Production Management

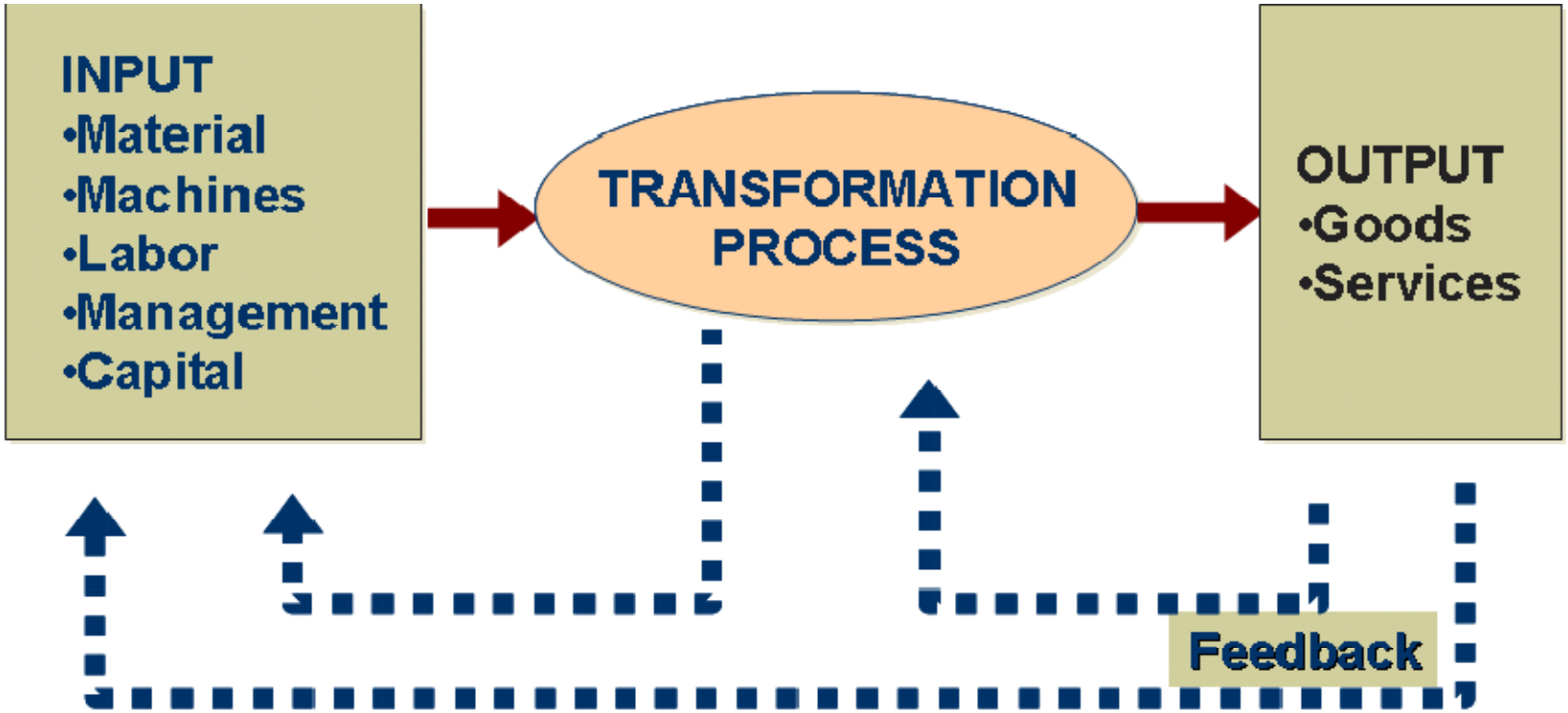
Dr. Monica Shrivastava

Definition

- “The field of study that focuses on the effective planning, scheduling, use, and control of a manufacturing or service organization through the study of concepts from design engineering, industrial engineering, management information systems, quality management, inventory management, accounting, and other functions as they affect the organization" -- **APICS The Association for Operations Management**

- Production management refers to the application of management principles to the production function in a factory. It involves application of planning, organizing, directing and controlling to the production function

Production System



Production/operations management

- It is concerned with the production of goods and services, and involves the responsibility of ensuring that business operations are efficient and effective.
- It is also the management of resources, the distribution of goods and services to customers.

