

CHAPTER

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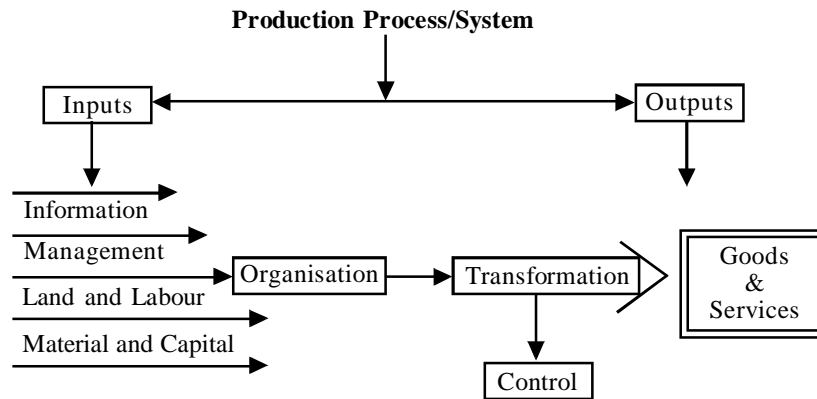
PRODUCTION MANAGEMENT

“Few minutes of planning can save hours of hard work”

MEANING OF PRODUCTION MANAGEMENT (WHAT IS PRODUCTION MANAGEMENT?)

Production is the creation of utilities for meeting human wants. Here, men, material and equipment are used for the creation of goods which can be used for different purposes. According to Carl Heyel, “Production is the process of transforming raw materials or purchased components into finished products for sale”. In the production process, raw materials and other inputs are converted into finished goods for actual use. There is creation of utilities through the process of production. Satisfaction of human wants is the guiding principle of all production activities. Thus, production is a process by which goods and services are manufactured or brought into existence. Production and production management are closely related concepts. Production is the creation of goods and services. Production management refers to the application of management principles to the production function/activity in a factory. The application of management functions to production activity was necessary due to the introduction of factory system of production, growing popularity of joint-stock companies and application of principles of scientific management to production activities.

Production process is also described as an act of transformation, i.e., inputs are processed and transferred into some tangible output. Such transformation is possible by assembling or by disintegration. In assembling, the components are integrated (e.g., assembling of an automobile) and in disintegration, the parts are separated (e.g., small bars from a big steel bar). Thus, managing productive system involves controlling the conversion process and all the variables that affect its performance. This process of production/productive system is made clear in the following chart:



Definition of Production Management

1. According to E. L. Brech, "Production management is the process of effective planning and regulating the operations of that section of an enterprise which is responsible for the actual transformation of materials into finished products.

2. According to E. S. Buffa, "Production management deals with decision making related to production process so that the resulting goods or service is produced according to specifications, in the amounts and by the schedule demanded and at minimum cost."

Production v/s Productivity

Production	Productivity
<p>1. Meaning Production: Merely means volume or value of output produced in a given period irrespective of the volume or value of input. Production is an absolute concept.</p>	<p>1. Productivity is the ratio of output to input. It refers to output in relation to the resources employed. Productivity is a relative concept as it relates output-input relationship.</p>
<p>2. Nature: Production is concerned with the end results of factors' contributions in the shape of volume or quantity of goods and services obtained out of an organization.</p>	<p>2. Productivity views the volume or value of production in relation to resources utilized in the making of such goods and services. It is the ratio of input of resources to output of products.</p>
<p>3. Rate of increase: Increased production is brought about by making larger capital investments and employing additional personnel and raw materials.</p>	<p>3. Increased productivity is only possible through the making of larger production by the use of lesser capital investment and smaller number of personnel.</p>
<p>4. Narrow/Broad Meaning: Production has a narrow meaning since it denotes only volume or value of output not in relative but in absolute terms.</p>	<p>4. Productivity has a wider meaning since it is related to input and output ratio.</p>
<p>5. How to raise? Increase in production is possible increasing the factors of input.</p>	<p>5. Increase in productivity is possible by more efficient utilization of the input factors.</p>

<p>6. Measurement: Measurement of production is simple and easy as it is made in terms of units or value.</p>	<p>6. Measurement of productivity is complicated as different input factors have to be reduced to a common denominator for such measurement</p>
<p>7. Effect on standards of living: Production by itself does not raise standards of living of the people as it has no direct effect on the real incomes of the people</p>	<p>7. Productivity raises the standards of living of the people as increase in the real income of the people is possible only through increase in productivity.</p>

The term 'production' is also referred as 'manufacturing' or 'operations'. It is to be noted that 'operations' is a broader concept as compared to production. The term production management is used for a system where tangible goods are produced, whereas, the term operations is used both for production of tangible goods and intangible services such as that of airlines, hospitals, educational institutions, etc.

Meaning of Production

Production refers to a sequence of processes that transform inputs into a desired form. It is a process by which raw materials are transformed into semi-finished goods and semi-finished goods into finished items. The transformation from inputs to outputs, may be done in any one or in the combination of the following ways:

1. Transformation by Disintegration: There is essentially one ingredient as input and producing several outputs. For example, producing rolling steel bars from steel ingots or producing a number of nails from a piece of iron.

2. Transformation by Integration or by Assembly: In this case, there is a use of several components as inputs and obtaining essentially one product as output. For example, producing a television set, automobiles, machines, etc.

3. Transformation by Service: In this case, certain operations are undertaken that may add to the value or utility of the item. For instance, regular maintenance of a machine would increase its life, and better performance.

Importance of Production Management

Production management is important to business firms as well as to the customers and to the society. The importance of production management is stated as follows:

I. Importance to Business Firms:

The importance of production management to business firms is stated as follows:

1. Accomplishment of Firm's Objectives: The production function helps a business firm to achieve its overall objectives. By producing products that satisfy customer's needs and wants, the company can increase its sales, which in turn enables a firm to achieve its objectives such as:

- Optimum utilization of production capacity,
- Higher profits, etc.

2. Reputation and Goodwill: Effective production enables a firm to earn reputation and goodwill in the market. Satisfied customers, dealers and others develop a good image of firms that provide efficient and effective goods and services. A good image helps a firm to expand and grow.

3. Helps to Introduce New Products: The production function helps to introduce new products in the market. Through research and development, production management enables a firm to develop new and better quality of goods and services.

4. Supports Other Functional Areas: The production function supports other functional areas in an organization, such as marketing, finance and personnel. For instance, the marketing department would find it easier to market quality products, and the finance department would be able to generate more funds by way of increase sales revenue.

5. Helps to Face Competition: Production management enables production of quality goods due to R&D and quality control. Therefore, a business firm would be able to face competition effectively with the help of right quality products, at the right price and at the right time.

6. Optimum Utilization of Resources: Production management facilitates optimum utilization of resources such as manpower, machines, etc. Thus, a firm can meet its capacity utilization objective, which in turn can bring higher returns to the organization.

7. Minimizes Cost of Production: The production management helps to minimize cost of producing goods. The production department tries to maximize output of goods and services with the minimum resource inputs. This helps a firm to achieve its cost and efficiency objective.

8 Expansion of the Firm: The production management enables a firm to expand and grow. This is due to the fact that the production department strives to improve the quality and to reduce costs. This, in turn helps a firm to generate more returns in the form of higher profits.

II. Importance to Customers and Society:

Production management is important not only to business firms but also to customers and society. The importance of production function to customers and to society is stated as follow:

1. Higher Standard of Living: Because of production function, consumers can enjoy new and better varieties of goods and services due to constant research and development undertaken by well established companies.

2. Generates Employment: Production activities create a number of jobs in the country, either directly or indirectly. Direct employment is generated because of job opportunities in the production area and indirect employment is generated in supporting areas such as marketing, finance, etc.

3. Improves Quality and Reduces Cost: Production management makes it possible to improve quality of the product because of research and development. Also due to large-scale production, there are economies of large-scale, which brings down the cost of production and consequently lowers down consumer prices.

4. Spread Effect: Because of production, other sectors also expand. This includes expansion of ancillary units to provide parts and components to the production firms. Also the service sector gets a boost such as banking, transport, communications, insurance, etc. Such spread effect offers more job opportunities.

5. Creates Utility: Production creates form utility. Consumers can get form utility in the shape, size and designs of the product. Production is also responsible for time utility, because goods are available as and when they need it.

6. Enhances Economic Growth: Production management ensures optimum utilization of resources. Through effective production of goods and services, production management enhances speedy economic growth and well-being of the nation.

Functions/Scope of Production Management

Production management is concerned with the planning, organizing, directing and controlling of production activities. The various activities that constitute production management include the following:

1. Product Selection and Design: Every firm needs to select the right product(s) and design in order to meet the customer's requirements. Products must be selected after detailed evaluation of the various product alternatives. Techniques like value engineering and value analysis may be adopted in order to create alternate designs, which can offer maximum value to the customer.

2. Process Selection and Planning: The business firm should select and plan for the right process. Process selection involves decisions relating to the choice of technology, equipment, machines, material handling systems, mechanization and automation. Process planning involves decisions relating to various stages of processes and their sequence.

3. Capacity Planning: The production manager should plan for the right production capacity. Excess and utilized capacity will result in low utilization of resources, whereas, inadequate capacity will lead to delivery problems. Certain factors must be considered in capacity planning such as market situation, availability of resources, etc.

4. Production Planning: The production manager performs the function of production planning. Production planning involves:

- (a) Routing: It involves decisions relating to the flow of production activities, so that the production takes place smoothly.
- (b) Scheduling: It involves preparation of time-table relating to production activities, so that the activities can start and complete on time.

5. Production Control: The production manager needs to monitor the production to find out whether the production is taking place as per the targets. The reports are prepared to measure actual production. If there are any deviations, necessary corrective steps are taken at the right time.

6. Quality Control: The production manager needs to place lot of emphasis in improving the quality of the product and at the same time in reducing the cost of production. The quality control officer reports to the production manager of any deviations in quality or if any improvement in quality is required. Accordingly, the production manager may initiate suitable action.

7. Inventory Control: Inventory control is also one of the important functions of the production department. The production manager monitors the level of inventories. There should neither be overstocking or understocking of inventories such as spare parts, components, raw materials, etc.

8. Work Study: Production management is concerned with work study. It involves method study and work measurement, employed to ensure the best possible use of resources in carrying out a specified activity. It is concerned with productivity improvement by redesigning existing jobs or by designing new jobs.

