



SYLLABUS

B.B.A. III SEM

Subject – Operations Management

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| UNIT – I | Introduction to productions and operations management: Nature of production, production and system, production as an organizational function, decision making in production, production management and operations management, Characteristics of modern production and operation management, organization of production function, recent trends in production/operations management. |
| UNIT – II | Production process, manufacturing and service operations: production process, manufacturing operation, service operations, selection of process non manufacturing or service operations, difference between manufacturing and service operations, classification of manufacturing process, manufacturing operations as conversion process, characteristics of modern manufacturing process, |
| UNIT – III | Design of production system: Product, process and production design, factors influencing product design, approaches for product design, process planning and process design, process selection, process management, major process decisions, |
| UNIT – IV | Plant Location & Plant layout – Location theories, freedom of locations, steps in selection, steps in location selection, importance of location factors, location models, Meaning and scope and of facility layout, factors influencing layout, types of layout, importance of layout, layout planning, layout tools and techniques, analysis of layout with computers, criteria for selection and design of layout, layout design procedure. |
| UNIT – V | Materials Management – functions, meaning and operations, – overview of materials planning & material requirement planning, over view of Store management, objectives & functions. |
| UNIT – VI | Quality control – Purpose of inspection and quality control – control charts and acceptance sampling by variable and attributes. Sample plan calculation, AOQL, AOQL, LTPD. |



UNIT - I

Introduction to operations management

Introduction

Production is the center of all activities of an organization. This is to say all the activities of an organization, such as: Finance, Personnel, Marketing...etc., are exists in an organization because of production activity. Hence the position of Production Management in an organization is very important.

Definitions of Production/Operations Management

1. POM is concerned with that process which converts inputs into outputs. The input are various resources like raw materials, men, machines technology etc. The outputs are goods & services.
2. Production Management: Deals with decision making related to production process so that resulting goods or services are produced according to specifications in amount & by schedules demanded & at minimum cost.
3. Operations management is that activity where by resources are combined and transformed in a controlled manner to add value in accordance with policies communicated by management.
4. POM is multidisciplinary approach which integrates the knowledge of science, technology, engineering & management to convert I/P into O/P's.

Shift from Production Management to Operations Management

Till the early 1970s, the term 'Production Management' was used but an important change emerged during the 1970s which was reflected in the new name - "Operations Management" which incorporated both production and service related concepts and procedures. As the service sector has become more prominent, the change from 'production' to 'operations' indicates the development of the field to service organization.

Difference

| Base | Production Management | Operations Management |
|---------------------------|---|---|
| 1. Concerned | It is concerned with manufacturing. | It is concerned with services also. |
| 2. Nature of output | Output is tangible. | Output is tangible and intangible also. |
| 3. Use | In this, job uses less labour and more equipment. | In this, job uses more labour and less equipment. |
| 4. Customer participation | There is no customer participation. | Frequent customer participation. |

Objectives of Operation Management

1. Ultimate Objectives -
 - A) Cost reduction
 - B) Quality improvement
 - C) Follow time schedule
2. Immediate Objectives -
 - A) Machinery & Equipment
 - B) Materials
 - C) Manpower
 - D) Manufacturing Services



Scope of Operation Management

1. Product Selection and Design
2. Process Selection and Planning
3. Facility Location
4. Facility Layout and Material Handling
5. Capacity Planning
6. Operational or Short term Decisions

Functions/Importance of Operations Management

The Important of operations management can be judged by the functions they perform.

