



OPERATIONS MANAGEMENT AND STRATEGIC MANAGEMENT

Time Allowed: 3 Hours

Full Marks: 100

The figures in the margin on the right side indicate full marks.
Where considered necessary, suitable assumptions may be made and clearly indicated in the answer.

SECTION – A : [OPERATIONS MANAGEMENT]

Answer Question No. 1 which is compulsory and any three from Questions Nos. 2, 3, 4 & 5

1. (a)

(i)	(d)
(ii)	(a)
(iii)	(b)
(iv)	(d)
(v)	(b)
(vi)	(a)
(vii)	(c)
(viii)	(b)

(b)

(i)	Project
(ii)	Slack
(iii)	higher
(iv)	downtime

(c)

(i)	False
(ii)	True
(iii)	True



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2. (a) Scope of Operation Management

Operations Management concerns with the conversion of inputs into outputs, using physical resources, so as to provide the desired utilities to the customer while meeting the other organizational objectives of effectiveness, efficiency and adoptability. It distinguishes itself from other functions such as personnel, marketing, finance, etc. by its primary concern for 'conversion by using physical resources'. Following are the activities, which are listed under Production and Operations Management functions:

1. Location of facilities.
2. Plant layouts and Material Handling.
3. Product Design.
4. Process Design.
5. Production Planning and Control.
6. Quality Control.
7. Materials Management.
8. Maintenance Management.

(b) The total cost of the three locations are:

At Total cost = Fixed cost + Variable cost for a volume "X"

Patna → Total cost = 30,00,000 + 300 × X

Ranchi → Total cost = 50,00,000 + 200 × X

Dhanbad → Total cost = 25,00,000 + 350 × X

We can compute and plot the total costs per annum at the three different locations for the various cases of production volume of 5,000, 10,000, 15,000, 20,000 25,000 units.

(i) Patna

Volume (x Units)	5,000	10,000	15,000	20,000	25,000
Fixed Cost (₹)	30,00,000	30,00,000	30,00,000	30,00,000	30,00,000
Variable Cost (₹ 300 x)	300 (5,000)	300 (10,000)	300 (15,000)	300 (20,000)	300 (25,000)
Total Cost (₹)*	= ₹45 lakhs	= ₹60 lakhs	= ₹75 lakhs	= ₹90 lakhs	= ₹105 lakhs

(ii) Ranchi

Volume (x Units)	5,000	10,000	15,000	20,000	25,000
Fixed Cost (₹)	50,00,000	50,00,000	50,00,000	50,00,000	50,00,000
Variable Cost (₹300 x)	200 (5,000)	200 (10,000)	200 (15,000)	200 (20,000)	200 (25,000)
Total Cost (₹)*	= ₹60 lakhs	= ₹70 lakhs	= ₹80 lakhs	= ₹90 lakhs	= ₹100 lakhs



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(iii) Dhanbad

Volume (x Units)	5,000	10,000	15,000	20,000	25,000
Fixed Cost (₹)	25,00,000	25,00,000	25,00,000	25,00,000	25,00,000
Variable Cost (₹350 x)	350 (5,000)	350 (10,000)	350 (15,000)	350 (20,000)	350 (25,000)
Total Cost (₹)*	= ₹42.5 lakhs	= ₹60 lakhs	= ₹77.5 lakhs	= ₹95 lakhs	= ₹112.5 lakhs

* In all the above tables, Total Cost = Fixed Cost + Variable Cost

If the volume distribution be as follows:

	Up to 10,000 units	Between 10,000 units to 20,000 units	Above 20,000 units
Favourable Location	Dhanbad	Patna	Ranchi

For a volume of 18000 units favourable location is Patna which can be substantiated by the followings calculations of Total Cost:

Patna → $30,00,000 + 300 \times 18,000 = ₹84$ lakhs

Ranchi → $50,00,000 + 200 \times 18,000 = ₹86$ lakhs

Dhanbad → $25,00,000 + 350 \times 18,000 = ₹88$ lakhs.