9. Maintenance and Replacement of Machines: Production management ensures proper maintenance and replacement of machines and equipment. The production manager must adopt preventive maintenance techniques, which includes preventive inspection, periodic cleaning and upkeep, planned replacement of parts, etc. At the same time, there should be timely breakdown, maintenance, so as to minimize breakdown time.

10. Other Functions: The production manager also performs some other functions such as:

- Cost Reduction and Cost Control
- Motivating the Workforce.

Productivity Meaning of Industrial Productivity

In the words of Peter Drucker, “Productivity means the balance between all factors of production that will give the greatest output for the smallest effort,” Thus, productivity is the ratio of output to input.

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

It is to be noted that productivity and production are not one and the same because productivity is a relative concept expressed as a ratio or percentage, whereas, production denotes the quantum of output; also increase in productivity is due to more efficient utilization of resources and reduction in wastage of resources, whereas, increase in production is due to increase in inputs.

INTRODUCTION TO PRODUCTIVITY

Q.1. What is the meaning of productivity? What is its importance?

Ans: Productivity is defined as the ratio of output and input.

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

Productivity in an organization is variously expressed in terms of productivity of workers, machines, materials or electric power.

Productivity of workers also called Labour productivity is output per man hour. Productivity in relation to machines is output per machine hour.

Productivity of materials is output per unit measure of a particular material. Productivity of electric power is output per megawatt or kilowatt of power.

Importance of Productivity:

Productivity in an organization, whether manufacturing or service rendering, is responsible for its efficient management, it helps to ensure the following:

- It helps in assessing the cost effectiveness of new equipment, processes or technologies incorporated for a higher rate of production prior to their introduction.

It helps in performance appraisal of the employees so as to enable them to higher wages or salaries, promotions, etc.

- It helps in effectively controlling the net price of a manufactured product and enhances the profitability of an organization.

- For an organization involved in selling raw materials, improvements in productivity helps in lowering the selling prices of more and more products and checking inflation.
- Efficient maintenance of productivity helps in boosting product reliability, quality improvement methodologies and thus, keeps a competitive edge over others.
- Productivity of each and every industry helps the consumerism, i.e., buying of various commodities at a country level. Lower price increases the purchasing power of consumers enabling a better standard of living. Thus, every nation strives to achieve higher productivity to improve its per capita gross national product (GNP).
- When the productivity of an organization in a particular industry is raised, others too have to adopt measures to increase their productivity in: order to remain competitive. It is thus very important for every organization to plan a systematic approach towards achieving a higher productivity.
- Increase in productivity concepts such as Total Productivity and Organisational Productivity are very useful for company and helps in moving towards its object.

NATIONAL PRODUCTIVITY COUNCIL

The National Productivity Council of India has instituted awards for productivity performance in order to encourage productivity improvement programmes at the units' level through a process of recognition for sustained and high productivity improvement. For this purpose, it has evolved a system of evaluating growth in the total factor productivity index. For instance, in automobile and ancillary units, it goes by the average total factor productivity index of the three consecutive previous years, besides the year for which the award is to be given, using the following pattern of weightage system to calculate the index:

Item	Weightage
(a) Overall Managerial Effectiveness	
1. Value added per rupee of cost of conversion	10
(b) Quantitative Factors	
1. Capacity utilization	35
2. Material utilization	20
3. Energy consumed per unit of production	5
4. Manpower utilization	10
(c) Qualitative Factors	
1. Quality Improvement	7
2. Productivity consciousness	4
3. Participative culture	5
4. Productivity plans	4
	100

Suitable weightage are given to individual factors in the quantitative and overall performance for assessing the relative productivity performance growth by the participating units. In respect of quantitative factors, the assessment marking is done on the basis of the maximum growth in the total factor productivity of the same organisation. For qualitative factors, the inter-unit comparison is done for providing a suitable marking on the basis of the actions planned and results obtained.

National Productivity Council gives awards in the following eleven fields in the industrial sector and nine in the agricultural sector.

Industrial Sector

1. Automobiles and ancillary industries
2. Cement
3. Fertilizers
4. Industrial machinery
5. Machine tools
6. Paper
7. Road transport
8. Small-scale sectors
9. Sugar
10. Leather and leather goods
11. Power-generation, transmission and distribution equipment

Agricultural Sector

1. Inland fish production cooperatives
2. Marine fish production cooperatives
3. Seeds corporations
4. Agro-industry corporations
5. Dairy development and production in the cooperative sector
6. Marketing federations in the cooperative sector
7. Bio-fertilizer producers
8. Oilseed federations
9. Horticultural development in the cooperatives and public sector.

National Productivity Council asks the units that may be interested in competing for the awards to submit information relevant to evaluation on some prescribed pro formas, which are first screened by the secretarial of the council in order to select the best ten to fifteen entries and are finally evaluated by a panel of judges appointed by it. Managements of the selected firms are also asked to present to the panel of judges their productivity improvement strategy and the best unit is awarded a plaque shield while the second best unit is awarded a citation. The pro forma was circulated by the council for the

award of the year 1983-84, for automobiles and ancillary units. Since all units do not make the same products, a direct comparison of the per-unit product-based factors is obviously not possible. As such, the information on various variables is taken for four years from the units interested in contesting for the awards to evaluate the growth of productivity during the year as compared to the levels of productivity during the preceding three years.

The National Productivity Council computes the following indexes.

1. Valued-added: It is measured as the difference between the output value (turnover + accretion to stock) and 'immediate inputs, that is, materials and components which go directly into the finished products including excise duty, etc'.

2. Cost of Conversion: The cost of conversion is calculated as the total cost of conversion (including remuneration, depreciation, interest or borrowed capital incurred in the process of design manufacturing production and installation of finished products).

3. Capacity utilization: Capacity utilization is measured as the production achieved against the capacity as registered with DGTD.

4. Installed capacity: Information has to be provided in the same unit of measurement for all the four years both for installed capacity and the production achieved.

Capital productivity is measured as a function of the following ratios:

$$(a) \frac{\text{Value Added}}{\text{Gross Fixed Assets}}$$

$$(b) \frac{\text{Value Added}}{\text{Current Assets}}$$

$$(c) \text{ Capacity utilization} = \frac{\text{Production Achieved}}{\text{Installed Capacity}}$$

5. Materials Utilization: Material productivity is measured as value added per rupee of material input, comprising all materials including purchased components, subassemblies and subcontracting.

6. Manpower Utilization: Manpower utilization is measured as the ratio of value added to total workmen-days deployed.

7. Energy Consumption Factor: This factor is measured as the ratio of 'direct energy consumed through thermal, electrical and other forms in kilo calories to the total number of units produced.

For the qualitative factors, information is provided in textual form relating to:

- Achievements in quality improvement during the previous three years, also explaining how each unit defines the overall quality of its products.
- Whether customer complaints are encouraged. If so, how the complaints are evaluated or processed, giving the trend of customer complaints during the previous three years.

- The type of QC organisation in the company and its functions, the QC techniques used and the manner in which the QC organisation may have helped in achieving the company's objectives.
- The measures taken by the company to make managers, supervisors and workers quality conscious.
- Whether the company has annual, quarterly or monthly productivity plans, enclosing a sample of the latest productivity plan.
- The system of monitoring the productivity plans/targets and whether the company also has any reward system for achieving productivity targets describe the reward system.
- The system of making the productivity plans and setting the productivity targets as well as the organisational measures designed to ensure participation of all concerned in achieving the targets.
- The specific gains achieved during the last three years as a result of productivity plans.
- The promotional efforts made during the year (for which applied for the award) for creating productivity consciousness in the organisation for both the workers and the managers.
- The number of officers, supervisors and workers trained, along with the duration of the training given for the last three years.
- The subjects on which training has been imparted.
- The manner in which the productivity promotional or productivity consciousness effort has helped the company, with supporting details.
- Whether company works more on consultative information sharing systems or by consulting joint decision forums, and how often does these forums meet.
- The manner in which the decisions taken or recommendations made by the participative forums are implemented.

Importance of Higher Productivity

Higher productivity or higher efficiency can bring in lot of advantages to the organization. The advantages are as follows:

1. Higher Profitability: Higher productivity enables the firm to generate more output. The increased output results in more profits to the firm. The increased profits can be utilized for expansion and other activities of the firm.

2. Employees' Welfare: Higher productivity brings more returns to the firm in the form of higher profits. The higher profits can be utilized to provide better facilities and working conditions to the employees. Thus, higher productivity enables employees' welfare.

3. Higher Return to Shareholders: The firm can generate higher return on investment due to higher productivity. The higher return on investment enables the firm to pay higher dividend to the shareholders. The market price of the shares on the stock exchange will also increase.

4. Better Relations: Higher productivity can generate better relations between the management and the employees in the organization. This is because employees are provided with good working conditions, facilities and incentives.

5. Customer Satisfaction: Higher productivity can generate better customer satisfaction. This is because customers are provided with quality products at good prices. Customer satisfaction will result into customer loyalty towards the organization.

6. Higher Credit Rating: Higher productivity can generate higher credit rating by financial institutions and rating agencies like CRISIL and CARE. This will enable the firm to obtain cheap funds from the market to meet working capital requirements as well as fixed capital requirements.

7. Corporate Image: The firm can enjoy a good corporate image in the minds of various sections of the society. This includes:

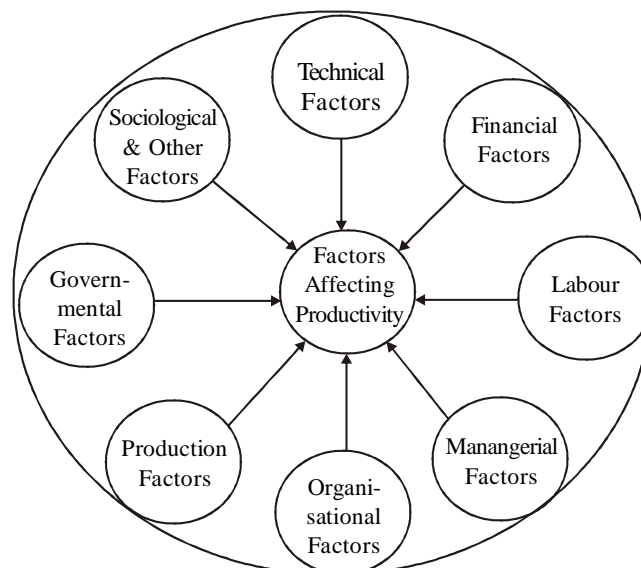
- (a) The shareholders
- (b) The suppliers
- (c) The financial institutions
- (d) The customers, etc.