- (1) **Planning:** - Planning means defining objective, goals strategies, policies & programs & procedures for production activities & supporting activities.
- (2) **Organizing:** - Organizing means arranging necessary I/P's such as materials, machines, Man/Labour Location etc for produce activities. The concepts are –
 - Facility Location
 - Layout Planning
 - Material Resource Planning etc.
- (3) **Controlling :-** Operations Manager exercise control by measuring actual O/P & comparing them with planned O/P. Controlling activity includes –
 - Quality Control
 - Cost Control
 - Preparing Produce/Operation Schedules
- (4) **Behaviour :-** POM managers are also concerned with how their efforts to plan, organize & control affect human behaviours

Decision making in Operation Management

- 1) **Strategic planning :** Strategic (or long-range) decisions of relevance to the production area (but with important interactions with other functional areas) included which products to produce, on which of the dimensions of cost, quality, delivery and flexibility to compete; where to locate facilities; what production equipment to use; and long-range choices concerning raw materials, energy and labour skills.
- 2) **Tactical planning :** Tactical (medium-range) plans, with a planning horizon from six months to two years into the future, take the basic physical production capacity constraints and projected demand pattern, established by a long-range plan, and ration available resources to meet demand as effectively and as profitable as possible. Even though basic production capacity is essentially fixed by long-range considerations, production capacity can be increased or decreased within limits in the medium term. A decision can be made to vary one or more of the following: the size of the work force, the amount of overtime worked, the number of shifts worked, the rate of production, the amount of inventory, the shipping modes and possible the amount of subcontracting utilized by the company. These plans, in turn, constrain but provide stability to what can be done at the operational level.
- 3) **Operational planning :** Operational (short-term) activities provide the day-to-day flexibility needed to meet customer requirements on a daily basis within the guidelines established by the more aggregate plans discussed above. Short-range operating schedules take the orders directly from customers, or as generated by the inventory system and plan in detail how the products should be processed through a plant. In most cases detailed schedules are drawn up for one week, then one day and finally one shift in advance. The schedules involve the assignment of products to



machines, the sequencing and routing of orders through the plant, the determination of replenishment quantities for each stock keeping unit and so on.

Characteristics of Modern production and operation management

Nature or features or characteristics of production and operation management

- 1) **It's a transformational process:** The production and operation management is concerned with the conversion of raw material.
- 2) **Its result into value addition:** In this at every successive level some value is added to the previous one. Example sand at sea shore does not add any value but sand used in construction adds to the value.
- 3) **It's a system itself :** It's a complete step wise process i.e. a proper well defined sequence is followed in production and operation management.
- 4) **It exists for certain objective:** First there is an objective and to meet that particular objective a complete procedure is followed.
- 5) **It's carried out in part of organization:** Its meaning is that production is not alone in the organization rather there are certain other acts also like finance, research and development etc.
- 6) **Inter relationship among the system:** No system can ever work in isolation and depends on others for certain help. So, there exists an interrelationship among different system.
- 7) **Stratum formulation:** A production system consist of various strata of corporate hierarchy in which every stratum has a role to play depending upon the size of the firm. Every stratum enjoys certain benefits as a result of stratum performance.
- 8) **Specialization of function:** As different functions are performed separately, due to this they are repetitively performed by same people and there is specialization of functions.
- 9) **Increase in productivity:** As there is specialization in functions so the speed of doing a task increases as a result there is increase in productivity.
- 10) **Decrease in cost :** Specialization leads to less wastage.

Recent Trends in Production/Operations management

1. Global Market Place
2. Production/Operations Strategy
3. Total Quality Management (TQM)
4. Flexibility
5. Time Reduction
6. Technology
7. Worker Involvement
8. Re-engineering
9. Environmental Issues
10. Corporate Downsizing (or Right Sizing)
11. Supply-Chain Management
12. Lean Production



UNIT - 2

Production Process, Manufacturing & Service Organisations

Meaning of Process

A series of stages involving man, machine, method, materials and others resources is known as process through which organizational inputs are transformed into value added output to satisfy customer needs.

Production Process

Also known as 'conversion process' or 'transformation process'.

Manufacturing Operations

Manufacturing operations by which inputs are converted into some tangible outputs.

Service Operations

Service operations are also known as non-manufacturing operations. They are used to transform a set of inputs into a set of outputs which are not tangible. Service operation can be classified into standard services and custom services according to the degree of standardization.

