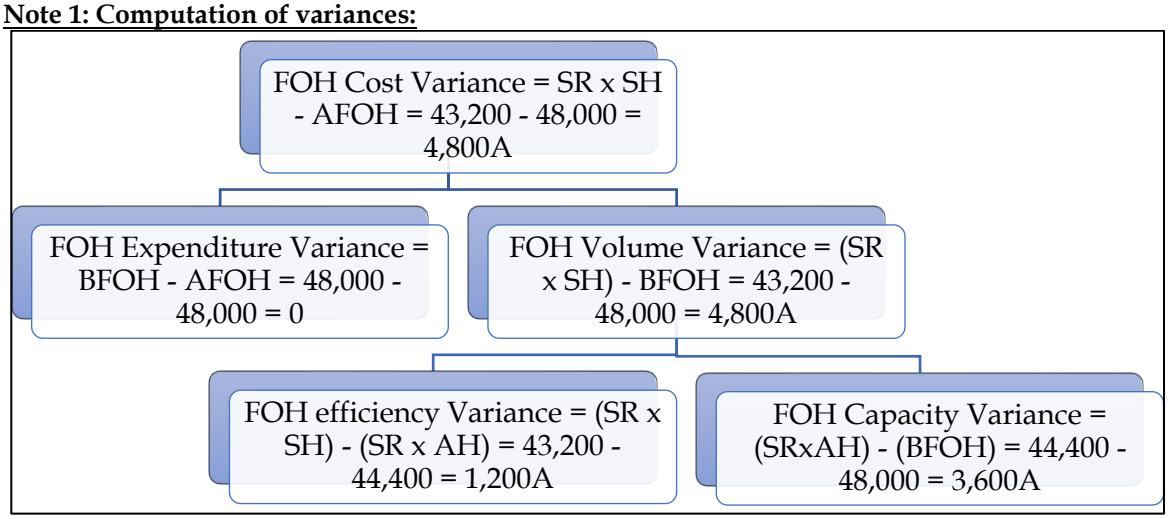


WN 4: Computation of FOH Variances:

SR X SH	SR X AH	SR X BH	AFOH

(OR) SR X AO	(OR) SR X SO	(OR) SR X BO (OR) **BFOH**	
3 x 14,400	3 x 14,800	48,000	48,000
43,200	**44,400**	**48,000**	**48,000**

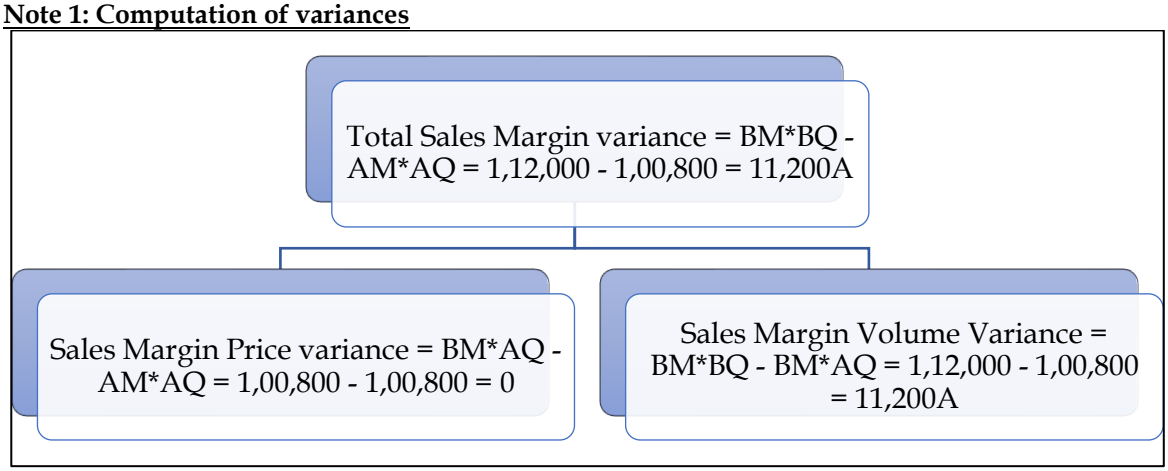
Note 1: Computation of variances:



WN 5: Computation of sales variances under Margin Approach (Absorption Costing):

BM x BQ	**BM x AQ**	**AM * AQ**
56 x 2,000	56 x 1,800	56 x 1,800
1,12,000	**1,00,800**	**1,00,800**

Note 1: Computation of variances



WN 6: Reconciliation of budgeted and standard profit with actual profit:

Particulars	**Conventional Method**	**Scarce Material**	**Scarce Labour**	**No scarce inputs**
Budgeted Profit (56 x 2,000)	1,12,000	1,12,000	1,12,000	1,12,000
Add/Less:				
Material usage variance	(8,000)	(24,000)	(8,000)	(8,000)
Labour efficiency variance	(3,200)	(3,200)	(7,200)	(3,200)
VOH efficiency variance	(1,200)	(1,200)	(1,200)	(1,200)
FOH efficiency variance	(1,200)	Nil	Nil	Nil
FOH capacity variance	(3,600)	Nil	Nil	Nil

Sales margin volume variance	(11,200)	Nil	(12,000)	(16,000)
Actual Profit	**83,600**	**83,600**	**83,600**	**83,600**

Scarce Material:

- Based on conventional method, direct material usage variance is Rs.8,000 (A) i.e. 2,000 Kg. × Rs.4. In this situation material is scarce, and, therefore, material cost variance based on relevant cost method should also include contribution lost per unit of material. Excess usage of 2,000 Kg. leads to lost contribution of Rs.16,000 i.e. 2,000 Kgs. × Rs.8. Total material usage variance based on relevant cost method, when material is scarce will be: Rs.8,000 (A) + Rs.16,000 (A) = Rs.24,000 (A). Since labour is not scarce, labour variances are identical to conventional method.
- Excess usage of 2,000 Kgs. leads to loss of contribution from 200 units i.e. Rs.16,000 (200 units × Rs.80). It is not the function of the sales manager to use material efficiently. Hence, loss of contribution from 200 units should be excluded while computing sales contribution volume variance. Therefore, sales contribution volume variance, when materials are scarce will be NIL i.e. Rs.16,000 (A) - Rs.16,000 (A).

Scarce Labour

- Material is no longer scarce, and, therefore, the direct material variances are same as in conventional method. In conventional method, excess labour hours used are: 14,400 hrs. – 14,800 hrs. = 400 hrs. Contribution lost per hour = Rs.10. Therefore, total contribution lost, when labour is scarce will be: 400 hrs. × Rs.10 = Rs.4,000. Therefore, total labour efficiency variance, when labour hours are scarce will be Rs.7,200 (A) i.e. Rs.3,200 (A) + Rs.4,000 (A).
- Excess usage of 400 hrs. leads to loss of contribution from 50 units i.e. Rs.4,000 (50 units × Rs.80). It is not the function of the sales manager to use labour hours efficiently. Hence, loss of contribution from 50 units should be excluded while computing sales contribution volume Variance. Therefore, sales contribution volume variance, when labour hours are Scarce will be Rs.12,000 (A) i.e. Rs.16,000 (A) - Rs.4,000 (A).

Fixed Overhead Volume Variance:

The fixed overhead volume variance does not arise in marginal costing system. In absorption costing system, it represents the value of the under or over absorbed fixed overheads due to change in production volume. When marginal costing is in use there is no overhead volume variance, because marginal costing does not absorb fixed overheads.

Comment on Efficiency and Responsibility of the Sales Manager

In general, Gross Profit (or contribution margin) is the joint responsibility of sales managers as well as of production managers. On one hand the sales manager is responsible for the sales revenue part, on the other hand the production manager is accountable for the cost-of-goods-sold component. However, it is the top management who needs to ensure that the target profit is achieved by the organization. The sales manager is accountable for prices, volume, and mix of the product, whereas the production manager must control the costs of materials, labour, factory overheads and quantities of production. The purchase manager must purchase materials at budgeted prices. The personnel manager must employ right people at the right place with appropriate wage rates. The internal audit manager must ensure that the budgetary figures for sales and costs are being adhered by all departments which are directly or indirectly involved in contribution of making profit. Thus, sales manager is not responsible for contribution lost due to excess usage or inefficient usage of resources in case of scarce resources. Hence, such contribution lost must be excluded from the sales contribution volume variance.

Chapter 13 - Linear Programming

Meaning of LPP:

A Linear Programming Problem (LPP) is a mathematical model dealing with the use or allocation of certain scarce resources (i.e. key factor like raw materials, labour hours, machine time, capital availability etc.) in the best possible manner in order to maximize profit or minimize cost.

Methods of solving LPP:

Method	Condition for applicability
Graphical Method	Number of variables should be Two (since there are only two axes x and y on the graph sheet). Any number of constraints / inequalities are permitted, but the feasible region may not be easily identified if numerous constraints are introduced. Detailed steps on solving graphical method is explained in the problem
Simplex Method	No restrictions as to number of variables and constraints

Steps involved in simplex method:

Step 1: Objective: Determine the objective function (denoted by Z). (either maximisation or minimisation)

Step 2: Constraints: List the constraints applicable for the objective. For maximisation objective, atleast one constraint should bear $\leq$ sign. For minimization objective, atleast one constraint should bear $\geq$ sign.

Step 3: Conversion of inequalities into equalities: Convert inequalities into equalities as below:

Particulars	Slack Variable	Surplus variable	Artificial variable
Meaning	Idle or unused resources	Excess amount of resources utilized	No physical or economic meaning. It is fictitious.
When used	'$\leq$'inequality	'$\geq$' inequality	'$\geq$' and '=' constraints
Co-efficient in the constraint	+1	-1	+1
Co-efficient in the objective function	0	0	+M for minimisation and -M for maximisation
Used as initial program variable	Used as starting point (initial table)	Cannot be used since unit matrix condition is not satisfied	Initially used but later eliminated
Presence in the optimal table	Helps to interpret idle & key resources	-	Indicates "No feasible" solution

Step 4: Revised objective: Redraft the objective function by including the variable in this order –

(a) Regular variables as given in the objective
(b) Slack variables with zero co-efficient
(c) Surplus variable with zero co-efficient and
(d) Artificial variables with +M for minimization and –M for maximisation

Step 5: Initial table: The format of the table is as under:

Fixed Ratio	Program Variable	Profit / cost	Quantity	Variables column				Replacement ratio
				A	B	S_1	S_2	
	Row 1							
	Row 2 etc.							
			Z					
			C					
			NER = Z - C					

Notes:

- Select slack variables as initial program variable. In case of minimization objective, slack and artificial variables constitute the initial program, forming a unit matrix of co-efficients.

- Fill up profit/cost of the program variable as per objective function
- Fill up quantity = RHS of constraints
- Fill-up co-efficients of various variables as per the constraints, in the respective columns
- Fill up values of Z against each variable as per objective function
- Compute C = Profit/cost * co-efficient of each variable
- Compute net evaluation row (NER) = Z – C
- Select maximum positive NER (Z – C) for maximisation objective and circle key column. Corresponding variable is the incoming variable. In case of minimisation objective, select worst negative NER
- Compute replacement ratio = Quantity / key column element
- Select minimum non-negative replacement ratio and circle key row. In case RR = 0, it shall be selected as minimum non-negative. In case of tie, arbitrary selection shall be made
- Identify pivot element. Junction of key row and key column is called as pivot element
- Fixed ratio is not applicable for key row. For other rows (non-key rows), Fixed ratio is calculated as = Key column element / pivot element
- Determine replacement decision: (a) Incoming variable = key column and (b) Outgoing variable = key row.

Step 6: Second and subsequent table:

- Fill up program variables by replacement decision as per earlier table
- Fill up profit/cost of the program variables based on objective function
- Update key rows by the transformation rule, previous table key row element / pivot element
- Update non-key rows by the transformation rule = (Previous table corresponding row element) Less (Key row element * fixed ratio)
- Fill up values of Z against each variable, as per objective function
- Compute C = Profit * Co-efficient of each variable
- Compute NER = Z – C
- Repeat the selection and reallocation procedure till all Z-C ≤ 0 for maximization, and all Z-C ≥ 0 for minimization objective

Procedure for minimisation objective:

- Introducing surplus variables, the constraint functions are to be re-written
- However, since these variables when introduced as initial program, violate the non-negativity assumption, artificial variables "M" of heavy cost (close to infinity) are introduced and the constraints and objective function are re-written
- Initial program is commenced using artificial variables only (since it satisfies the unit matrix condition)
- An artificial variable once eliminated (i.e. selected as key row) will never re-enter the simplex table in the subsequent iterations
- If artificial variable exists in the optimal table the solution is not optimal. There is no feasible solution for that case.

Treatment in special cases:

Situation	Treatment
Degeneracy	• It occurs if there is a tie in the minimum non-negative replacement ratio • In case of degeneracy, the outgoing variable should be selected on an arbitrary basis • The variable not selected as outgoing, will bear "0" in the quantity column in the subsequent table
Equality Constraints	• Artificial variable is introduced to the constraint
Multiple optimal solutions	• For any optimal solution, NER = 0 for all program variables • LPP is said to have alternative solutions if in the optimal table, a non-program variable has NER = 0

	• The alternative solutions can be obtained by identifying such non-program variable (bearing NER = 0) as the incoming variable
No feasible solution	• Artificial variable, once eliminated, should not re-enter subsequent iterations (tables) • If artificial variable persists in the "optimal" table, there is no feasible solution
Unbounded solution	• Outgoing variable is selected on the basis of minimum non-negative replacement ratio • If all replacement ratios are negative, the outgoing variable cannot be identified • The LPP is said to have unbounded solution in such cases, when all RR are negative.

Practical problems/ case studies/ important questions:

1. **Maximization under simplex method – Economic interpretation of slacks [Category A]**

A dealer has to purchase scientific and ordinary calculators and sell them at a profit of Rs.22 and Rs.18 per unit respectively. The purchase price of scientific and ordinary calculators is Rs.360 and Rs.240 per unit respectively. Due to constraints, he can invest a maximum of Rs.5760 and buy at the most only 20 units. Formulate as LPP and solve it by the simplex method. Interpret the economic value of the resources in the question.

Answer:

Step 1: Objective Function:

Let us assume X1 to be the number of units of scientific calculator and X2 to be the number of units of ordinary calculator

Maximize Z = 22X1 + 18X2

Step 2: Constraints:

- 360X1 + 240X2 $\leq$ 5,760 (Investment condition)
- X1 + X2 $\leq$ 20 (Quantity condition)
- X1, X2 $\geq$ 0 (Non-negativity condition)

Step 3: Conversion of inequalities into equalities

We will have to introduce slack variables to convert the inequalities into equalities

- 360X1 + 240X2 + S1 = 5,760
- X1 + X2 + S2 = 20
- X1, X2, S1, S2 $\geq$ 0

Step 4: Revised Objective function

- Maximize Z = 22X1 + 18X2 + 0X1 + 0X2

Step 5: Initial Simplex Table:

Fixed Ratio	Program Variable	Profit	Quantity	X1	X2	S1	S2	Replacement ratio
NA	S1	0	5760	**360**	240	1	0	16
1/360	S2	0	20	1	1	0	1	20
In = X1 & Out = S1			Z	22	18	0	0	
			C	0	0	0	0	
			NER	22	18	0	0	

Notes:

- Fill up Program Variables (S1 and S2)
- Fill up Profit column – Profit column will carry coefficient of the program variable in the objective function
- Fill up Quantity column – This would be equal to right-hand side of the constraints (5,760 and 20)
- Fill up the variables column (X1, X2, S1, S2) = Co-efficient of each variable from the constraints

- Check whether co-efficients relating to program variables constitute a unit matrix, but need not be adjacent (all Diagonal Elements =1), all other Elements = 0
- Write Z (Objective value) Row = Coefficient of each variable from objective function
- Compute C = Total of [Profit x Co-efficient of each variable] e.g. for Column X1, C value = (0 x 360) +(0 x 1) = 0
- Compute Net evaluation row = Z – C
- Select maximum positive NER for maximization objective. This is called as key column
- Calculate Replacement ratio = Quantity/Key column element. For instance, for first row it is 5,760/360 = 16 and for second row it is 20/1 = 20
- Select minimum non-negative replacement ratio. This is called as key row.
- Identify Pivot Element = Intersection of key row and key column. In this case it is 360
- Fixed Ratio for key row is not applicable. For non-key row it is (Key column element/Pivot Element). In this case it is (1/360) for S2 row
- Key row element = Outgoing variable (S1) and key column element = Incoming variable(X1)

Step 6: Second Simplex Table:

Fixed Ratio	Program Variable	Profit	Qty	X1	X2	S1	S2	Replacement ratio
2	X1	22	16	1	2/3	1/360	0	24
NA	S2	0	4	0	**1/3**	-1/360	1	12
In = X2 & out = S2			Z	22	18	0	0	
			C	22	44/3	22/360	0	
			NER	0	10/3	-22/360	0	

Note:

- Fill up the revised problem variable replacing the outgoing variable(S1) with incoming variable (X1)
- Fill up profit column equal to co-efficient of objective function of program variables
- Fill up Key row (Qty till S2) as Previous Table Key row Element/Key Element
- Fill up non-key rows using transformation rule = (Previous table corresponding row element) **Less** (Key row element x fixed ratio)

	Quantity	X1	X2	S1	S2
Previous Table corresponding Row Element	20	1	1	0	1
Key row element x Fixed Ratio	5,760 x 1/360 16	360 x 1/360 1	240 x 1/360 2/3	0 x 1/360 0	1 x 1/360 1/360
New Element	**4**	**0**	**1/3**	**0**	**-1/360**

- Write Z value as co-efficient of each variable from objective function
- Compute C = Total of [Profit x Co-efficient of each variable] e.g. for Column X1, C value = (22 x 1) +(0 x 4) = 22
- Compute Net evaluation row = Z – C
- Select maximum positive NER for maximization objective. This is called as key column
- Calculate Replacement ratio = Quantity/Key column element. For instance, for first row it is $\frac{16}{2/3}$= 24 and for second row it is $\frac{4}{1/3}$ = 12
- Select minimum non-negative replacement ratio. This is called as key row.
- Identify Pivot Element = Intersection of key row and key column. In this case it is 1/3
- Fixed Ratio for key row is not applicable. For non-key row it is (Key column element/Pivot Element). In this case it is $\frac{2/3}{1/3}$ = 2 for X1 row
- Key row element = Outgoing variable (S2) and key column element = Incoming variable(X2)
- We should continue this process of replacement till all NER $\leq$ 0 for Maximization objective

Step 7: Third Simplex Table:

Fixed Ratio	Program Variable	Profit	Qty	X1	X2	S1	S2	Replacement ratio
	X1	22	8	1	0	1/120	-2	

	X2	18	12	0	1	-1/120	3	
			Z	22	18	0	0	
			C	22	18	1/30	10	
			NER	0	0	-1/30	-10	

Conclusion: All elements of NER is ≤ 0 and hence the optimum solution is achieved

Computation of X1 row:

	Quantity	X1	X2	S1	S2
Previous Table Row Element	16	1	2/3	1/360	0
Key row element x Fixed Ratio	2 x 4 8	2 x 0 0	2 x (1/3) 2/3	2 x (-1/360) -2/360	2 x 1 2
New Element	**8**	**1**	**0**	**1/120**	**-2**

Step 8: Optimum Solution:

- The company should sell 8 units of X1 (Scientific calculators) and 12 units of X2(ordinary calculators) to maximize profit
- Maximum Profit = (8 x 22) + (12 x 18) = Rs.392

Step 9: Interpretation of slack variables:

- NER of S1 is -1/30. Slack variable (S1) was introduced for converting the investment constraint into equal constraint. NER of -1/30 indicates that every rupee of investment the company is making profit of (1/30)
- NER of S2 is -10. Slack variable (S2) was introduced for converting the units constraint into equal constraint. NER of -10 indicates that every unit of sales, the company is making profit of 10
- Profit of company can also be calculated as = 5,760(1/30) + 20(10) = Rs.392

2. Minimization under simplex method [Category A]

Minimize Z = 16A + 16B

Subject to the constraints:

2A + 4B >3,

3A + 2B >4 and

A, B > 0

Answer:

Step 1: Objective Function:

Let us assume X1 to be the number of units of A and X2 to be the number of units of B

Maximize Z = 16X1 + 16X2

Step 2: Constraints:

- $2X2 + 4X2 \geq 3$
- $3X1 + 2X2 \geq 4$
- $X1, X2 \geq 0$ (Non-negativity condition)

Step 3: Conversion of inequalities into equalities

Convert inequalities into equalities by introducing/subtracting surplus variables. However, since these variables are subtracted, their co-efficients do not form a unit matrix. To resolve this 'Artificial variables' are introduced. Surplus and artificial variables are introduced for every $\geq$ sign

- 2X1 + 4X2 – S1 + A1 = 3
- 3X1 + 2X2 - S2 + A2 = 4
- $X1, X2, S1, S2, A1, A2 \geq 0$

Step 4: Revised Objective function

- Co-efficient of surplus and slack variable will be 0 in objective function. Artificial variable will have co-efficient of +M(infinite cost) in objective function
- Minimize Z = 2X1 + 4X2 +0S1 + 0S2 +MA1 + MA2

Step 5: Initial Simplex Table:

Fixed Ratio	Program Variable	Cost	Qty	X1	X2	S1	S2	A1	A2	Replacement ratio
NA	A1	M	3	2	**4**	-1	0	1	0	3/4
½	A2	M	4	3	2	0	-1	0	1	2
In = X2 & Out = A1			Z	16	16	0	0	M	M	
			C	5M	6M	-M	-M	M	M	
			NER	16-5M	16-6M	M	M	0	0	

Notes:

- Fill up Program Variables (A1 and A2)
- Fill up Cost column – Cost column will carry coefficient of the program variable in the objective function
- Fill up Quantity column – This would be equal to right-hand side of the constraints (3 & 4)
- Fill up the variables column (X1, X2, S1, S2, A1 and A2) = Co-efficient of each variable from the constraints
- Check whether co-efficients relating to program variables constitute a unit matrix, but need not be adjacent (all Diagonal Elements =1), all other Elements = 0
- Write Z (Objective value) Row = Coefficient of each variable from objective function
- Compute C = Total of [Profit x Co-efficient of each variable] e.g. for Column X1, C value = (M x 2) +(M x 3) = 5M
- Compute Net evaluation row = Z – C
- Select worst negative NER for minimization objective. This is called as key column
- Calculate Replacement ratio = Quantity/Key column element. For instance, for first row it is 3/4 and for second row it is 4/2 = 2
- Select minimum non-negative replacement ratio. This is called as key row.
- Identify Pivot Element = Intersection of key row and key column. In this case it is 4
- Fixed Ratio for key row is not applicable. For non-key row it is (Key column element/Pivot Element). In this case it is (1/2) for A2 row
- Key row element = Outgoing variable (A1) and key column element = Incoming variable(X2)
- Any outgoing artificial variable will be permanently eliminated and not appear in the next simplex table