8. Better Terms from Suppliers: Higher productivity can enable the firm to obtain better terms from the suppliers. The suppliers may provide higher credit period due to the goodwill enjoyed by the firm.

9. Less Employees Turnover: Higher productivity enables the firm to provide better facilities and working conditions to the employees. Therefore, this will generate employees loyalty towards the firm and they may not leave the organization.

FACTORS AFFECTING PRODUCTIVITY

There are several factors affecting industrial productivity. Overall productivity can be increased by improving these factors and attaining a balance between them, The factors are:



1. Labour Factors

- Scientific recruitment and selection of employees.
- Proper placement of employees throughout the organization

- Provision of proper training to the right people at the right time.
- Proper promotion and transfer policies.
- Proper working environment: — good working conditions, working hours, etc.

2. Management Factors

- There is a need to have proper division of work in the organization
- There must be a balance between authority and responsibility at all levels.
- There must be good discipline at all levels in the organization
- The principles of unity of command need to be followed, etc.

3. Organizational Factors

- Every organization should have well defined and specific objectives.
- The organization structure should be designed to achieve the benefits of specialization.
- There must be proper coordination throughout the organization.
- The principles of span of control and delegation of authority must be followed.

4. Production Factors

- There must be proper production planning and control
- There is a need to have proper inventory control.
- Quality control should be strictly followed.
- Constant efforts in research and development are required.
- Proper arrangement of necessary materials and tools.

5. Technical Factors

- Properly designed machines and equipment
- Introduction of automation and modernization.
- Proper maintenance and repairs of machines.
- Proper layout of machines and equipment.

6. Financial Factors

- Proper management of working capital
- Proper management of fixed capital
- Proper financial planning and control
- Diversification in the right areas.
- Proper sources of funds
- Investment in the right areas.

7. Government Factors

- Good working relations with government authorities.
- Adequate knowledge of government rules and regulations.

8. Sociological Factors

- Social values of the society.
- Attitude of the workers towards work and their organization
- Attitude and behavior of customers, suppliers, dealers, etc.

9. Natural Factors

- Climatic conditions
- Geographic locations

TECHNIQUES OF PRODUCTIVITY

(Measures/Methods to Improve Productivity)

The different techniques of productivity improvement may briefly explained as follows:

1. Value Engineering: VE is the process of improving the value of a product or service at every stage of product life cycle. At the development stage, value engineering plays an important role in improving value of a product or service by placing emphasis on cost reduction without reducing quality. At the maturity stage, VE places emphasis on components or parts. At this stage, cost reduction is possible through substitution and/or locating alternate sources of original components. The following are steps in VE:

- Select the product for improvement
- Record relevant data such as primary and secondary functions.
- Examination of existing design or process
- Development of alternative designs
- Selection of the best design
- Installation of the new design.

2. Quality Circles: The concept of QC was introduced by Dr. I. Kaoru in 1960s, in Japan. QC is a small group of employees who meet regularly to identify, analyst, and solve problem in the work area.. The QC members provide recommendations to the management to, implement new methods or practices in order to solve work related problems, which in turn would help to increase productivity.

3. PERT & CPM: The PERT & CPM are time event network analysis techniques. These techniques help managers to plan and control activities. These techniques focus on the critical path or sequence of events that requires the maximum possible time, so that the critical path can be properly monitored, which in turn helps the project to get completed as per the schedule.

4. Monetary and Non-monetary Incentive Plans: The organization must motivate the employees by designing appropriate monetary and non-monetary plans. The monetary plans are designed to provide better monetary terms to the employees such as wages and salaries, bonus, and other monetary incentives. The non-monetary plans are framed to provide better non-monetary facilities or incentives such as good working conditions, welfare facilities, workers participation in management, etc.

5. Operations Research: It is a broad technique that makes use of mathematical and scientific models to solve management problems, including those concerning productivity. This technique makes use of scientific methods, to study the alternative courses of actions with a view to obtain quantitative basis for selecting the best alternative. OR experts have developed various sub-techniques such as linear programming, game theory, etc., to arrive at proper decision making which in turn would help to improve productivity.

6. Training: It is a process of imparting skills and knowledge to the employees. It is often found that training is a must, especially for new employees as it shortens the period of learning about the job. Again training results in good attitudes and overall efficiency of the employee increases.

7. Job Enlargement: It is a job design strategy involving horizontal expansion of the job range so as to make jobs more interesting and satisfying. It involves increasing the variety of duties. For instance, a typist may also be given the job of a receptionist or accounts writing apart from typing.

8. Job Enrichment: It is a job design strategy involving increase in vertical depth of a job so as to make routine jobs more meaningful and satisfying. It involves providing more challenging tasks, and responsibilities. For instance, an executive who is involved in preparing and presenting reports of performance, may also be asked to frame plans for his department.

9. Inventory Control: There must be proper level of inventory. Overstocking and understocking of inventories is to be avoided. Overstocking of inventories would result in blocking of funds and also there are chances of spoilage or misuse of funds and also there are chances of spoilage or misuse of materials. Under stocking of inventories will result in shortages which would block the smooth flow of production, and thus delivery schedules will be affected.

10. Materials Management: Materials management is concerned with the optimum use of materials used in the manufacturing prices. It involves scientific purchasing, systematic storekeeping, proper inventory control, etc. Some of the main objectives of materials management is to purchase quality materials at right and reasonable prices, to maintain favorable supplier relations, to reduce the cost of production, etc.

11. Quality Control: The main objectives of quality control includes, to produce quality goods at reasonable prices, to reduce wastage, to locate causes of quality deviation and to correct such deviations, to instill quality consciousness among employees, etc.

12. Job Evaluation: It is a process of determining the relative worth of each job in the organization in order to establish a basis for relative wage rates and other personnel matters. A proper job evaluation increases morale of the employees and as such there is enhanced productivity.

13. Human Factor Engineering: Human factor engineering or ergonomics refers to man-machine relationship designed to match the technology to human requirements. The term ergonomics has originated from the Greek work '*ergs*' meaning '*work*', and '*nomikos*' meaning '*law*'. It literally means '*laws of work*' and concerns with the study of how to fit a job to a man's psychological, and physiological characteristics to enhance human efficiency and well-being.

Measurement of Industrial Productivity

Productivity is the ratio of output to input. The general or overall productivity of an industrial unit can be measured with the help of the following formula.

Where P = Productivity

$$P = \frac{O}{I}$$

O = Output

I = Input

The output can be expressed in terms of volume (i.e., the number of units produced). Similarly, the input can be expressed in terms of the amount of inputs used, (i.e., the number of units of materials used, the amount of capital invested, the number of man-hours worked, the number of machine hours worked, the area of land used and so on.)

It is to be noted that there are practical difficulties in measuring the overall productivity. This is because one cannot just add the amount of capital invested and number of man-hours worked, or number of units of raw materials used in producing goods or services. Therefore, productivity of specific factor of production is usually measured.

Productivity of Specific Factor

Basically, the various factors of production are labor, capital, materials, machines and land. The productivity of each of these factors can be measured as follows:

(a) Labor Productivity: Labor productivity is the relation between output to man-hours worked. Labour productivity can be expressed as follows:

Where PL = Labour Productivity

$$LP = \frac{O}{MH}$$

O = Output, and

MH = Man = Man-hours worked

Labor productivity is higher when:

- The output increases with the same man-hours or lesser man-hours.
- The output remains the same with lesser man-hours.

(b) Capital Productivity: Productivity of capital is the relation between output and capital employed. It can be expressed as follows:

Where CP = Capital Productivity

$$CP = \frac{O}{CE}$$

O = Output

CE = Capital employed

Capital productivity is said to be higher when:

- The output increases at the same capital or lower capital cost.
- Th output remains the same at a lower capital cost.

(c) **Raw Materials Productivity:** The productivity of raw materials is the relations between output to raw materials consumed. It can be expressed as follows:

Where RMP = Raw materials productivity

$$\text{RMP} = \frac{\text{O}}{\text{RMC}}$$

O = Output

RMC = Raw materials consumed

It is to be noted that the raw materials productivity can be measured in terms of number of units of raw materials consumed as well as the cost of raw materials.

(d) **Machines Productivity:** The productivity of machines is the relation between output to machine-hours worked. It can be expressed as follows:

Where MP = Machines productivity

$$\text{PL} = \frac{\text{O}}{\text{MHW}}$$

O = Output

MHW = Machine-hours worked

(e) **Productivity of Land:** The productivity of land is the relation between output to area of land used. It can be expressed as follows:

Where PL = Productivity of land

$$\text{PL} = \frac{\text{O}}{\text{AL}}$$

O = Output

AL = Area of land used

Difficulties in Measuring Productivity

1. Difficulty in Measuring Output: Output can be measured either in terms of physical volume or in terms of money value. If measured in physical volume the problem will arise when physical units of different size, shape, color, etc., are produced as such physical units cannot be totalled up. Further, certain by-products may arise during the manufacturing process, whose evaluation becomes arbitrary.

If output is measured in terms of money value then the firm will have certain difficulties in measuring productivity, especially, when the firm manufactures a wide variety of items and where inter-company comparison has to be made.

2. Difficulty in Measuring Labour Productivity: It is difficult to measure and compare the labour productivity. This is because one cannot easily compare the labour productivity of one firm with that of another. For instance, the labour of one firm may be more trained and capable as that of the other and therefore the productivity of labour in the first firm may be higher.

3. Difficulty in Measuring Capital Productivity: It is difficult to measure and compare the capital productivity of two different firms. This is because one firm may employ capital obtained from sources at low rate of interest as compared to the other firm.

4. Difficulty in Measuring Land Productivity: It is difficult to measure and compare the land productivity at two different locations. The land may differ in various respects such as rent, locational advantages, etc.

5. Difficulty in Measuring Machines Productivity: It is difficult to measure the productivity of machines employed by two different firms. For instance, one firm may employ latest machines as compared to the other. Therefore, the productivity of machines employed by the firm may be higher as compared to the other firm.

6. Difficulty in Measuring Materials Productivity: It is difficult to measure the productivity of materials employed by two different firms. For instance, one firm may make use of good quality materials as compared to that of another firm. Therefore, the productivity of materials used by the first firm may be higher as compared to the other firm.

7. Difficulty in Measurement of Man-hours: It is difficult to figure out the exact figures of productive man-hours. Wages paid to labour includes cost of idle time also.