Manufacturing and Services

Common Characteristics of Manufacturing & Service organization:

- Entail customer satisfaction as a key measure of effectiveness
- Require demand forecasting
- Require design of both the product and the process
- Involve purchase of materials, supplies, and services
- Require equipment, tools, buildings, and skills, etc.

Differences between Manufacturing & Service organization:

- **Customer contact:** Service involves a much higher degree of customer contact than manufacturing does.

The performance of a service typically occurs at the point of consumption. Manufacturing allows a separation between production and consumption.

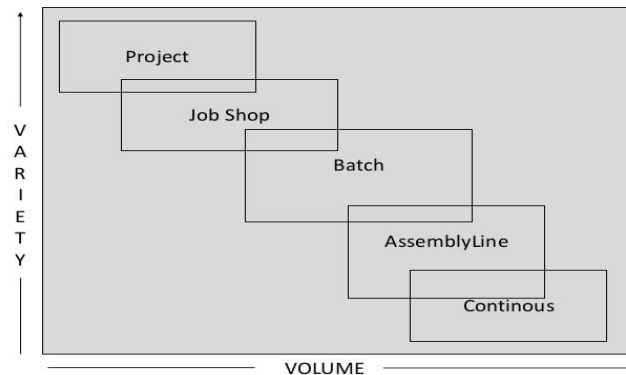
- **Uniformity of input** Service operations are subject to more variability of inputs than manufacturing operations are. Each patient, each lawn, each TV presents a specific problem.
- **Labor content of jobs** Manufacturing ---capital -intensive .Service ---a higher labor content.
- **Uniformity of output** **Products**--standardization, low variability, smooth, efficient. **Service**--customization, variable, slow.
- **Storage of output** - In manufacturing Store Goods may be stored. Services are consumed during delivery, cannot be stored.
- **Measurement of productivity** In manufacturing, measurement is more straightforward In service operation, measurement is more difficult due to variations in demand intensity.

| Characteristic | Manufacturing | Service |
|----------------------|---------------|------------|
| Output | Tangible | Intangible |
| Customer Contact | Low | High |
| Uniformity | high | low |
| Labor content | Low | High |
| Uniformity of output | High | Low |



| | | |
|---------------------------|------|-----------|
| Store of output | Easy | Difficult |
| Measurement of production | Easy | Difficult |

Classification of Manufacturing Process/Types of production system



(a) Job Shop Production: In this system Products are manufactured to meet the requirements of a specific order. The quality involved is small and the manufacturing of the product will take place as per the specifications given by the customer. This system may be further classified as.

(i) The Job produced only once: Here the customer visit the firm and book his order. After the completion of the product, he takes delivery of the product and leaves the firm. He may not visit the firm to book the order for the same product. The firm has to plan for material, process and manpower only after receiving the order from the customer. The firms have no scope for pre-planning the production of the product.

(ii) The job produced at irregular intervals: Here the customer visits the firm to place orders for the same type of the product at irregular intervals. The firm will not have any idea of customer's visit. Here also planning for materials, process and manpower will start only after taking the order from the customer. In case the firm maintains the record of the Jobs Produced by it, it can refer to the previous plans, when the customer arrives at the firm to book the order.

(iii) The Jobs Produced periodically at regular intervals: In this system, the customer arrives at the firm to place orders for the same type of product at regular intervals. Here firm knows very well that the customer visits at regular intervals, it can plan for materials, and process and manpower and have them in a master file. As soon as the customer visits and books the order, the firm can start production. If the volume of the order is considerably large and the number of regularly visiting customers are large in number, the Job Production system slowly transform into Batch Production system.

(b) Batch Production: Batch Production is the manufacture of number of identical products either to meet the specific order or to satisfy the demand. When the Production of plant and equipment is terminated, the plant and equipment can be used for producing similar products. This system also can be classified under three categories.

(i) A batch produced only once: Here customer places order with the firm for the product of his specification. The size of the order is greater than that of job production order. The firm has to plan for the resources after taking the order from the customer.