Step 6: Second Simplex Table:

Fixed Ratio	Program Variable	Cost	Qty	X1	X2	S1	S2	A2	Replacement ratio
1/4	X2	16	3/4	1/2	**1**	-1/4	0	0	3/2
NA	A2	M	5/2	**2**	0	1/2	-1	1	5/4
In = X1 & Out = A2			Z	16	16	0	0	M	
			C	8 +2M	16	-4+M/2	-M	M	
			NER	8-2M	0	4-M/2	M	0	

Note:

- Fill up the revised problem variable replacing the outgoing variable(A1) with incoming variable (X2)
- Fill up Cost column equal to co-efficient of objective function of program variables
- Fill up Key row (Qty till A2) as Previous Table Key row Element/Key Element
- Fill up non-key rows using transformation rule = (Previous table corresponding row element) **Less** (Key row element x fixed ratio)

	Quantity	X1	X2	S1	S2	A2
Previous Table Row Element	4	3	2	0	-1	1
Key row element x Fixed Ratio	3 x 1/2 3/2	2 x 1/2 1	4 x 1/2 2	-1 x 1/2 -1/2	0 x 1/2 0	0 x 1/2 0
New Element	**5/2**	**2**	**0**	**½**	**-1**	**1**

- Write Z value as co-efficient of each variable from objective function
- Compute C = Total of [Profit x Co-efficient of each variable] e.g. for Column X1, C value = (16 x 1/2) +(M x 2) = 8 +2M
- Compute Net evaluation row = Z – C
- Select worst negative NER for minimization objective. This is called as key column
- Calculate Replacement ratio = Quantity/Key column element.
- Select minimum non-negative replacement ratio. This is called as key row.
- Identify Pivot Element = Intersection of key row and key column. In this case it is 2
- Fixed Ratio for key row is not applicable. For non-key row it is (Key column element/Pivot Element). In this case it is $\frac{1/2}{2} = 1/4$ for X2 row
- Key row element = Outgoing variable (A2) and key column element = Incoming variable(X1)
- We should continue this process of replacement till all NER $\geq$ 0 for Minimization objective

Step 7: Third Simplex Table:

Fixed Ratio	Program Variable	Cost	Qty	X1	X2	S1	S2	Replacement ratio
	X2	16	1/8	0	1	-3/8	1/4	
	X1	16	5/4	1	0	¼	-1/2	
			Z	16	16	0	0	
			C	16	16	-2	-4	
			NER	0	0	2	4	

Conclusion: All elements of NER is $\geq$ 0 and hence the optimum solution is achieved

Computation of X2 row:

	Quantity	X1	X2	S1	S2
Previous Table Row Element	¾	½	1	-1/4	0
Key row element x Fixed Ratio	5/2 x 1/4 5/8	2 x 1/4 ½	0 x 1/4 0	1/2 x 1/4 1/8	-1 x 1/4 -1/4
New Element	**1/8**	**0**	**1**	**-3/8**	**¼**

Step 8: Optimum Solution:

- The company should buy 5/4 units of X1(A) and 1/8 units of X2(B) to minimize cost
- Minimum cost = (5/4) x 16 + (1/8) x 16 = 22

3. LPP formulation and simplex solution [Category A]

A gear manufacturing company makes two types of gears - A and B. Both gears are processed on 3 machines. Hobbing M/c, Shaping M/c and Grinding M/c. The time required by each gear and total time available per week on each M/c is as follows:

Machine	Gear (A) (Hours)	Gear (B) (Hours)	Available Hours
Hobbing M/c	3	3	36
Shaping M/c	5	2	60
Grinding M/c	2	6	60
Other Data:			
Selling Price (Rs.)	820	960	
Variable Cost (Rs.)	780	900	

Required

Determine the optimum production plan and the maximum contribution for the next week by simplex method.

Step 1: Objective Function:

Let us assume X1 to be the number of units of Gear A and X2 to be the number of units of Gear B

Maximize Z = 40X1 + 60X2

Step 2: Constraints:

- 3X1 + 3X2 ≤ 36 (Hobbing Machine Constraint)
- 5X1 + 2X2 ≤ 60 (Shaping Machine Constraint)
- 2X1 + 6X2 ≤ 60 (Grinding Machine Constraint)
- X1, X2 ≥ 0 (Non-negativity constraint)

Step 3: Conversion of inequalities into equal constraints:

- 3X1 + 3X2 + S1 = 36
- 5X1 + 2X2 + S2 = 60
- 2X1 + 6X2 + S3 = 60
- X1, X2, S1, S2, S3 ≥ 0

Step 4: Revised Objective function:

- Maximize Z = 40X1 + 60X2 + 0S1 + 0S2 + 0S3

Step 5: First Simplex Table:

Fixed Ratio	Program variable	Profit	Qty	X1	X2	S1	S2	S3	Replacement ratio
3/6	S1	0	36	3	3	1	0	0	12
2/6	S2	0	60	5	2	0	1	0	30
NA	S3	0	60	2	**6**	0	0	1	10
In = X2; Out = S3			Z	40	60	0	0	0	
			C	0	0	0	0	0	
			NER	40	60	0	0	0	

Step 6: Second Simplex Table:

Fixed Ratio	Program variable	Profit	Qty	X1	X2	S1	S2	S3	Replacement ratio
NA	S1	0	6	**2**	0	1	0	-1/2	3
13/6	S2	0	40	13/3	0	0	1	-1/3	120/13
1/6	X2	60	10	1/3	1	0	0	1/6	30
In = X1 and out = S1			Z	40	60	0	0	0	
			C	20	60	0	0	10	
			NER	20	0	0	0	-10	

Computation of Non-Key rows:

Computation for S1 Row:

	Quantity	X1	X2	S1	S2	S3
Previous Table Key Row Element	36	3	3	1	0	0
Key row element x Fixed Ratio	30	1	3	0	0	½
New Element	**6**	**2**	**0**	**1**	**0**	**-1/2**

Computation for S2 Row:

	Quantity	X1	X2	S1	S2	S3
Previous Table Key Row Element	60	5	2	0	1	0
Key row element x Fixed Ratio	20	2/3	2	0	0	1/3
New Element	**40**	**13/3**	**0**	**0**	**1**	**-1/3**

Step 7: Third Simplex Table:

Fixed Ratio	Program variable	Profit	Qty	X1	X2	S1	S2	S3	Replacement ratio
	X1	40	3	1	0	1/2	0	-1/4	
	S2	0	27	0	0	-13/6	1	3/4	
	X2	60	9	0	1	-1/6	0	1/4	

			Z	40	60	0	0	0	
			C	40	60	10	0	5	
			NER	0	0	-10	0	-5	

Computation for non-key rows:

Computation for S2 Row:

	Quantity	X1	X2	S1	S2	S3
Previous Table Key Row Element	40	13/3	0	0	1	-1/3
Key row element x Fixed Ratio	13	13/3	0	13/6	0	-13/12
New Element	**27**	**0**	**0**	**-13/6**	**1**	**¾**

Computation for X2 Row:

	Quantity	X1	X2	S1	S2	S3
Previous Table Key Row Element	10	1/3	1	0	0	1/6
Key row element x Fixed Ratio	1	1/3	0	1/6	0	-1/12
New Element	**9**	**0**	**1**	**-1/6**	**0**	**¼**

Step 8: Optimum solution:

The company should produce 3 units of X1(Gear A) and 9 units of X2(Gear B) to earn maximum profit of Rs.660 [(3 x 40) + (9 x 60)]

4. Simplex Interpretation [Category A]

Given below is an iteration in a simplex table for a maximization objective linear programming product mix problem for products x, y and z. Each of these products is processed in three machines KA-07, KB-27 & KC-49 and each machine has limited available hours.

C_j			30	40	20	0	0	0
C_B	Basic Variable (B)	Value of Basic Variables b (=X_B)	x	y	Z	s1	s_2	s_3
30	x	250	1	0	-26/16	10/16	-12/16	0
40	y	625	0	1	31/16	-7/16	10/16	0
0	s_3	125	0	0	11/16	-3/16	1/8	1

s1, s2 and s3 are slack variables for machine KA-07, KB-27 and KC-49 respectively.

Answer the following questions, giving reasons in brief:

(i) Does the table above give an 'Optimal Solution'?
(ii) Are there more than one 'Optimal Solution' / 'Alternate Optimal Solution'?
(iii) Is this solution 'Feasible'?
(iv) Is this solution 'Degenerate'?
(v) Write down the 'Objective Function' of the problem.
(vi) Write the 'Optimal Product Mix' and 'Profit' shown by the above solution.
(vii) Which of these machines is being used to the full capacity when producing according to this solution?
(viii) How much would you be prepared to pay for another hour of capacity each on machine KA-07, machine KB-27, and machine KC-49?
(ix) If the company wishes to expand the production capacity, which of the three resources should be given priority?
(x) What happens if 16 machine hours are lost due to some mechanical problem in machine KB-27?
(xi) A customer would like to have one unit of product z and is willing to pay higher price for z in order to get it. How much should the price be increased so that the company's profit remains unchanged?
(xii) A new product is proposed to be introduced which would require processing time of 4 hours on machine KA-07, 2 hours on machine KB-27 and 4 hours on machine KC-49. It would yield a profit of Rs.12 per unit. Do you think it is advisable to introduce this product?

Simplex Table:

Fixed Ratio	Program variable	Profit	Qty	X	Y	Z	S1	S2	S3
	X	30	250	1	0	-26/16	10/16	-12/16	0
	Y	40	625	0	1	31/16	-7/16	10/16	0
	S3	0	125	0	0	11/16	-3/16	1/8	1
			Z	30	40	20	0	0	0
			C	30	40	115/4	5/4	5/2	0
			NER	0	0	-35/4	-5/4	-5/2	0

Solution:

Part (i):

- All elements of NER $\leq$ 0 for maximization objective and hence optimum solution is achieved

Part (ii):

- None of the non-program variables has NER of 0 and hence alternative optimum solution does not exist

Part (iii):

- Yes, because the given solution has no artificial variable in the basis

Part (iv):

- No, solution is not degenerate as none of the basic variables has zero quantity

Part (v):

- Maximize Z = 30x + 40y + 20z

Part (vi):

- According to the given solution, 250 units of x and 625 units of y are being produced. The total profit is Rs.32,500 (250 units × Rs.30 + 625 units × Rs.40).

Part (vii):

- Machine KA-07 and KB-27 are being used to the full capacity because, variable s1 and s2 corresponding to them has a zero value in the solution

Part (viii):

- The shadow price of hours on machine KA-07, machine KB-27 and machine KC-49 are being Rs.5/4, Rs.5/2 and Rs.0, respectively, these are the maximum prices one would be prepared to pay for another hour of capacity for these three machines

Part (ix):

- Machine KB-27 may be given priority as its shadow price is the highest

Part (x):

- NER of KB-27 is 5/2 and hence loss of 16 hours would lead to reduction in profit by Rs.40 (16 x 5/2)

Part (xi):

- NER for z being -35/4, production of each unit of z would cause a reduction of 35/4 rupee. Thus, the price for z should be increased by at least 35/4 rupee to ensure no reduction of profits

Part (xii):

- Shadow prices of times on machines KA-07, KB-27 and KC-49 are Rs.5/4, Rs.5/2 and Rs.0. Production of a unit of the proposed new product would, therefore, reduce profit by Rs.10 [(4 hrs. × Rs.5/4) + (2 hrs. × Rs.5/2) + (4 hrs. × Rs.0)]. Since the product would yield a profit of Rs.12, it would result in a net increase in profit at a rate of Rs.2 per unit. It is advisable, therefore to introduce it

5. Maximization – Graphical Method [Category A]

A company manufactures two products A and B, involving three departments - Machining, Fabrication and Assembly. The process time, profit/unit and total capacity of each department is given in the following table:

Particulars	Machining (hours)	Fabrication (hours)	Assembly (hours)	Profit (Rs.)
A	1	5	3	80
B	2	4	1	100
Capacity	720	1,800	900	

Required

Set up Linear Programming problem to maximize profits. What will be the product-mix at maximum profit level? What will be the profit? (Solve by using graphic method)

Step 1: Objective Function:

Let us assume X and Y to be the number of units of A and B respectively

Maximize Z = 80X + 100Y

Step 2: Constraints:

$X + 2Y \leq 720$

$5X + 4Y \leq 1,800$

$3X + 1Y \leq 900$

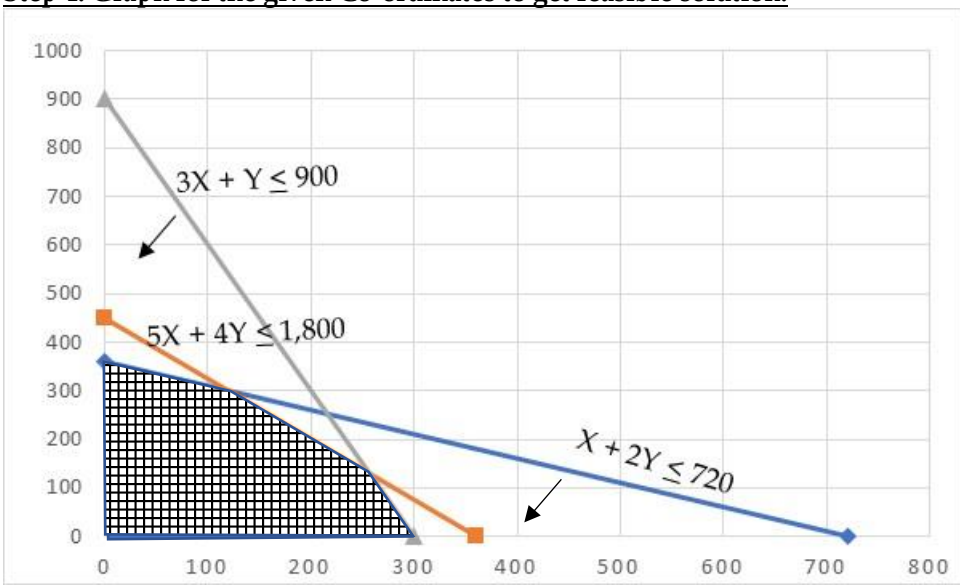
$X, Y \geq 0$

Step 3: Getting the co-ordinates for graph:

Equation	When X = 0, Y = ?	When Y = 0, X = ?	Co-ordinates (x,y)
X + 2Y = 720	360	720	(0,360), & (720,0)
5X + 4Y = 1,800	450	360	(0,450) & (360,0)
3X + Y = 900	900	300	(0,900) & (300,0)

Note: We fill the above table by first assuming X = 0 and get the value of Y. Then we assume Y =0 and get the value of X. Then co-ordinates are written which will be plotted in graph to get the feasible solution

Step 4: Graph for the given Co-ordinates to get feasible solution:



Feasible solution and corner points:

- Feasible solution is the area which is common to all constraints. In this case equations are of less than type constraint and hence the area below the graph will be applicable. We look at the area of all equations and select the common area
- Shaded area has the below corner-points
  - (0,0)
  - (0,360)

- Intersection point of X + 2Y = 720 & 5X + 4Y = 1,800
- Intersection point of 5X + 4Y = 1,800 & 3X + Y = 900
- (300,0)

Solving the intersection points:

Intersection point of X + 2Y = 720 & 5X + 4Y = 1,800

- First equation x 5 : 5X + 10Y = 3,600
- Second equation : 5X + 4Y = 1,800
- (1) – (2) : 6Y = 1,800; Y = 300 units
- Substituting Y in equation 1 we get X = 120
- Corner points are (120,300)

Intersection point of 5X + 4Y = 1,800 & 3X + Y = 900

- First equation: 5X + 4Y = 1,800
- Second equation x 4 : 12X + 4Y = 3,600
- (2) – (1) : 7x = 1,800; X = 257
- Substituting X in equation 1 we get Y = 129
- Corner points are (257,129)

Step 5: Finding optimum solution:

Corner Point	Profit Z = 80X + 100Y
(0,0)	0
(0,360)	36,000
(120,300)	**39,600**
(257,129)	33,460
(300,0)	24,000

The maximum profit is made when we sell 120 units of A and 300 units of B to earn maximum profit of Rs.39,600

6. Optimum Product Mix [Category A]

A company manufactures two products. Each product passes through two departments A and B before it becomes a finished product. The data for the year are as under:

	Product X	Product Y
Maximum Sales Potential (in units)	7,400	10,000
Product unit data:		
Selling Price p.u.	Rs.90	Rs.80
Machine hrs. p.u.		
Department A hrs. @ Rs.40/ hr.	0.50	0.30
Department B hrs. @ Rs.60/ hr.	0.40	0.45

Maximum Capacity of Department A is 3,400 hrs. and Department B is 3,640 hrs.

Maximum Quantity of Direct Materials available is 17,000 kgs. Each product requires 2 kg. of Direct Materials. The Purchase Price of direct materials is Rs. 5/ kg.

Required

(i) FIND optimum product mix.

(ii) In view of the aforesaid production capacity constraints, the company has decided to produce only one of the two products during the year. Which of the two products should be produced and sold in the year to maximise profit? State the number of units of that product and relevant contribution.

Answer:

(i) Calculation of Optimum Production Mix

Statement Showing Limiting Factor

Particulars	Material	Hours in	Hours in Department B

		Department A	
Required: X	14,800 Kg	3,700 hours	2,960 hours
Required: Y	20,000 Kg	3,000 hours	4,500 hours
Total requirement	34,800 Kg	6,700 hours	7,460 hours
Available resources	17,000 Kg	3,400 hours	3,640 hours
Shortage	17,800 Kg	3,300 hours	3,820 hours

Hence all the three resources are limiting factors.

Statement of Rank

Particulars	Product X	Product Y
Sales	90	80
Less: Direct Material	10	10
Department A	20	12
Department B	24	27
Contribution per unit	36	31
Contribution per Kg. of RM	18	15.5
Rank	I	II
Contribution per hour of Dept A	72	103.33
Rank	II	I
Contribution per hour of Dept B	90	68.89
Rank	I	II

To find the optimum mix of products that shall lead to maximum profits while taking into consideration of shortage of resources (i.e. constraints), we have to use Linear Programming.

Let X and Y donate quantities of product 'x' and product 'y' respectively. The linear programming model for the given problem is:

Maximize Z = 36X + 31Y

Subject to:

$2x + 2y \leq 17,000$ (for material)

$0.5x + 0.3y \leq 3,400$ (for Department A)

$0.4x + 0.45y \leq 3,640$ (for Department B)

$x \leq 7,400$ (demand constraint)

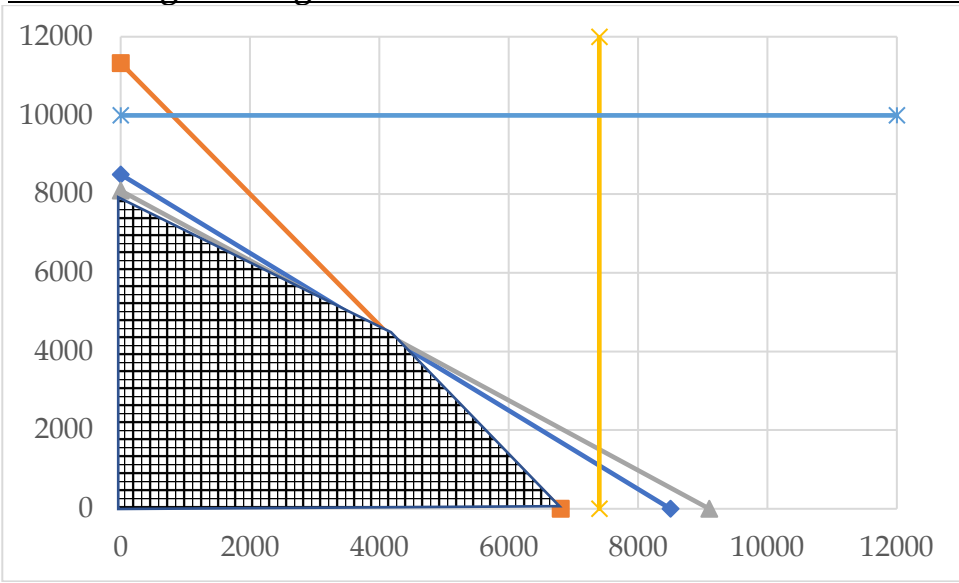
$y \leq 10,000$ (demand constraint)

Getting the co-ordinates for graph:

Equation	When X = 0, Y = ?	When Y = 0, X = ?	Co-ordinates (x,y)
2X + 2Y = 17,000	8,500	8,500	(0,8500) & (8500,0)
0.5X + 0.3Y = 3,400	11,333	6,800	(0,11333) & (6800,0)
0.4X + 0.45Y = 3,640	8,089	9,100	(0,8089) & (9100,0)
X = 7,400	NA	NA	Straight line restricting X = 7,400
Y = 10,000	NA	NA	Straight line restricting Y = 10,000

Note: We fill the above table by first assuming X = 0 and get the value of Y. Then we assume Y =0 and get the value of X. Then co-ordinates are written which will be plotted in graph to get the feasible solution

Step 4: Graph for the given Co-ordinates to get feasible solution:



Feasible solution and corner points:

- Feasible solution is the area which is common to all constraints. In this case equations are of less than type constraint and hence the area below the graph will be applicable. We look at the area of all equations and select the common area
- Shaded area has the below corner-points
  - (0,0)
  - (0,8089)
  - Intersection point of 2X + 2Y = 17,000 & 0.5X + 0.3Y = 3,400. Solving these two equations we will get (4,250&4,250)
  - Intersection point of 2X + 2Y = 17,000 & 0.4X + 0.45Y = 3,640. Solving these two equations we will get (3,700&4,800)
  - (6,800,0)

Step 5: Finding optimum solution:

X	Y	Total Contribution	Rank
6,800	0	2,44,800	IV
0	8,089	2,50,759	III
3,700	4,800	2,82,000	II
4,250	4,250	2,84,750	I

Therefore, optimum product mix = X 4,250 units and Y 4,250 units.

(ii) Statement Showing Product with Higher Contribution

Product	Maximum demand	Maximum production by Dept A	Maximum production by Dept B	Maximum production with available material	Feasible maximum production	Contribution
X	7,400	6,800	9,100	8,500	6,800	2,44,800
Y	10,000	11,333	8,089	8,500	8,089	2,50,759

Therefore, Product Y should be produced at 8,089 units resulting in a contribution of Rs.2,50,759.

7. Graphical method – Minimization [Category A]

A sports club is engaged in the development of their players by feeding them certain minimum amount of vitamins in addition to their normal diet. In view of this, two types of products X and Y are purchased from the market. The contents of vitamin constituents per unit are given below:

Vitamin constituents	Vitamin contents in products		Minimum requirement for each player
A	36	06	108
B	03	12	36
C	20	10	100

The cost of product X is Rs.20 and that of Y is Rs.40. Formulate the LPP for the above to minimize the total cost. Solve the problem by using graphic method.