3. (a) (i) The activities and responsibilities of product design include the following:
- Understand and translate the requirements of the customers (Voice of the Customers) into a set of technical requirements (Voice of the Process) for design and execution planning and processes.
 - Differentiate the existing products to stretch the product life cycle
 - Developing new products
 - Providing inputs required for the formulation of the quality goals
 - Help in cost optimization
 - Building and testing model prototypes
 - Documentation of the design specifications

(ii) **The Five Stages of Design Thinking**

The Hasso Plattner Institute of Design at Stanford (aka the d.school) describes design thinking as a five-stage process. These stages are not always sequential, and teams often run them in parallel, out of order and repeat them in an iterative fashion.

Stage 1: Empathize—Research Users Needs

Empathy is crucial to a human-centered design process such as design thinking because it allows to set aside assumptions about the world and gain real insight into users and their needs.

**OPERATIONS MANAGEMENT AND STRATEGIC MANAGEMENT****Stage 2: Define — State Users’ Needs and Problems**

It’s time to accumulate the information gathered during the Empathize stage. Then analyze observations and synthesize them to define the core problems. These definitions are called problem statements.

Stage 3: Ideate — Challenge Assumptions and Create Ideas

The solid background of knowledge from the first two phases means one can start to “think outside the box”, look for alternative ways to view the problem and identify innovative solutions to the problem statement. Brainstorming is particularly useful here.

Stage 4: Prototype—Start to Create Solutions

This is an experimental phase. The aim is to identify the best possible solution for each problem found.

Stage 5: Test—Try Your Solutions Out

Evaluators rigorously test the prototypes. Although this is the final phase, design thinking is iterative: Teams often use the results to redefine one or more further problems. So, one can return to previous stages to make further iterations, alterations and refinements – to find or rule out alternative solutions.

Overall, one should understand that these stages are different modes which contribute to the entire design project, rather than sequential steps. Goal throughout is to gain the deepest understanding of the users and what their ideal solution/product would be.

- (b) Let x_1 be the no. of units of product P
Let x_2 be the no. of units of product Q
Let x_3 be the no. of units of product R
Objective function: Max. $Z = 3x_1 + 5x_2 + 4x_3$
Subject to constraints:
 $2x_1 + 3x_2 \leq 8$ (Constraint on availability of Raw Material ‘A’)
 $3x_1 + 2x_2 + 4x_3 \leq 15$ (Constraint on availability of Raw Material ‘B’)
 $2x_2 + 5x_3 \leq 10$ (Constraint on availability of Raw Material ‘C’)
And $x_1, x_2, x_3 \geq 0$ (Non negativity constraint)

4. (a) Normal time per unit = Observed time / unit \times Rating factor = $5 \times (120/100) = 6$ minutes
Allowances = 30% of normal time = $(30 \times 6)/100 = 1.8$ minutes
Standard time/unit = Normal time/unit + Allowances = $6 + 1.8 = 7.8$ minutes / unit
Standard production in shift of 8 hours = $(8 \times 60)/7.8 = 61.54$ units.



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- (b) a. The arrival rate is given in the problem: $\lambda = 16$ customers per hour. Change the service time to a comparable hourly rate by first restating the time in hours and then taking its reciprocal. Thus, (3 minutes per customer)/(60 minutes per hour) = $1/20 = 1/\mu$. Its reciprocal is $\mu = 20$ customers per hour = Service Rate.
- b. Average no. of customers being served at any time.
 $r = \lambda/\mu = 16/20 = 0.80$ customer.

Formulas for basic single-server model

Performance Measure	Equation
Average number in line/queue	$L_q = \frac{\lambda^2}{\mu(\mu - \lambda)}$
Probability of zero units in the system	$P_0 = 1 - \left(\frac{\lambda}{\mu}\right)$
Probability of n units in the system	$P_n = P_0 \left(\frac{\lambda}{\mu}\right)^n$
Probability of less than n units in the system	$P_{<n} = 1 - \left(\frac{\lambda}{\mu}\right)^n$

- c. Given: $L_q = 3.2$ customers
 $L_s = L_q + r = 3.2 + 0.80 = 4.0$ customers
Average time customers wait in line
 $= W_q + \frac{L_q}{\lambda} = \frac{3.2}{16} = 0.20$ hour, or $0.20 \text{ hour} \times 60 \text{ minutes/hour} = 12 \text{ minutes}$

$$W_s = \text{Average time customers wait in system} = W_q + \frac{1}{\mu}$$

Waiting time in line plus service

$$0.20 + \frac{1}{20} \text{ hour, or 15 minutes}$$

- d. System utilization is $\rho = \frac{\lambda}{M \times \mu}$.

$$\text{For } M = 1, \rho = \frac{16}{1(20)} = 0.80$$

$$\text{For } M = 2, \rho = \frac{16}{2(20)} = 0.40$$

$$\text{For } M = 3, \rho = \frac{16}{3(20)} = 0.27$$

Note that as the system capacity increases, the system utilization for a given arrival rate decreases.