(ii) A Batch produced at irregular intervals as per Customer order or when the need arises: As the frequency is irregular, the firm can maintain a file of its detailed plans and it can refer to its previous files and start production A Batch Produced periodically at known Intervals: Here the firm either receives order from the customer at regular intervals or it may produce the product to satisfy the demand. It can have well designed file of its plans, material requirement and instructions for the ready reference. It can also



purchase materials required in bulk in advance. As the frequency of regular orders goes on increasing the Batch Production system becomes Mass Production System. Here also, in case the demand for a particular product ceases, the plant and machinery can be used for producing other products with slight modification in layout or in machinery and equipment.

(c) Continuous Production: Continuous Production system is the specialized manufacture of identical products on which the machinery and equipment is fully engaged. The continuous production is normally associated with large quantities and with high rate of demand. Hence the advantage of automatic production is taken. This system is classified as:

(i) Mass Production: Here same type of product is produced to meet the demand of an assembly line or the market. This system needs good planning for material, process, maintenance of machines and instruction to operators. Purchases of materials in bulk quantities is advisable.

(ii) Flow Production: The difference between Mass and Flow Production is the type of product and its relation to the plant. In Mass Production identical products are produced in large numbers. If the demand falls or ceases, the machinery and equipment, after slight modification be used for manufacturing products of similar nature. In flow production, the plant and equipment is designed for a specified product. Hence if the demand falls for the product or ceases, the plant cannot be used for manufacturing other products. It is to be scrapped. The examples for the above discussed production system are

(i) Job Production Shop: Tailors shop; cycle and vehicles repair shops, Job typing shops, small Workshops.

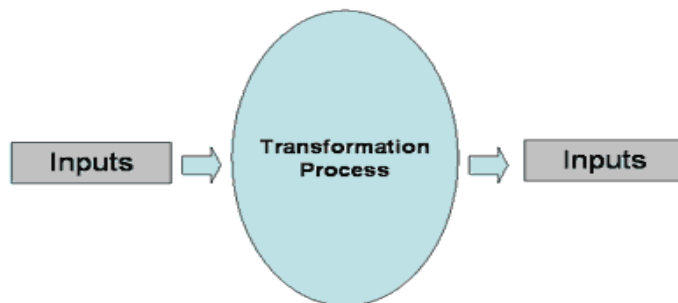
(ii) Batch Production Shop: Tyre Production Shops, Readymade dress companies, Cosmetic manufacturing companies...etc.

(iii) Mass Production Shops: Components of industrial products,

(iv) Flow Production: Cement Factory, Sugar factory, Oil refineries...etc.

Manufacturing operations as conversion Process

Production and Operations Management ("POM") is about the transformation of production and operational inputs into "outputs" that, when distributed, meet the needs of customers.



The process in the above diagram is often referred to as the "**Conversion Process**".

Characteristics of Modern Manufacturing Process -

1. Use of Scientific Methods
2. Use of Machines
3. Use of Technology
4. Specialization
5. Wide use of Computer



UNIT - 3 DESIGN OF PRODUCTION PROCESS

Product Design

Before a product can embark on its journey through the four product life cycle stages, it has to be developed. New product development is typically a huge part of any manufacturing process. Most organizations realize that all products have a limited lifespan, and so new products need to be developed to replace them and keep the company in business. For developing a product, product design is must.

Product Design:

Design has a great impact on the quality of a product or service. If the design of product or service is poor, it may not satisfy needs of the customers.

Definition:

“Product design is concerned with the determination of what a product would look like, how it will be made, what function the product will perform and how it will perform.”

Objectives of Product Design:

Following are the basic objectives of product design:

- 1) To achieve the desired product quality.
- 2) To reduce the cost of the product.
- 3) To ensure availability of the product according to the needs of customer.
- 4) To generate profit in the long run.
- 5) To implement the idea of a new product.