8. War and Peace Periods: Comparison during war and peace periods also becomes difficult, because the value of inputs and outputs varies according to conditions prevailing in the country.

9. Technology Changes: Change in Technology also poses a problem as it would cause a change in the nature and quality of output.

10. Service Institutions: In service Institutions like banks, insurance companies, etc., it is difficult to work out productivity ratios. Output figures in physical terms for intangible services are difficult to compute.

11. Price Changes: Value comparison over a period of time does not give a correct picture due to inflation. There arises a problem of reducing prices to proper base price.

Productivity vs Performance Appraisal

Productivity: Productivity is the quantitative relation between what we produce and what we use as a resource to produce them. Productivity also indicates the efficiency of production management. It is an indicator to show how well the factors of production land, labour, capital and enterprise are utilized. Productivity leads to better utilization of resources at the enterprise level. Higher productivity provides improved wages to employees. Productivity cuts down wastage along with cost and improves margin of profits. Higher productivity earns improved credit rating for the enterprise from the rating agencies.

Performance Appraisal: Performance appraisal is an objective assessment of an individual's performance against well defined standards. Performance is essentially what an employee does and does not do. On the other hand, at the organizational level performance appraisal is a systematic evaluation of performance of employees at work by their superiors. Performance appraisal is conducted mainly on traits such as quality and quantity of output, presence at work. Cooperativeness, timely work, etc. Performance appraisal is useful for guiding the employees for self-improvement and self-development.

Linking Productivity with Performance Appraisal: Productivity and performance appraisal are closely linked to one another. High productivity raises the competitive capacity of an enterprise and enables it to remain in the business with reasonable stability and an opportunity to move further towards prosperity. Quality improvement and cost reduction are also possible through productivity improvement. The benefits of higher productivity goes down to individual employees whose positions and remuneration show marked improvement. Performance appraisal develops a spirit of healthy competition among the employees who aim to contribute in increasing productivity. Performance appraisal helps the employees in their development through their performance feedback. Productivity contributes in improving individual efficiency resulting in better performance appraisal report. Employees contribute more and get better financial benefits due to higher productivity. This ensures

cordial industrial relations making it possible to conduct appraisal under pleasant conditions. Employees get better working conditions, welfare facilities and other incentives. Work days are not lost in industrial conflicts making way for higher productivity, higher profits and pleasant relations between employers and employees.

Productivity Movement In India

Productivity in industrial enterprises has gained immense significance in recent years. This is because of intense competition both national and international and also due to the limitations of resources.

The need for higher productivity was felt since independence of our country. After independence, Government of India intended to increase productivity consciousness in our country.

In 1952 and in 1954, Government of India invited a team of productivity experts from International Labour Organization to study and set up a Productivity Center in India.

In 1957, Government of India set up a Commission on Productivity under the Chairmanship of Dr. Vikram Sarabhai. This Commission visited Japan to study the working of Productivity Center of Japan. The Commission submitted its report in March 1957.

On the basis of the recommendations of the above commission, the Government of India set up the National Productivity Council (NPC) at New Delhi in Feb. 1958.

NPC is an independent autonomous body registered under the Societies Registration Act, 1860.

Objectives of NPC:

The main objectives of NPC are as follows:

1. To promote productivity consciousness in all sections of national economy.
2. To disseminate the knowledge of the concepts and techniques of productivity and demonstrate their value and validity in the practical applications.

Organization and Working of NPC

- NPC is an autonomous body having 75 members representing various sections as under:
- Central Government — 12 members
- Representative of Employers — 12 members
- Representatives of Employees — 12 members
- Representatives of Productivity Councils — 12 members
- Representatives of several national, professional and technical organizations — 27 members.

The administration of NPC is in the hands of Governing Body which is elected from among the members of NPC. The Governing Body, consists of 25 members. It is represented by 5 members each from Central Government, Employers, Employees, Local Productivity Councils and others. The Governing Body is a policy making body and meets once in 3 months.

The Headquarters of NPC is at New Delhi. It has established nine regional directorates and two sub-regional directorates in the important industrial centers of the country. It has also established more than 50 Local Productivity Councils in the important industrial cities of India.

The regional directorates of the NPC look after the Local Productivity Councils coming under their jurisdiction. Local Productivity Councils represent the State Government, employers, employees and other professional bodies.

Main Activities of NPC:

1. Training Programmes: It organizes training programmes either directly or through LPCs. Training is given to the participants in various fields such as work study, industrial engineering, inventory control, etc.

2. Seminars and Workshops: It organizes seminars and workshops at national and regional levels. The workshops and seminars are conducted on vital topics such as R&D, Human Engineering, Total Quality Management, etc.

3. Productivity Surveys: It conducts productivity surveys in different fields. It investigates into organizational, managerial, technical, and other aspects of individual units with a view to detect difficulties and discover areas of improvement.

4. Sponsors Personnel for Training Abroad: It sponsors management and technical personnel for training abroad under the scheme of technical assistance. So far Indian personnel has been sent for training in U.S.A., Germany, UK, Japan, France, etc. They are trained in the areas like industrial management, industrial engineering, human resource development, personnel management industrial relations, etc.

5. Sponsors Study Teams Abroad: It also sponsors study teams abroad for undertaking productivity studies and then to submit its report to the NPC.

6. Supply of Information: It disseminates the information, and increases productivity consciousness through various publications such as:

- Productivity Journal (published quarterly)
- NPC Informations (published monthly)
- Publication of reports of study teams
- Other publications

7. Maintains Libraries: It also maintains libraries at its headquarters, regional directorates and local productivity councils. It also develops training materials such as audio-visual aids on productivity.

8. Assists Local Productivity Councils: It helps in established and developing LPCs and guides and supports their activities.

9. Fuel Efficiency Service: It guides and promotes efficient utilization of fuel and heat in industry. For this purpose, Fuel Efficiency Service was established by NPC 1964.

10. Assists Asian Productivity Organization (APO): It supports the activities of APO. APO has its Headquarters at Tokyo NPC assists the study teams sponsored by APO visiting India. NPC has organized and conducted many programmes in collaboration with APO.

QUALITY MANAGEMENT

Professionalism means consistency of quality.

— Frank Tyger

(A) QUALITY MANAGEMENT**Meaning and Definition of Quality Management**

Historically, building quality into product was the responsibility of skilled craftsmen. They used to manufacture goods only on the receipt of orders. This enabled to make quality goods. With the onset of industrial revolution, man-made goods were replaced by machine-made goods. Industrial Revolution introduced factory system of production and along with it mass production. Inspection of produced items was the only basis of quality. Thereafter, the concept of product quality drastically changed with changes in the methods and technology used in production. The concept of inspection has today grown into total quality management. Now product quality is checked by quality control department to protect the image of the company by the removal of poor quality products.

When customers buy products they use their own inspection skills and put forth their personal reactions. So far as large firms are concerned they establish a separate department to exercise quality control covering all processes and functions to achieve quality specifications. Mere inspection of products has become outdated instead quality management has become new slogan; making plans to bring about continuous quality improvement to achieve specified standards. The primary objective of every firm is to remove poor quality from the product rather than to remove poor quality product. In the words of J.M.Juran, "Quality management has progressed establishing proactive rather than reactive organizations." Quality management is a comprehensive concept. It covers all aspects of quality control. The evolution of quality management is represented by (a) quality inspection (b) quality control (c) quality assurance (d) total quality management and (e) ISO 9000 and 14000 standards.

Definition of Quality Management:

Quality management is "totality of features and characteristics of a product or service that bear on its ability to satisfy a given need."

— American Society for Quality Control

(B) TOTAL QUALITY MANAGEMENT (TQM)**Meaning:**

Total quality management is a comprehensive concept and not related only to the quality of goods and services. TQM is a preventive approach and not a corrective one. It aims at producing best possible product and service through regular innovation by doing right things every time.

Total quality management reflects the culture of an organization. It indicates consumer-oriented, quality-oriented management philosophy. It is a commitment to quality by all managers and workers. TQM is a philosophy for achieving customer satisfaction, which involves all, managers and employees.

MEANING OF TQM

Total Quality Management (TQM) is a strategic approach to produce the best possible product and service through constant innovation and timely action. It places emphasis on prevention rather than rectification.

TQM is focused on the requirements of the customer – both internal and external customer. In the words of Prof. K. K. Chaudhari "TQM represents a customer-oriented, quality focused management philosophy."

In simple words, TQM is a management philosophy that places emphasis on continuous improvement in quality in the interest of the organization and that of its customers.

TQM can be conceptualized into three processes:

1. Quality Process: Understanding who the customer is, what are his needs and thereby, taking steps to completely satisfy the needs of the customer.

2. Management Process: For continuous improvement, the term management refers to all levels of management. The management process comprises of planning — organization, directing, and controlling. Management process stresses continuous improvement to keep up with —

- (a) Changing requirements,
- (b) Competitive environments, and
- (c) Technological advancement.

3. People Process: The people process involves dedication and commitment on the part of the personnel of the organization. People should exhibit:

- (a) Intellectual honesty,
- (b) Self-control, and
- (c) Respect for others.

In this regard it is worth quoting Prof. W. E. Deming - “Abundance of natural resources is not a requirement for prosperity. The wealth of a nation depends on its people.”

TQM is concerned with turning a company around in terms of improving overall performance by focusing upon quality. The overall performance can be improved by many initiatives such as:

- Quality Circles
- Quality Assurance
- Value Engineering
- Just in Time
- Statistical Process Control
- Suggestion Scheme
- Process Control
- Customer Service, etc.

Total quality is a process which goes on forever, because at no time quality can be 100% right. However, there is always a new and better way of doing things. Quality experts like Dr. Juran and Dr. Deming have claimed that 80% of the quality costs originate in areas other than manufacturing. It is possible to improve systems and procedures to reduce time-consuming low value activities.

Features of TQM

The following are some of the features of TQM:

1. Customer Focus: TQM places emphasis in meeting the requirements of both the internal and the external customer. In order to meet the requirements of the external customer, it is necessary to meet the needs of the internal customer. If the internal customers' requirements are agreed and met, then it is possible to meet the requirements of the external customers.

2. Continuous Process: TQM is a continuous process. Constant and continuous efforts are made to improve the quality, and to reduce internal costs. Quality improvement helps the organization to face the challenges of the competitors and to meet the requirements of the customers. Reduction in costs helps to generate higher returns to the organization.

TQM is a process which goes on forever, because at no time quality can be 100% right. There is always a possibility for new and better way of doing things.