Aspects Of PM

1. Production as a System

Concept:

- Production system: A system whose function is to convert a set of inputs into a set of desired outputs.
- Conversion subsystem: A subsystem of the larger production system in which inputs are converted into outputs.
- Control subsystem: A portion of the outputs is monitored for feedback signals to provide corrective action if required.

2. Production as an Organization Function

- The process of conversion is at the heart of production and operations management and is present in some form in all organizations. Where this conversion process is carried out and what we call the department or function where it is located vary greatly among organizations.

3. Decision Making in POM

- The best way to understand how operations managers manage the examination of the decisions in POM, these include:

Strategic decisions: Decisions about products, processes, and facilities. (long-term)
(launch a new-product development, design for a production process, allocate scarce raw materials, utilities, production capacity, new factories need)
Operating decisions: Decisions about planning production to meet demand.
(how much finished-goods inventory to carry, what products and how muck of next period, whether to increase by overtime or subcontract to suppliers)
Control decisions: Decisions about planning and controlling operations.(short term)

Concept of Production

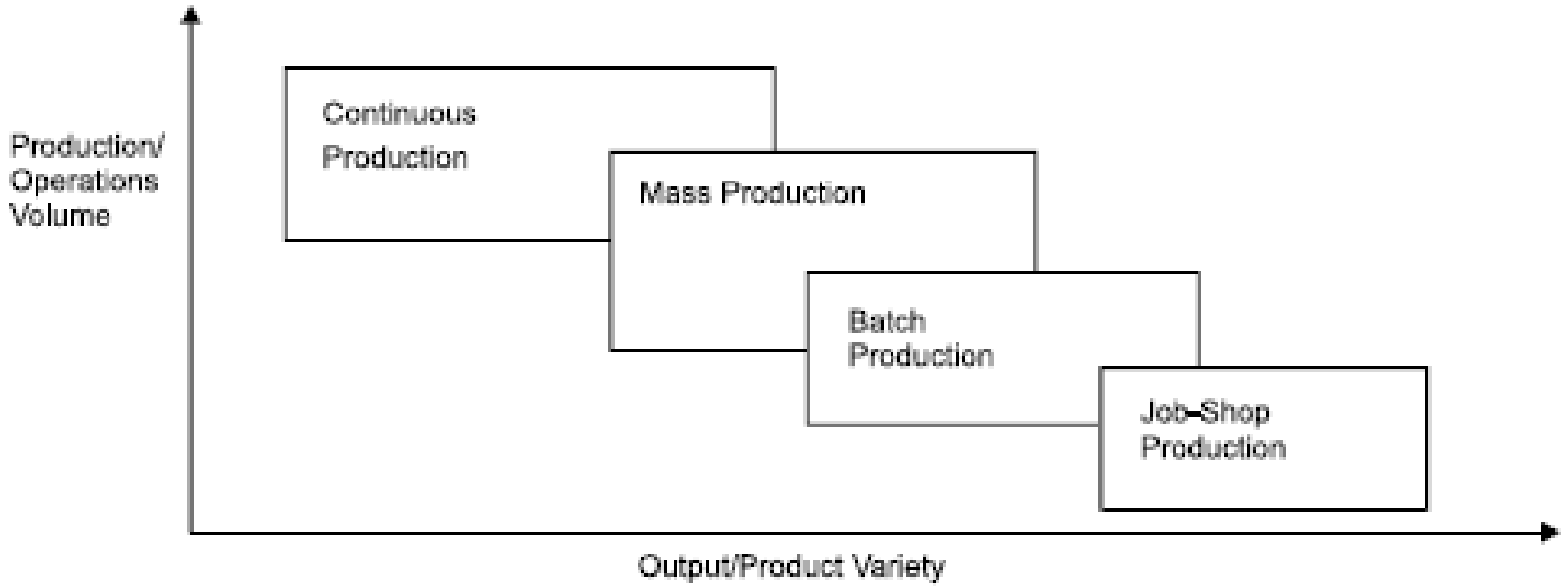
- Production function is that part of an organization, which is concerned with the transformation of a range of inputs into the required outputs (products) having the requisite quality level.
- Production is defined as *"the step-by-step conversion of one form of material into another form through chemical or mechanical process to create or enhance the utility of the product to the user." Thus production is a value addition process. At each stage of* processing, there will be value addition.
- Edwood Buffa defines production as '*a process by which goods and services are created'.*