Steps for Product Design:

1. Idea Generation
2. Feasibility Study
3. Form Design
4. Functional Design
5. Production Design
6. Final Design
7. Design Review
8. Launching of Product

1. Idea Generation

Ideas for new products or improvements to existing products can be generated from many sources like complaints or suggestions of customers, sales persons in the field, factory workers, marketing research, company's own R&D and new technological developments. Competitors are also a source of ideas for new products and services.

2. Feasibility Study

Feasibility study means whether the concept is suitable as well as practically possible or not. Different types of ideas may generate from the first stage or product design. Alternative product and service concepts undergo a feasibility study.

Several type of analysis are performed for this purpose like market analysis, economic analysis, technical analysis and strategic analysis. They are described below:



- i) Market analysis determines whether there is enough demand for the proposed product.
- ii) Economic analysis estimates production and development costs and compares them to estimated sales volume.
- iii) Technical analysis determines whether the new product requires new technology and whether the company has sufficient labour and management skills to support the required technology.
- iv) Strategic analysis answers such questions as: Does the new product provide a competitive advantage for the company? Does it draw on corporate strengths? Is it compatible with the core business of the firm?

3. Form Design

Form design refers to the physical appearance of a product – its colour, size, shape and style. Other features like image, market appeal and personal identification are also a part of form design.

4. Functional Design

Functional design is concerned with how the product performs. Three performance characteristics are considered during this phase: reliability, maintainability and usability.

- i) **Reliability** is the probability that a given product will perform its intended function for a specified length of time under normal conditions of use.
- ii) **Maintainability** refers to the cost of maintaining or repairing a product or service.
- iii) **Usability** means whether the product or service is a good fit for its targeted customer.

5. Production Design

Production design is concerned with how the product will be made. When the designs are difficult to make, they often result in poor quality products. Lack of knowledge about manufacturing capacities may result in designs which are not possible to make. The approaches used to production design are simplification, standardization, modularity and design for manufacture (DFM).

6. Final Design

The final design consists of detailed drawing and specifications for the new product or service. Many companies known for creativity and innovation in product design are slow in getting new products to the market. In order to reduce time-to-market, there is a need for change in the decision making process and the participants in that process.

7. Design Review

Before finalizing a design, the value of every component and the possibility of its failure should be reviewed.

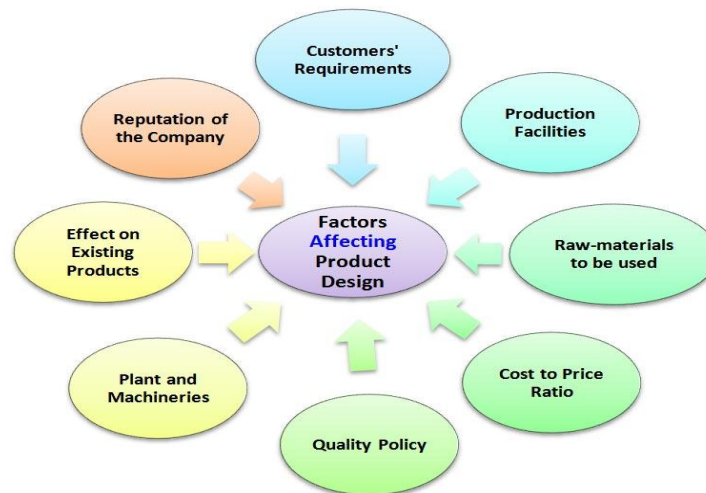
8. Launching of Product

After assessing the product design on the basis of above criteria, the product may be finally launched. When a product is launched, there is a need for coordinating the supply chain and rolling out marketing plans. These are the areas in which marketing and production department must work together very closely.



Factors Influencing Product design

The factors that determine or affect a product design are as follows:



1. Customers' requirements: The product designers must consider and study the requirements of their targeted customers. The designed product must satisfy customers in terms of good product requirements like quality, performance, reliability, durability, etc. The product must create confidence among customers so that they become loyal to it and start entrusting its company. This will lead to repeated cycle of sales for the company, thus boosting its profits.