Answer:

Step 1: Objective function:

Let us assume X and Y to be the number of units of X and Y purchased by the sports club

Minimize X = 20X + 40Y

Step 2: Constraints:

$36X + 6Y \geq 108$

$3X + 12Y \geq 36$

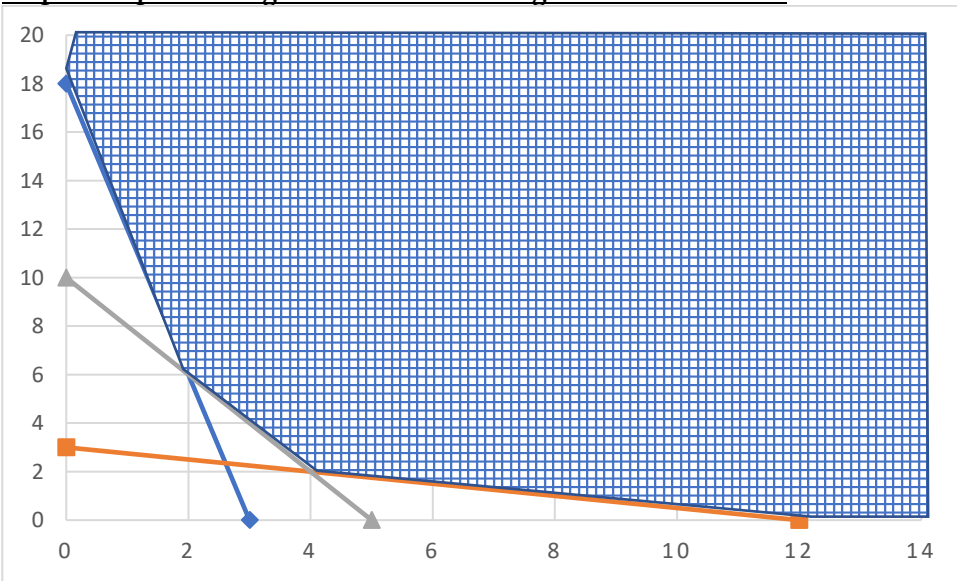
$20X + 10Y \geq 100$

$X, Y \geq 0$

Step 3: Getting the co-ordinates for graph:

Equation	When X = 0, Y = ?	When Y = 0, X = ?	Co-ordinates (x,y)
36X + 6Y = 108	18	3	(0,18) & (3,0)
3X + 12Y = 36	3	12	(0,3) & (12,0)
20X + 10Y = 100	10	5	(0,10) & (5,0)

Step 4: Graph for the given Co-ordinates to get feasible solution:



Feasible solution and corner points:

- Feasible solution is the area which is common to all constraints. In this case equations are of greater than type constraint and hence the area above the equation will be applicable. We look at the area of all equations and select the common area
- Shaded area has the below corner-points
  - (0,18)
  - Intersection point of 6X + Y = 18 and 2X + Y = 10 - (2,6)
  - Intersection point of 2X + Y = 10 & X + 4Y = 12 – (4,2)
  - (12,0)

Step 5: Finding optimum solution:

Corner Point	**Cost Z = 20X + 40Y**
(0,18)	720
(2,6)	280
(4,2)	**160 (minimum)**
(12,0)	240

The cost is minimum when we buy 4 units of X and 2 units of Y and the associated cost is Rs.160

Chapter 14 - Learning Curve Theory

Learning curve:

"Learning curve is a geometrical progression, which reveals that there is steadily decreasing cost for accomplishment of a given repetitive operation, as the identical operation is increasingly repeated. The amount of decrease will be less and less with successive unit produced. The slope of the decision curve is expressed as a percentage. The other names given to learning curve are experience curve, improvement curve and progress curve".

Learning curve equation (to be used in case of non-doubling of production)

Mathematicians have been able to express relationships in equations. The basic equation is

$$y = ax^b$$

Where:

y	=	Average time per unit for x units
a	=	Time required for first unit
x	=	Cumulative number of units produced
b	=	Learning co-efficient

Students are requested to understand how to look at log and antilog values to solve questions

How to find log values?

- We should ignore the decimal while looking at log values. Log tables start from 1000 to 9999. For instance, if we have to look at log of 0.80, we will look for the log values for 8000. In case we want log value for 75, then we will look for the log values for 7500
- The log value will be added or subtracted by a number depending on number of digits before decimals. We need to add or subtract (number of digits -1) from the arrived log value
- When we look at log value of 75 (two-digit number), we will add 1 to the arrived answer. When we look at log value of 0.80 (no numbers before decimal, we will subtract 1 from the arrived answer. If we are looking for log values for 757 then we need to search for log values of 7570 and add 2 to the arrived answer

How to find antilog values:

- In order to find antilog value we need to ignore the number which is before decimals. We should look at decimal values and find antilog for the same
- Antilog tables start from 0.0001 to 0.9999. Fin the antilog values for the required number post decimal.
- The computed answer needs to be multiple with $10^{(\text{number before decimal} + 1)}$
- If we are required to calculate antilog value for 3.1111, then the answer would be multiplied with 10^4. If we are required to calculate antilog value for 1.1111, then the answer would be multiplied with 10^2

Learning curve ratio (to be used in case of doubling of production)

In the initial stage of a new product or a new process, the learning effect pattern is so regular that the rate of decline established at the outset can be used to predict labour cost well in advance. The effect of experience on cost is summarized in the learning ratio or improvement ratio.

$$\text{Learning ratio} = \frac{\text{Average labour cost of first 2N units}}{\text{Average labour cost of first N units}}$$

Practical problems/ case studies/ important questions:

1. **Learning curve – Basics [Category B]**

A firm has received an order to make and supply 8 units of standard product which involves intricate labour operations. The first unit was made in ten hours. It is understood that this type of operations is subject to 80 percent learning effect. The workers are paid a wage rate of Rs.12 per hour.

- What is the total time and labour cost required to execute the above order?
- If repeat order of 24 units is also received from the same customer, what is the labour cost necessary for the second order?

WN 1: Computation of labour time required for first order of 8 units and repeat order of 24 units:

Units	Average Time	Total Time	Total labour cost
1	10	10	120
2	8 (10 x 80%)	16	192
4	6.4 (8 x 80%)	25.6	307.2
8	5.12 (6.4 x 80%)	40.96	491.52
16	4.10 (5.12 x 80%)	65.6	787.2
32	3.28 (4.10 x 80%)	104.96	1,259.52

- Average Labour time for 2X units = Average labour time for x units x Learning ratio; using this formula we compute the average time for every level of double production
- Total time = Average time x No of units
- Total labour cost = Total time x Rs.12/hour

WN 2: Solution:

- **Total labour time for 8 units = 40.96 hours**
- **Total labour cost for 8 units = Rs.491.52**
- Labour cost for second order of 24 units = Labour cost for 32 units – Labour cost for 8 units
- **Labour cost for second order = 1,259.52 – 491.52 = Rs.768**

2. **Cost Estimation and Price Quotation [Category A]**

A company has 10 direct workers, who work for 25 day a month of 8 hours per day. The estimated down time is 25% of the total available time. The company received on order for new product. The first unit of the new product required 40 direct labour hours to manufacture the product. The company expects 80% (index is – 0.322) learning curve for this type of work. The company uses standard absorption costing and the cost data on a under:

Direct Materials ……. Rs. 60 per unit
Direct Labour……. Rs. 6 per direct labour hour
Variable Overheads……..Rs. 1 per direct labour hour
Fixed Overheads……Rs. 7,500 per month

Required

(i) Calculated the cost per unit of the first order of 30 units.
(ii) If the company receives a repeat order for 20 units, what price will be quoted to yield a profit of 25% on selling price?

Answer:

WN 1: Computation of cost per unit for the first order of 30 units:

Particulars	Calculation	Amount
Direct Material		60
Direct Labour	13.39 x 6 (WN 2)	80.34
Variable overhead	13.39 x 1	13.39
Fixed overhead	13.39 x 5 (WN 3)	66.95
Cost per unit		**220.68**

WN 2: Computation of average time for 30 units:

- $Y = aX^b$
- $Y = 40(30^{-0.322})$
- Taking log on both sides
- $\text{Log } Y = \log(40) + \text{Log } (30^{-0.322})$
- $\text{Log } Y = (0.6021 + 1) - 0.322 \text{ Log } 30$
- $\text{Log } Y = 1.6021 - 0.322(0.4771 + 1)$
- $\text{Log } Y = 1.1265$
- Taking antilog in both sides:
- $Y = \text{Antilog } (1.1265)$
- **$Y = 0.1339 \times 10^2 = 13.39$ hours**

WN 3: Computation of recovery rate for fixed overheads:

Particulars	Calculation	Amount
Budgeted fixed overheads	Given	7,500
Budgeted hours per month	25 days x 8 hours per day x 10 workers x 75%	1,500
Fixed overhead rate per hour		**5**

WN 4: Computation of price to be quoted for repeat order of 20 units:

Particulars	Calculation	Amount
1. Direct material	20 units x 60	1200
2. Direct Labour	165.8 hrs x 6	994.8
3. Variable Overheads	165.8 hrs x 1	165.8
4. Fixed Overheads	165.8 hrs x 5	829
Total cost		**3189.6**
Add: Profit	¼ on sales = 1/3 on cost	1063.2
Total sales		**4252.8**
No of units		20
Selling Price		**212.64**

WN 5: Computation of labour hours required for incremental 20 units:

- $Y = aX^b$
- $Y = 40(50^{-0.322})$
- Taking log on both sides
- $\text{Log } Y = \log(40) + \text{Log } (50^{-0.322})$
- $\text{Log } Y = (0.6021 + 1) - 0.322 \text{ Log } 50$
- $\text{Log } Y = 1.6021 - 0.322(0.6990 + 1)$
- $\text{Log } Y = 1.0550$
- Taking antilog in both sides:
- $Y = \text{Antilog } (1.0550)$
- **$Y = 0.1135 \times 10^2 = 11.35$ hours**
- Time for extra 20 units = Total time for 50 units – Total time for 30 units
- Time for extra 20 units = (50 x 11.35) – (30 x 13.39)
- Time for extra 20 units = 165.80 hours

3. Learning curve – estimating labour time [Category B]

A company which has developed a new machine has observed that the time taken to manufacture the first machine is 600 hours.

Required

Calculate the time which the company will take to manufacture the second machine if the actual learning curve rate is (i) 80% and (ii) 90%. Explain which of the two learning rates will show faster learning.

Answer:

Particulars	80%	90%

Average Time for 1 unit	600	600
Average time for 2 units (AT for 1unit x Learning rate)	480	540
Total time for 2 units	960	1,080
Less: Time for 1st unit	(600)	(600)
Time for 2nd unit	**360**	**480**

The company will have higher learning benefit at learning ratio of 80%. This is because the time taken for 2nd unit is less in case of learning rate of 80 percent

4. Learning curve – Quoting for an order [Category B]

The Gifts Company makes mementos for offering chief guests and other dignitaries at functions. A customer wants 4 identical pieces of hand-crafted gifts for 4 dignitaries invited to its function.
For this product, the Gifts Company estimates the following costs for the 1st unit of the product.

Particulars of Costs	Rs./ **unit**
Direct Variable Costs (excluding labour)	2,000
Direct Labour (20 hours @ Rs. 50 hour)	1,000

90 % learning curve ratio is applicable and one labourer works for one customer's order.

Required

(i) What is the price per piece to be quoted for this customer if the targeted contribution is Rs. 1,500 per unit?

(ii) If 4 different labourers made the 4 products simultaneously to ensure faster delivery to the customer, can the price at (i) above be quoted? Why?

Answer:

Computation of price to be quoted if the targeted contribution is Rs.1,500 per unit

Particulars	**Calculation**	**Amount**
Direct variable cost	Given	2,000
Direct Labour	1,000 x 90% x 90%	810
Variable cost per unit		**2,810**
Add: Contribution		1,500
Selling Price		**4,310**

- The company can quote rate of Rs.4,310 per unit if same labourer works on the order
- If the company wants 4 labourers to work on 4 products then there will be no benefit of learning curve. The cost per unit would be Rs.3,000 per unit and hence the company will fix a selling price of Rs.4,500 per unit

5. Learning Curve and Standard Costing [Category A]

City International Co. is a multiproduct firm and operates standard costing and budgetary control system. During the month of June firm launched a new product. An extract from performance report prepared by Sr. Accountant is as follows:

Particulars	**Budget**	**Actual**
Output	30 units	25 units
Direct Labour Hours	180.74 hrs.	118.08 hrs.
Direct Labour Cost	Rs.1,19,288	Rs. 79,704

Sr. Accountant prepared performance report for new product on certain assumptions but later on he realized that this new product has similarities with other existing product of the company. Accordingly, the rate of learning should be 80% and that the learning would cease after 15 units. Other budget assumptions for the new product remain valid.
The original budget figures are based on the assumption that the labour has learning rate of 90% and learning will cease after 20 units, and thereafter the time per unit will be the same as the time of the final unit during the learning period, i.e. the 20th unit. The time taken for 1st unit is 10 hours.

Required

Show the variances that reconcile the actual labour figures with revised budgeted figures in as much detail as possible.

Note:

The learning index values for a 90% and a 80% learning curve are −0.152 and −0.322 respectively.

[log 2 = 0.3010, log 3 = 0.47712, log 5 = 0.69897, log 7 = 0.8451, antilog of 0.6213 = 4.181, antilog of 0.63096 = 4.275]

Answer:

WN 1: Computation of standard time for 25 batches:

- Total time for 25 batches = (AT for 15 batches x 15) + (Time for 15th batch x 10)
- Total time for 25 batches = (4.181 x 15) + (2.865 x 10) = 91.365 hours

Computation of Average Time for 15 batches:

- $Y = aX^b$
- $Y = 10(15^{-0.322})$
- Taking log on both sides
- $\text{Log } Y = \log(10) + \text{Log } (15^{-0.322})$
- Log Y = (0.0000 + 1) -0.322 Log 15
- Log Y = (0.0000 + 1) -0.322 Log (3 x 5)
- Log Y = (0.0000 + 1) -0.322 [Log 3 + Log 5]
- Log Y = (0.0000 + 1) -0.322 Log 3 -0.322 Log 5
- Log Y = 1 – 0.322 (0.47712) – 0.322(0.69897)
- Log Y = 0.6213
- Taking antilog in both sides:
- Y = Antilog (0.6213)
- **Y = 4.181 hours**
- Total time for 15 units = 4.181 x 15 = 62.715 hours

Computation of Average Time for 14 batches:

- $Y = aX^b$
- $Y = 10(14^{-0.322})$
- Taking log on both sides
- $\text{Log } Y = \log(10) + \text{Log } (14^{-0.322})$
- Log Y = (0.0000 + 1) -0.322 Log 14
- Log Y = (0.0000 + 1) -0.322 Log (2 x 7)
- Log Y = (0.0000 + 1) -0.322 [Log 2 + Log 7]
- Log Y = (0.0000 + 1) -0.322 Log 2 -0.322 Log 7
- Log Y = 1 – 0.322 (0.3010) – 0.322(0.8451)
- Log Y = 0.63096
- Taking antilog in both sides:
- Y = Antilog (0.63096)
- **Y = 4.275 hours**
- Total time for 14 units = 4.275 x 14 = 59.85 hours

Computation of time taken for 15th unit:

- Time for 15th unit = Total time for 15 units – Total time for 14 units
- Time for 15th unit = 62.715 hours – 59.85 hours = 2.865 hours

WN 2: Computation of variances:

SR x SH	SR x AH	AR X AH
660 x 91.365	660 x 118.08	675 x 118.08
60,300.9	**77,932.8**	**79,704**

- SR per hour = 1,19,288/180.74 = Rs.660 per hour
- AR per hour = 79,704/118.08 = Rs.675 per hour

Variances:

Labour cost variance	(SR x SH) – (AR x AH)	60,300.9 – 79,704	19,403.1 A
Labour rate variance	(SR x AH) – (AR x AH)	77,932.8 – 79,704	1,771.2 A

Labour efficiency variance	(SR x SH) – (SR x AH)	60,300.9 – 77,932.8	17,631.9 A

6. Learning curve and standard costing [Category A]

Genting Mfg Co. has developed a product for which the following standard cost estimates have been made for the first batch to be manufactured in Jan'13:

	Rs.
Direct Materials (100 Kgs. @ Rs. 55 per Kg.)…….	5,500
Direct Labour (100 hours @ Rs. 40 per hour)…….	4,000
Variable Overhead (100 hours @ Rs. 75 per hour)……	7,500
	17,000

From experience the firm knows that labour will benefit from a learning effect and labour time will be reduced. This is expected to approximate to an 80% learning curve. In addition, the growing expertise of labour is expected to improve the efficiency with which materials are used. The usage of materials is expected to approximate to a 95% learning curve.

The actual production for Jan'13 to Jun'13 was 320 batches. During Jun'13 following results were recorded for the 320th batch made:

	Rs.
Direct Materials (80 Kgs.).....	4,000
Direct Wages (20 hours)……..	1,000
Variable Overhead…….	1,800

Required

Calculate variances in connection with 320th batch.

[Note: Learning Coefficient is -0.322 and -0.074 for learning rate of 80% and 95% respectively, log2=0.30103, log5=0.69897, log319=2.50379, Antilog of 1.81462 =65.26, Antilog of 1.81472 =65.27, Antilog of 1.19334 =15.61, Antilog of 1.19378 =15.62]

WN 1: Computation of SQ for 320th batch:

Average quantity for 320 batches:

- $Y = aX^b$
- $Y = 100(320^{-0.074})$
- Taking log on both sides
- $\text{Log } Y = \log(100) + \text{Log } (320^{-0.074})$
- $\text{Log } Y = (0.0000 + 2) - 0.074 \text{ Log } 320$
- $\text{Log } Y = (2) - 0.074 \text{ Log } (2^6 \times 5)$
- $\text{Log } Y = 2 - 0.074 [6\text{Log } 2 + \text{Log } 5]$
- $\text{Log } Y = 2 - [0.074 \times 6 \times 0.30103] - [0.074 \times 0.69897)$
- $\text{Log } Y = 1.81462$
- Taking antilog in both sides:
- $Y = \text{Antilog } (1.81462)$
- **Y = 65.26Kg**

Average quantity for 319 batches:

- $Y = aX^b$
- $Y = 100(319^{-0.074})$
- Taking log on both sides
- $\text{Log } Y = \log(100) + \text{Log } (319^{-0.074})$
- $\text{Log } Y = (0.0000 + 2) - 0.074 \text{ Log } 319$
- $\text{Log } Y = (2) - 0.074(2.50379)$
- $\text{Log } Y = 1.81472$
- Taking antilog in both sides:
- $Y = \text{Antilog } (1.81472)$
- **Y = 65.27 Kg**

Standard quantity for 320th batch:

- Standard Quantity = Total quantity for 320 batches – Total quantity for 319 batches
- Standard quantity = (320 x 65.26) – (319 x 65.27)
- Standard Quantity = 62.07 KG

WN 2: Computation of material variances:

SP x SQ	SP x AQ	AP x AQ
55 x 62.07	55 x 80	50 x 80
3,413.85	4,400	4,000

Variance calculation:

Material cost variance	(SP x SQ) – (AP x AQ)	3,413.85 – 4,000	586.15A
Material Price variance	(SP x AQ) – (AP x AQ)	4,400 – 4,000	400F
Material Usage variance	(SP x SQ) – (SP x AQ)	3,413.85 – 4,400	986.15A

WN 3: Computation of SH for 320th batch:

Average time for 320 batches:

- $Y = aX^b$
- $Y = 100(320^{-0.322})$
- Taking log on both sides
- $\text{Log } Y = \log(100) + \text{Log } (320^{-0.322})$
- $\text{Log } Y = (0.0000 + 2) - 0.322 \text{ Log } 320$
- $\text{Log } Y = (2) - 0.322 \text{ Log } (2^6 \times 5)$
- $\text{Log } Y = 2 - 0.322 [6\text{Log } 2 + \text{Log } 5]$
- $\text{Log } Y = 2 - [0.322 \times 6 \times 0.30103] - [0.322 \times 0.69897]$
- $\text{Log } Y = 1.19334$
- Taking antilog in both sides:
- $Y = \text{Antilog } (1.19334)$
- **Y = 15.61 hours**

Average time for 319 batches:

- $Y = aX^b$
- $Y = 100(319^{-0.322})$
- Taking log on both sides
- $\text{Log } Y = \log(100) + \text{Log } (319^{-0.322})$
- $\text{Log } Y = (0.0000 + 2) - 0.322 \text{ Log } 319$
- $\text{Log } Y = (2) - 0.322(2.50379)$
- $\text{Log } Y = 1.19378$
- Taking antilog in both sides:
- $Y = \text{Antilog } (1.19378)$
- **Y = 15.62 hours**

Standard time for 320th batch:

- Standard Time = Total Time for 320 batches – Total Time for 319 batches
- Standard Time = (320 x 15.61) – (319 x 15.62)
- Standard Quantity = 12.42 hours

WN 4: Computation of labour variances:

SR x SH	SR x AH	AR x AH
40 x 12.42	40 x 20	50 x 20
496.80	800	1,000

Variance calculation:

Labour cost variance	(SR x SH) – (AR x AH)	496.80 – 1,000	503.20A
Labour rate variance	(SR x AH) – (AR x AH)	800 – 1,000	200A
Labour efficiency variance	(SR x SH) – (SR x AH)	496.80 – 800	303.20A

WN 5: Computation of Variable Overhead Variances:

SR x SH	SR x AH	AR x AH
75 x 12.42	75 x 20	90 x 20
931.50	**1,500**	**1,800**

Variance calculation:

VOH cost variance	(SR x SH) – (AR x AH)	931.50 – 1,800	868.50A
VOH Expenditure variance	(SR x AH) – (AR x AH)	1,500 – 1,800	300A
VOH efficiency variance	(SR x SH) – (SR x AH)	931.50 – 1,500	568.50A

7. Learning curve and pricing decisions [Category A]

Bosch Ltd. has developed a special product. Details are as follows: The product will have a life cycle of 5,000 units. It is estimated that market can absorb first 4,500 units at Rs. 64 per unit and then the product will enter the "decline" stage of its life cycle.

The company estimates the following cost structure:

Direct Labour…….. Rs. 6 per hour

Other variable costs……..Rs. 19 per unit

Fixed costs will be Rs. 40,000 over the life cycle of the product. The 'labour rate' and both of these costs will not change throughout the product's life cycle. The first batch of 100 units will take 1,000 labour hours to produce. There will be an 80% learning curve that will continue until 2,500 units have been produced. Batches after this level will each take the same amount of time as the 25th batch. The batch size will always be 100 units.

Required

CALCULATE average selling price of the final 500 units that will allow the company to earn a total profit of Rs. 80,000 from the product if average time for 24 batches is 359.40 hours.