Production System

- The production system of an organization is that part, which produces products of an organization.
- It is that activity whereby resources, flowing within a defined system, are combined and transformed in a controlled manner to add value in accordance with the policies communicated by management.

- The production system has the following characteristics:
- 1. Production is an organized activity, so every production system has an objective.
- 2. The system transforms the various inputs to useful outputs.
- 3. It does not operate in isolation from the other organization system.
- 4. There exists a feedback about the activities, which is essential to control and improve system performance.

Classification of Production System



JOB SHOP PRODUCTION

- Job shop production are characterized by manufacturing of one or few quantity of products designed and produced as per the specification of customers within prefixed time and cost.
- The distinguishing feature of this is low volume and high variety of products.
- A job shop comprises of general purpose machines arranged into different departments.
- Each job demands unique technological requirements, demands processing on machines in a certain sequence.

Characteristics

- The Job-shop production system is followed when there is:
- 1. High variety of products and low volume.
- 2. Use of general purpose machines and facilities.
- 3. Highly skilled operators who can take up each job as a challenge because of uniqueness.
- 4. Large inventory of materials, tools, parts.
- 5. Detailed planning is essential for sequencing the requirements of each product, capacities for each work centre and order priorities.

- **Advantages**

1. Because of general purpose machines and facilities variety of products can be produced.
2. Operators will become more skilled and competent, as each job gives them learning opportunities.
3. Full potential of operators can be utilized.
4. Opportunity exists for creative methods and innovative ideas.

- **Limitations**

1. Higher cost due to frequent set up changes.
2. Higher level of inventory at all levels and hence higher inventory cost.
3. Production planning is complicated.
4. Larger space requirements.

BATCH PRODUCTION

- Batch production is defined by American Production and Inventory Control Society (APICS) *"as a form of manufacturing in which the job passes through the functional departments in lots or batches and each lot may have a different routing." It is characterized by the manufacture* of limited number of products produced at regular intervals and stocked awaiting sales.

Characteristics

- Batch production system is used under the following circumstances:
- 1. When there is shorter production runs.
- 2. When plant and machinery are flexible.
- 3. When plant and machinery set up is used for the production of item in a batch and change of set up is required for processing the next batch.
- 4. When manufacturing lead time and cost are lower as compared to job order production.

- **Advantages**
- 1. Better utilization of plant and machinery.
- 2. Promotes functional specialization.
- 3. Cost per unit is lower as compared to job order production.
- 4. Lower investment in plant and machinery.
- 5. Flexibility to accommodate and process number of products.
- 6. Job satisfaction exists for operators.
- **Limitations**
- 1. Material handling is complex because of irregular and longer flows.
- 2. Production planning and control is complex.
- 3. Work in process inventory is higher compared to continuous production.
- 4. Higher set up costs due to frequent changes in set up.

MASS PRODUCTION

- Manufacture of discrete parts or assemblies using a continuous process are called mass production.
- This production system is justified by very large volume of production. The machines are arranged in a line or product layout. Product and process standardization exists and all outputs follow the same path.

Characteristics

- 1. Standardization of product and process sequence.
- 2. Dedicated special purpose machines having higher production capacities and output rates.
- 3. Large volume of products.
- 4. Shorter cycle time of production.
- 5. Lower in process inventory.
- 6. Perfectly balanced production lines.
- 7. Flow of materials, components and parts is continuous and without any back tracking.
- 8. Production planning and control is easy.
- 9. Material handling can be completely automatic.

- **Advantages**

1. Higher rate of production with reduced cycle time.
2. Higher capacity utilization due to line balancing.
3. Less skilled operators are required.
4. Low process inventory.
5. Manufacturing cost per unit is low.