2. Production facilities: The product designers must check that production department has got all necessary facilities to produce a product. Simple product design requires minimum production facilities. This will make the job of production department easy, and it will also minimize the cost of production. The machines and tools which are used to produce the product must give comfort and convenience to the employees of production department.

3. Raw-materials to be used: The type and quality of the raw-materials to be used, greatly influence the design and making of a product. The designer must have proper knowledge about latest materials, which are required to produce the product. He must collect information about required materials from primary and secondary sources. He must also find out what materials are used by the competitors for their products.

4. Cost to price ratio: Cost is one of the main factors, which influences the design of a product. Sometimes the product designer is informed about the maximum cost of the product. So he has to design the product within this cost. In such a case, he has no freedom to over-design the product. The product designer is also guided by the cost of competitor's products. It may happen that the designer first designs the product and then the final price of the product is decided. In this case, the designer gets a freedom to design the products. However, he must never over design the product.

5. Quality policy: The design of the product is guided by quality policy, which is fixed by the top level of management. This policy gives, guidelines for quality standard. It sets the design trend for the future. It also builds a particular quality image of the company's products. Some companies prefer to have the 'prestige



image' for their products. For e.g. Mercedes-Benz, Rolls Royce, Rolex Watches, etc. Other companies prefer the 'popular image' for their products.

6. Plant and machineries: The product design depends on the availability of plant and machinery. The designer must not design a product which cannot be manufactured by the machines available in the company. The machines to be used for production should be of good quality and in a better condition (well maintained) to meet the needs of the product designers and the quality standards.

7. Effect on existing products: The product designer must consider the impact or effect of the product design on the existing products of the company. An upcoming new product may badly affect the sale of existing products. The designer must avoid this situation. For e.g. a company may design a low-quality product, but it may badly affect the sale of its high quality existing product. Secondly, if a new product is going to replace a former product, then it must be able to use the same manufacturing and distribution strategies of the existing product.

8. Reputation of the company: The product designer must consider the reputation of the company in the market. Companies which have a good name and goodwill in the market will want their new product designs to match or keep up their positive image.

PROCESS PLANNING AND PROCESS DESIGN

Meaning of Process

A process is a sequence of activities which are performed to achieve some result e.g. creating value for the customers. A process converts inputs into outputs in a production system.

Process Planning

For survival and success of a product or service, it should possess the desired quality standards. It should be produced at the right time (when the customers need it) and the total costs associated with it should be within the budgeted limits. Process planning refers to complete description of the specific stages in the production process. It determines how a product will be produced or a service will be provided. It decides which components will be made in-house and which will be purchased from a supplier.

Process planning is required mostly for new products or services. However, it is also necessary when business or market conditions change, when equipments with better technology are introduced in the market or when the production capacity of the organization is to change.

Process planning is the base for designing factory building, facility layouts and selecting production equipments. It also affects job design and quality control of the organization. Hence, it is important for operations managers to determine how products will be produced or service will be provided.

Process Design

Process design includes choice of process and technology, analysis of flows through operations and the associated job design in operations. Process design is said to be effective for an organization only when it is able to accommodate the product/service design.

Factors Affecting Process Design Decisions

1. Nature of Demand:



The basic objective of any production system is to produce goods or services according to the requirements of customers. It is essential for an organization to schedule its production in such a way that it can always fulfill estimated future demand levels.

The demand for a product does not follow a fixed pattern overtime. The rise or fall of demand is influenced by several factors like seasonal fluctuations, change in fashion and technology etc. The process should be flexible enough to change the production level as per the fluctuations in demand.

2. Degree of Automation:

Automation has become essential for the organization to compete the market. Automation helps an organization to produce goods and services of better quality at reasonable cost within shorter period of time. However, it is not always advisable for a producer to automate all processes completely because savings in labour costs may not justify always the huge investment required for automation. Therefore, operations managers should decide on the degree of automation required for their production processes.