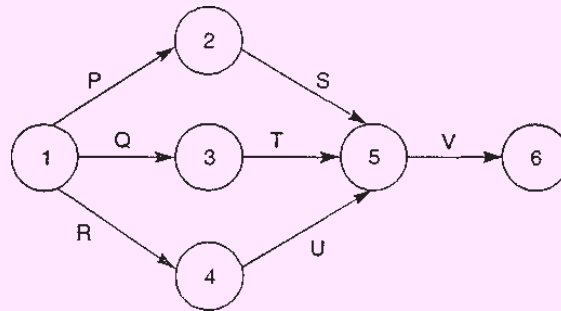


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Single server, exponential service time, M/M/1

The simplest model involves a system that has one server (or a single crew). The queue discipline is first-come, first-served, and it is assumed that the customer arrival rate can be approximate by a Poisson distribution and service time by a negative exponential distribution. There is no limit on length of queue.

5. (a) Network of the Project:-



(b) Cost of machine, $C = ₹ 15,000 + ₹ 3,500 = ₹ 18,500$
 Scrap value, $S = ₹ 1,500$.

Year	Maintenance Cost, M_1 (₹)	Cumulative Maintenance Cost, ΣM_1 (₹)	Cost of Machine – Scrap Value (₹)	Total Cost $T_{(n)}$ (₹)	Annual Cost $A_{(n)}$ (₹)
(i)	(ii)	(iii)	(iv)	(v) = (iii) + (iv)	(vi) = (v) / n
1	260	260	17,000	17,260	17,260
2	760	1,020	17,000	18,020	9,010
3	1,100	2,120	17,000	19,120	6,373
4	1,600	3,720	17,000	20,720	5,180
5	2,200	5,920	17,000	22,920	4,584
6	3,000	8,920	17,000	25,920	4,320
7	4,100	13,020	17,000	30,020	4,288*
8	4,900	17,920	17,000	34,920	4,365
9	6,100	24,020	17,000	41,020	4,557

Lowest average cost is ₹4,288 approx., which corresponds to $n = 7$ in above table. Thus machine needs to be replaced every 7th year.

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SECTION – B : [STRATEGIC MANAGEMENT]

Answer Question No. 6 which is compulsory and any two from Questions Nos. 7, 8 & 9

6. (a)

(i)	(ii)	(iii)	(iv)
d	d	c	d

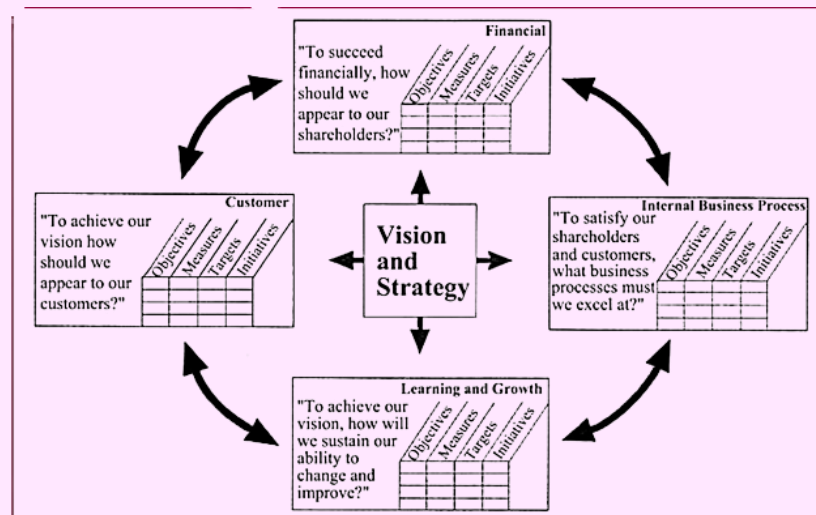
(b)

(i)	(ii)	(iii)
False	False	False

(c)

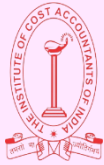
(i)	(ii)	(iii)
The Specialised Cultures Test	The Difficult Links Test	The Accountability Test

7. (a)



The sole purpose of setting objectives is to convert the vision and mission into specific measurable targets. There are broadly two types of objectives namely, financial and strategic.