- **Limitations**

1. Breakdown of one machine will stop an entire production line.
2. Line layout needs major change with the changes in the product design.
3. High investment in production facilities.
4. The cycle time is determined by the slowest operation.

CONTINUOUS PRODUCTION

- Production facilities are arranged as per the sequence of production operations from the first operations to the finished product. The items are made to flow through the sequence of operations through material handling devices such as conveyors, transfer devices, etc.

Characteristics

- Continuous production is used under the following circumstances:
- 1. Dedicated plant and equipment with zero flexibility.
- 2. Material handling is fully automated.
- 3. Process follows a predetermined sequence of operations.
- 4. Component materials cannot be readily identified with final product.
- 5. Planning and scheduling is a routine action.

- **Advantages**

1. Standardization of product and process sequence.
2. Higher rate of production with reduced cycle time.
3. Higher capacity utilization due to line balancing.
4. Manpower is not required for material handling as it is completely automatic.
5. Person with limited skills can be used on the production line.
6. Unit cost is lower due to high volume of production.

- **Limitations**

1. Flexibility to accommodate and process number of products does not exist.
2. Very high investment for setting flow lines.
3. Product differentiation is limited.

Objectives of PM

1. RIGHT QUALITY

- The quality of product is established based upon the customers needs. The right quality is not necessarily best quality. It is determined by the cost of the product and the technical characteristics as suited to the specific requirements.

2. RIGHT QUANTITY

- The manufacturing organization should produce the products in right number. If they are produced in excess of demand the capital will block up in the form of inventory and if the quantity is produced in short of demand, leads to shortage of products.

3. RIGHT TIME

- Timeliness of delivery is one of the important parameter to judge the effectiveness of production department. So, the production department has to make the optimal utilization of input resources to achieve its objective.

4. RIGHT MANUFACTURING COST

- Manufacturing costs are established before the product is actually manufactured. Hence, all attempts should be made to produce the products at pre-established cost, so as to reduce the variation between actual and the standard (pre-established) cost.

Scope of PM

- 1. Location of facilities
- 2. Plant layouts and material handling
- 3. Product design
- 4. Process design
- 5. Production and planning control
- 6. Quality control
- 7. Materials management
- 8. Maintenance management.

LOCATION OF FACILITIES

- Location of facilities for operations is a long-term capacity decision which involves a long term commitment about the geographically static factors that affect a business organization.
- It is an important strategic level decision-making for an organization. It deals with the questions such as ‘where our main operations should be based?’
- The selection of location is a key-decision as large investment is made in building plant and machinery.
- An improper location of plant may lead to waste of all the investments made in plant and machinery equipments. Hence, location of plant should be based on the company’s expansion plan and policy, diversification plan for the products, changing sources of raw materials and many other factors.
- The purpose of the location study is to find the optimal location that will results in the greatest advantage to the organization.

PLANT LAYOUT AND MATERIAL HANDLING

- Plant layout refers to the physical arrangement of facilities. It is the configuration of departments, work centres and equipment in the conversion process. The overall objective of the plant layout is to design a physical arrangement that meets the required output quality and quantity most economically.
- According to ***James Moore,*** *"Plant layout is a plan of an optimum arrangement of facilities including personnel, operating equipment, storage space, material handling equipments and all other supporting services along with the design of best structure to contain all these facilities".*
- 'Material Handling' refers to the 'moving of materials from the store room to the machine and from one machine to the next during the process of manufacture'. It is also defined as the 'art and science of moving, packing and storing of products in any form'.
- It is a specialized activity for a modern manufacturing concern, with 50 to 75% of the cost of production. This cost can be reduced by proper section, operation and maintenance of material handling devices. It increases the output, improves quality, speeds up the deliveries and decreases the cost of production.

PRODUCT DESIGN

- Product design deals with conversion of ideas into reality.
- Every business organization have to design, develop and introduce new products as a survival and growth strategy.
- Developing the new products and launching them in the market is the biggest challenge faced by the organizations.
- The entire process of need identification to physical manufactures of product involves three functions: marketing, product development, manufacturing.
- Product development translates the needs of customers given by marketing into technical specifications and designing the various features into the product to these specifications.
- Manufacturing has the responsibility of selecting the processes by which the product can be manufactured.
- Product design and development provides link between marketing, customer needs and expectations and the activities required to manufacture the product.