(Note: Learning coefficient is –0.322 for learning rate of 80%).

The values of Logs have been given for calculation purpose:

log 2 = 0.30103; log3 = 0.47712; log5 = 0.69897; antilog of 2.534678 = 342.51; antilog of 2.549863 = 354.70; antilog of 2.555572 = 359.40; antilog of 2.567698 = 369.57

WN 1: Computation of time to be taken for 5,000 units:

a) Average Time for 25 batches:

- $Y = aX^b$
- $Y = 1000(25^{-0.322})$
- Taking log on both sides
- $\text{Log } Y = \log(1000) + \text{Log } (25^{-0.322})$
- $\text{Log } Y = (0.0000 + 3) - 0.322 \text{ Log } 25$
- $\text{Log } Y = (3) - 0.322 \text{ Log } (5^2)$
- $\text{Log } Y = 3 - 0.322 [2\text{Log}(5)]$
- $\text{Log } Y = 3 - [0.322 \times 2 \times 0.69897]$
- $\text{Log } Y = 2.54986$
- Taking antilog in both sides:
- $Y = \text{Antilog } (2.54986)$
- **$Y = 354.70$**

b) Time taken for 25th batch:

- Time for 25th batch = Total time for 25 batches – Total time for 24 batches
- Time = (25 x 354.70) – (24 x 359.40)
- Time = 241.90 hours

c) Total time for 5,000 units:

- Total Time = [AT for 25 batches x 25] + [Time for 25th batch x 25]
- Total Time = [354.70 x 25] + [241.90 x 25]
- Total Time = 14,915 hours

WN 2: Computation of selling price:

Particulars	Calculation	Amount
Direct Labour	14,915 x 6	89,490
Other variable cost	5,000 x 19	95,000

Fixed cost		40,000
Total cost		**2,24,490**
Add: Profit		80,000
Target sales		**3,04,490**
Less: Sales of 4,500 units	4,500 x 64	(2,88,000)
Sale value of balance 500 units		**16,490**
No of units		500
Selling price	**16,490/500**	**32.98**

Chapter 15 - Case Studies

Guidelines for answering case studies:

- Case Study is not about the quantity, but the quality.
- Prepare a plan for each issue.
- Decide what models to use and prioritize the issues.
- Identify the impact and alternative actions that could be taken, as well as the relevant concepts and calculations required.
- Answer should have a logical flow.
- Offer a detailed analysis of the issues and conclude with sound, well justified recommendations.
- Not to spend too much time on calculations.
- Do not place too much attention and time on the presentation.
- Quality of discussion on each issue which is most important, not the ranking order.
- Discuss each of the issues in depth, explaining their impact.
- Do not leave any of the issue undecided.
- **Recommendations should include 'what to do', 'why to do it' and 'how to do it'.**
- Identify ethical issues and then briefly justify.
- Recommendation should appear at the end of the report.
- Practice makes perfect.

Areas where case study can be asked:

Level I classification	Level II classification	Level III Classification	Level IV classification
Environment Management Accounting			
Ethics and non-financial considerations			
Strategic cost management	Value recognition	Value chain analysis/ Value shop model	
	Quality management tools	Total quality management	
		Cost of quality	
		Business excellence model	EFQM
			Balridge Criteria
	Cost management techniques	Target costing	
		Life-cycle costing	
		Throughput accounting	
	Product service and delivery	Lean system	JIT, Kaizen, 5S, TPM, Cellular Mfg, Six sigma
		Supply chain management	Upstream and downstream flow
Decision making	Decision making		
	Pricing decision	Internal	Transfer pricing
		External	
Performance management	Linking of CSF to KPIs and strategy		
	Divisional performance measures	Financial	ROI, RI, EVA and SVA
		Non-financial	BSC, TBL, Performance Prism, Pyramid etc.
	Benchmarking		
Cost control and analysis	Standard costing		
	Budgetary control	Beyond budgeting	
		Behavioural aspects	
Profitability analysis	Strategic analysis through ABC		

Planning and forecasting tools	ABB and ABM		

Meaning of different words:

VERBS USED	DEFINITION
List	Make a list of
State	Express, fully or clearly, the details/facts of
Define	Give the exact meaning of
Describe	Communicate the key features
Distinguish	Highlight the differences between
Explain	Make clear or intelligible/State the meaning or purpose of
Identify	Recognise, establish or select after consideration
Illustrate	Use an example to describe or explain something
Apply	Put to practical use
Calculate	Ascertain or reckon mathematically
Demonstrate	Prove with certainty or to exhibit by practical means
Prepare	Make or get ready for use
Reconcile	Make or prove consistent/compatible
Solve	Find an answer to
Tabulate	Arrange in a table
Analyse	Examine in detail the structure of
Categorise	Place into a defined class or division
Compare and contrast	Show the similarities and/or differences between
Construct	Build up or compile
Discuss	Examine in detail by argument
Interpret	Translate into intelligible or familiar terms
Prioritise	Place in order of priority or sequence for action
Produce	Create or bring into existence
Advise	Counsel, inform or notify
Evaluate	Appraise or assess the value of
Recommend	Advise on a course of action

Case Studies

1. Transfer Pricing [Category A]

Rest Easy Company is a rapidly growing start-up in the technology sector. It develops customized ERP packages for clients across various business sectors. The business comprises primarily of two departments (1) consultant and (2) customer support. Consultant department has highly qualified professionals from management, accounting and technology background, who approach clients as a team and work out solutions that meet their needs. Customer support personnel are in charge of IT implementation and provide support through telephone, e-mail or on-site. Currently, the strength of the consultants department is 200 while that of customer support is 150.

Yash, the founder and CEO of the company, is very passionate about this business model. To deliver high-quality product solutions, he believes that his staff should be well-trained and up-to date with

developments in their professional fields. Therefore, Rest Easy provides periodic training to its staff in-house. All employees are expected to undergo 2 weeks of training annually. A training department has been set up with qualified trainers in various fields, who provide periodic training sessions to both Consultant and Customer Service departments. The training department has 5 trainers. Training sessions are aimed at providing skills that the executives need to provide better service to their clients. This in-house focus of high-quality delivery, is the key factor that Yash believes would set apart Rest Easy from its competitors.

In addition to delivering training sessions, trainers are responsible for developing training material for routine, on-going as well as specialized training sessions. They attend conferences, train the trainer sessions and subscribe to journals to keep themselves up-to-date with various developments that consultants and customer support executives need to be aware of.
At the beginning of each year, heads of consultant and customer service departments advise the training department on the expected number of training sessions that their staff would undertake. In special situations, where developments need to be communicated rapidly, extra sessions can also be conducted. Training department budgets are prepared based on these needs.

Transfer Pricing - Training Cost Allocation

Cost incurred by the training department is allocated to the consultant and customer service department based on the training sessions availed by both departments. A standard quote (transfer price) based on budgets is provided at the beginning of the year. At the end of the year, actual cost is allocated based on actual training sessions of each department.

Each of the user departments use the transfer price to prepare their individual budgets, that further gets built into their pricing models used for billing clients. One of the metric for manager appraisal is also the financial performance of their individual departments. Hence, managers of both consultant and customer service departments are very cost conscious.

Figures for budget and actual costs for 2017 of the training department are as follows:

Figures in Rs.

Cost Particulars	Budget	Actual
Salaries	25,00,000	30,00,000
Depreciation on Office Equipment	2,00,000	5,00,000
Software Licenses for Training Packages	80,000	1,05,000
Conference Travel for Train the Trainer Sessions	10,000	15,000
Telephone	20,000	25,000
Training Supplies	50,000	60,000
Trainee Lunch	100,000	120,000
Total Expenses	29,60,000	38,25,000

Consultant and Customer service departments are charged based on the number of training sessions actually availed. Details of training sessions for each department are:

Department	Budget	Actual
Consultant	100	100
Customer Service	100	80
Total	200	180

Problem of Goal Congruence

In accordance with the above explanation, the training department quoted a rate of Rs.14,800 per session based on the budgeted cost and budgeted training sessions. (Budgeted cost Rs.29,60,000 for 200 training sessions). Actual cost per session is Rs.21,250 (Actual cost Rs.38,25,000 for 180 training sessions). Cost overrun of Rs.6,450 per session, a jump of 44% from the original quote.

Consequently, a meeting was called that was attended by the managers of consultant, customer service and training departments, along with the CEO Yash.

The user departments were unhappy with the higher charge. Manager of the consultant department raised the following concerns:

(a) The market rate for similar trainings provided by external vendors was only Rs.12,000 per session. He has accepted a higher transfer price of Rs.14,800 per session only because the in-house training program was more customized towards Rest Easy's end-user-clients. However, if the department is actually going to be charged Rs. 21,250 per session, he would rather source the training to the outside vendor.

(b) Further, he pointed out that while his department had adhered to its commitment of 100 training sessions, the customer service department has availed of 20 lesser sessions than its commitment. Reviewing the cost structure of the training department, most of the expenses are fixed in nature. Therefore, when the transfer price is based on the actual cost and actual training sessions, the per session cost has increased because the customer service department did not undergo the entire 100 sessions. He questions, why he should bear a higher allocation of cost due to variance in actual and budgeted usage of training resources of the customer service department?

Manager of the customer service department explained that the variance of 20 training session is on account of the executives handling high-priority work pressure that did not allow them enough time to complete some of the training sessions. At the same time she contended that she should not be charged for those 20 sessions for which no training was availed.

Manager of the training department explained that the Rs.500,000 cost overrun on salary due to new hire of a trainer. The trainer's experience is very valuable to the company and hence to get her on board, the company had to offer a higher pay scale. Depreciation on office equipment was higher by Rs.300,000 due to higher replacement cost of ageing equipment. A specialized software license resulted in an excess spend of Rs.25,000. The manager argued that the rest of the expenses were normal increases which were not controllable.

Yash, the CEO, was understandably not happy with the cost over-run. Higher internal transfer price to the end user departments would affect employee morale. However, even though a cheaper option was available from an outside vendor, he could still foresee the value of investing in in-house training programs. Intangible benefits from these customized sessions, would definitely help the company's growth.

To conclude, he was not willing to shut down the training department. At the same time, he had to resolve the dispute resulting from internal transfer pricing in an amicable way. Like profits, teamwork is critical to success.

Required

i. IDENTIFY the threats to goal congruence due to internal transfer pricing.

ii. During the meeting, an alternate transfer pricing methodology based on two-part pricing system was formulated. Costs would be segregated into fixed and variable categories. A transfer price for each category would be arrived based on budgeted costs and budgeted usage. The standard rate for fixed cost will be applied to the budgeted training sessions and charged to the user departments. The standard rate for variable cost will be applied to the actual training sessions and charged to the user departments. Fixed cost would be defined as those that are not directly impacted by the number of training sessions. CALCULATE the transfer price to be charged to each department under this method.

iii. EVALUATE how the two-part pricing price method of transfer pricing address the threats to goal congruence as identified in question 1?

Answer:

(i) Threats to goals congruence due to internal transfer pricing are:

- User groups, consulting and customer service department **are concerned that training department is not controlling its costs**. Since the entire actual costs gets allocated to the users, training department may not be managing its costs efficiently. Since the financials of user departments are affected, it may lead to conflict between the departments.
- Yash, the CEO is a firm believer of in-house training and its benefits. **However, there are outside vendors that provide similar service at substantially reduced costs.** Performance assessment of managers of consulting and customer service are based on their department's financial metrics. Higher internal transfer price for training would affect employee morale since they have no control over these allocated costs. However, their performance is being evaluated based on uncontrollable factors. This could lead to discontent among the managers. Alternatively, Yash may want to reconsider his strategy of in-house training. When suitable, training can be sourced to cheaper options available in the market, without compromising on quality.
- **Most costs of the training department are fixed in nature, as they need to be incurred irrespective of the number of training sessions**. These costs are being allocated to the users based on actual training sessions. The budgeted target price is used by the user departments, to determine their billing model to Rest Easy's end user clients. Hence it is important that the budget transfer price is not very different from the actual transfer price charged at the end of the year.
- **In the given problem, internal transfer price has been based on a budget of 200 sessions. Here the customer service department does not adhere to its commitment of 100 training sessions, training sessions actually availed are only 80. Since costs are mostly fixed in nature, the actual cost per training session increases. This is then charged out to the consultant and customer service departments. Consequently, despite meeting its commitment, the consultant department bears a higher cost allocation due to variance in the usage of training resources. This can lead to friction between the user departments**.

(ii) By segregating the costs into fixed and variable components, Rest Easy is working out two-part pricing system for transfer price.

Two-Part Pricing System = Lump-Sum Charge + Marginal Cost

To segregate the costs into fixed and variable categories, the criteria is whether the costs change per additional training session. Accordingly, the classification of costs will be as below:

Cost Particulars	Budget (Rs.)	Classification
Salaries	25,00,000	Fixed
Depreciation on Office Equipment	2,00,000	Fixed
Software Licenses for Training Packages	80,000	Fixed
Conference Travel for Train the Trainer Sessions	10,000	Fixed
Telephone	20,000	Fixed
Training Supplies	50,000	Variable
Trainee Lunch	100,000	Variable
Total Expenses	29,60,000	

The lump-sum charge would be based on the fixed cost budget. Marginal cost would be based on the variable cost budget.

Total budget fixed expenses = Rs.28,10,000 and total budget variable expenses = Rs.150,000. Number of training sessions is 200, that is 100 each for consultant and customer service departments. Hence the fixed cost allocation rate would be Rs.14,050 per session and variable cost allocation rate is Rs.750 per session.

Transfer price to the consulting department = lump-sum charge + marginal cost
= (Standard Fixed Cost per session × Budgeted Training Sessions) + (Standard Variable Cost per Session × Actual Training Sessions)
= (Rs.14,050×100) + (Rs.750×100)
= Rs.14,05,000 + 75,000 = Rs.14,80,000.

Transfer price to the customer service department = lump-sum charge + marginal cost
= (Standard Fixed Cost per session × Budgeted Training Sessions) + (Standard Variable Cost per session × Actual Training Sessions)
= (Rs.14,050 × 100) + (Rs.750 × 80)
= Rs.14,05,000 + Rs.60,000 = Rs.14,65,000.

Total transfer price allocation is Rs.29,45,000 versus actual expenses of Rs.38,25,000. Unallocated expenses are Rs.880,000.

(iii) Evaluate how the two-part transfer pricing model would address the goal congruence issues listed in question 1?

- **Since transfer prices are based on budgets, the training department would become more cost-conscious**. As explained above, as per this transfer pricing method, unallocated expenses of Rs.880,000 would have to be borne by the training department. As given in the problem, this variance is mainly on account of extra cost for the newly hired trainer and the higher depreciation expense. The department will be more cautious while taking future decisions. However, Yash the CEO must ensure that the quality of training is not compromised and remains in line with the company's strategic policy.
- **Internal transfer price of Rs.14,800 per session is still higher than the outside rate of Rs.12,000 per session**. Further decisions would be based on the company's strategic objective. At the same time, if the number of training sessions are expected to increase beyond the budget, this transfer pricing method charges the user department only a marginal cost of Rs.750 per session. This is definitely lower that the external rate.
- **Under this method, fixed expenses that form majority of the cost are allocated based on budgeted cost and budgeted usage**. Variable expense are allocated based on actual training sessions. Hence, any variance in the utilization of training resources, does not impact the other user department.

Therefore, most of the goal congruence issues can be addressed through this methodology.

2. Kaizen Costing [Category A]

Zen Limited is a leading mobile manufacturing company and sells its mobile phone across the world. In a fast-changing technological environment, Zen has been able to maintain its leadership in smartphones segment for third year in a row now. Though the revenues have grown year on year, the costs have increased at a higher rate in the mobile phone industry as a whole.

"We have been leaders in revenue. We must lead in cost reduction front as well. I believe we can achieve this with improvements overtime, however minor they might be!"

– This is what the CEO of Zen has told its directors in a recently concluded board meeting.

The net profit margins of the company has fallen from 10% in 2016 to 8% in 2017 owing to rise in raw material & repair cost. Another significant rise in the cost was on account of repairs of mobiles which are under warranty. There was an increase in these repair costs by 1.5 crores which represents 1% of the total turnover of the company.

The process of repairs/ replacement of under warranty product is outlined below:

- The company own 200 repair centres in various cities in India.
- A customer whose phone is under warranty and requires replacement/ repair visits any of the 200 centres to deposit the faulty mobile phone.

- The technician at service centres examines the phone and the service centre sends the phone to a centralised repair centre at Mumbai. The phones are sent to Mumbai even for minor repairs which can be done locally if requisite infrastructure is provided to the service centres.
- The phones are sent in batches. Each service centre creates 3-4 batches of mobile phones in a day. (A recent study showed that the batches could be combined into a single batch per day)
- The phones are repaired in Mumbai's centralised centres and sent back to the respective service centres for handing them back to the customer. The phones which are repaired are sent in separate batches and those which are replaced are sent in separate batches.

Required

You are working as a Finance Manager in Zen. The finance director has approached you to understand whether the minor improvement would be useful given the size of the company. The Finance Director has asked you to examine the process of warranty repairs and replacement and submit a report covering the following aspects:

i. What is the CEO referring to when he says "minor improvements"?
ii. What are the benefits of such minor improvements?
iii. Apply the above process to the warranty claim process and explain how the process can be improved.
iv. Any other matter which you consider relevant.

Answer:

Issue

Zen limited is a leader in manufacturing of mobiles and is concerned about increasing costs. The increase in warranty related costs has been significant in the current year as compared to previous year. This has reduced the net profit of the company by 1% of sales.

Applicability of Kaizen Costing

"Kaizen" is a Japanese word which means "Change for Better". In business parlance, Kaizen is used to refer to **small and continuous improvement** across all functions, processes and employees. Kaizen costing is a cost reduction system. Yashihuro Moden defines Kaizen Costing as "the maintenance of present cost levels for products currently being manufactured via systematic efforts to achieve the desired cost level.

Toyota Production System is considered as a pioneer in Kaizen Costing. Though the model was used for eliminating wastage from production at factory initially, the concept can be applied in any of the processes in a business. Since Kaizen is a continuous improvement process, a radical change or disruptive innovation is not expected in Kaizen costing.

The following are the key features of Kaizen -

- Kaizen processes **focus on eliminating waste** in the systems and processes of an organisation, improving productivity and achieving sustained continual improvement.
- **Application of small, incremental changes** routinely applied and sustained over a long period can lead to significant improvements.
- It aims to **involve workers from multiple functions and levels** in the organisation.
- A value chain analysis **helps to quickly identify opportunities to eliminate wastage**
- Although incremental changes can often be too small to be seen, **Kaizen can be very effective in the long run.** An airline which identified that 75% of its flyers would leave the olive from salad, the airline decided to remove it from its servings. This saved the airline $ 40,000 per year. Another example is where an airline stopped printing its logo in the rubbish bags as it did not add value saved over $ 300,000 per year.

The CEO is referring to Kaizen costing when he mentions minor improvements to save costs over time. Kaizen costing takes into consideration various costs such as costs of supply chain, manufacturing costs, marketing, sales, distribution costs etc.

Benefits of Kaizen Costing

- Kaizen **reduces waste in areas such as employees waiting time, transportation, excess inventory etc., which leads to improved efficiency in overall business processes and systems**.
- A company applying Kaizen philosophy can achieve cost reduction through small incremental improvements and cost savings.
- Kaizen **looks at functions and processes at all levels of organisation** and requires participation of all employees and massive as well as open communication system. This participative approach improves teamwork across the organisation.
- Product improvement using Kaizen is likely to result in less number of defective products leading to customer satisfaction and reduction in warranty related costs.
- **The reduction in wastage, improved efficiency and cost reduction improves the overall** profitability of the company.

Implementation of Kaizen in the Current Case

The implementation of Kaizen as a cost reduction techniques can take several forms. The key question to ask for implementation is - "Can we eliminate waste?". The waste can take several forms like -

- **Unnecessary movement of material and men** - Travelling for meeting in cases where a video conferencing could help.
- **Unwanted part in a product which if removed is not likely to impact the performance of the product**. (Nano sim card has reduced a significant portion of use fibre boards as compared to the traditional sim cards.)
- **Defects which involve extra cost** in terms of reworks.
- **Waiting time -** A simple example could be locating for files in your computer which has not be arranged properly. This leads to waste of time.

The above is just an indicative list where improvements can be made. However, an important point to note is that reduction of waste should not be done by compromising the quality of product. Apple launched iPhone 5c as a budget phone by using plastic material instead of Aluminium. The market did not like the product as it was considered to be an inferior product as compared to iPhone 5s.

Another way of looking at Kaizen is asking following questions -

- Can we eliminate functions from the production process **without compromising the quality and utility of end products?** - Removing unnecessary movements of material and men.
- Can we **eliminate some durability?** - Use of unbreakable plastic for producing disposable glasses would be waste of resources
- Can we **minimise design?** - e.g. use of Nano Sims.
- Can we **substitute parts** of the product being manufactured?
- Can we **take supplier's assistance to get better quality parts**?
- **Is there a better way?** - This is a question which must be asked continuously to ensure that the improvement is not a one-time exercise.

(The above questions also form a part of the Value Engineering Process)

Application of Kaizen at Zen Limited

The current warranty claim process at Zen involves movement of mobile phones from various service centres across the country to a centralised centre in Mumbai. The possible improvements in the claim process is explained below -

- **The company needs to analyse whether it requires to own 200 centres by itself across the country**. The company can evaluate closing down centres with less customer footfalls or outsource the ones which are not located at the strategic location. This would save some cost to the company.
- **The current process requires each service centre to send the faulty mobile phones back to Mumbai for repair or replacement**. This is done even in case of minor repairs which can be handled locally. The company can provide necessary infrastructure to the service centres to carry out minor repairs locally. This would save logistics cost of sending the phones to Mumbai and back to service centre. The company should analyse the past data to understand the proportion of phones which require minor repair. Repairing the phones locally would also reduce the turnaround time and the customer will get back the phone faster.

- The current process is to send phones in 3-4 batches in a day. **This effectively means creating 3-4 consignments, documents for dispatches and incurring extra costs for transportation**. Combining the phones in a single batch would reduce the cost of transportation and administrative cost as well.
- The phones **can be sent back from Mumbai in single batch** instead of creating multiple batches to save transportation costs.

The above improvements must be revisited continuously to derive required benefit from Kaizen process.

Apart from eliminating waste in the warranty claim process, the company must also identify root causes of increase in warranty claims in the current year as compared to previous year. Every phone being sent back for repair/replacement involves avoidable cost. The company must also revisit the manufacturing process and quality control processes to eliminate wastage in production process and improve quality.

- Zen **can consider producing better quality mobiles** at the manufacturing process to reduce the warranty claims.
- The pattern of warranty claim must be analysed to understand **whether there is certain common problem related to repair claims**. If the issue has some relation with parts used in mobile, the issue can be taken up with supplier of such parts.