- Financial objectives relate to the financial performance targets that the management has established for the organisation to achieve.
- Financial objectives of an organisation can include increasing the annual revenues, annual increase in the earnings per share, profit margins of fixed percent, increased shareholder value, generating internal cash flows, etc.
- Strategic objectives relate to target outcomes that indicate whether a company is strengthening its market standing, competitive position and future business prospects.

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- Strategic objectives of an organisation can include winning a certain per cent of market share, achieving lower overall costs than competitors, developing broader, better and deeper technological capabilities than rivals, consistently getting new or improved products to market ahead of the rivals, having stronger national and global sales and distribution capabilities than rivals, etc.

There is a need to balance the financial objectives with the strategic objectives. It is imperative that attaining financial objectives that includes adequate profitability and financial strength is of paramount importance as the organisation's long term health and ultimately its survival will depend on it. However, one cannot ignore the need for accomplishment of strategic objectives as it signals whether the organisations competitive position is on the rise or not. It may be mentioned that one can expect a strong financial performance if the competitive strength and market position is on the rise.

The most widely used method for combining the use of both strategic and financial objectives, tracking their achievement, and giving management a more complete and balanced view of how well as organisation is performing is known as the balanced score card. This is a method for linking financial objectives to specific strategic objectives that derive from a company's business model. It provides a company's employees with clear guidelines about how their jobs are linked to overall objectives of the organisation, so that they can contribute most productively and collaboratively to the achievements of these goals.

The balanced score card was developed by Robert S. Kaplan and David Norton of Harvard Business School. This system tries to do away with the overemphasis on short term financial objectives and tries to improve organisational performance by focusing attention on measuring a wide range of non-financial, operational objectives. Later, the system also tried to incorporate the strategic planning technique.

The balanced score card is a top-down approach to performance management. It starts with the strategic intent and ends with operationally relevant targets. The balance score card model requires an evaluation of organisational performance from four different perspectives.

- **Financial Perspective:** It considers the financial measures such as revenues, earnings, return on capital and cash flow arising out from the strategic intent of the organisation.
- **Customer's Perspective:** This measures the ability of the organisation to provide quality goods and services, effective delivery and overall customer's satisfaction. Customer's perspective includes market share, customer satisfaction measures and customer loyalty.



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- **Internal Business Perspective:** The mechanisms through which the performance expectations are achieved are called as internal businesses processes. This provides data regarding the internal business results that have led to financial success and satisfied customers. It is very important to identify the key business processes that should be excelled to meet the organisational objectives and customer satisfaction.
 - **Learning and Growth Perspective:** This perspective focuses on the ability of the organisation to manage its business and adapt to changes in the environment. Organisations take on new responsibilities that require its employee to develop new skills and capabilities in order to cope with the changing environment and customer expectations.
- (b) Management by objective (MBO) is a management strategy that uses specific, measurable objectives to guide and direct an organization. It is an approach that focuses on setting objectives that are agreed upon by both managers and employees. The objectives are then monitored and reviewed in order to ensure that the organization is progressing in the right direction. The objectives need to be relevant, measurable and achievable in order for them to be effective. MBO is a goal-oriented approach that encourages employee involvement and ownership of objectives, which in turn can lead to increased job satisfaction and productivity.

The FAST framework is a strategic management tool used to develop and implement strategies for an organization. It stands for Focus, Action, Structure, and Team. The framework uses a three-step process to help organizations develop a clear strategy and ensure that it is implemented in an effective and efficient manner. The first step in the FAST framework is to define the Focus. This includes setting a clear vision and mission statement, establishing goals and objectives, and determining the desired outcome. The second step is to take Action. This involves developing a detailed plan to achieve the goals and objectives identified in the Focus step, including deciding on resources, developing a timeline, and outlining the steps that need to be taken. The third step is to create Structure. This includes determining the roles and responsibilities of each team member, setting up processes and procedures, and developing systems and measures to track progress. Finally, the fourth step is to build a Team. This involves recruiting, training, and motivating a team of people to work together to achieve the desired outcome.