3. Defect-free Approach: TQM place emphasis on the defect-free work most of the time. The defect-free approach is phrased in various ways as right first time, working smarter or zero defects. The idea is to strive for perfection in the work, the way a footballer aims to shoot the penalty kick or an archer aims for the bull's eye on a target.

Thomas J. Watson, the founder of IBM said "One may not always achieve the target, but the 'mindset' to strive for perfect work is important. It's better to aim at perfection and miss than it is to aim at imperfection and hit it."

4. Employees Involvement: In TQM everyone is involved in the process from the managing director to the junior clerk or worker in the organization. It is not just manufacturing people, but also the accounting, finance, marketing, and even the canteen people are involved in the TQM process.

Everyone in the company is responsible for, producing quality goods and services and in reducing the internal costs. In one year Toyota employees made nearly 7,00,000 suggestions for improving their products and processes, most of them through quality improvement teams. (Toyota has less than 40,000 employees.)

5. Recognition and Rewards: Recognition and rewards is an integral part of company's TQM programmes, positive reinforcement through recognition and reward is essential to maintain achievements and continuous improvements in quality.

Recognition is a means of encouraging individuals and groups by acknowledging their achievements. Some examples of recognition are a letter of thanks, award of merit certificates, hosting of lunch or dinner, presentation of achievement at management reviews, etc.

Rewards are in the form of financial benefits linked to performance. This includes merit pay, promotion with higher status and pay, etc.

6. Synergy in Teamwork: The Japanese are great believers in synergy (to work together). Engineers, technicians, and workers look upon themselves as equals and communicates easily as they work side by side. They create what Professor Okuda has called a 'synergetic partnership'.

7 Techniques: TQM can take place by following various techniques such as quality circles, value engineering, statistical process control, etc. Through such techniques it is possible to improve systems and procedures. It is also possible to reduce time-consuming low value activities.

8. Systems Approach: TQM is a systems approach to managing business and improving performance. The system approach starts with the commitment and leadership of the chief executive officer. Without the total commitment on the part of chief executive officer and his senior executives. TQM cannot take off to a good start.

Need and Importance of TQM

The need and importance of TQM can be stated with the help of its advantages:

1. Customer Satisfaction: TQM stresses the need to satisfy both the internal as well as the external customer. (Internal customer refers to the person within the company who receives the work of another and then adds his or her contribution to the product or service before passing it on to someone else. For example, in a restaurant, the chef has the waiters as internal customers and the chef must meet their requirements if they are to please the guests.)

TQM must focus on the customers, the eventual buyer of the product or service. To do so, the initial focus should be on meeting the needs of internal customer before an attempt is made to meet the requirements of the external customer.

2. Helps to Face Competition: A proper emphasis on TQM enables a company to face competition in the market. The company may even come out as a winner or a leader. This is because of high quality product, at the lowest possible cost, produced by a dedicated team of work force.

3. Goodwill: TQM generates name and reputation to the company in the market. This is because of its constant efforts in bringing the improvement in the products design, variety, shape, size, color, shade and other features.

4. Highly Motivated Personnel: TQM develops a sense of dedication and discipline in the employees. There is willingness on the part of the employees to identify quality improvements and waste elimination opportunities.

The employees become aware of their importance in the company's performance and progress. This leads to greater involvement and participation of the employees.

The employees receive recognition and rewards for their services. Those who perform exceptionally well or who provide valuable suggestions are recognized with appreciation, and are rewarded with promotion and monetary incentives. This results in enhanced 'job ownership' of employees

5. Lower Rejection Rate: Internal rejection rate gets reduced considerably over a period of time. Various initiatives such as quality circles, process control, right first time approach, just in time approach, etc., enables the company to reduce rejection rate.

The goods are produced at acceptable quality levels (AQL) or with zero defects. Since TQM is widely followed in Japan, they are in a position not only to manufacture the goods at acceptable quality levels but with zero defects.

The concept of zero defect can be illustrated as follows:

An IBM firm in Windsor, Ontario, ordered a shipment of components from a Japanese firm, specifying the AQL as 3 defective components for every 10,000 components. In a covering letter from the Japanese supplier to the IBM firm that accompanied the order, the Japanese company explained how difficult it was to produce the defective parts and said: 'We Japanese have hard time understanding North American business practices. But the 3 defective parts per 10,000 have been included and are wrapped separately. Hope this pleases.'

6. Reduction in Customer Complaints: TQM results in less or no customer complaints. This is because the products are built to specification with zero defects. Again, efforts are made to improve upon the customer specification so as to provide complete satisfaction.

7. Better Facilities to Employees: TQM results in higher benefits to the organization in terms of increased profits. This is because of higher sales, and cost reduction efforts on the part of the company. The higher profits are utilized in a way to provide better facilities to the employees in terms of training, salary, working conditions, amenities like canteen facilities, transport facilities, recreation facilities, and so on.

8. Expansion and Diversification: TQM generates a good name in the market. It also brings in higher returns. This enables a company to expand and diversify. The company may be in a better position to introduced more brands or product lines.

Problems of TQM In India

In India, there are certain problems relating to the implementation of TQM, which are as follows:

1. Conservative attitude of Indian management: Most of the Indian management continue to do what they were doing before. They are reluctant to go for a change in the organization. The Indian management follow traditional approach in managing the organization.

2. Lack of training to the personnel: Training is a must to make TQM successful. It is through training that employees learn to upgrade their skills and knowledge and at the same time to change their attitude towards organization and work.

3. Divide and rule policy: Indian management prefer to follow the divide and rule policy. However, to make TQM more successful, there is need for teamwork.

4. Lack of loyalty: Indian employees are not so loyal to their organization. They merely work in the organization to get their pay and not for the growth and expansion of the organization. However, the fault of lack of loyalty, often lies with the management rather than with the workers.

5. Master and servant relationship: There is a feeling of master and servant relationship. The higher position people such as engineers, accountants, etc., feel that they belong to a superior status and they want to maintain it. However, in TQM there is a need for synergy in teamwork. The status differences often create problems in the implementation of TQM.

6. Failure to recognize and reward: In India, dedicated employees often receive criticisms and not recognitions and rewards. Even if management wants to recognize and reward certain employees, they often delay in doing so.

7. Problem of trade unions: In India, trade unions are politically motivated. They are more interested in their self-interest rather than serving the interest of workers. They make the workers to stick to numerical quotas of production.

For instance, in many of the large-scale organizations, daily production quotas are fixed. Once, the quota is completed, the workers stop the work, even when there is enough time to complete more production.

8. Attitude of Indian Society: To make TQM more successful in India it requires the active support of the Government, customers, educational institutions and others in the society. However, such support is lacking in India.

Government is yet to give a serious and purposeful thought to the TQM approach. The customers are not so quality conscious, and the educational institutions impart mere theoretical knowledge, and there are limited efforts to develop a well balanced personality which is a must for those who are going to start their careers in the industry.

A Note on Quality Circles

The concept of quality circles was first popularized in Japan early 1960s. Dr. Ishikawa Kaoru (1915-89) is known as the 'Father of Quality Circles' for his role in launching Japan's quality movement in the 1960s.

Meaning:

QC is a small group of volunteered employees from same work area, doing similar work, who meet regularly to identify, analyze and solve problems in their work field.

Objectives:

The following are the main objectives of QC:

1. To improve quality, productivity and profitability.
2. To secure employee involvement, motivation and development.

3. To improve management-employees relations.
4. To improve communication at all levels.
5. To develop team spirit among the employees.
6. To provide better working environment to employees.

QC Process:

QC may consist of 4 to 12 members. At the first meeting, instructions in problem solving techniques such as brainstorming techniques, are usually given by the QC leader or a staff specialist. The QC leader is chosen by the members of QC from among themselves.

The following are the steps involved in QC:

1. Listing of Problems: The first step is to list out problems. Such listing of problems can be done by management and/or employees.

2. Selection of Problem: The second step involves discussion over the list of problems. The QC members select one problem at a time to work on.

3. Analysis of Problem: The selected problem is analyzed by following any number of solving techniques and if required, functional specialists are invited at the meetings to secure additional information.

4. Generating Solutions: After analysis of the problem, the QC members arrive at a possible solution. The QC members may come up with alternative solutions.

5. Recommendations: The recommendations are then presented to the management for necessary action.

6. Acceptance of Recommendations: The management studies the recommendations, and decides whether or not to accept them or any part thereof. Normally, a majority of the recommendations are accepted.

7. Implementation: The management then implements the decision. Implementation often requires help from other workers who are not the members of QC. The team spirit among the workforce ensures proper implementation of the decision.

8. Rewarding the Employees: The QC members are recognized and rewarded for their positive and fruitful recommendations.

ISO 9000

ISO is the International Organization for Standardization, located in Switzerland. It has been established to develop common international standards worldwide. The term ISO 9000 refers to a set of quality management standards. Currently ISO 9000 is supported by national standards bodies from more than 120 countries including India. ISO currently includes three quality standards:

- ISO 9000 : 2000
- ISO 9001 : 2000
- ISO 9004 : 2004.

ISO 9001 : 2000 relate to the requirements for a supplier's quality management system, while ISO 9000 : 2000 and ISO 9004 : 2004 present guidelines. All of these are process standards and not

product standards. ISO first published its quality standards in 1987, revised them in 1994, and then republished and updated version in 2000. These new standards are referred to as the “ISO 9000 : 2000 Standards.”

The purpose of ISO is to facilitate international trade by providing a single set of standards that people worldwide recognize and respect. The ISO 9000 – 2000 Standards apply to all kinds of organizations in all kinds of areas.

Firms or clients dealing with ISO certified companies can be assured that the certified firms have taken significant measures to ensure that the products/services provided are carefully monitored for quality. ISO 9000 standards continue to be the global measure for both foreign and domestic markets. Many companies that are currently ISO 9000 certified are requesting their suppliers/partners to obtain ISO 9000 certification as well. In India, recognizing the importance of ISO 9000, the Bureau of Indian Standards (BIS) has adopted the ISO standards and brought them out as the IS 14000.

It is to be noted that there is no compulsion to obtain ISO certification and use ISO 9000 standards, except in some cases where governments or regulatory authorities impose them for public security reasons, or where they are required in contractual terms. However, the demand for these standards has been increasing in the global markets and avoiding them will soon become impossible. It is also to be noted that the ISO registration does not automatically extend to other plants of a company, even if the same product or the same service is being offered. Therefore, all the plants or units located at different places must be separately inspected by the certification agency.