PROCESS DESIGN

- Process design is a macroscopic decision-making of an overall process route for converting the raw material into finished goods.
- These decisions encompass the selection of a process, choice of technology, process flow analysis and layout of the facilities.
- Hence, the important decisions in process design are to analyze the workflow for converting raw material into finished product and to select the workstation for each included in the workflow

PRODUCTION PLANNING AND CONTROL

- Production planning and control can be defined as the process of planning the production in advance, setting the exact route of each item, fixing the starting and finishing dates for each item, to give production orders to shops and to follow up the progress of products according to orders.
- The principle of production planning and control lies in the statement 'First Plan Your Work and then Work on Your Plan'. Main functions of production planning and control includes planning, routing, scheduling, dispatching and follow-up.
- **Planning is deciding in advance what to do, how to do it, when to do it and who is to do** it. Planning bridges the gap from where we are, to where we want to go. It makes it possible for things to occur which would not otherwise happen.
- **Routing may be defined as the selection of path which each part of the product will follow,** which being transformed from raw material to finished products. Routing determines the most advantageous path to be followed from department to department and machine to machine till raw material gets its final shape.
- **Scheduling determines the program for the operations. Scheduling may be defined as** 'the fixation of time and date for each operation' as well as it determines the sequence of operations to be followed.

- **Dispatching is concerned with the starting the processes. It gives necessary authority so** as to start a particular work, which has already been planned under ‘Routing’ and ‘Scheduling’.
- Therefore, dispatching is ‘release of orders and instruction for the starting of production for any item in acceptance with the route sheet and schedule charts’.
- The function of **follow-up is to report daily the progress of work in each shop in a prescribed** proforma and to investigate the causes of deviations from the planned performance.

QUALITY CONTROL

- Quality Control (QC) may be defined as 'a system that is used to maintain a desired level of quality in a product or service'. It is a systematic control of various factors that affect the quality of the product.
- Quality control aims at prevention of defects at the source, relies on effective feed back system and corrective action procedure.
- Quality control can also be defined as 'that industrial management technique by means of which product of uniform acceptable quality is manufactured'. It is the entire collection of activities which ensures that the operation will produce the optimum quality products at minimum cost.
- The main objectives of quality control are:
  - To improve the companies income by making the production more acceptable to the customers *i.e., by providing long life, greater usefulness, maintainability, etc.*
  - To reduce companies cost through reduction of losses due to defects.
  - To achieve interchangeability of manufacture in large scale production.
  - To produce optimal quality at reduced price.
  - To ensure satisfaction of customers with productions or services or high quality level, to build customer goodwill, confidence and reputation of manufacturer.
  - To make inspection prompt to ensure quality control.
  - To check the variation during manufacturing.

MATERIALS MANAGEMENT

- Materials management is that aspect of management function which is primarily concerned with the acquisition, control and use of materials needed and flow of goods and services connected with the production process having some predetermined objectives in view.
- The main objectives of materials management are:
  - To minimise material cost.
  - To purchase, receive, transport and store materials efficiently and to reduce the related cost.
  - To cut down costs through simplification, standardization, value analysis, import substitution, etc.
  - To trace new sources of supply and to develop cordial relations with them in order to ensure continuous supply at reasonable rates.
  - To reduce investment tied in the inventories for use in other productive purposes and to develop high inventory turnover ratios.

MAINTENANCE MANAGEMENT

- In modern industry, equipment and machinery are a very important part of the total productive effort. Therefore, their idleness or downtime becomes are very expensive. Hence, it is very important that the plant machinery should be properly maintained.
- The main objectives of maintenance management are:
  - To achieve minimum breakdown and to keep the plant in good working condition at the lowest possible cost.
  - To keep the machines and other facilities in such a condition that permits them to be used at their optimal capacity without interruption.
  - To ensure the availability of the machines, buildings and services required by other sections of the factory for the performance of their functions at optimal return on investment.