Management by objectives (MBO) is a management philosophy that focuses on setting measurable goals and objectives for an organization and then developing a plan to reach those goals. It involves setting specific, measurable.

Thus the two concepts are intricately related.

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It was in the year 1954 when Peter Drucker, the great management guru, introduced “management by objectives”. Management by objectives according to Drucker is an approach where employees would agree with their boss on a set of goals and work toward achieving those objectives throughout the year. The importance of goal setting and accomplishment of objectives has been the central for managers who follow a well-established set of practices. Traditionally the managers aspired to make their goals SMART, by ensuring they are specific, measurable, achievable, realistic, and time-bound. However, over the past few decades, a handful of leading companies including Google, Intel, etc. have pioneered and refined an alternative approach to harness the power of goals to drive and align action. The four core principles that underpin effective goal systems can be summarised into the acronym FAST. Goals should be embedded in frequent discussions; ambitious in scope; measured by specific metrics and milestones; and transparent for everyone in the organisation to see. The modern concept views goals to be FAST and not SMART.

Acronym	Term	Definition	Advantages
F	Frequently discussed	Goals should be frequently discussed in order to see the progress, allocate resources as and when needed, prioritise of initiatives and provide feedback	Gives guidance for important decisions. Helps employees remain focused on the most important matters. Links performance feedback to concrete goals. Evaluates the progress and helps in course corrections.
A	Ambitious	Goals should be challenging or ambitious but not impossible to achieve	Motivates performance of individuals and teams towards goal. Helps in minimising the risk of downplaying the achievements of the subordinates. Focuses on the innovative ways to achieve goals.
S	Specific	Goals should be translated into specific metrics so that there is clarity in achieving the goals.	Clearly mentions what the employees are expected to deliver. Helps in easy identification of deviations from the goals and offers quick course corrections. Enhances performance of individuals and teams.



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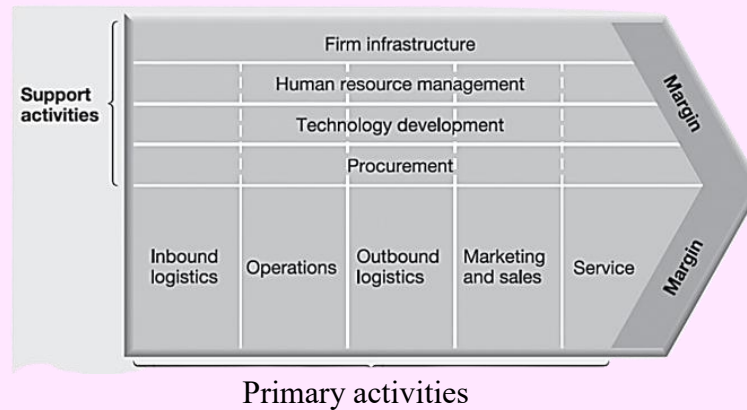
T	Transparent	Goals and their achievements should be made public for all employees to see.	Use of peer pressure to perform on goals. Clearly showcases the activities and contribution of the employees towards goal achievement. Helps employees understand the agenda of other employees and the teams. Helps to identify the strategies those are redundant and are not aligned to the overall organisational goals
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8. (a) The value chain describes the categories of activities within and around an organisation, which together create a product or service. The concept was developed in relation to competitive strategy by Michael Porter. The term value chain refers to the idea that a company is a chain of activities that transforms inputs into outputs that customer’s value. The transformation process involves both primary activities and support activities that add value to the product. Activities can be broadly divided into two types namely, primary activities and secondary or support activities. Primary activities are directly concerned with the creation or delivery of a product or service. For example, for a manufacturing business the primary activists are as follows:

- Inbound logistics are activities concerned with receiving; storing and distributing inputs to the product or service including materials handling, stock control, transport, etc.
- Operations transform these inputs into the final product or service. Operations include machining, packaging, assembly, testing, etc.
- Outbound logistics collect, store and distribute the product to customers, for example warehousing, materials handling, distribution, etc.
- Marketing and sales provide the means whereby consumers/users are made aware of the product or service and are able to purchase it. This includes sales administration, advertising and selling.