3. Value Chain [Category A]

You are the Finance Manager of DP Limited which is in the business of manufacturing wire rods. A division in the company manufactures copper wire rods from a single manufacturing plant in Central India. The division purchases raw material (copper cathodes) from various suppliers across the country. The cathodes are melted and wire rods of various dimensions are produced. Each batch of wire rods produced are tested for quality and strength.

The wire rods are stored in rolls in the warehouse and dispatched in company owned trucks as per the requirement of the customers. The customers are required to pay 50% of invoice value as advance and balance 50% within 30 days of delivery of goods. The company prices its copper wire rods based on the price prevailing on London Metal Exchange after adjusting it with a factor to cover conversion costs and profits.

The company explores newer markets by advertising in national dailies and participating in various industrial events in India as well as abroad. An annual conference of customers is conducted by the company to improve customer relationships and attract newer customers. The customers have right to return the material if quality specifications are not met. There is a separate team to handle such complaints.

The following email was sent by the Chief Financial Officer of the company to you.

From: Chief Financial Officer
To: Finance Manager
Subject – Commodity Price Fluctuation

The board is quite aware of foreign exchange fluctuation related risks. However, they are not much aware of risks related to fluctuation in commodity prices. The prices of copper which are used to manufacture copper wire rods have fallen down by over 20% in the last six months owing to global factors.
The procurement team of Copper Wire Division has been waiting for the right time to buy these metals as they expect the prices to fall down further. However, we are at a verge of stock-out of these metals as no purchase was made in the last one month.
The bonus of procurement team largely depends on the annual savings as compared to the budgeted cost of purchase. I am not happy with the approach of speculation and making profits out of price fluctuation in raw materials. Could you highlight the issues related with our performance measurement mechanism and suggest how it could be improved?
Regards
Chief Financial Officer
Attachment:

Copper Prices Quoted on LME

Required

(i) EXPLAIN and IDENTIFY the various primary activities of Copper Division.

(ii) DISCUSS the issues with performance measure in force in the company.

(iii) ADVISE an alternate performance measure and Identify Key Performance Indicators (KPI).

Answer:

Value chain is defined as "a chain of value added activities; products pass through the activities in a chain, gaining value at each stage". Value chain focuses on systems, and how business inputs are changed into business outputs purchased by customers. The entire set of activities that a business undertakes to covert inputs to outputs are interlinked to each other.

Porter's value chain classifies activities into primary activity and secondary activity.

Primary Activities

Primary activities are those activities that are directly related with creating and delivering a product to the end customers. The following activities are considered as primary activities:

Inbound Logistics

Inbound logistics involves arranging inbound movement of materials from suppliers to the manufacturing plants. The activities related to inbound logistics in the case of copper division of DP limited would involve transporting copper cathodes from multiple suppliers across the country and storing them in the warehouse. The cathodes stored in warehouse would be issued to the production facilities depending on the requirement of the production plants.

Operations

Operations involve those activities which are concerned with conversion of input into outputs in case of manufacturing companies. The activities under operations would include those related to melting of copper cathode and converting the copper cathodes into wire rods. The quality tests carried out for wire rods would also be included as a part of operations.

Outbound Logistics

These include planning and dispatch, distribution management, transportation, warehousing, and order fulfilment. This includes warehousing of finished goods (copper wire rods) and distribution of copper wire rods to its customers. The company uses its own trucks to distribute finished goods to its customers. The scheduling of trucks and dispatch of material would also be a part of outbound logistics.

Marketing & Sales

Marketing and sales are the means whereby consumers and customers are made aware of the product which is ultimately sold to them. The activities include selling products to the end customers covering activities like product management, price management, promotion and marketing management. DP limited uses advertisement in national dailies and holds conferences as a part of its marketing and sales

efforts. The company also holds annual customer conference to improve customer relations and attract new customers.

Service

In case of manufacturing industry, service generally refers to the after sales service which are required to maintain the value of product and includes activities like installation, repair etc. The service team is also expected to handle customer returns on account of poor quality of copper wire rods.

Issues:

- A procurement team is generally a cost centre and the most appropriate way to evaluate **performance of cost centre is the comparison between actual cost and budgeted cost** (also called variance). A large portion of bonus (performance measurement) is dependent on the savings in actual purchases.
- The **company has adopted variance analysis as a measure of performance**. If the team is able to reduce the actual cost of purchase as compared to the budgeted cost, a higher bonus is paid. The procurement team has stopped purchase of copper cathodes to save on the purchase budget which ultimately would translate into higher payout of bonus.
- The **commodity prices of copper have fallen by about 20% in the last six months**. The speculation of fall in price has resulted in halting of procurement process. It is very difficult to time the market and such speculation could lead to losses to the company. There could be a stock-out situation if the procurement is not resumed and the situation could hamper the production and overall delivery schedules.
- **The procurement team appears to have taken a short- term view of price movement.** The team is focused on earning higher bonus and hence is waiting to buy at lower prices. There is a larger impact of not being able to deliver product on time which could damage the reputation of the company. This has been ignored by the procurement team. Managers must be encouraged to consider the impact on the company as a whole and not on just the own department.
- **The company is using just a financial measure to measure performance.** This can result in lopsided view of the goals and objectives of the company. Managers tend to look at short term profits and ignore the long- term growth.

Optimum Performance Measurement

- A performance measurement is most effective when the goals of the respective departments are aligned with that of the company. This ensures that each employee within the company works towards the overall objective of the company. **The company manufactures wire rods and the objective of the copper division is to manufacture copper wire rods as per the requirement of the customers.**
- The profit flows from the main business of the company. **If a department focusses on an objective which is not aligned with the main goal, the company as a whole suffers.** A stock-out like situation would hamper the image of a company, if wire rods are not delivered as per schedule to the customers.
- Another aspect to be considered is **that managers and employees are evaluated only on those parameters which are controlled by them**. If for example, the procurement team is able to purchase copper at a discount to market price because of their efforts, it could be considered as saving.
- The prices of copper are determined by the prices on commodity exchanges and are not in the control of procurement managers. **The performance of managers and employees should not be impacted by global change in prices of commodities as they are not controlled by the concerned employees.**

Alternate Performance Measure

- The issue with financial performance measures alone is that managers tend to have a short- term view as can be seen in our case. **In order overcome possible short-termism of financial measures Kaplan and Norton developed the Balanced Scorecard which outlined four key areas in which company and divisional performance should be measured to focus on both the short- and long-term needs of the organisation.**

- The key idea is that managers are to be appraised on a variety of measures which include non-financial measures so that their focus is both long and short term. The four perspectives used to measure performance measure in a Balanced Scorecard is given below:
- **Financial Perspective:** This measures the financial performance which is linked to the overall objective of maximising shareholder's wealth. We already use financial measures to measure performance. The weightage could be reduced to include other measures. Also, factors beyond the control of managers like commodity prices should be excluded.
- **Customer Perspective:** This includes focussing on customers and meeting their needs. Measures could include quality of material produced, optimum levels of inventory maintained, number of stock-out instances, etc.
- **Internal Business Perspective:** This includes measures to evaluate the performance of business processes with particular emphasis on productivity and efficiency. Measures could include procurement lead time, number of defective purchases etc. The company could use measures like JIT to reduce the procurement lead time.
- **Training and Growth:** This includes focusing on innovating in processes and developing and learning for the future. Trainings could be given to procurement managers to identify best quality of copper cathodes, aspects related to purity etc.

4. Relevant costing, Transfer Pricing and Cost of Quality [Category A]

About Aditya Group

Aditya Group was established in 1975, manufactures and sells electronic personal grooming and beauty products. The group has two 100% subsidiaries AUS Ltd. and ANZ Ltd. AUS Ltd. manufactures luxury products that cater to niche customers who prefer specialized personal grooming and beauty care. ANZ Ltd. caters to regular daily beauty and grooming requirements that has a wide reach within the market. Factories of both companies are located within India. The products are sold to wholesalers, who supply these products to the retail market.

Aditya Group purchases its raw material requirements from both domestic and overseas markets. Additionally, certain products manufactured by AUS Ltd. can be enhanced based on the products manufactured by ANZ Ltd. Therefore, as per production requirements, AUS Ltd. sources some product components from ANZ Ltd.

Aditya Group has a centralized decision making set-up. Basic policy decisions for functions such as production planning, sales and client relationship, finance and human resources are handled at the group level. Individual units AUS Ltd. and ANZ Ltd. concentrate on the manufacturing alone.

About You

You are an Assistant Manager in Finance and Accounts department of Aditya Group, headed by Director-Finance Ms. Elsea. You assist and report to Ms. Fiona, Manager of your department. Sometime you also assist Director Finance in analysing financial and non-financial information, drafting reports for board meetings, preparation of presentation and staff trainings.

Business Situation- 1 Yesterday, 5.15 P.M.

You got an email from Ms. Elsea, with Cc to Ms. Fiona. Ms. Elsea, asked you to prepare a cost statement for making a quotation to a new customer. She has also informed you that the customer can also maintain a long- term business relation with us. You have been requested to gather information related to the specification from Sales Manager.

Yesterday, 5.25 P.M.

You have been called by Ms. Fiona, and provided the product specification received from Sales- Manager for which quotation has to be quoted. Ms. Fiona has also requested you to gather relevant information to prepare cost statement. Due to the expected long term business relationship that AUS Ltd. wants to have with the customer, the sales manager wants to quote the lowest possible price. AUS Ltd. currently has some spare capacity that can be utilized to cater to this entire order. Therefore, only the relevant cost to AUS Ltd. has to be considered to arrive at the quote.

After meeting with your reporting officer, you mailed to various concerned department and requested for data.

The following information has been obtained in relation to the contract:

Today, 10.05 A.M.

You got an e-mail from Production Manager, it has been informed that 40 tonnes of material Dx would be required. This material is in regular use by AUS and has a current purchase price of Rs.380 per tonne. Currently, there are 5 tonnes in inventory which cost Rs.350 per tonne. The resale value of the material in inventory is Rs.240 per tonne.

Further, with regards to components, it has been informed that 4,000 components would be required. These could be bought externally for Rs.15 each or alternatively they could be supplied by ANZ Ltd. The variable cost of the component if it were manufactured by ANZ Ltd. would be Rs.8 per unit. ANZ Ltd. has sufficient capacity to produce 2,500 components without affecting its ability to satisfy its own external customers. However, in order to make the extra 1,500 components required by AUS Ltd., ANZ Ltd. would have to forgo other external sales of Rs.50,000 which have a contribution to sales ratio of 40%. To have uniformity in the quality of the component, it is assumed that AUS Ltd. would procure its entire requirement of 4,000 components either externally or from ANZ Ltd. The transfer pricing policy of Aditya Group for sales between units aims at goal congruence. The unit selling the goods would be allowed to charge any opportunity cost on account of catering to internal demand, while the purchasing unit should ensure that the company is not at a loss.

Today, 10.45 A.M.

You got an e-mail from Personnel Manager, it has been informed that 2,000 high skilled labour hours would be required. The grade of labour required is currently paid Rs.5 per hour. Highly skilled labour is in short supply and cannot be increased significantly in the short-term. This labour is presently engaged in meeting the, demand for product 'G', which requires 4 hours of highly skilled labour. The contribution from the sale of one unit of product L is Rs.24.

It has also been informed that the contract would require a specialist machine. The machine could be hired for Rs.15,000 or it could be bought for Rs.50,000. At the end of the contract if the machine were bought, it could be sold for Rs.30,000. Alternatively, it could be modified at a cost of Rs.5,000 and then used on other contracts instead of buying another essential machine that would cost Rs.45,000. The operating costs of the machine are payable by AUS whether it hires or buys the machine. These costs would total Rs.12,000 in respect of the new contract.

Supervisor

The contract would be supervised by an existing manager who is paid an annual salary of Rs.50,000 and has sufficient capacity to carry out this supervision. The manager would receive a bonus of Rs.5,000 for the additional work.

Development Time

15 hours of development time at a cost of Rs.30,000 have already been worked in determining the resource requirements of the contract.

Fixed Overhead Absorption Rate

AUS uses an absorption rate of Rs.20 per direct labour hour to recover its general fixed overhead costs. This includes Rs.5 per hour for depreciation.

Today, 11.15 A.M: Ms. Fiona called you in her place as asked you the following:

Required

(i) CALCULATE the relevant cost of the contract to AUS. You must present your answer in a schedule that clearly shows the relevant cost value for each of the items identified above. You should also EXPLAIN each relevant cost value you have included in your schedule and why any values you have excluded are not relevant. Ignore taxation and the time value of money.

(ii) DISCUSS two problems that can arise as a result of setting prices using relevant costing.

Business Situation- 2

Today, 5.26 P.M: A memo from Managing Director of the group has been circulated to all officers of the group which stated "My objective for the forthcoming year is to reduce our quality costs in each of the primary activities in our value chain". The company is keen to build a reputation for quality and gives a five-year guarantee with all of its products.

Today, 5.37 P.M: Ms. Fiona, called you in her place and asked the following:

Required

(iii) EXPLAIN, by giving examples, how each of the four types of quality cost could be reduced. You should also IDENTIFY in which primary activity each one of your examples would occur in Aditya Group's value chain.

Answer:

(i) Statement Showing Relevant Cost

Type of Cost	Explanation	Amount (Rs.)
Material Dx (40 tonnes × Rs.380)	1	15,200
Components	2	52,000
Direct labour (2,000 hrs. × Rs.11)	3	22,000
Specialist machine	4	10,000
Machine operating cost	5	12,000
Supervision	6	5,000
Development time	7	Nil
General fixed overhead	8	Nil
Total relevant cost		1,16,200

Explanation

1. Material Dx is in regular use by AUS Ltd. and must be replaced. Consequently, its relevant value is its replacement cost. The historical cost is not relevant because it is a past cost and the resale value is not relevant because AUS Ltd. is not going to sell it because the material is in regular use.

2. AUS Ltd. would like to procure 4,000 components either from ANZ Ltd. or externally from the market. At the current production level, ANZ Ltd. (seller) has available capacity to accommodate part of AUS Ltd's request to the extent of 2,500 components. At this point, ANZ Ltd. would be operating at its maximum capacity. To cater to the remaining demand of 1,500 units from AUS Ltd., ANZ Ltd. has to forego external sales of Rs.50,000 to its own customers. Given that the contribution to sales ratio is 40%. Therefore, ANZ Ltd. has to forego contribution of Rs.20,000 (40% of external sales foregone ₹50,000) in order to cater to AUS Ltd.'s request. Fixed cost at ANZ Ltd. is irrelevant, since it would be incurred irrespective of whether AUS Ltd.'s order to catered to or not.

Therefore, in spirit of goal congruence, the transfer price that ANZ Ltd. would charge AUS Ltd. would be the variable cost of Rs.8 per unit and Rs.20,000 towards lost contribution as explained above. Therefore, the transfer price

= (Rs.8 per unit × 4,000 components) + Rs.20,000

= Rs.32,000 + Rs.20,000

= Rs.52,000 for 4,000 components

Therefore, per component, the price charged would be Rs.52,000 / 4,000 = Rs.13 per component. This is lower than the external market price of Rs.15 per unit. Therefore, in the interest of goal congruence the cheaper option is preferred. AUS Ltd. should source its components from ANZ Ltd, for a total procurement cost of Rs.52,000.

3. Skilled labour is in short supply and can only be obtained by reducing the production of product 'G', resulting in a loss of contribution of Rs.24 (given) or Rs.6 per hour of skilled labour. Hence the relevant labour cost will be Rs.6 (contribution lost per hour) + Rs.5 (hourly rate of skilled labour) i.e. Rs.11 per hour.

4. AUS Ltd. has a number of options: (a) If the machine were to be hired it would have a cost of Rs.15,000; (b) if the machine were bought and then sold at the end of the work it would have a net cost of Rs.20,000; or (c) if the machine were bought and then modified to avoid the need to buy the other machine it would have a net cost of Rs.10,000 (Rs.50,000 plus Rs.5,000 modifications less Rs.45,000 cost of another machine). Thus, the most economic approach is buy the machine and then modify it so the relevant cost is Rs.10,000.

5. The machine operating costs are future costs of doing the work and therefore are relevant.

6. The supervisor's salary is irrelevant, but the bonus needs to be included because it is dependent on this work and therefore is relevant.

7. The development time has already been incurred. Therefore, it is a past cost and not relevant.

8. General fixed overhead costs and their absorption are not relevant because they will be incurred whether the work goes ahead or not. Depreciation is also not relevant because it is an accounting entry based on the historical purchase of assets. It is not affected by the work being considered.

(ii) Two main issues arise when pricing work based on relevant costs:

- **Profit reporting; and**
- **Pricing of future work.**

With regard to profit reporting, the decision as to whether to proceed with the work will have been based on the use of relevant costs, but the routine reporting of the profit from the work will be based on the company's normal accounting system. Since this system will be based on total cost, it is probable that the costs of the work reported will be greater than its relevant cost. Consequently, the amount of profit reported to have been made on this order will be lower than expected and may even be a loss. This may cause difficulties for the manager who accepted the work as an explanation will be required of the reasons why there is such a difference in profit.

With regard to the pricing of future work the difficulty lies in increasing the price for similar items for the same customer in future. Once a price is set, customers tend to expect that any future items will be priced similarly. However, where a special price has been offered based on relevant cost because of the existence of spare capacity the supplier would not be able to continue to price on that basis as it does not recover its long term total costs. There may also be difficulties created by this method of pricing as other customers are being charged on a full cost basis and if they were to discover that a lower price was offered to a new customer they would feel that their loyalty was being penalised.

(iii) **Prevention**

Operations: Preventative maintenance and checking of the calibration of machinery. This would reduce the number of potentially faulty products being produced and therefore reduce guarantee claims.

Appraisal

Inbound Logistics: Reduce costs of incoming inspections by building close links with suppliers and getting them to adopt TQM. If suppliers can guarantee their quality, then inbound inspections could be eliminated.

Internal Failure

Operations: Reduce costs of re-works by training employees on a continual basis e.g. quality circles. This would reduce failure costs and also improve quality.

External Failure

Service: Design quality into the product to try to prevent guarantee claims and therefore the cost of servicing/repairing the product.

5. Competitive advantage and control system [Category A]

Wings International is a major airline operating from India. It is the biggest airline operator within the domestic airline segment and is a well-established player in the international airline segment. Except for a period of few years as outlined below, Wings International has been operating for the last 3 decades in a segment that caters primarily to the business and premium segment travellers. On its international routes and certain long distance, yet busy domestic routes, the airline offers full service on-board. The ticket price includes on board entertainment, transfer of baggage between flights, more leg room, option to upgrade from economy to business class seats, meals, and beverages etc. Baggage allowance is liberal with each flyer being allowed 2 checked in baggage and a cabin baggage. A tag line in its advertising goes "GRAB YOUR BAGS, THEY FLY FREE". In the domestic segment, the airline operates across major metro cities and certain other tier-2 cities. International flights operate only from these major metro cities.

Indian aviation industry has been growing exponentially in the recent years due to a thriving economy. Consequently, there have been many new entrants in the domestic segment, offering low-cost fares to customers. These airlines have been offering tickets at huge discounts, thereby attracting a sizable chunk of customers away from Wings International. To counter this and maintain its market share, Wings International also followed suit. For a period of five years, tickets on various domestic routes were offered at low competitive price. At the same time, low fares can be offered only if it is profitable to do so. Therefore, certain cost management measures were undertaken. Wings International converted to a "no-frills" airline on most of the domestic routes. Now a ticket covered only the cost of the seat and 1 checked in baggage and 1 cabin baggage. Going further, baggage allowance was reduced to economize on space and fuel requirements. To avail any other facility, the flyer wanted had to purchase extra. Another measure taken was to offer last-minute deals of tickets at a heavy discount if the flight is not fully occupied. Vacant seats are "perishable", therefore instead of letting them go empty, the flight can be filled at cheaper rates. This yield management measure based on capacity utilization was expected to increase market share and subsequently the airline's revenue. Tickets could be booked online using the internet rather than through ticket kiosks maintained by the airline at various locations in selected cities.

In order to quickly respond to a competitor's move, the pricing and marketing staff were given sufficient autonomy to make this price war work. Therefore, in many situations, decisions could be taken even without the prior approval of the top management. Meanwhile adding to the stiff competition, fuel prices have been soaring in the last few years. Maintenance of aircrafts, staff compensation and other overheads have also been increasing. Landing fees in major airports have increased manifold due to congestion and limited slots on account of multiple airline operators vying for limited slots.

Given this scenario, after 5 years of operations, the management at Wings International found that they were not able to generate sufficient profits on many of the domestic routes. A price discount by a competitor had to be matched with a similar price discount by Wings International and vice versa. Offering last minute deals to fill up capacity did not generate additional revenue. The volume of last minute flyers was low. It was found that most flyers booking at the last minute were anyway "price indifferent". Had the deals not been offered, the flyer would have been willing to pay more money anyway to use the airline. Therefore, neither did these deals generate extra customers nor extra revenue.

Wings International has always been perceived to cater the premium segment traveller, therefore participating in this price war had been contrary to its image of a premium quality airline. This left a section of the customers confused about the product offering. Therefore, the management of Wings International decided to discontinue its discount pricing strategy and exit the "low cost" airline business. The tickets are now being offered at its usual "full service" rates. This strategy is proposed to be followed for both current and prospective projects and operations.

The government has been formulating policies that are aimed at changing the landscape of the aviation sector. Airports are being built in smaller cities and towns that until date did not have one. This will improve connectivity within the country. It will increase air traffic as the public now has an alternate means to travel other than road and rail transport. Instead of flying between two small airports directly, Wings International proposes to develop a model where flyers from smaller towns are connected to one of the major metro cities which will serve as a main hub. For Wings International, the cost of operations will be

lower as compared to flying point to point between the two small airports. For the passengers, better connectivity and more route options will be available. For example, a flyer from a smaller city, wanting to go to a destination abroad can now reach the nearest hub by flying with Wings. From the hub, Wings International can fly the passenger further to the desired destination abroad in its international fleet. For the flyer, this is a better alternative as compared to reaching the hub by say road transport. For Wings International, the proposition broadens its customer base. To this effect, Wings International is already scouting the market for smaller aircrafts that can be operated more economically on the hub-spoke route. Also, it is in talks with for partnership with other airlines, hotels, car rentals in order to offer attractive holiday packages to customers. Since most of the other airlines do not have the scale of operations to achieve the "hub-spoke" model or the ability to offer holiday packages, Wings International identifies this as a unique proposition that it can offer its customers. This time the proposed tag line for its advertisement would be "WINGS TO FLY ANYWHERE, ANYTIME". Also, Wings International proposed to increase the turnaround time of flights for better capacity utilization.