Procedure To Obtain ISO 9000

The following is the procedure to obtain ISO 9000 certification:

1. Evaluation of Existing Quality Procedures: A company wishing to obtain ISO 9000 certification should evaluate its existing quality procedures. The company can appoint an ISO steering team to evaluate the existing quality procedures prevailing within the firm.

2. Initiating Corrective Action: If the company (ISO steering team) finds deficiencies in the existing quality procedures, then there is a need to correct or overcome such deficiencies. Such correction is required so as to conform to ISO series standards.

The corrective action would involve

- Investigating causes of non-conforming products and identifying corrective actions to prevent recurrence.
- Analyzing process, records, customer complaints, etc., to detect and to eliminate potential causes of non-conforming products.
- Applying controls to ensure that corrective and effective actions are taken.
- Implementing changes in procedures, as corrective actions require.
- Initiate preventive action to eliminate potential problems.

3. Preparation of Quality Assurance Programme: The company should prepare a quality assurance programme. This programme would involve details regarding:

- The various areas, departments, or products that require observance of quality control.
- Training to be provided to the employees
- Other activities, which are required to maintain high quality standards.

4. Preparation of Quality Manual: The company must also prepare a quality manual. The quality manual would provide guidelines to the employees of the firm so as to maintain quality standards.

The quality manual may include details in respect of:

- Purchase procedures.
- Quality control procedures.
- Maintenance and repairs of plant and machinery.
- Procedures relating to handling and storage of inventory.
- Procedures relating to packaging and delivery
- Procedures relating to servicing of product, etc.

5. Selection of Certification Agency: The company must select an agency to provide ISO 9000 certification. The company may select Bureau of Indian Standards (BIS) or a foreign accredited agency.

Normally, Indian firms, especially the exporters prefer to appoint a foreign agency (although the expenses are more), as a certification by a reputed foreign agency carries more weight in the international markets. The company should make an application to the accredited agency along with necessary documents which includes quality manual, undertaking to pay required fees, etc.

6. Pre-assessment Meeting: The company's representative would hold a pre-assessment (pre-inspection) meeting with the registrar of the agency. The pre-assessment meeting is required to analyse the quality manual of the firm, and to appraise the quality standards being adopted by the firm. The firm may also come to know of any specific arrangements required by the agency before certification.

7. Preliminary Visit: The accredited agency, normally, arranges for a preliminary visit to the firm and notifies the company of any significant omissions or deviations from the prescribed requirements, so that any suitable modifications or changes can be made prior to the assessment visit.

8. Actual Assessment Visit: The actual assessment visit is a practical evaluation to check that the company's systems are functioning effectively. If there are any discrepancies, which indicate a systems failure, the company is given a period to rectify the deficiencies.

9. Certification: If the assessment agency is satisfied with the quality systems of the company, then it would certify or grant ISO 9001:2000 certification to the firm. The firm can use the ISO 9001:2000 in their advertisements, product packages, letterheads, etc.

10. Surveillance: The accredited agency's registrar normally performs periodic surveillance to assure that the certified company's quality system is being maintained. Many agencies may undertake a complete review of the firm's quality systems of the certified firms. If the firm fails to maintain the quality system, the agency's registrar will suspend or cancel the registration or certification.

INVENTORY MANAGEMENT

Meaning and Objectives of Inventory Management

It is a process of planning and controlling inventories. Inventories refer to those items which are kept in stock for sale, and which are in the process of production. Inventories also includes tools, spares, consumables, etc.,

Inventories are held for variety of reasons. The main objectives are:

1. To achieve economy in buying: Inventory management enables a firm to achieve economy in purchasing. For instance, purchase of raw materials in bulk enables a firm to get bulk discounts. Apart from bulk discounts, the firm can negotiate for delivery of materials on easy terms.

2. To overcome seasonal fluctuations in supply: Certain materials are subject to seasonal fluctuations in supply. For instance, certain agriculture related materials are seasonal in nature, and therefore, there is a need to keep them in adequate stock in order to overcome seasonal fluctuations in supply.

3. To enable smooth flow of production: Inventory management ensures smooth flow of production. Adequate stock of inventories reduces the problem of shortages, and therefore, production can take place uninterrupted.

4. To achieve operational efficiency: Scientific inventory management is required so that neither excess stock nor shortage affects the operational efficiency and production costs. Excess stocks not only involve interest costs (cost of invested funds) but also holding costs, i.e, expenses towards storage, maintenance, insurance, etc. Underinventory increases the risk of “Out of Stock” situation, which can affect the production and delivery schedule.

5. To enable prompt execution of orders: Inventory management facilitates prompt execution of orders. Due to inventory management, there can be smooth flow of production. Also adequate amount of finished stocks would enable a firm to supply the goods on time, which in turn can develop good customer relationships.

6. To avoid emergency orders: Proper inventory management facilitates the ordering of right amount of materials. Understocking of materials is avoided. Therefore, it does not lead to unwarranted emergency orders, which are normally procured at higher costs.

Meaning and Objectives of Inventory Control

Inventory is a stock of physical items such as materials, components, work-in-progress, finished goods, etc., held at a specific location at a specific time. Inventory control is a technique of maintaining and monitoring the size of the inventory at appropriate level, so that the production and distributions takes place effectively.

Inventory control is achieved by:

- Purchasing items at proper time and price and in right quantity.
- Provision of suitable storage location with sufficient space.
- Maintaining appropriate level of stocks.
- Adequate inventory identification system.
- Up-to-date and accurate record keeping.
- Appropriate requisition procedures

Inventory control is important to an organization due to the following reasons:

1. Protection against fluctuations in demand: In many cases, the demand forecast of any product is never accurate. There is likely to be some difference, and at times there can be huge difference in estimated demand and actual demand for the product. If sufficient items are available in the inventory, then fluctuations in demand can be easily adjusted and the organization can protect itself from unforeseen economic losses.

2. Better service to customers: Proper inventory control of materials helps to undertake production on time. Therefore, the company can adhere to deliver schedules in the market. Also sufficient inventory of finished products helps to match the customers' requirements. Thus, inventory control can provide better service to the customers by delivering the products at the right time as demanded by the customers.

3. Continuity of production operations: Proper inventory control helps in maintaining continuity of production operations. This is because inventory control ensures uniform flow of materials, thereby eliminating the possibility of shortages.

4. Reduction in risk of loss: Inventory control helps to reduce risk of loss on account of obsolescence or deterioration of items. Proper inventory control helps to maintain the right stocks. Through periodic checks, it helps to weed out obsolete and non-moving items.

5. Reduction in administrative work load: Proper inventory control helps to reduce administrative workload in respect of purchasing, inspection, store keeping, etc. This in turn reduces manpower requirements and consequently, costs.

6. Protection against fluctuations in output: An important function of inventory control is to reduce the gap between actual and scheduled production. There are cases where production schedule cannot be adhered due to reasons like sudden breakdown of machines, problems in supply of materials, sudden labour strikes, etc. In such instances, the difference in actual production and the scheduled (planned) production can be bridged by inventories.

7. Effective utilization of working capital: Proper inventory control helps to make effective use of working capital. Inventory control helps in maintaining the right amount of stocks of materials, components, etc. Overstocking is avoided. Therefore, the working capital would not be blocked in excess inventory.

8. Check against loss of materials: Inventory control helps to maintain a check against loss of materials through carelessness or pilferage. If there is no proper inventory control then there are more chances of carelessness and pilferage on the part of employees, especially, in the store-keeping section.

9. Facilitates cost accounting activities: Inventory control facilitates cost accounting activities. This is possible because inventory control provides a means for allocating material costs to products, departments or other operating accounts.

10. Avoids duplication in ordering: Inventory control eliminates duplication in ordering or in replenishing stocks by centralizing the source from where the purchase orders are issued.

Systems of Inventory Control

An inventory system provides the organizational structure and the operating policies for maintaining and controlling the inventory items.

The inventory system is responsible for ordering and receipt of items, timing the order placements and keeping a track of the ordered items in terms of quantity and the source of supply. The system also undertakes follow-up activities, such as whether the vendor received the order or not, whether the items are shipped, whether the items are of the right quantity and so on.

There are two general approaches to inventory system:

I. PERPETUAL INVENTORY SYSTEM

This system maintains a continuous record of receipt and issue of materials. It gives information about the level of inventory at any point of time.

CIMA defines perpetual inventory system as “the recording as they occur of receipts, issues and the resulting balance of individual items of stock in either quantity or quantity and value.”

Under this system, entries are made in bin cards and stores ledger as when the receipts and issues of materials take place and ascertaining the balance after every receipt or issue of materials. The stocks as per both the records, i.e., bin card and the stores ledger are reconciled on a continuous basis.

The main advantages of perpetual inventory system are as follows:

1. Easy Stocktaking: The stocktaking becomes easier. One can come to know the level of stock at any given point of time. This is because records are maintained on a continuous basis.

2. Facilitates Production Planning and Control: This inventory system facilitates effective production planning and control. This is because, adequate quantity of materials can be maintained, as there is regular stock-checking,

3. Facilitates Preparation of Financial Statements: The perpetual inventory system facilitates preparation of financial statements, such as profit and loss, and balance sheet at any period of time – quarterly, half-yearly and yearly.

4. Reliable Check: This system provides a detailed and reliable check on stocks. Any difference in stock can be easily identified, as the information from the bin card can be reconciled with that of stores ledger.

5. Efficient Use of Working Capital: This system facilitates efficient use of working capital. This is because; this system maintains accurate record of materials at any point of time. Therefore, the firm can order the right amount of materials at a given point of time, which in turn would facilitate optimum use of working capital.

6. Proper Flow of Production: This system enables proper production planning and control, which in turn ensures proper flow of production. Due to smooth flow of production, the firm can adhere to delivery schedules.

II. PERIODIC INVENTORY SYSTEM

Under this system, the stock levels are reviewed at fixed intervals. The fixed interval may be after a period of one month, three months, etc. this system provides for recording of purchases, purchase returns and purchase allowances on a daily basis, but it does not provide for a continuous inventory for a daily computation of the cost of goods sold. At the end stocks on hand, and the value of inventory is determined by using an inventory pricing method, i.e., LIFO, FIFO or Average Cost, thereby, determining the cost of the units checked or counted.

The cost of goods sold is calculated by adding the opening stock with the purchases made during the period and deducting the closing stock. There is no accounting for losses, theft of materials throughout the accounting period and they are discovered only after the end of the period.