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Service includes those activities that enhance or maintain the value of product or service, such as installation, repair, training and spares



The Value Chain

Support activities help to improve the effectiveness or efficiency of primary activities. The following are the support or secondary activities:

- Procurement: It refers to the processes that occur in many parts of the organisation for acquiring the various resource inputs to the primary activities.
- Technology development: All value activities have a ‘technology’, even if it is just know-how. Technologies may be concerned directly with a product or with processes or with a particular resource.
- Human resource management: This transcends all primary activities. It is concerned with those activities involved in recruiting, managing, training, developing and rewarding people within the organisation.
- Infrastructure: The formal systems of planning, finance, quality control, information management, and the structures and routines that are part of an organisation’s culture. In the value chain process the value can be added early in the value chain, i.e. upstream and later in the value chain, i.e. downstream.

Porter’s five Forces Framework



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It helps to identify the sources of competition in an industry or sector.

The following are important to understand the framework

- It must be used at the level of strategic business units (SBUs) and not at the level of the whole organisation. This is because organisations are diverse in their operations and markets.
- The framework must not be used just to give a snapshot in time.
- Understanding the connections between competitive forces and structural drivers is essential.
- The five forces are not independent of each other.
- Competitive behaviour may be concerned with disrupting these forces and not simply accommodating them.

Porter's five forces framework is a tool used to analyze the competitive forces in an industry and assess the attractiveness of an industry for potential entrants. The five forces are:

1. Bargaining power of buyers: This is the ability of buyers to influence the price of goods and services in an industry.
2. Bargaining power of suppliers: This is the ability of suppliers to influence the price of goods and services in an industry.
3. Threat of new entrants: This is the threat of new competitors entering the industry and taking away market share.
4. Threat of substitute products: This is the threat of substitute products taking away market share.
5. Rivalry among existing competitors: This is the degree of competition among existing competitors in the industry.

Porter's five forces framework provides a comprehensive view of the competitive landscape of an industry and helps strategists to make informed decisions on how to position their business in the market.

- (b)** Portfolio analysis is a tool used in strategic management to analyze a company's strategic position in terms of its product/market range and its financial performance. It is a systematic way of evaluating the business mix of a company in terms of its product lines, its markets, and its financial performance. The purpose of portfolio analysis is to determine the most appropriate mix of investments and activities for the company to achieve its strategic objectives. Portfolio analysis is a powerful tool for strategic planning, enabling managers to make decisions about the company's current and future product/market mix. It enables managers to identify and prioritize the various activities that are necessary for the company to achieve its desired level of performance. It also

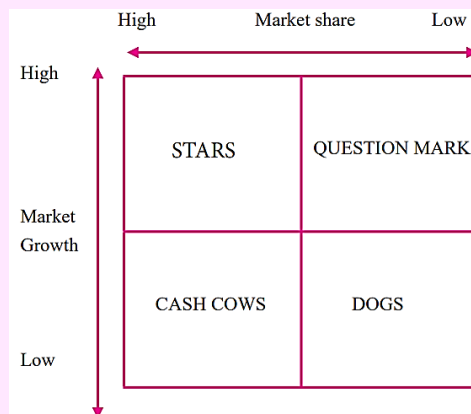


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helps managers to identify and implement strategies to achieve a competitive advantage. By analyzing the company's current product/market mix and its financial performance, portfolio analysis helps managers to identify areas for improvement and develop strategies for achieving maximum returns.

Portfolio Analysis One of the most popular aids to developing corporate strategy in multiple business corporations is portfolio analysis. Portfolio analysis is an analytical tool which views a corporation as basket of portfolio of products or business units to be managed for the best possible returns. Portfolio analysis puts corporate headquarters into the role of an internal banker. In portfolio analysis top management views its product lines and business units as a series of investments from which it expects a profitable return. A study on 200 largest U.S. corporations made by McKinsey & Company found that companies that actively managed their business portfolios through acquisitions and divestitures created substantially more shareholder value than those companies that passively held their businesses. Given the increasing number of strategic alliances in today's corporations, portfolio analysis is also being used to evaluate the contribution of alliances to corporate and business unit objectives. Two of the most popular portfolio techniques are the BCG Growth-Share Matrix and GE Business Screen.