Ticket booking is still offered over the internet. In the past, customers like this option due to the convenience it offered. Dedicated customer service lines available 24×7 to resolve issues is proposed. The management of Wings International wants to have a seamless implementation of this project. This could be a game changer for the company that will help it consolidate its position in the aviation industry. Therefore, a meeting has been called to discuss critical reporting that needs to be in place that ensures a successful launch.

Required

(i) EVALUATE the strategy adopted by Wings International in becoming a "no frills" airline. (ii) IDENTIFY the strategy adopted by Wings International for the proposed project

(iii) The entire strategy of Wings International 13.71 for the proposed project depends on information available about the future outlook in the industry. RECOMMEND guidelines to the management to put in place a control reporting mechanism that can enable Wings International to take preventive measures to avoid errors in its strategy.

(iv) In its previous venture, it took 5 years for Wings International to decide to exit the "no frills" airline operations. To avoid a delay in taking such decisions, RECOMMEND guidelines to the management to put in place a control reporting mechanism that can enable Wings International to correct its errors and make changes in its operations in a more timely manner.

Answer:

(i) Wings International is a premium segment airline charging "full service" rates for its ticket. However, due to intense competition in the domestic market, **it adopted a "low-cost advantage" strategy**. Low-cost advantage or cost leadership was achieved through following measures:

(a**) Becoming a "no-frills" airline**, where the ticket included only the seat and 1 each of cabin and checked in baggage. All other facilities had to be purchased extra.

(b) **Baggage allowance reduced to economize of space** within the flight and save on fuel costs.

(c) Online ticket booking facilitated so that the **number of ticket kiosks maintained by the airline were reduced.**

Cost leadership **enabled it to offer "low cost" fares to the customers that was generated through (a) giving huge discounts on ticket prices and (b) yield management of ticket price based on capacity utilization of the flight**. Although, due to its long-standing image as a premium airline, the transformation to a "no frills" airline could have caused confusion about the product offering in the minds of discerning traveller, who expect higher service quality. This could have eroded the customer base in this segment.

This "Low-cost advantage" strategy did not work due to the following reasons:

(a) **Price war from competitors** reduced the ticket prices to levels that were unviable to Wings International.

(b) **Variable prices to fill up flight capacity worked against the airline**, since it was found that these flyers, due to their immediate need, may have willing paid a higher price for the ticket than what was offered as

part of the deal. These flyers were "price indifferent" which should have been used to Wings International's advantage and not against it.

(c) Costs of operations including **fuel prices, aircraft maintenance, staff compensation, overheads such as landing fees had been rising in the recent years.**

Due to the above reasons, Wings International's venture as a low-cost airline became unviable.

(ii) Wings International plans to foray into offering its service to flyer from smaller cities. This time it has adopted a "differentiation advantage" strategy. It is marketing in the following ways as being different from its competitors:

(a) **Offering a "full service" price** where high quality facilities are provided to the traveller. Facilities offered ranging from on flight meals and entertainment, better seating options, liberal baggage allowance and transfer facility etc. differentiate Wings' airlines from its "low cost, no frills" competitors.
(b) **Ability to offer more connectivity to** flyers as compared to other airlines using its unique "hub-spoke" model. "Wings to fly anywhere, anytime" is a catchy line to present this concept to potential customers.
(c) **Ability to offer vacation packages** due to strategic tie-ups with other airlines and hospitality providers like hotels, car rentals etc.
(d) **Product differentiation can also be made between the road and rail transport providers**. It can be based on relative facilities offered and better connectivity, if not based on relative cost of travel.
(e) Dedicated customer service lines providing support to customers to resolve issues.

Superior quality, customer responsiveness and innovation will enable Wings International to consolidate its position in the industry in the long run.

(iii) Management Control Report – Feed-forward Control Report
Management control is required to set performance measure to determine if the desired objectives of the company are being achieved or not. Control is required at every stage before the activity commences, while the activity is being performed and after the activity has been completed. **Accordingly, control reports generated could be Feed-forward reports (prior), concurrent reports (during) and feedback reports (after).**

When the management of Wings International wants to have a reporting system that enables to take preventive measures, it would need to have a "Feed-forward" control. This control will help measure the error before it actually takes places. Preventive measure can then be taken to change the operational variables to achieve the desired result. Guidelines to implement a "Feed-forward" control are as follows:

(a) **Through planning and analysis is required**. In the case of Wings International, the proposal should be planned and analysed at various levels. The strategy of selection of appropriate routes, "full service" pricing, strategic partnerships, financing the proposal need to be taken at a higher level of management. Decisions relating to flight operations, procurement of supplies like fuel, marketing, human resource planning etc. can be done by the management in charge of operations.

(b) **Careful discrimination must be applied in selecting input variables**. Planning and analysis should be done in an integrated fashion. There should be synergy in the thinking at an operational level and top management strategic level.

(c) **Feed forward mechanism should be kept dynamic**. Wings International should keep a close watch on the government policies and its implementation in the civil aviation sector. Reporting may be done in pre-determined intervals say a monthly feedforward reporting can be decided upon. Changes to plans should be made in a timely fashion to make them relevant.

(d) **A model control system should be developed**. Authority and responsibility for various functions need to be determined and clearly defined while developing this model.

(e) **Data on input variables should be collected regularly**. For example, Changes in fuel prices, which form a large share of expenses, have to be tracked continuously. If the prices are expected to fluctuate widely, hedging options or long term price agreements with suppliers can be considered.

(f) Feed-forward control requires action. At the time of implementation, the control model developed should be followed in order to establish a systematic course of operations.

(iv) Management Control Report – Feedback Control Report

These are control reports that provide feedback about the operations. It tracks the actual results with the budgeted / forecasted results. These reports in themselves do not cause a change in performance. The management has to take timely action to correct the errors and change its operations, if required.

Guideline to implement this reporting system are as follows:

(a) **Feedback report should disclose both accomplishment and responsibility.** As discussed in the feed forward report, Wings International would have already put in place an organizational structure defining individual authority and responsibility. Performance should be tracked accordingly, so that individual performance can be assessed.

(b) Feedback reports should be extracted promptly. **The management has to decide the interval at which these reports need to be generated.** The interval should be such, that changes required can be assessed and action can be taken in a timely manner. In the previous instance, Wings International had given autonomy to the marketing and pricing division to take decisions to meet the competitor's actions. It took five years to determine that the project was unviable. However, a timely reporting mechanism such as a feedback report should have been in place to appraise the top management about the decisions taken. This information would have enabled the top management to make an earlier assessment as to the viability of "no frills" airline.

(c) **Feedback reports should disclose trends and relationships**. Trends could be customer travelling preferences, deals offered by competitors or other changes in flight operations. Relationships could be supplier relationships, customer relationships, strategic partner relationships etc. Information generated from all these areas should be collated in order to provide proper feedback to the management.

(d) **Feedback reports should disclose variations from standards**. These standards could be from financial budgets or from non-financial metrics identified as key performance indicators. For example, delay in flight operations could be a non-financial metric that can be tracked against an expected standard set in the planning stage. The information metric for actual operations should be assessed in the same manner with which the standard was set. For example, a flight delay in operations could be a delay in arrival beyond 15 mins. This same standard should be used to assess actual performance.

(e**) Feedback reports should be in a standardized format**. It should be easily understood and well presented to the management. Facts should be stated without ambiguity and in a standard manner.

6. Beyond Budgeting [Category A]

Magical Stay is a hotel chain that has properties in popular tourist destinations. Each hotel is at least a 50 rooms establishment that has standard, elite and luxury size suites. Currently, the chain has 9 properties spread across World. Magical Stay has its corporate headquarters in Singapore, from where the senior management operate. Operations management executives are based out of each specific property that they cater to. Magical Stay is a public listed company, with majority of its shareholders being institutional investors like mutual funds, banks and insurance companies. Since these investors had a high stake in the company, they had representatives of the board of directors to govern strategic decisions. One of the strategic goals of the company for 2018, was to earn a profit of ₹1,500 million and keep increasing this target by 10% each year. Due to recessionary conditions, business has been volatile. Consequently, senior management is under pressure to meet the targets.

In order to have a defined plan for operations, Magical Stay prepares an annual budget for each of the properties as well as one master budget that consolidates at a company level. There is a separate financial and business analysis team that is in charge of this exercise. Key assumptions and future expected trends

are discussed at with the operations management of each property. After incorporating the corporate headquarters numbers, the consolidated budget is presented to the senior management for approval. In order to have a uniform policy across locations, key metrics like room rent per day, material procurement for kitchen and rooms, employee hiring, capital investments at each property, advertising and promotional activities are handled directly by the corporate headquarters.

The management at each location is responsible to ensure smooth operations of the hotel chain by implementing these policies. The manager of each hotel property is given a target in terms of revenue to be generated, room occupancy and profit to be achieved. Therefore, the management at each location is also under pressure to perform and meet the target set by the senior management. In the past, if the target had not been met for couple of years, the senior management had closed down the hotel and exited the property. At the same time, best performers are given more liberal budgets to operate on. Hence, competition between various locations has always been fierce. There are constant negotiations for been given a "reasonable / practical target" that has to be achieved.

Monthly meetings are scheduled with the corporate office to explain variance of results from the budget. The recent monthly results have shown that 7 of the 9 properties have consistently not been able to meet the targets in the past six months. The situation is confounded because the tourism industry has been affected greatly by recessionary trends in the global economy. Therefore, the footfalls at the regular tourist places, where the hotel has properties, have reduced considerably. In some places occupancy during peak season has only been 60%. Therefore, operations are bleak and uncertain. At these meetings, the operations management argue that due to this dynamic scenario, the budgeted targets set become obscure since they are not based on the current circumstances.

The corporate office has met with the operations management at each of these properties in order to understand the situation better. Discussions have taken place about how the business can be improved. Few of the suggestions to improve performance are:
(1) When the hotel is not fully booked, especially during off-season, give manager at each property the authority to rent out rooms at an attractive discount. These opportunities have to encased quickly, therefore the decision about the rate would be better handled by the personnel at the hotel. A guideline on the discount policy can be worked out with the corporate office. This will ensure that room occupancy rates increase, while earning reasonable return.
(2) Allow for procurement of kitchen supplies locally, rather than buying it only from specified authorized vendors. Not only will this be cheaper, it also allows for moderate flexibility with the kitchen menu that can cater to customer demands based on current availability of supplies. Prior approvals can be taken by the management from the quality control department to ensure that customer satisfaction does not suffer.
(3) A monthly reward and recognition program for employees, based on their service record for the month. Recommendations can be from fellow employees or the location manager.
(4) Allow the location management autonomy, with a reasonable budget to cater to purchasing equipment. In order to address certain urgent requirements or repairs, quick response from the operations management is needed. The current process of getting approval the corporate office is cumbersome since it takes a longer time. Autonomy can help address these issues quickly without much damage done to customer satisfaction. Funding can be quickly procured from banks if required.

Based on these discussions, the senior management has decided to decentralize all of the above decisions. As a pilot project, they have decided against preparing a line-wise detailed budget (sales budgets, operations cost budgets, advertising etc.) for each location. Instead the operations management will be given clear targets at each of the locations regarding the key profitability ratios, liquidity ratios and leverage ratios, as also guidelines on market share, quality and customer satisfaction. These benchmarks have been finalized based on industry research of peer group companies. However, the managers have the autonomy to achieve the expected target based on their individual business scenarios at each location. The focus is therefore not on achieving budget numbers that have been finalized. Instead management gets growth targets to achieve.

One year after implementing this decision, it was found that company was able to meet the shareholders' expectations, have a robust growth and an energetic employee morale.

Required

(i) DISCUSS the traditional budgeting process had a negative impact on Magical Stay's operations.
(ii) EXPLAIN the philosophy behind "growth based targets" instead of "budget based targets".

Answer:

(i) Magical Stay is operating in a business scenario **that is highly competitive and dynamic**. Focus of the traditional budget was driven towards achievement of the company's strategic goal, which was profit target of Rs.1,500 million for the year 2018. **Accordingly, the senior management followed a top-down approach to budgeting. Most important policy decisions like room rent per day, material procurement, employee hiring, capital investments at each property, advertising and promotional activities are handled directly by the corporate headquarters**. Management in charge of operations at each location only implement it. In a changing business scenario, this budgeting methodology has the following shortcomings:

(a) **Budgets based on these policies may not be flexible** enough in a fast-changing business environment. Although it is based on assumptions and expectations of the management has made about the business growth, in a dynamic scenario, it is very difficult to predict the future accurately. Therefore, targets or benchmarks set by the traditional budgets may become outdated quickly.

(b) These budgets were based on business functions like sales, advertising, operations etc. While a strategy for these functions is important, they are based on internal benchmarks and assumptions made by the management. **However, for the company to be flexible in a changing environment, the focus should also be on external factors.**

(c) The management aims to make a yearly profit that is 10% more than the previous year's profit. **If previous year profit alone is the benchmark for growth, certain decisions may be shelved because they may decrease current year's profits below target**. However, had these decisions been implemented they may have generated value in the long term and ultimately may have been better for earning profits in future years. For example, certain capital expenditures that may need to be undertaken quickly in order to improve customer satisfaction, may not be incurred at all simply because there is no budget for it.

(d) **Operations management did not have much autonomy since policies were controlled at the corporate headquarters**. At the same time, they were responsible for achieving the targets set out as per the budget. Responsibility without authority creates a negative working environment. Consequently, it might be difficult to retain talented personnel.

(e) In order to meet budget targets, **managers may try to negotiate for lower sales targets to achieve, more budget allocations to meet costs etc. This does not foster positive business growth**. Managers are more intent in meeting targets rather than focusing on business growth. It leads to lower sales than can otherwise be achieved and leads to protection of costs rather than working towards lowering operational costs.

It can be concluded that the traditional budgeting process was more inward looking. Focus is on achieving budget target rather than implementing strategies that can create more value to the company.

(ii) Following feedback from operations managers, **the management given them targets based on growth instead those based on the budget alone. This is the philosophy of "beyond budgeting".** Below are features of this philosophy that has enabled Magical Stay to achieve better results:

(a) It is a **more decentralized and participative way of operating a business**. Rather than being made responsible for business decisions, which were not in their control, the employees delegated responsibility, combined with the necessary authority to execute decisions.

(b) Operations management and the personnel at each location are capable of **quickly adapting to changing market scenarios**. Likewise, since they interact with the customers directly, it enables them to make quicker decisions to ensure customer satisfaction or identify opportunities to generate more revenue.

(c) Targets are based on **performance of peer group companies**. Benchmarks based on peer group performance will be unbiased and reflects the current business scenario better. Due to this, customer's needs and satisfaction automatically gets priority. It is the customers who ultimately drive business growth. Therefore, rather than having an inward-looking outlook, focus is shifted to the external market conditions. Due to autonomy, managers at various locations need not compete with each other for budget allocation. This channelizes the operational focus to meet challenges from outside competitors rather than having detrimental competition within the organization. At the same time, the targets for the company are also based on guidelines from the corporate office. Therefore, there is congregation of goals with the shareholders' expectations.

(d) **Employee morale is also boosted** due to the monthly reward and recognition system. It fosters healthy competition among employees.

Since the focus is on growth, beyond budgeting can be a way of achieving better results in challenging business environment.

7. Control through standard costing system [Category A]

'HAL' is a manufacturer, retailer, and installer of Cassette Type Split AC for industrial buyers. It started business in 2001 and its market segment has been low to medium level groups. Until recently, its business model has been based on selling high volumes of a standard AC, brand name 'Summer', with a very limited degree of customer choice, at low profit margins. 'HAL''s current control system is focused exclusively on the efficiency of its manufacturing process and it reports monthly on the following variances: material price, material usage and manufacturing labour efficiency. 'HAL' uses standard costing for its manufacturing operations. In 2018, 'HAL' employs 20 teams, each of which is required to install one of its 'Summer' AC per day for 350 days a year. The average revenue per 'Summer' AC installed is Rs.36,000. 'HAL' would like to maintain this side of its business at the current level. The 'Summer' installation teams are paid a basic wage which is supplemented by a bonus for every AC they install over the yearly target of 350. The teams make their own arrangements for each installation and some teams work seven days a week, and up to 12 hours a day, to increase their earnings. 'HAL' usually receives one minor complaint each time a 'Summer' AC is installed and a major complaint for 10% of the 'Summer' AC installations.

In 2016, 'HAL' had launched a new AC, brand name 'Summer-Cool'. This AC is aimed at high level corporates and it offers a very large degree of choice for the customer and the use of the highest standards of materials, appliances, and installation. 'HAL' would like to grow this side of its business. A 'Summer-Cool' AC retails for a minimum of Rs.1,00,000 to a maximum of Rs.5,00,000. The retail price includes installation. In 2017 the average revenue for each 'Summer-Cool' AC installed was Rs.3,00,000. Currently, 'HAL' has 7 teams of 'Summer-Cool' AC installers and they can install up to 240 AC a year per team. These teams are paid salaries without a bonus element.

'HAL' has never received a complaint about a 'Summer-Cool' AC installation. 'HAL''s business is generated from repeat orders, recommendations, and local press advertising. It employs three sales executives who earn an annual salary of Rs.3,00,000 each. It offers a six-month money back guarantee and this has to be fulfilled for 1% of its installations. 'HAL' has always been in profits but was shocked to see that in its results in 2017 it only earned 0.2% net profit on its turnover.

Required

(i) EVALUATE the appropriateness of 'HAL''s current control system.
(ii) RECOMMEND four Critical Success Factors (CSFs) which could assist 'HAL' in achieving future success.
(iii) ADVISE 'HAL' about the changes it could implement in its standard costing and reporting system to achieve improved control.

Answer:

(i) HAL's Control System HAL's current control system is **'focused exclusively' on the manufacturing process and its efficiency even though HAL is also a retailer and installer of industrial ACs**. It is suitable for HAL's control system to monitor manufacturing efficiency with the help of the three variances: material usage, material price and manufacturing labour efficiency. **No reasons have been given for focusing on**

these three variances and there may be other variances which can provide useful control information that are not currently computed for example, labour rate and material yield. Although HAL uses standard costing, it is unclear whether it calculates product costs. A lack of product costs computation may be the reason that it was shocked about its 2017 profit margin. **Standard costing could be in criticism for misdirecting management's attention. Thus, in the case of a 'SummerCool' AC where the highest standards of materials are used, it is pertinent that the quality of the finished product is not compromised.** Therefore, it might be proper to accept an unfavorable material price variance to maintain the product's standards. Variance analysis should not be done in isolation but a holistic view needs to be taken about HAL's operations and the current control system may not lead to this. HAL is not currently controlling and monitoring aspects which are important for competitive success. HAL's Critical Success Factors have not been identified yet. There is monthly reporting of variances but in addition to this, there should also be follow-up actions for outcome resulting from these reports. However, a month is not inevitably the relevant reporting period for all aspects of HAL's business. If there is a production problem leading to excessive materials wastages, a month is too long time to wait before remedial action are taken. **Therefore, real-time or coexistent reporting may be more relevant for manufacturing operations. A major deficiency of HAL's control systems is that they do not extend to retailing and installation activities. The 'Summer' installation teams are incentivized to complete ACs which could be good for their productivity.** However, there is a high level of complaints associated with their work. As there is no evident means of monitoring the installation team's work, the reasons of the complaints cannot be identified

(ii) **Critical Success Factors (CSF) are elements tied to the strategy of business and they represent objectives that business is trying to achieve, as a corporation, as a department or as a business unit.** Critical success factors may vary over time and may include items like employee attitudes, manufacturing flexibility etc. There are a range of CSF's which could be appropriate for HAL. They include:

CSF: Installations Quality There are different quality expectations for the two ACs and there have been different levels of quality achieved, can be seen in the historic pattern of complaints. This strongly implies that the quality of installation should be tracked as a separate CSF for each AC. This CSF is important for HAL due to cost implications of rectifications and guarantee claims. It is also important to consider that because of the effect that poor quality will have on HAL's future business.

CSF: Customer Satisfaction Like quality, this CSF will need to be monitored separately for each AC. Customer satisfaction encompass the complete life of a transaction beginning with the initial enquiry about a purchase and continuing after installation for the life of the AC. Customer satisfaction will have an influence on HAL's future business which is dependent, in part, on repeat orders and recommendations. This CSF will also show the market's view of HAL's brand.

CSF: Brand Performance HAL has two distinct brands. They are directed at different market segments and have different associated attributes. 'Summer' ACs offer limited choice to the customer and retail, on average, for Rs.36,000. HAL would like to maintain this business at its present level (7,000 ACs a year minimum) Rs.252 million revenue. HAL needs to ascertain where this brand is situated in its life-cycle and what marketing activities may be required to support it. The 'Summer-Cool' brand is aimed at a different market segment and HAL would like to grow this aspect of its business which produces revenue of Rs.504 million. The success of both brands is important for the continual success of HAL and this CSF indicate a complete view of performance.

CSF: Manufacturing Excellence HAL manufactures all the ACs which it sells and installs. Manufacturing must be a substantial part of HAL's total costs and a significant contributor to profitability. Currently, HAL monitors some limited aspects of manufacturing through its control system. However, there are many other aspects which have not been reported upon, for example- innovation, labour abseentism, manufacturing flexibility and investment in technology. This CSF is much broader than the current control system. It also assists in searching for competitiveness.

(iii) Standard Costing and Reporting System HAL may be required to abandon or modify its standard costing and reporting system. **The rationale behind this is that the current control system might lead to an inappropriate emphasis being placed on certain aspects of performance.** It is noteworthy that the

installations for 'Summer' AC is causing a substantial level of complaints whereas there has never been a complaint made about a 'Summer Cool' AC. It could be that the different remuneration arrangements for the ACs' installation teams have led to this and as the complaint level is an important aspect of the CSF i.e. Customer Satisfaction, HAL may need to modify its remuneration arrangements. **It should also reckon whether it would be benefited from a broader range of variance reporting, for example, it may find reporting useful to report on labour rates and material yield. For all CSFs, HAL will need to determine the appropriate reporting intervals. Although it is useful to synchronize this with the accounting reporting cycle, CSFs and KPIs do not necessarily coexist with accounting period ends.** Some KPI's may require to be reported in real-time, for example, material wastage, others may be of a longer duration like Customer Satisfaction. There is a strong argument for disassociation of the CSFs reporting from the financial reporting cycles.

8. Value Chain/Product Life Cycle/Outsourcing (Category A – Nov 2019 RTP)

Staywell Hotels was established 10 years ago as a budget hotel in the vicinity of Mumbai airport. It provides accommodation for cost-conscious travelers visiting the city for short stay lasting a day or two. Typically, a room would provide comfortable beds, high speed internet connection, air conditioning facility, coffee machine, fridge and free television service. Food service based on a limited menu is provided on the premises. It has few conference rooms that provide space for guests to hold business meetings. This saves them precious time otherwise wasted in travelling on congested city roads. The hotel provides free shuttle service to and from the airport at specific times during the entire day. Hotel's proximity to the airport, the free shuttle service and convenience of conducting work at the conference rooms have been marketed to attract guests to stay here. The guests also comprise of people who are in transit between airports. Also, when there are longduration delays in flight operations due to which passengers need to be provided overnight accommodation, few airline operators host their guests here. Like all other guests, these airline operators are also interested in Staywell for its location and low-cost room rental.