The main advantages are as follows:

- This system is suitable in case of materials of small value, because such materials do not contribute significantly to the cost of production, and any discrepancies in such stocks may not adversely affect the organization.
- This system is less expensive as compared to perpetual inventory system. This is because perpetual inventory system becomes expensive for slow moving and low value items.

- This system does not require monitoring of stock on continuous basis, and therefore, it is less time consuming.

The main disadvantages are:

- There is possibility of fraud or theft as there is lack of continuous check.
- Interim profit and loss accounts and balance sheets cannot be prepared due to non availability of stock data.
- Stocktaking at the end of a definite period will take a considerable time and effort.

Inventory Size

One of the importance decision, which the inventory manager must take, is in respect of inventory size. The manager must decide about the ECONOMIC LOT SIZE in respect of inventory. The economic lot size is the optimum order quantities of item. The economic lot size is determined by striking a balance between the administrative work of the purchase and stores department and the investment in such stocks.

Investment in inventories and the administrative work largely depends upon the quantities in which items are ordered for the purchase of replenishment. Ordering large lots infrequently reduces administrative work of the purchase and stores department, but it involves high working capital for such large stocks. On the other hand, ordering small lots frequently keeps investment low, but it increases administrative work. The small lots imply high order frequency, which involves:

- More purchase requisitions
- More frequent receipt of materials and hence, more inspection.
- More recording of purchase entries.
- More bills to be handled.

To overcome the problem of orders in large lots and in small lots, the inventory manager must determine the optimum inventory size or the economic lot size. The economic lot size is determined by taking into consideration certain factors such as:

- The nature of product to be manufactured.
- The nature of customer demand.
- The availability of warehousing space.
- The cash flow position of the firm.
- The distance from the source of supply
- The availability of inventory staff.

It is to be noted that the inventory manager should constantly monitor the economic lot size. One cannot maintain rigidity in respect of economic lot size. The inventory manager must maintain flexibility in respect of economic lot size depending upon the situation such as changes in customers, fluctuations in supply of materials, etc.

Inventory Control Techniques

There are several techniques of inventory control. Some of the commonly used techniques are as follows:

1. The ABC (Always Better Control) Classification: It is the most popular technique of inventory control. Under this technique, items are classified into three classes:

- (a) A Class items are high in value but low in quantity.
- (b) B Class items are moderate in value and quantity
- (c) C Class items are high in quantity but low in value.

Strict control is maintained on A Class items through accurate records of receipts and issues, and by coordination of incoming materials with production requirements. On the other hand C Class items may simply be ordered in large quantities covering several months requirements. No record is made of their issue to manufacturing section.

2. High, Medium and Low (HML) Classification: In this case, the items of inventory are to be listed in the descending order of unit value. For instance, the manager may decide that all items above ` 5000 per unit be classified as high inventory items. ` 3000 to ` 5000 per unit as medium inventory items and below ` 3000 per unit as low inventory items. The HML classification helps to check the consumption of items at departmental levels and also to plan purchases.

3. Vital, Essential and Desirable (VED) Classification: In this case, the inventory items are classified as vital, essential and desirable. In case of vital inventory items, high stock is maintained, and in the case of desirable inventory items, low stock may be maintained.

4. Fast moving, Slow moving and Non-moving (FSN) Classification: Under this technique, the inventory manager classifies the inventory into three groups:

- (a) Fast moving items are those items which are regularly required for production.
- (b) Slow moving items are those items which are required occasionally
- (c) Non-moving items are those items which are rarely required.

5. Economic Order Quantity (EOQ): In this case, the fixed order quantity of materials is ordered when the stock on hand reaches the re-order point. The re-order point is the inventory level at which the stock should be re-ordered for the smooth flow of production.

6. Materials Requirement Planning (MRP): It is a technique for planning the ordering and the use of materials at various levels of production. MRP helps to monitor the level of inventory. Therefore, it is a technique of both inventory control and scheduling of materials. It includes three components, i.e., Master Production Schedule, Inventory Status File, Bill of Materials, in order to determine inventory for the purpose of scheduling and ordering.

7. Just-in-time (JIT) Technique: The JIT technique is also referred as zero inventory production system (ZIPS). In this case, the firm may hold absolutely no inventory at any stage of production. The exact required amount of inventory is purchased or organized amount of inventory is purchased or organized as and when required at each stage of production. In other words, there is no warehouse for inventory. The firm maintains special tie-up with the suppliers.

8. Maximum-Minimum System: This technique is used in the case of manual inventory system. The manager decides the minimum inventory plus the optimum lot size.

9. MAPICS: It stands for Manufacturing, Accounting and Production Information Control System. It is a software programme that was developed by IBM. In April 2005, MAPICS has been in-class software that addresses the essential challenges faced by manufacturers and distributors in key areas such as enterprise resource planning (ERP), supply chain management, customer relationship management, performance management and much more. These software solutions are built around the business processes of manufacturing – from design, planning and production to sales, delivery and after-market service and support.

Benefits:

- It improves the overall performance of the firm
- Improves factory throughput.
- Reduces inventory levels.
- Lower scrap and waste.
- Better equipment up time (Reduces equipment downtime)
- Greater on-time deliveries performance
- Faster payment of receivable to suppliers

10 CARDEX System: In this system, cards are vertically arranged in a tray and kept in cabinets. Posting in these cards may be done manually. However, nowadays computers are taking over the place of manual posting. The cards known as ‘Stock Control Cards’ are of different types – sizes and colours. The cards indicate the position of stock which include.

- Stock of items ordered
- Stock of items received from suppliers
- Stock of items issued
- Balance of stock.

Inventory Costs

In operating an inventory system, managers should consider only those costs that vary directly with the operating doctrine in deciding when and how much to re-order. Basically there are five types of relevant costs:

1. Cost of Item: The cost of the item is usually its purchase price – the price paid to the supplier for the item. In certain cases, however, costs such as transportation, receiving and incoming inspection costs may be included as part of the cost of the item.

2. Procurement Costs: Such costs refer to the costs of placing a purchase order, or the set-up costs if the items are manufactured at the factory. These costs vary directly with each purchase order placed. Such costs include:

- (a) Preparing a purchase order
- (b) Processing payments
- (c) Receiving and inspecting the materials

Procurement costs may also include incidental costs such as cost of telephone calls to the vendor, labour costs in purchasing and accounting, receiving costs, computer time for record keeping, etc.

3. Carrying (Holding) Costs: These costs refer to the costs of maintaining the warehouse and protecting the inventory items. Typical costs are insurance, security, warehouse rental, heat, lights, taxes, and losses due to pilferage, spoilage or breakage.

4. Stock out Costs: Such costs are associated with demand, when stocks have been depleted; generally lost sales or back order costs. When sales are lost because of stock outs, the firm loses both the profit margin on unmade sales and its customers goodwill. If customers order somewhere else, future profit margins may also be lost. When customers agree to come back after inventories have been replenished, they make back orders. Back order costs include loss of goodwill and money paid to re-order goods and notify customers when goods arrive.

5. Cost of Operating the Information Processing System: These costs include updating the records as stock levels change. For systems in which inventory levels are not recorded daily, the cost is primarily incurred in obtaining accurate physical counts of inventories. Frequently these, operating costs are more fixed than variable over a wide quantity range.

6. Issue of Certificate: The auditors should ensure whether the company has complied with the ISO-9000 standard. A verbal feedback is given to the company at the time of audit. The auditors, if satisfied, will submit favorable report to the registration board. When the registration board approves the registration, the registrar issues a certificate which enables the company to use ISO-9000 mark.

(E) ISO 14000

Meaning of ISO 14000:

ISO-14000 series of standards was established in 1966. Its basic aim is to provide all industries with a structure for an environmental management system to confirm that all operational processes are consistent and will attain the environmental objectives of the firm. ISO-14000 includes 20 standards which consists of environmental labeling and evaluating life cycle of products. The standard is based on the following five principles:

1. To formulate an environmental policy and commit itself to environmental management system.
2. To prepare and keep ready a plan to achieve its environmental goal.
3. To develop the capabilities, and support mechanism to achieve its environmental policy and objectives.
4. To evaluate a company's environmental performance.
5. To review environmental management system in order to improve overall environmental performance.

ISO-14000 does not need third party registration. All over the world ISO-14000 provides a common approach to environmental management. The standards of ISO-14000 are as follow:

- (a) Management systems: It represent standards for system development and integration.
- (b) Operation: It deals with standards for use of natural resources and energy.
- (c) Environmental-related systems: It refers to standards for assessing emission, effluents and waste matter.

ISO-14000 Certification:

ISO-14000 is not supported by any enactment. It acts as a mere guideline not to pollute the environment. Countries that follow ISO-14000 and willing to have business only with such companies that have adopted ISO-14000. The main areas in ISO-14000 standards include organization evaluation and product evaluation.

(a) Organizational Evaluation:

1. Environmental Management System Standard: Under this standard, a company follows a system to meet environmental goals through a formal environmental policy. Employees are communicated about environmental specifications which they have understood. Care is taken that no legal provisions are violated. Necessary documents are prepared and workers are given relevant training. Adequate preparations are done to deal with emergency situations.

2. Environmental Auditing Standards: This standard prescribes the qualification of auditor, procedure of audit and observing all the principles of auditing. No area of work can be left out from environment audit. Moreover, a company must perform self-audit environmental obligations periodically.

3. Environmental Performance Evaluation Standards: Under this standard, a company is required to evaluate its environmental management system and the various operational systems to ensure that they are in place. Some of the areas to be evaluated would include reduced consumption of water and energy, decline in air emissions, cutting down generation of hazardous waste and reduction in fines and penalties. When the findings are positive, it indicates that the business is taking all precautions and discharging its environmental responsibilities well.

(b) Product Evaluation:

1. Environmental Labelling Standards: This standard is directed towards preventing exaggerated and false advertising. A company using environmental product.

CASE 1:**Blue Bird Plastic Company**

“I just don’t want him telling me what to do, that’s all”, Stated Shri. Korane over the telephone to his superior, Shri. Bhushan vice president of Finance Blue Bird Plastic Company, Pune.

“I’ll talk with him again Korane. Sorry it happened, but don’t let it worry you” assured Shri. Bhushan in reply.

“No, that’s for sure. But for goodness sake put him in his place.” O.K. Korane, “will do.”