One of the most common and long-standing ways of conceiving of the balance of a portfolio of businesses is the Boston Consulting Group (BCG) matrix.



Here market share and market growth are critical variables for determining attractiveness and balance. High market share and high growth are, of course, attractive. However, the BCG matrix also warns that high growth demands heavy investment, for instance to expand capacity or develop brands. There needs to be a balance within the portfolio, so that there are some low growth businesses that are making sufficient surplus to fund the investment needs of higher growth businesses. The market growth/market share axes of the BCG matrix define four sorts of business:



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- A **star** is a business unit which has a high market share in a growing market. The business unit may be spending heavily to keep up with growth, but high market share should yield sufficient profits to make it more or less self-sufficient in terms of investment needs.
- **Question mark** (or problem child) is a business unit in a growing market, but not yet with high market share. Developing question marks into stars, with high market share, takes heavy investment. Many question marks fail to develop, so the BCG advises corporate parents to nurture several at a time. It is important to make sure that some question marks develop into stars, as existing stars eventually become cash cows and cash cows may decline into dogs.
- A **cash cow** is a business unit with a high market share in a mature market. However, because growth is low, investment needs are less, while high market share means that the business unit should be profitable. The cash cow should then be a cash provider, helping to fund investments in question marks.
- **Dogs** are business units with a low share in static or declining markets and are thus the worst of all combinations. They may be a cash drain and use up a disproportionate amount of company time and resources. The BCG usually recommends divestment or closure

Since Critical Analysis is asked for the student would have to draw upon the criticisms

However, there are at least three potential problems with the BCG matrix:

1. **Definitional vagueness:** It can be hard to decide what high and low growth or share mean in particular situations. Managers are often keen to define themselves as ‘high share’ by defining their market in a particularly narrow way (for example, ignoring relevant international markets)
2. **Capital market assumptions:**
 - The notion that a corporate parent needs a balanced portfolio to finance investment from internal sources (cash cows) assumes that capital cannot be raised in external markets, for instance by issuing shares or raising loans.
 - The notion of a balanced portfolio may be more relevant in countries where capital markets are underdeveloped or in private companies that wish to minimize dependence on external shareholders or banks.
3. **Unkind to animals:**
 - Both cash cows and dogs receive ungenerous treatment, the first being simply milked, the second terminated or cast out of the corporate home. This

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treatment can cause motivation problems, as managers in these units see little point in working hard for the sake of other businesses.

- There is also the danger of the self-fulfilling prophecy. Cash cows will become dogs even more quickly than the model expects if they are simply milked and denied adequate investment.
- Finally, the notion that a dog can be simply sold or closed down also assumes that there are no ties to other business units in the portfolio, whose performance might depend in part on keeping the dog alive. This portfolio approach to dogs works better for conglomerate strategies, where divestments or closures are unlikely to have knock-on effects on other parts of the portfolio.

9. (a) The Internet of Things (IoT) is a network of physical objects, such as vehicles, home appliances, and other items embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. The IoT allows these objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. The internet of things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. A thing in the internet of things can be anything from a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data. over a network. Increasingly, organisation in a variety of industries are using IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the value of the business. In IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices- for instance, to set them up, give them instructions or access the data. Some examples of internet of things

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- Smart thermostat
- Smart refrigerator
- Smart lighting
- Wearable fitness trackers
- Connected security cameras
- Smart doorbells
- Connected appliances
- Smart locks
- Smart garage door openers
- Smart sprinkler systems

Although the idea of IoT has been in existence for a long time, a collection of recent advances in a number of different technologies has made it practical. These technologies include:

- Access to low-cost, low-power sensor technology: Affordable and reliable sensors are making IoT technology possible for more manufacturers.
 - Connectivity: A host of network protocols for the internet has made it easy to connect sensors to the cloud and to other “things” for efficient data transfer.
 - Cloud computing platforms: The increase in the availability of cloud platforms enables both businesses and consumers to access the infrastructure they need to scale up without actually having to manage it all.
 - Machine learning and analytics: With advances in machine learning and analytics, along with access to varied and vast amounts of data stored in the cloud, businesses can gather insights faster and more easily. The emergence of these allied technologies continues to push the boundaries of IoT and the data produced by IoT also feeds these technologies.
 - Conversational artificial intelligence (AI): Advances in neural networks have brought natural-language processing (NLP) to IoT devices (such as digital personal assistants Alexa, Cortana, and Siri) and made them appealing, affordable, and viable for home use
- (b) Goal congruence is the alignment of individual goals with the overall goals of an organization. It occurs when the interests of an individual are in line with the objectives of the organization and its stakeholders. Goal congruence results in increased job satisfaction, motivation, and engagement among employees, leading to improved performance and productivity. The following points are important to note.

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- Goal congruence is the term that is used to describe the situation when the goals of different interest groups coincide.
- The achievement of goal congruence is essential in order to increase the profitability of the organisation and to achieve its goals.
- It is very important that the individual goals are consistent with the organisational goals. It may be said that in a perfect organisation individual goals and organisational goals should correspond perfectly. However, it is rarely the case as employees have both personal as well as organisational goals. One way of to achieve goal congruence between shareholders and managers is by carefully designing remuneration packages for managers which would motivate managers to take decisions which were consistent with the objectives of the shareholders.

Goal congruence is important for superior performance of the organisation because it encourages alignment between individual and organisational objectives. When goals of the organisation and the goals of individuals are aligned, it allows for an efficient flow of communication and improved collaboration, which leads to better decision-making and an increase in productivity. Additionally, when goals are congruent, individuals are more likely to be motivated and inspired to strive for the company's success, which ultimately leads to improved performance.

Aspects of Goal Congruence

The following are some of the areas that have the ability to create goal congruence:

a. Communication and Understanding

Channels of communication and how goals are perceived are important to achieve goal congruence. Operational managers have a responsibility of being aware as to what actions are desirable and what goals are to be achieved. It should be understood that the communication of different goals can occur through informal channels, which involves meetings and face to face interactions, or through formal channels including budgets or other financial documents. There is a inherent risk that even if the communication is well executed, it might be perceived in different ways. Organisations, therefore, should internalise the goals in a good manner to avoid that employees feel inability to achieve them.

b. Create direction

One of the reasons for lack of goal congruence is the absence of direction related to employees' behaviour. Performance management and goals facilitate efficient communication about what managers want their subordinates to focus on. It needs no mention that providing clear information and direction, employees can better

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understand what is expected from them, how to perform adequately, and how to contribute effectively to the achievement of the organisational goals. There is a need to increase the employees understanding of the strategic objectives as well as the organisation's value drivers.

Achieving Goal Congruence

Goal congruence can be achieved, and at the same time, the agency problem can be dealt with, providing managers with incentives which are related to profits or share price, or other factors such as: An agency problem is a conflict of interest inherent in any relationship where one party is expected to act in the best interest of another.

Agency problems arise when incentives or motivations present themselves to an agent to not act in the full best interest of a principal.

Through regulations or by incentivising an agent to act in accordance with the principal's best interests, agency problems can be reduced.

The following are some of the ways by way of which the agency problem can be dealt with:

Pay or bonuses related to the size of profits termed as profit-related pay.

Rewarding managers with shares, e.g.: when a private company 'goes public' and managers are invited to subscribe for shares in the company at an attractive offer price.

Rewarding managers with share options. In a share option scheme, selected employees are given a number of share options, each of which gives the right (after a certain date) to subscribe for shares in the company at a fixed price. The value of an option will increase if the company is successful and its share price goes up.

Such measures might encourage management in the adoption of "creative accounting" methods which will distort the reported performance of the company in the service of the manager's own ends. However, creative accounting methods such as off-balance sheet finance present a temptation to management at all times given that they allow a more favourable picture of the state of the company to be presented than otherwise, to shareholders, potential investors, potential lenders and others. An alternative approach is to attempt to monitor manager's behaviour, for example, by establishing 'Management audit' procedures, to introduce additional reporting requirements, or to seek assurance from managers that shareholders' interests will be foremost in their priorities.