Over the past decade, management of Staywell has ploughed in profits from this establishment to acquire similar properties in other major cities. They function based on business model similar to the original establishment in Mumbai. All of them are now functioning as well-established budget hotels near city airports for cost-conscious business travelers. In all, Staywell hotels have 18 properties spread over 15 cities. To keep its costs of operations within control, Staywell hotels has outsourced its cleaning and food service to specialized vendors. Cleaning service includes cleaning of kitchen crockery, bedding, laundry and housekeeping of premises. The entire set of activities related to preparation of food has been outsourced. Vendor service has been satisfactory, barring few instances where guests have complained of unhygienic rooms or non-palatable food service. However, due to high guest volume and quick turnover of guests due to short stay periods, this has never been a hindrance to business.

This business model has been profitable since its establishment. Staywell Hotels has a sizeable market share in this segment. Competition has increased in the recent past. Price wars have put pressure on profit margins in this segment. The management plans to continue to operate in this segment to maintain its market presence. At the same time, to sustain business in the long term, the management of Staywell Hotels now wants to foray into developing properties for luxury resorts. Target guest segment are vacationing tourists interested in an enjoying a laid-back time in scenic places. These guests would not mind paying premium for availing good quality service.

Required

(i) IDENTIFY and EXPLAIN the various primary activities of Staywell in its value chain.
(ii) IDENTIFY and EXPLAIN the stage of product life-cycle.
(iii) EVALUATE the risks of outsourcing cleaning and food services for the luxury resort properties.

Answer:

(i) The five Primary Activities of Michael Porter's Value Chain Model

Inbound Logistics

Activities related to receiving, handling of materials from the supplier and their storage until further use later in operations. In the case of Staywell Hotels, **materials would include food service received from the vendor. This needs to be stored and maintained properly until the item is ordered by the guest. Similarly, the vendor delivering freshly laundered crockery, bedding and laundry would be materials that need to be stored until their use to serve the guests**. These are inbound logistics for the hotel.

Operations
Activities related to converting inputs into production of output or service. In the case of Staywell Hotels, **operations would include maintenance of hotel premises including guest rooms, conference rooms and common area**. Activities related to ensuring cleanliness and safety of rooms, working order of facilities offered like TV and internet service, coffee machines, shuttle service are part of hotels operations.

Outbound Logistics
Storage and movement of the end product from the production line to the customer. In the case of Staywell Hotels, **it includes activities such as maintaining "nonsmoking" rooms as such, so that when the customer finally uses it comes across as a "non-smoking" room. Likewise, the food should be prepared in a professional manner, stored in such a way that it ensures customer satisfaction and safety**. Therefore, the review of food items to remove the ones past expiry would be part of Outbound Logistics. Therefore, any activity relating to making sure that the guests get what they have ordered for, would be part of outbound logistics.

Marketing and Sales
The activities related to communicating, selling, and delivering the product or service to the customer. In the case of Staywell Hotels, **advertising its properties to the cost and time conscious traveller would be a marketing activity**. Free shuttle service is a promotional activity to attract guests. Any agreement with airline companies to accommodate guests would also form part of this activity.

Service
All types of service such as after sale service, handling customer complaints, customer support, training etc. In the case of Staywell, **service is one of the most important activities in their value chain model. Good service ensures happy guests. Therefore, all activities from front-desk, room service, catering, repair services, shuttle service would be included here**. All employees have to trained to handle needs of the guests in an effective and efficient manner.

(ii) Product Life-cycle Stage of Staywell Hotels
"Budget Accommodation" to the cost and time conscious traveller is the current product offering of Staywell Hotels. Starting out with a single establishment, Staywell Hotels ploughed in profits to expand its business offering to other cities as well. The product has been well established in the past decade. Competition is intense indicating similar offering by rivals. Price wars have put pressure on profit margins. Staywell Hotels plans to continue in this segment due to its sizeable market share. **This information indicates that Staywell Hotels is in the maturity stage of its product lifecycle. It has a well-established product, with a sizeable market share at the same time it is now facing competition. Business has hit a plateau. Hence, Staywell Hotels needs to improve its product offering to beat competition**. The management's plans to foray into luxury resort business is an indication of its future plans to sustain business.

(iii) Risks of Outsourcing Cleaning and Food Service under the Luxury Resort Model
Staywell Hotels is a budget accommodation provider to the cost and time conscious traveller. **Primary feature of this model is "value for money"**. To remain profitable the cleaning and food service has been outsourced, which enables Staywell Hotels to keep the costs of operation low. **There have been instances of dis-satisfaction among guests as regards quality of cleaning and food service. However, since the turnover of guests is quick due to high volume and short stay period, it has not negatively impacted business.**

In the luxury resort business, **the target guests are travellers on leisure. The primary feature of this model would be "good quality of service".** Maintaining cleanliness of premises and food service are critical activities in the operation of luxury hotels. Therefore, customer satisfaction on these metrics is paramount to sustain and grow business. **With the ability to post reviews online on booking portals, any negative review (whether justified or not) can reach very easily to a large number of potential guests. This can negatively impact future business**. Hence, Staywell Hotels has to ensure that the quality of service that it provides in terms of cleanliness and food should meet and beat the guest's expectation.

Outsourcing these services to well established vendors is advantageous since the focus can remain on improving guest experience. It may also be cost advantageous in many cases. However, there a number of risks in this model. **Detailed service level agreements need to be drawn up to ensure that the required quality of service is being provided**. Staywell Hotels should be able to monitor the performance of these vendors. In cases of non-delivery of the required level of service, the agreement should provide for means of redressal. This could vary from compensation for any loss in business to immediate termination of service. Staywell Hotels should ensure that it can easily and economically switch service providers if required. For this it has to identify alternate vendors who can provide the same level of service as the current ones. **The other risk in outsourcing could be of instances where well performing vendors could go bankrupt and shut shop**. In such cases, Staywell Hotel's operations could be immediately impacted since such services can no longer be availed from these vendors. Again, list of alternate service providers is a necessary back-up that the hotel should have.

Alternatively, since these are very critical activities to business operations, Staywell Hotels may choose to have complete control over them. This can be achieved by having in-house departments that cater to cleanliness and food service. Control over factors such as input material used, the performance of service, equipment used, training of staff and other essential activities can ensure that the required service quality can be achieved. Better service enhances guest experience. Compared to outsourcing, this might be a costlier option. However, since the guests are ready to pay a premium for service quality, within reasonable limits cost need not be a primary concern for Staywell Hotels for this business model.

9. **Value Chain Analysis/Performance Prism (Category A – May 2019(exam)**

Audio Tech is a company that designs, develops and sells audio equipments. Audio Tech is best known for its home audio systems and speakers, noise cancelling headphones, professional audio systems and automobile audio systems.

Audio Tech sells audio equipments to consumers through its large network of retail outlets in its home country and via the company's website.

Audio Tech purchases the materials and components that it needs to manufacture audio equipments from a number of different suppliers. All of the purchases are delivered to a company's godown at its factory and are held there until they are needed for production and assembling.

Finished products are transported from the factory to Audio Tech's retail outlets by company's own trucks. The trucks follow the same schedule each week irrespective of the load they are carrying. Audio equipments that are required for sale via the company's website are transported to Audio Tech's distribution centre.

The company believes that it can attract more customers by offering quality products at reasonable prices. Each unit is tested for quality with a real time analyzer ipad app and a calibrated microphone to measure how consistently each sound system reproduced various frequencies. A bass-test sweep tone allows checking how well the subwoofer managed low-end frequencies.

Finally, they drive each in cars briefly to see how sound quality changes while on the move.

The company aims to build customer loyalty also through high level of customer services and value chain analysis. The customers can return the product if quality specifications are not met. There is a separate department to handle such complaints.

Audio Tech had implemented Balanced Scorecard as a performance measurement and management system. Company has been doing great on financial parameters and customer satisfaction parameters. Market capitalization of the company has been increased considerably over the years.

Of late, the company has witnessed high employee turnover ratio. Though the company has a formal exit interview process for the resigning employees, the input received from these interviews is rarely considered in improving HR practices. One of the common feedbacks from employees was that working

hours are too long and they have to frequently work on weekends also and there is so much pressure to improve customer service without adequate support of system and processes. Also the truck drivers have been on strike thrice in the last one year demanding better pay, retirement benefits and good working conditions.

Audio Tech is keen to address the above issues and recently held a meeting to discuss the performance of the company. The Management Accountant suggested to the Managing Director to use an alternative performance measurement mechanism which considers all the stakeholders instead of just shareholders and customers. The Managing Director is skeptical of the Management Accountant's suggestions and is unclear as to whether they are suitable for the company or not. Therefore, the company seeks your assistance.

Required

(i) IDENTIFY and EXPLAIN the various primary activities of Audio Tech in its value chain. Also SUGGEST, if there is any scope for cost reduction in these activities.

(ii) RECOMMEND an alternative performance measurement mechanism which considers all stakeholders instead of just shareholders and customers. Also INDICATE the performance measures as applicable to the situations of Audio Tech in the alternative mechanism suggested by you.

Answer:

(i) The Various Primary Activities of Audio Tech in its Value Chain Analysis

Michael Porter describes the value chain as **"internal processes or activities a company performs to design, produce, market, deliver and support its product.**" Rather than looking at costs as per accounting cost pools, the value chain model focuses on the work flow of an organization in the form of discrete set of activities that are linked to each other. The value chain model is a generic model that examines activities as Primary Activities and Secondary Activities. Passing through each activity, the product or service gains some value. **The idea is to (a) eliminate non-value adding activities and (b) identify product differentiating or cost leadership opportunities among the value adding activities.**

Individual activities reflect the company's strategy, implementation of its strategy and underlying economics of the activities themselves.

- **Profit margin for the company = Value created less the cost of creating that value**

Primary activities are those activities that enable inputs (raw material) to be transformed into output (finished goods) or in the provision of service. Primary activities as per Porter's model are:

Inbound Logistics

Activities related to receiving, storing and distributing the inputs (raw materials) to the production process. **Audio Tech has its materials and components needed to manufacture audio equipment delivered to its godown at the factory premises**. These materials are stored until needed for production and assembling at the factory. These are the inbound logistics related activities.

Operations

Activities involved in transforming raw materials into final products. **These would include machining, packaging, testing and equipment maintenance.** Audio Tech's work flow activities related to manufacturing of the audio equipment and components need to be considered here. In addition, the testing of equipment using ipad application, bass sweep test as also sound quality check after assembly into the car, are operations related activities.

Outbound Logistics

Activities involved in collecting, storing and distributing the products from the assembly line to the end user customers. **This includes finished goods warehousing, delivery vehicle operation, order processing and scheduling.**

Some of the activities that would be classified here are:

(a) **Storage** of Audio Tech's finished goods within factory premises and at its distribution centre.

(b) **Scheduling and dispatch** of goods using trucks to retail outlets and distribution centres.

(c) Activities related to **order taking from retail outlets as well as direct orders** on the company's website

Marketing and Sales

Activities such as advertising, promotion, distribution channel selection, sales force management, pricing policy and such other activities that make the customer aware of the product would be listed here. All of Audio Tech's activities that relate to the above list of activities **whereby it aims to spread customer awareness would be classified here. It aims to build customer loyalty by offering quality products**. Service Activities related to after sales service such as installation, repair and part replacement would be classified here. Audio Tech has a separate department to handle customer complaints. Customers can return the product if quality specifications are not met. Also, any activity relating to after sale service would be classified here

Below are certain measures that Audio Tech can implement to Reduce Costs

(a) Just in Time raw material procurement system: Procure input materials and components only when needed for production and handling. This would reduce inventory holding costs. Less inventory on hand could also result in savings in storage and material insurance costs. Before implementation, the company needs to consider the risk of loss incurred on account of stock-outs. It needs to develop close relationships with its suppliers to ensure streamlined delivery of inputs. At the same time inputs should meet the required quality standards

(b) Company's trucks deliver the finished goods to retail outlets as per a fixed schedule each week, irrespective of the load they carry. This indicates that there may be possibilities of dis-economies of cost. **If there is a pile up of inventory due to lesser number of truck delivery runs, it could lead to high inventory holding cost. Conversely, if delivery runs are scheduled even if the trucks are not loaded to full capacity, diseconomies of delivery cost would creep** in. Therefore, the production and truck delivery schedule should be streamlined efficiently and economically.

(c) Audio Tech lays importance in the quality of the product to ensure customer satisfaction. **Lower the defects higher the customer satisfaction. It has extensive testing and inspection processes in place. This preventive step should be assessed to find out if it is effective in reducing the cost of poor quality – internal failure cost as well as external failure costs**. Internal failure costs (repair, scrap, rework) are associated with defects found after the production but before delivery to the customer. This can be avoided, if quality inspection is done throughout the production work-flow rather than just at the end of production. External failure costs (repairs and servicing, sale returns, warranty claims, complaints) are incurred when the customer finds the product defective and returns it. External failure costs can severely impact customer loyalty and should be minimized. **Therefore, Audio Tech should invest in preventive and appraisal costs to ensure good quality in order to balance out the cost of poor quality**. Preventive costs would include quality planning and assurance, error proofing quality improvements, education and training. Appraisal costs could be inspection, quality audits, supplier rating etc. Total Quality Management (TQM) and Six Sigma could be effective tools to ensure efficient good quality production that would minimize cost of poor quality

(ii) Alternate Performance Measurement Mechanism considering all Stakeholders

Audio Tech uses Balanced Scorecard to measure performance. **Balanced Scorecard focuses on the financial, customer, business, and innovation perspectives**. It is given that the company is doing well on financial and customer satisfaction parameters. Market capitalization has also increased over the years, the company is on a growth trajectory. However, the company is facing issues in the form of high employee turnover and dissatisfaction among truck drivers who deliver the goods.

An alternate performance measurement mechanism can be Performance Prism. This is a second-generation performance management framework conceptualized by Andy Neely and Chris Adams. The reasons why it would be an effective replacement for models like Balanced Scorecard are:

(a) **Balanced scorecard focuses on just two of the stakeholders – Investors and Customers**. Performance measurement of other stakeholders like employees, suppliers, government etc. have not been considered. The other stakeholders play an important role in the growth of the company's business. Hence, performance measures are needed to monitor both their contribution to the company as well as their overall satisfaction with the company.

(b) **Most of the performance measurement models do not focus on the changes that need to be made to strategies and processes**. Balanced Scorecard assumes that once the strategies are implemented, measuring a relevant set of metrics of performance will ensure that the rest of the business also functions properly. However, this is not true. In the case of Audio Tech, both customers and shareholders are happy with the company's performance. Yet even in a growing business, the drivers of growth, namely other stakeholders like employees and suppliers are not satisfied. Neither is their contribution nor their satisfaction is captured under the Balanced Scorecard performance measurement.

(c) **A company has a "Quid Pro Quo" relationship with all its stakeholders. Stakeholders contribute to the company's business while they also derive benefits from it**. For example, employees perform their functions well, this is their contribution to Audio Tech's growth. In return, employees would want good working condition and pay to remain motivated and loyal to the company.
Therefore, Performance Prism can be an alternate performance measurement mechanism that considers metrics related to a broader set of stakeholders of an organization, not limited to just customers and shareholders alone

Five Interrelated Facets of the Performance Prism
Stakeholder Satisfaction: "Identify the organizations set of stakeholders and their needs" Unlike a balanced scorecard, the performance prism focuses on all the stakeholders of a company. Audio Tech has satisfied investors and customers, but dissatisfied employees and truck operators. The company must likewise identify all its stakeholders and determine the relative importance of each of the stakeholders. It can use Mendelow's Matrix to identify key shareholders in terms of power and interest of stakeholders. A stakeholder group with higher power and high interest (say a trade union) must be kept satisfied. The main stakeholders of a company are:

- Investors - They want return on investment.
- Customers - They want good quality products at reasonable prices.
- Suppliers - They want better price for procurements or service.
- Government - They want revenues and development.
- Society at large - They want employment opportunities.

After identification of the stakeholders, the company must identify the requirement of each of the stakeholder group. What must the company do to ensure stakeholder satisfaction? Audio Tech has to ensure that it improves employee satisfaction in order to reduce its employee turnover. It should also address the issues faced by truck drivers and involve them in a dialogue. If they are not satisfied, the company might suffer financially in the longer run.

Performance Measure: Employee turnover ratio, average employment duration of employees, number of strikes by truck drivers etc

Stakeholder Contribution: "What the organization expect the stakeholders to contribute and deliver?" In the second facet, the company has to identify the contribution required from each stakeholder group and must define ways to measure contribution of stakeholders. In turn the company will have something to offer the stakeholders. **This is the "Quid Pro Quo" relationship**. For example, Audio Tech provides quality products to its customers. The customers in turn contribute towards the profits of the company, they pay a price for the value Audio Tech offers.
Audio Tech should provide for better working conditions to its employees. Motivated employees will perform better and remain loyal to the company. They would drive the growth of the company. Similarly, dialogue with truck drivers would be needed to provide better pay, retirement benefits and good working conditions. Truck drivers in turn need to ensure timely and safe delivery of goods to retail outlets.

Performance Measure: Efficiency of employees, productivity, on time delivery by truck drivers

Strategies: "What strategies should an organization adopt that derives stakeholder contribution while reciprocating by ensuring their satisfaction?" The organization should identify strategies that ensure that:

- The wants and needs of the stakeholders are satisfied.
- Stakeholders contribute to the organizations objectives.

Performance measures must be put in place to confirm that the strategies are working. Effective implementation depends on appropriate communication of strategies, implementation by managers and continuous evaluation of appropriateness of strategies. **Audio Tech has to roll out strategies to retain employees by means of better pay, working conditions and growth opportunities within the company**. The strategy will be effective when the employee turnover is reduced following these initiatives. Similarly, the issues faced by truck drivers need to be addressed by taking appropriate strategic decisions. The absence of strikes will indicate that these decisions have been effective.

Performance Measures: Employee turnover after implementation of new strategy, efficiency of deliveries after issues with truck drivers have been resolved

Processes: "What are the necessary processes to satisfy the above strategies?"

Processes ensure successful implementation of strategies. Each process could have subprocess. Process owners have to be identified to assign responsibility of functioning of the process. Processes require continuous evaluation. Instead of evaluating all at once, the company has to identify important processes that are critical to the business. **Porter's Value Chain Analysis can be used to identify and evaluate various processes in the organization. Audio Tech should have well defined processes to hire appropriately skilled personnel for the job, transparent pay structure etc**. This process may be owned by the Human Resource Manager. The working condition of truck drivers can be improved by providing sufficient training and better working conditions.

Performance Measures: Number of personnel hired at various skill levels, average payout for each of these skilled groups, hours of employee training, maintenance log of trucks etc.

Capabilities: "What resources should an organization need to effectively operate these processes?"

The company must have the right capabilities in order to support the process. **Capabilities could include resources, technology, and infrastructure for a particular process to work**. Audio Tech may decide to increase pay/salaries, however it should have sufficient financial resources to make these payments.

Performance Measures: Amount spent of new recruitments and training etc.

Conclusion

"Manage these interlinked facets to cater to all stakeholders" While meeting targets as defined by performance measures should be emphasized, the performance measurement system should be dynamic and flexible to allow the stakeholders to voice their opinions and expectations as well. Taking their requirements into consideration, along with managing capabilities and processes, Audio Tech can implement effective strategies that will cater to the needs of all stakeholders.

10. **SIX SIGMA and Transfer Pricing (Category A – May 2019(exam)**

CPT Limited manufactures furniture made of MDF board for domestic use and plywood for commercial use. It has three divisions – Furniture Division, Plywood Division and Retail Division.

The furniture division purchases raw materials from external suppliers and performs all manufacturing and packaging operations. All sales of furniture are made through retail division which has 120 retail stores in India as well as through its own website. Furniture is sold in boxes for customers to assemble themselves. About 20% of the furniture sold by CPT limited is purchased already packaged from other manufacturers. All deliveries are outsourced through a third-party distribution company.

CPT Limited's objective is to maximize shareholders' wealth by producing new model functional furniture and plywood board at low cost. The CEO is concerned about increasing levels of returns of furniture made by the customers and increasing number of customers complaining on online forums about furniture purchased from CPT Limited. Not a single case of return of plywood board was reported in past three years.

Considering the impact of returns of its products, the CEO has approached you as a performance management expert to help the company in implementation of six sigma technique to reduce the number

of products returned and define customers' requirements and measure existing performance of the company.

A team of managers has been recently trained in six Sigma. The returns data are compiled every six months along with the key performance indicators (KPIs) for customer satisfaction. The last compilation indicates that 92% of customers were satisfied with the manufacturing quality of furniture.

The following reasons are given by customers while returning furniture:

Category	Reasons for return of Furniture	% Responses
1	Difficult to assemble or parts missing	48%
2	Goods arrived damaged	13%
3	Goods were not as described or were defective	27%
4	Goods were of poor quality or no longer wanted	10%
5	Arrived late	2%
	Total	100%

Since last year the plywood division has also started to manufacture MDF board on pilot project basis in small quantity. Based on the feedback from the market the management of CPT Limited decided to manufacture MDF board at large scale in plywood division in the forthcoming year. CEO has also decided that for manufacture of Furniture, MDF boards should be purchased from plywood division.

Details of Furniture and Plywood Divisions are given below:

Furniture Division:

35,000 MDF boards of standard size will be needed in the next year. External suppliers could supply at Rs.800 each.

Plywood Division:

It has the capacity to produce a total of 60,000 MDF boards of standard size per year. Budgeted details for the forthcoming year are as follows:

- Budgeted sales volume – 60,000 units
- Selling price per unit of external sale – Rs.850
- Variable cost per unit of external sale – Rs.770

The variable cost per unit will be Rs.20 per unit lower in case of internal sale, due to cost saving in distribution and packaging. Maximum external demand for MDF boards is 30,000 units per year.

Required:

I. Advise the CEO how six sigma could be implemented using DMAIC methodology so as to reduce sales returns from customers (10 Marks)
II. Advise with the help of suitable calculations, the number of MDF boards that plywood division should internally supply to furniture division in order to maximize the group profit (6 Marks)
III. Recommend the transfer price at which the internal sales should be made (4 Marks)

Answer:

Part 1:

The DMAIC process is a technique used to implement six-sigma to improve existing processes and is split into five phases as described below.

- **Define the process:** The CEO is concerned that the increase in returns from customers is increasing costs and threatens to affect the company's brand. **Six sigma focuses closely on the requirements of the customer and it is important to be clear exactly what customers' requirements are and, in this case, specifically why products are returned**. Customers will expect certain minimum requirements from the manufacturing and packaging process. Customers' perceptions of quality should correspond to the price paid, though different customers will have different expectations of this.
- **Measure the existing process:** The **current returns figures do give some data to as to why products are returned, but its usefulness is limited as it is unclear which of the categories relates to defective manufacture, and which relate to activities of other divisions**. The ambiguity of the data and category definitions will need addressing to enable the process to be measured effectively.