3. Desired Quality Level:

Decision about the desired quality level of products/services affects the design of production process at all stages. The quality level of a product or service decides whether it can compete in the market. The desired level of quality has a direct implication on the degree of automation in the production process.

4. Flexibility:

An organization is said to be flexible when it responds quickly to the changing customers needs or market conditions. Flexibility is essential for organization to increase or maintain their market share. The production processes for organizations must be designed such that the production level may be increased or decreased as per the changes. The flexibility required in a system affects the designs of its production process significantly.

5. Degree of Customers Contact:

For many products and services, the extent of customer contact affects the design of production process. For example, in systems like clinics and schools, the customer is actively involved and the service is directly performed on the customer. In such systems, equipment and employee training should be designed keeping in view the customer. In other systems where customer interaction is negligible like production of steel or cement, the price and speed of delivery are the matter of operations strategies.

Process Selection

There are various types of processes that can be selected and the corresponding situations where a particular process is preferred. Broadly, there are two main types of process classification:

1) **Product Flow**

- a. Line flow
- b. Batch flow
- c. Project

2) **Types of Customer Order**

- a. Made-to-stock (MTS)
- b. Made-to-order (MTO)

Selection of the Process

The major considerations in any process selection are capacity, flexibility, lead time and efficiency in using resources.



Process selection decision is also influenced by the environment. When new materials become available, different transformation process may become more appropriate. For example, plastic containers have become very popular in place of metal containers.

Development of new technology may render a process obsolete because the new technology is more economical, uses cheaper material and produces goods with a high quality level. Previously, the bolts were made of hexagonal rods.

The competitions also affect the selection of process. If the competitors can deliver the product or service much faster than us, it may lead us to review the form of process selected for our operations functions.

Process Management

Process Management is concerned with the selection of inputs, operations and methods which transform inputs into outputs. It includes process definition, documentation, statistical process control and the tools of quality improvement.

Definition:

“Process management is the application of knowledge, skills, tools, techniques and systems to define, visualize, measure, control, report and improve processes with the goal to meet customer requirements profitability.

Major Process Decisions

The production/operations managers considers five common process decision which are discussed below:

1. Process Choice:

It helps to determine whether the resources are organized around products or processes so that the flow strategy can be implemented. It depends on the volume and degree of customization to be provided.

The five basic process types which are chosen by production manager are:

- i) Job shop process
- ii) Batch process
- iii) Repetitive process
- iv) Continuous process
- v) Project process

2. Vertical Integration:

When the production and distribution chain, from suppliers of components to the delivery of products and services to customers is brought under the ownership of a firm, it is known as vertical integration. The degree of integration is decided by the management keeping in view all the activities performed from the acquisition of raw material to the delivery of finished products to customary.

There are two directions of vertical integration:

- i) Forward integration
- ii) Backward integration

If a manufacturer decides to buy a wholesale firm and distribute its products only through that wholesaler, the integration is ‘forward’ toward the market. On the other hand, if the manufacturer buys a supplier company, the integration is ‘backward’.

3. Resource Flexibility:

Flexibility is desired by a firm about its resources i.e. employees, facilities and equipments. The degree of flexibility depends on the competitive priorities of management. Production managers must decide whether they should maintain flexible workforce which will provide reliable customer



service and adjustment is capacity. Flexible workforce is useful if there is fluctuations in workloads. However, it is better to have certain amount of permanent workforce having multiple skills. It will help in movement of surplus workforce from a work center to another work center.

4. Customer Involvement:

The level of customers interaction with the process is known as customer involvement. Now a days, the involvement of customers is increasing due to growing competition on customization. Companies are allowing customers to specify their requirement or even to be involved in the designing process for the product.

5. Capital Intensity:

The level of capital resources used in manufacturing like equipments and machines is known as capital intensity. Decision about the amount of capital investment required for equipments and machines is important for designing a new process. Capital intensity is important for increasing productivity and quality but there is a risk of high investment cost for low volume operations.

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