Shri. Lele was executive secretary to Bhushan, a cautious and quiet man. Shri. Lele was transferred to his office about four months back when the Aurangabad regional sales offices was closed by the company. Top managers hoped to provide Shri. Bhushan, expert help by assigning Shri. Lele whose personal record showed him to be capable, highly efficient, ambitious, somewhat impatient short-tempered person. He is thirty years of age and single.

Reporting to Shri. Bhushan is Shri. Korane, head of accounts of accounts, Shrimati Pagnis, head of order writing, Shri Patne, in-charge dispatches and Miss. Anand, operator and receptionist. Earlier, about two week ago, Shrimati Pagnis, aged 45 and Shri. Lele had a little verbal scuffle, about priority in

completion of the order writing for certain customers. The issues was settled by Shri. Bhushan who decided it in favour of Shrimati Pagnis. Then he had a talk with Shri. Lele about human relations in business. During the discussions, he commented that it was unwise to be too aggressive in most business relationships. He give Shri. Lele several books to read which, he stated, should help him in his work.

Shri. Lele feels, the people reporting directly to Shri. Bhushan are taking advantage of him and have been doing so for long time. He (Bhushan) is so buried in details that he delays many financial decisions. Shri Lele is certain that the management personel of the finance group are going all in different directions and Shri. Bushan does not realize this. Shri. Lele is positive in his feelings that his dealing with various heads within the finance group are for the best interests of the company. He also feels that subordinates of Shri. Bhushan go head and decide issues, sometimes poorly, when the final decision should come from Shri. Bhushan, or at least with his sanction and knowledge.

QUESTIONS:

1. What is the problem as you see it?
2. What factors attributed to the present state of affairs? Give reasons.
3. What play of actions would you recommend to remedy the situation?

CASE 2:

Subsidiary Company

A subsidiary company of a large industrial group was not doing well. And everybody, including Directors of the subsidiary as well as the parent company, was dissatisfied, but there was considerable amount of fault-finding and 'post-mortem' discussion, rather than constructive decision making.

The Director or the subsidiary company took some outside advice and the working of the company was analysis. It was found that the responsibility for a substantial part of area of dissatisfaction was primarily with the parent company and its management, and quality of decision making at the policy level of the subsidiary also was poor. In general this diagnosis was found to be true for the working of the parent company itself, and was reflected in the image of the company and the management before the shareholders, the Government and public circles in general. The Chairman of the subsidiary company was pleased with the diagnosis and took up the matter with the parent company.

However, the discussions at the policy level of the parent company did bear fruit, and the issue was 'settled' merely by a general indication that the subsidiary company, if necessary may be disposed of or handed over to another group for running. This put the subsidiary board and management on the defensive. The Chairman resumed his original fault-finding habit with the Executive Director, the Manager, etc. and which in turn caused a considerable amount of frustration and setback to progress and enthusiasm generated by analysis of the responsibilities and remedial measures evolved, which were largely agreed upon before taking up matters with the parent company.

Discuss the issues and suggest suitable remedies.

CASE 3:**Production Manager and Performance**

A developing organisation appointed a General Manager to take care of the increasing business. The new manager felt the production manager was not a capable man and appointed a new production manager since it was found convenient to effect coordination. In six months, production increased appreciably. Shop inspection was restricted to dimensions checking and to major specifications. The performance tests could only be carried out on site after erection.

The machinery was dismantled for despatch which was then assembled and erected on site by the Erection Division. Erection was placed under sales for maintaining proper liaison with the customer. Usually, there were complaints from erection supervisor about irregularities in manufacture which came in the way during erection.

After a short working of the machinery, complaints came from the users about non-satisfactory performance. In many cases, the post-mortem was difficult. The damage was of such nature that the reasons could be attributed to production quality as well as to lack of erection care. Sales would blame the production and the production would blame erection. In the process, the Company suffered considerably.

Discuss the issues and suggest suitable remedies

Production Management**Match the Following**

Group A	Group B
(a) Adam Smith	(i) Propounded time and motion study
(b) Gilbreth	(ii) Just in Time
(c) JIT	(iii) Location of variances
(d) Plant Layout	(iv) Quality certification
(e) ISO	(v) Inventory control
	(vi) Focused on division of labour

Multiple Choices

- Adam Smith focused on
 - Division of labour
 - Quality control
 - Time study
 - None of the above
- F.W. Taylor is a father of
 - Scientific management
 - Inventory management
 - Purchase management
 - Quality management

3. JIT is a technique of
- (a) Inventory management (c) Quality management
(b) Production management (d) None of the above
4. Plant should be located
- (a) Near the source of material (b) Near power
(c) Near water (d) At such place which reduces production and distribution cost
5. Production planning involves
- (a) Planning the type of material (d) All of the above
(b) Planning the quantity (c) Planning the quality

Fill in the Blanks

- H. Gantt devised _____.
- F. W. Harris developed _____.
- Frank Gilbreth propounded _____.
- FMS stands for _____.
- JIT stands for _____.
- _____ involves taking decisions about space requirement.
- Work schedule is _____ of production activities.
- Productivity is a relation _____.

Productivity

Match the Following

Group A	Group B
(a) Productivity	(i) Output-Input
(b) Training	(ii) Command from one boss
(c) Unit of command	(iii) Value of command capital employed
(d) Capital productivity	(iv) National productivity council
(e) NPC	(v) Production
	(vi) Increase productivity

Fill in the Blanks

- Productivity = Output _____.
- Training increases _____.
- Labour productivity = Value of Output _____.
- Land productivity = _____

Multiple Choices

1. Productivity is the ratio between

(a) Output & Input	(c) Production & material
(b) Production & finance	(d) None of the above
2. Level of technology

(a) Increases productivity	(c) Decreases morale
(b) Decreases output	(d) None of the above
3. Productivity depends on

(a) Decentralization	(c) Improved control
(b) Training	(d) All of the above
4. Process productivity is measured by

(a) Value of output Raw Material	(b) Value of output Capital employed
(c) Value of output Process time	(d) None of the above
5. NPC was formed to

(a) Control cost	(c) Form quality circles
(b) Promote productivity in industry	(d) None of the above

State Whether the Following Statements are True or False

1. Productivity expresses relationship between output & input.
2. Productivity is created by wastage.
3. Shareholder’s wealth depends on productivity.
4. Untrained employees increase productivity.
5. Unity of command is a principle developed by Gantt.
6. Better technology brings down productivity
7. Labour productivity is the output per labour hour.
8. In service sector output is tangible.
9. NPC was established in 1958.

Quality Management

Match the Following

Group A	Group B
(a) Quality is	(i) Principle of quality management
(b) Error free work	(ii) Quality certification
(c) ISO	(iii) Charging the sequence of stocks
(d) Process mapping	(iv) Dimension of quality
(e) Reliability	(v) Fitness for use

Multiple Choices

1. Quality is
 - (a) Fitness for use
 - (b) Consumer perception
 - (c) A & b
 - (d) None of the above
2. Quality principles include
 - (a) Meeting consumer needs
 - (b) Error free work
 - (c) Proactive strategies
 - (d) a, b & C
3. Checklist is the list
 - (a) Design
 - (b) Safety
 - (c) Checks
 - (d) A & b
4. Charting the sequence of steps is
 - (a) Process mapping
 - (b) Sampling
 - (c) ASP
 - (d) None of the above
5. Relationship between two variables is
 - (a) Scatter diagrams
 - (b) 80/20 rule
 - (c) Sampling
 - (d) None of the above
6. Dimensions of quality include
 - (a) Consistency
 - (b) Speed
 - (c) Reliability
 - (d) All of the above
7. SQC attempts to
 - (a) Prevent occurrence of defective units
 - (b) Prevents breakdown of machinery
 - (c) Prevents theft of materials
 - (d) All of the above
8. TQM applies
 - (a) Quality of materials
 - (b) Quality management at all the levels of the organisation
 - (c) Quality of labour
 - (d) All of the above
9. TQM
 - (a) Reduces wastage
 - (b) Lowers rejection Rate
 - (c) Improves image
 - (d) All of the above

Inventory Management

Match the Following

Group A	Group B
(a) Carrying cost	(i) Make to order
(b) MTO	(ii) Assemble to order
(c) ATO	(iii) The level at which order is placed
(d) Re-order level	(iv) Cost of holding inventory
(e) Bin card	(v) The card which shows inventory in the bin

Group A	Group B
(a) Perpetual Inventory System	(i) That quantity which gives maximum benefits
(b) JIT	(ii) Just in Time
(c) EOQ	(iii) A technique of inventory control
(d) ABC	(iv) A technique of inventory control
	(v) Recording inventory after every issue and receipt

Fill in the Blanks

- The objective if inventory management is _____ production.
- Purchasing materials from a fixed supplier is _____.
- Buying in bulk is called _____.
- _____ is a computerized inventory control system.
- _____ Cost arises when the product is out of stock is _____.
- Extra stock hel by a company due to uncertain supply is _____.
- _____ shows inventory at the Bin.
- The level at which the trader places an order _____.
- The size at which buying cost and carrying cost is lowest _____.

Multiple Choices

- Objectives of inventory management

(a) Continuous production	(c) Avoid wastage
(b) Prompt execution of order	(d) All of the above
- Contract purchasing involves

(a) Purchasing on small-scale	(c) Purchasing on large-scale from fixed suppliers
(b) Purchasing on large-scale	(d) None of the above
- MRP helps to achieve

(a) Production target	(c) Profit target
(b) Sales target	(d) a & b

4. In periodic inventory system
- (a) Stock position is reviewed periodically
 - (b) Stock position is reviewed everyday
 - (c) Stock position is reviewed annually
 - (d) None of the above
5. At re-order level
- (a) Order is placed
 - (c) Order is executed
 - (b) Material is purchased
 - (d) None of the above
6. EOQ is that quantity which
- (a) Gives maximum benefit while purchasing
 - (b) Gives minimum benefit while purchasing
 - (c) Gives bulk discount
 - (d) None of the above
7. ABC analysis stands for
- (a) Activity based costing analysis
 - (b) A,B,C categorization
 - (c) Acquire best control
 - (d) None of the above

Theory Exercise Question

- Q.1 Define Production Management? State its Advantages.
- Q.2 State the Function/Scope of Production Management.
- Q.3 Distinguish between production and productivity.
- Q.4 Explain production with various measurement of productivity.
- Q.5 State factors affecting productivity.
- Q.6 Enlist the measures to improve productivity.
- Q.7 Write short Note on:
- (a) Total Quality Management
 - (b) Quality Circles
 - (c) ISO 9000/1400
- Q.8 What is Inventory Management? State the methods of inventory Management.