Returns in Category 1 could be because the goods were not manufactured or packed properly in the manufacturing division, but could also be due to poor design, customers losing components or simply being unable to assemble furniture. Damaged goods in Category 2 probably do not arise because of defective manufacturing either, though customers may wrongly categorise defective goods as damaged. For the other categories it is less clear. Though goods may become damaged by the distribution company, it seems that only a small number of returns relate directly to them. Returns in Categories 3 and 4 could be due to defective manufacture or if the customer had simply changed their minds and no longer wanted the product. In Category 3, the identification of 'defective' items is too broad. Returns in Category 5 which arrived late are clearly not due to manufacturing defects and as this causes only 2% of returns, is relatively insignificant. Currently 20% of company's sales are of products from other manufacturers. There is no indication from the data given how many of the returns relate to these products, nor of the total number of returns relative to the number of items sold. Therefore, the existing data are insufficient to reliably measure existing performance and take no account of inputs such as raw materials. Only items which customers value should be measured. The CEO has suggested more detailed data are required, for example, on overall customer satisfaction with the manufacturing, but this is at 92% which already seems high and there is little point in incurring costs to measure what customers are already satisfied with. In the context of the six-sigma project, there is little that can be done to improve this particular area and such items should not be measured.

- **Analyze the process: This stage is where the root causes of the problems are identified**. Additional information may be needed, for example, to analyse customer returns by type of product, by country of sale or with a clearer definition of what is meant by 'defective'. By doing so, company may identify areas of the business where customer returns are particularly high and so be able to focus on these.
- **Improve the process: At this stage the proposals for improving the process are implemented and availability of resources and likely costs of making the improvements need to be carefully considered**. Company may need to consider which aspects of the production or packaging process could be improved, for example, by better maintenance or calibration of machinery. Additional training of staff may also be required.
- **Control: This is the on-going monitoring that the reduction in customer returns due to defective manufacturing is being maintained**. Reporting on the number of returns may be done by exception if they reach a particular level. In CPT Limited, it seems likely that the data on customer returns used to manage this process will need to be redesigned to make it clearer in which responsibility centre the problems arise. The ongoing monitoring may indicate that some of the earlier stages in the DMAIC process need to be revisited.

Part 2 and Part 3: Decision on number of MDF boards to be transferred and fixation of transfer price:

Minimum Transfer Price	Variable cost + opportunity cost
Maximum Transfer Price	External purchase price ± change in cost

Calculation of Minimum Transfer Price:

- Plywood division currently has capacity of 60,000 MDF boards and it has external demand for 30,000 boards. Therefore, it has idle capacity of 30,000 boards
- **Transfer price for first 30,000 boards = Variable cost = Rs.750** [There will be no opportunity cost; Additionally, variable cost per unit is Rs.20 lower and hence the same would be Rs.750 per unit]
- Transfer price for balance 5,000 boards = Variable cost + Opportunity cost = Rs.750 + Rs.80 = Rs.830 per unit

Calculation of Maximum Transfer Price:

- External suppliers are currently supplying at prices of Rs.800 per unit and hence the maximum transfer price by Furniture Division would be Rs.800 per unit

Decision:

- **Comparing the minimum and maximum transfer price, we can conclude that the company should go for transfer of 30,000 boards. The transfer price for 30,000 boards can be fixed between Rs.750 per unit to Rs.800 per unit**

- Balance 5,000 boards cannot be transferred as minimum transfer price of Rs.830 per unit exceed maximum transfer price of Rs.800 per unit. This would indicate that a transfer is not feasible

11. Cost reduction and Profitability enhancement (Category A – May 2020 RTP):

Fresh Bazar was founded in 2014 as a Fresh Bazar Mart. It provides amazing place for fresh organic fruits and vegetables, after launching its operations in November 2014, it grew to about 150 stores within three years majorly in metro cities, but soon it found that it did not have the systems and infrastructure to support that expansion.

Fruits and Vegetables as a category of competitive market types, which offers these products, very low margins, "while the rental cost and other overheads are very high". Also, staff attrition, poor locations, supply-chain issues, and infrastructure problems prompted it to shut nearly 45 stores within two years of the launch. Since then, the company has standardized its operations and increased centralization of its supply chain.

Though they provide all types of fresh organic fruits and vegetables under one roof, instead in local mandis people have to go from one place to another to buy different fruits and vegetables, still they are unable to compete with local vendors.

It also faces huge opposition from politically powerful small vendors, farmers, and middlemen. Fresh bazar had major hurdles in 2016, when it chased out state Uttar Pradesh, Jharkhand, India's most populous region, after protest by small vendors, farmers, and intermediaries.

Mr. Kailash, manager of Fresh Bazar, purchases fruits and vegetables from wholesale mandis. Price of Fruits and Vegetables fluctuates in wholesale mandis daily basis which is directly depends on the supply of fruits and vegetables by farmers. In addition, supply also depends on transport facilities, rain, political factors etc.

Fresh Bazar sells these fruits and vegetables at the almost same price as of local vendors in local mandis. Though the quality of local vendors is not as good as Fresh Bazar but local public prefer to buy fruits and vegetables from local vendors on road sides.

Their business still requires a lot of investments, and there is no synergy to the activity of the company. Due to all these reasons, Fresh Bazar is incurring continuous losses.

Fresh Bazar wants to expand its business and wants to make money in every store that they set up, and that would be the way in which they scale up their business.

Required

ADVISE is there any scope to reduce losses and increase profitability.

Answer:

Fresh Bazar sells these fruits and vegetables at the almost same price as of local vendors in local mandis. Though the quality of local vendors is not as good as Fresh Bazar but local public prefer to buy fruits and vegetables from local vendors on road sides. **This is because of the bargaining power of the buyer is more from local vendor while Fresh Bazar sells at fixed price**

Fresh Bazar should try to reduce the cost by closely study of the organization's value chain. In agriculture sector, approximately 30% of total production lost every year before it reaches to the consumer. Fresh Bazar can reduce these losses by analyzing the various segments of value chain. In India, each segment of agriculture sector like production, processing, marketing etc. work in an isolated manner and not in integrated manner, resulting in multiple losses in value chain. Fresh Bazar should attempt to integrate all the segments of value chain and try to remove all the intermediaries involved, benefiting both farmers and consumers. Moreover, contract farming participation could enhance the overall value chain performance in terms of increasing production, lowering transaction costs and boosting quality of the output product.

At present, Fresh Bazar purchases fruits and vegetables from wholesale mandis. **Instead of buying from wholesale mandis Fresh Bazar should participate in contract farming to reduce the input price risk i.e. price of fruits and vegetables which fluctuate every day in wholesale mandi. Through contract framing Fresh Bazar can also agree to support the farmers by supplying of inputs, assisting with preparation of land, information about latest technologies, effective use of power supply, providing production advice and transporting produce to its premises to maintain the desired level of quality.**

In addition, Fresh Bazar can also use target costing to reduce their other operating costs.

Since the small road side vendors continue to coexist, therefore, Fresh Bazar should also supply their fruits and vegetables to them. In this way, they can avoid opposition from small vendors and farmers, it's a win-win situation benefiting everyone.

12. Supply Chain Management (Category A)

Memorable Travels is a tour operator offering holiday packages to a variety of customers. They advertise and promote their packages using print advertising in newspapers and colourful brochures. A basic holiday package would include transport from the city to the destination, stay, food, attractions, or activities. Memorable Travels has been in business for the past 15 years. It has standard agreements with its suppliers based on which it has been offering standard holiday packages to its customers. Profitable business over these years has resulted in surplus cash that the company intends to reinvest in its business. Recently, the management has noticed increase in the number of complaints regarding these packages. This has resulted in lesser number of customers opting for these tours.

A study of these complaints has indicated that customer expectations from a holiday trip vary depending on their age group. Accordingly, Memorable Travels wants to offer customized holiday package trips that would suit the travellers' expectations. It wants to increase the number of packages offered to customers in addition to adding variety to them. This would provide customers the choices from which they can customize their holidays with the help of Memorable Travels.

The management wants to understand the need and importance of supplier chain management in a service organization such as itself.

Required:

(i) DEFINE the objective of Memorable Travels should have when considers incorporating the supply chain management framework into its business model.
(ii) IDENTIFY possible components of Memorable Travels' upstream supply chain.
(iii) SUGGEST the key processes in the business model of Memorable Travels.

Answer:

(i) Memorable Travels is providing a service wherein it uses its assets, staff, and resources to provide customized travel packages to its customers. **It should consider how to utilize its assets and staff to design and manage its supply chain such that it meets the customers' demand in a cost-effective manner**. Customers' demand is uncertain due to (a) customization of holiday packages to suit their individual expectations and (b) sensitivity of travel to factors like economic prosperity, law, and order etc.

Business processes must be effectively coordinated across organizations and functions to meet the customers' expectation in the best possible manner. The ability of Memorable Travels to respond to its customers' demand defines its operational capacity. Having more capacity (capability) to meet customers' demand helps it be more responsive and flexible. However, this has to be balanced with its ability to maintain an effective supply chain management. **A supply chain is effective only when Memorable Travels and consequently the ultimate customer, is able to get the required level of service from its suppliers.**

(ii) As mentioned in the problem, **a basic holiday package would include transport from the city to the destination, stay, food, attractions, or activities**. Accordingly, possible components of Memorable Travels upstream supply chain would include partnerships with:

(a) Transport providers – road, rail, and air travel providers. This includes travel to the holiday destination as well as the local transport within that location.

(b) Lodging and accommodation providers – hotels, bed, and breakfast providers etc.

(c) Local food producers and restaurants.

(d) Providers of tourist attractions and activities.

(iii) Key processes in the business model of Memorable Travels would be:

Information Flow

Information flow is critical at various stages:

- **to understand expectations** of customers
- **to share this information** with the suppliers of service with whom Memorable Travels has partnership
- **to establish clear service level agreements** with these suppliers and to clearly define the scope of work
- to be able **to monitor the performance of these suppliers**. Performance has to be monitored because it will impact payment settlements with these suppliers
- **to collect constructive feedback** from customers about the performance of these suppliers

Capacity and skills management:

Memorable Travels **has to develop the ability to cater to various expectations of its customers**. It has to develop assets and skilled staff who can attract customers and help them customize their holiday packages. To enable this, the company has to invest in its organization, processes, assets and staff. As mentioned above in point (a), information flow is a key process in this business model. **The company has to invest in its processes to ensure that information flow is smooth and accurate**. Similarly, it has to invest in assets like IT infrastructure, offices and also develop a skilled staff who can provide quality service. Memorable Travels should also have the ability to develop pool of suppliers who provide good quality service. Better capacity to cater to customers' demand better will ensure that Memorable Travel can develop and maintain its business efficiently. However, since building capacity and developing skills comes with a cost, that has to be balanced out with the revenue it generates.

Demand Management:

Memorable Travels will have to focus on how to generate demand for its products. In tune with changing times, Memorable Travels will have to change its marketing from print based advertising to online advertising in order to have a larger outreach to attract customers. The company should be able to manage variation in customers' expectations in a cost- effective way. As explained in point (b) above, this will be determined by the capacity of its operations and skills of its employees. Higher the capacity more the flexibility in its operations.

Customer Relationship Management:

Customer segmentation and monitoring help in understanding customer's needs in a better way and to focus on efforts to meet those needs through proper and timely communication of information with its service suppliers. However, the cost of maintaining this framework should not exceed the revenue that each customer segment generates. Accordingly, customer account profitability analysis should be prepared for each customer segment.

Supplier Relationship Management:

Based on customer needs, **potential suppliers who provide services of the requisite quality need to be identified. Service level agreements need to be drawn up after comprehensive rounds of negotiations**. It is imperative to have a clear understanding with these suppliers regarding the quality service expected.

Service Delivery Management

Agreements with suppliers will help to ensure that expectations of customers of Memorable Travels are being met. Service performance must be monitored, checked continuously for compliance. Any deviation from scope may have an impact on the payment settlement to be made with the supplier.

Cash Flow

As mentioned above, **service delivery should be monitored to ensure that payment is made only to the extent the agreed quality of service is delivered**. Periodic payments to suppliers should be made based on service level agreements. Similarly, cash inflow from customers should be monitored to avoid any bad debts. Pricing for packages should be based on the level of service offered. Again, clear understanding of the terms of contract is essential to avoid uncertainties.

All processes within the company are linked to each other. Understanding the customers' expectations have a direct impact on the supply chain. Therefore, proper co-ordination is required for smooth functioning of the organization and its supply chain.

13. Activity Based Cost Management (Category A):

Melody is a manufacturer of musical instruments. The company specializes in manufacture of Piano and Electronic Keyboard instruments. They are both labour-intensive products. Therefore, Melody follows absorbed its production overheads based on direct labour hours.

Piano

Melody's Pianos are of very high quality. Client patronage include professional Piano musicians. Some of these instruments are sold in its standard form. However, musicians particularly the concert players require their pianos to be customized to certain specifications. Customization primarily relates to the acoustic quality of the piano sound. Quality of sound is of paramount importance to musicians as it determines the power and warmth of tone. Each musician has a preference to achieve a special quality of sound. Therefore, no two customized Pianos can be the same. Due to its reputation, Melody receives numerous requests for customization from its customers. Ability to provide customization service sets Melody apart from its competitors.

Customization requires the services of professional craftsmen. They are hired as subcontractors for such work based on the need. These craftsmen perform their services within the factory premises. For this a special work, space is maintained by Melody. Melody charges its customers extra for subcontracting cost plus 10%. This would cover the actual cost of subcontracting and any incidental overheads incurred. The Board of Melody accepts that this method of billing is very simplistic. It is unsure if the company is recovering the entire cost of providing this customization service.

Electronic Keyboard Instruments

These are instruments manufactured by Melody are home Keyboards that are targeted at young music enthusiasts who are beginning to learn music. They come in standard sizes, comprised of standard components. No customizations are done to Keyboards.

As a performance management expert, the Board wants your advice. The extract below provides the most recent management accounts for the Piano and Keyboard Division.

Sr. No	Particulars	Piano	Keyboard	Total
1	Number of items manufactured	1,000	10,000	
2	Sale price per unit	2,50,000	15,000	
3	Revenues	25,00,00,000	15,00,00,000	40,00,00,000
4	Materials	7,50,00,000	3,75,00,000	11,25,00,000

5	Direct Labour	8,00,00,000	6,75,00,000	14,75,00,000
6	Subcontracting cost	3,75,00,000	-	3,75,00,000
7	Production overheads	4,50,00,000	65,00,000	5,15,00,000
8	Total cost of production	23,75,00,000	11,15,00,000	34,90,00,000
9	Gross Profit	1,25,00,000	3,85,00,000	5,10,00,000

Production overheads:

Particulars	Amount
Inspection and testing	3,45,00,000
Space Maintenance Cost for Subcontracting Work (rent, utilities, 2 support staff to maintain storage	50,00,000
Other Production Overheads (rest of the utilities, rent, salary of support staff at storage)	1,20,00,000

Required

(i) DISCUSS the difference in treatment of production overheads under absorption costing and activity based costing.

(ii) LIST the steps to implement activity based costing within Melody.

(iii) ASSESS whether activity based costing would be suitable for the Piano and Keyboard Divisions.

(iv) ADVISE Melody about the activity based management and ways to improve business performance.

Answer:

(i) Product cost under absorption costing method includes all manufacturing costs that are incurred to produce a product {direct material, labour, and overheads (both fixed and variable)}. **The allocation of overhead is determined by a single cost driver based on volume of production (popular ones are machine hours or direct labour hours)**. This driver is applied to the entire production overhead to arrive at the production overhead rate. For example, in the given problem, labour hours are being used to allocate overheads to Pianos and Keyboards. **All production overheads are allocated to products based on this driver irrespective of whether this resource was used by the product or not**. For example, production overheads include maintenance cost relating to space for subcontracting work. This cost is incurred for the manufacture of Piano alone. This portion of the maintenance cost gets clubbed with other production costs. Eventually, an overhead absorption rate is calculated using the ratio direct labour hours for each product. **Absorption costing would ignore the fact that the manufacture of Keyboards does not utilize the space allocated for subcontracting work**. This skews the product costing by erroneously inflating the cost of Keyboards, some portion of the cost of manufacturing Pianos passes onto the product cost for Keyboards. Application of a single cost driver may not be the most appropriate way of allocating costs between products. For example, in the given problem, factory rent that is clubbed with total overheads and applied to the product cost as part of the overhead rate. **Absorption costing ignores that direct labour may not be the most appropriate basis to allocate factory rent overhead to the products.**

Activity based costing identifies the cost of each activity and assigns costs to units produced based on the number of activities used by each unit. Instead of being clubbed as a single overhead cost, costs for each activity are captured in their respective cost pools. The most appropriate cost driver is selected. Cost drivers could be volume based (machine hours / direct labour) or transaction based (# of purchase orders). This cost driver is used as the basis to allocate costs to various products based on the utilization of the resource related to that activity. Overhead costs are assumed to be variable, determined (or driven) by the selected cost driver. **Here, the cost of maintaining space for subcontracting relates entirely to the manufacture of Pianos. Using ABC method, this cost will be allocated only to Piano products since allocation is now based on utilization of the resource to manufacture the product**. Again, under this method, factory rent could have space utilization as the cost driver. Therefore, using ABC method, the allocation of rent overhead to the products will be made on a more logical basis as compared to absorption costing.

To conclude, product costing using absorption costing is relatively simpler, a method regularly followed for financial accounting purpose. Product costing using ABC method results in more detailed yet accurate figures. It highlights the cost / benefit of various activities that helps management focus on eliminating non-value-added activities

(ii) Implementation of ABC Method within Melody would include the following steps:

- **Activity Mapping:** Production process has to be first broken down into various activities. Based on their nature, activities must then be clubbed to form activity pools. Activity pools must then tie in with the products or services.
- **Cost Pools:** Overheads costs are then identified to each activity pools. This gives the cost pool for each category of activity.
- **Cost Driver:** Identify the activity that bring about the cost. For example, space utilization would be a standard cost driver for factory rent. Cost drivers could be volume based or transaction based.
- **Overhead Rate:** Once the cost pool and cost driver are identified, the cost per unit of cost driver (overhead rate) is determined.
- **Overhead Cost Allocation:** Depending on how much of the resource (cost driver) the product utilizes, the cost is allocated accordingly to that product.
- **Product Cost:** The allocated overhead cost is added to the cost of direct materials and labour to arrive at the full cost of production for the unit.

(iii) Appropriateness of ABC Method for the Keyboard and Piano Divisions

The Piano Division **receives numerous requests for customization from its customers**. While it produces only 1,000 Pianos in a year, no two customizations are the same. Therefore, the range of Pianos manufactured by Melody can be considered varied. **Production overheads cost, including subcontracting work, form 35% of the total production cost. ((₹3,75,00,000 + ₹4,50,00,000)/ ₹23,75,00,000). Therefore, overheads form a substantial portion of product cost. Due to the variety in customization, it is important to price each customization at a rate that will yield an acceptable profit margin to Melody**. To do this, manufacturing process has to be segregated into various activities and cost pools. Depending on utilization of resources related to each activity, each Piano can be sold at an appropriate price. If a Piano requires more of a resource from an activity, this can be included in the product cost and factored into the selling price, such that even with customization an acceptable profit margin can be earned. Thus, ABC method can help Melody arrive at a more accurate cost of production as compared to absorption costing.

While, overhead cost is one aspect of ABC analysis, the other information that an organization gets from this framework is that it can identify the activities that add value to the product. **At the same time, non-value adding services can be identified (for example storage) and measures can be taken to minimize them. This helps it partner better with its customers and gain a competitive edge.**

The Keyboard Division produces 10,000 Keyboards annually, all sold as a standard product with no customization. **Activities are standardized, with no variation in the process between the Keyboards. Production overheads form only 6% of total cost of production. (₹65,00,000 / ₹11,15,00,000). Implementation of ABC method is time consuming and complex. Here, due to the standardized nature of production and low quantum of production overheads, ABC method may not be justified for the time and effort involved. In this case, absorption costing may seem to be a more practical approach to arrive at product price.**

(iv) Activity Based Management to help Melody improve business performance

Activity based management can help Melody to meet the customer needs while using the lowest possible resource or cost. ABM can be used at an operational or strategic level.

Product Pricing

This would be especially in case of the Piano Division. As explained above, ABC method would enable Melody calculate a more accurate cost of production for each Piano. Currently, the cost of subcontracting

work used for customizing Pianos is ₹3,75,00,000. This is being charged to the customers with a 10% mark-up to cover for any incidental overhead. However, this is very simplistic. As such the mark-up that can be earned under this method will be ₹37,50,000. However, the cost of maintenance of the area for subcontracting work is higher at ₹50,00,000. Therefore, it can be concluded that Melody is not recovering the entire portion of the incidental overheads incurred by providing the subcontracting work.

By identifying the cost pools relating to the subcontracting work, **Piano Division can determine that it is making a loss on the subcontract work as a whole. It could therefore adjust the price of customized Pianos such that it earns an acceptable margin on each sale. This is at an operational level. At a strategic level, Melody can determine which type of customizations are most profitable.** Customizations that are not very frequent, too complex, and costly may be avoided as it takes away resources from Melody in terms of labour, space etc. At the same time, careful consideration should be given to such decisions since it is this customization service that gives Melody an edge over other competitors. Therefore, Melody should take decisions that help it balance the customer base, while keeping the costs low and processes as standardized as possible.

Analysis of Activities

Implementation of ABC method forces the company to take a more detailed look at its activities that comprise of its manufacturing process. It may be found that certain activities can be performed in more efficient manner. Also, activities can be identified as that that add value to the product and those that are not value adding. For example, in the given example, storage is not a value adding activity. Melody can work on a system where it optimizes the production process such that storage requirements are lower. The inventory turnover of Piano can also be improved, since quicker the Piano is shipped to the customer, lower the space requirement. Inspection is another non- value adding activity. For example, Melody switch to a standardized procurement system for its raw materials from reputed suppliers. While it may be a costlier option, this may lead to lower defects in the product, therefore requiring lesser need for inspection.

Performance Measurement

Employee resource should be used more towards value adding activities. Proper training would be required to ensure acceptable quality of work. This would automatically reduce non-value adding activities like rework, idle time, and inspection. There has to be proper information system in place that captures such data. This is facilitated through the implementation of ABC costing method and use of ABM. However, to have a successful system, senior management need to be committed to this model, proper communication and training has to be given to employees. To implement such a performance system the management has to commit sufficient time and effort. Cost benefit considerations of having such systems should also be taken into consideration. To conclude, implementing ABM should not take up productive time of employees and become a non- value activity in itself!