PRODUCTION AND MATERIAL MANAGEMENT

Presented By

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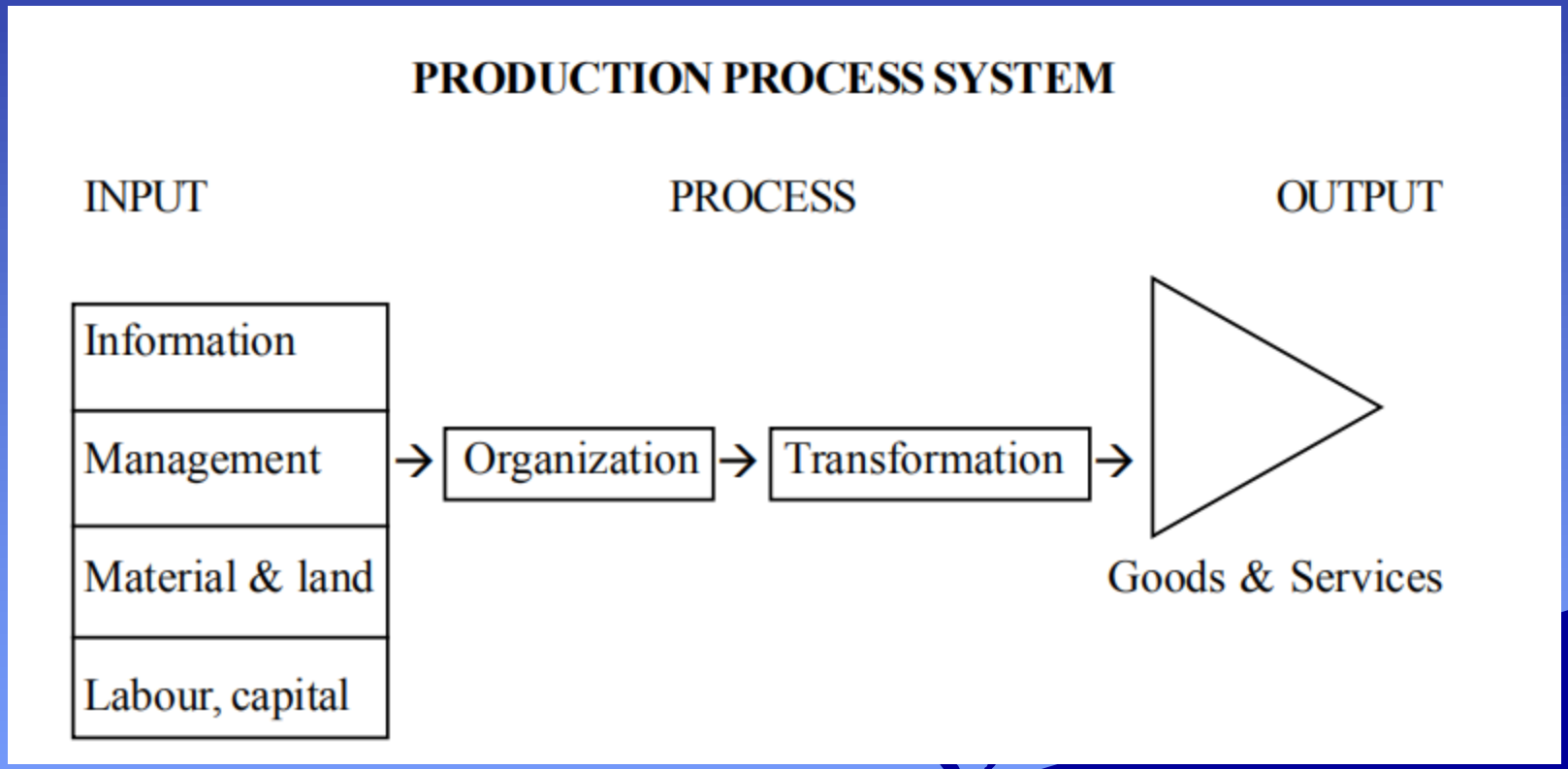
MEANING OF PRODUCTION



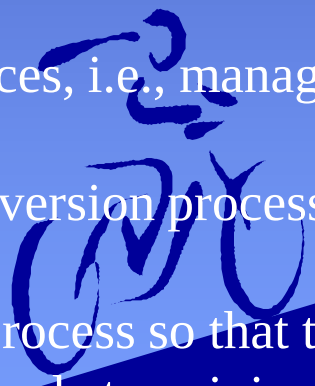
The main objectives of a production process are :

(i) optimum use of resources at optimum cost.
(ii) manufacture of the desired quality and quantity of goods and services.

Meaning of Production Management

Production management, thus, is assigned with the following tasks –

(i) Specifying and accumulating the input resources, i.e., management, men, information, materials, machine and capital.
(ii) Designing and installing the assembly or conversion process to transform the inputs into output, and
(iii) Coordinating and operating the production process so that the desired goods and services may be produced efficiently and at a minimum cost.



SCOPE OF PRODUCTION MANAGEMENT

1. Product Selection and Design :
2. Activities Relating to Production System Designing :
3. Facilities Location:
4. Method Study :
5. Facilities Layout and Materials Handling :
6. Capacity Planning :
7. Production Planning :
8. Production control :

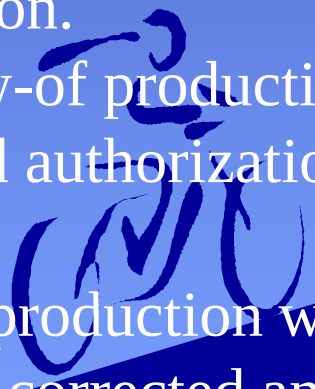
Thus production control involves the following stages :

(i) Planning — setting targets of production.

(ii) Routing — to decide the route or flow-of production activity.

(iii) Dispatching — to issue materials and authorizations for the use of machines and plant services.

(iv) Follow-up — it compares the actual production with the targeted production. Deviations are found out and corrected and reasons are investigated.



SCOPE OF PRODUCTION MANAGEMENT

9. Inventory Control :

The production manager has to look after the inventory control activities at three levels –

(i) Control of inventories such as raw materials, purchased parts, finished goods and supplies through the inventory control technique;

(ii) Control of flow of materials into the plants through the technique of judicious purchasing;

(iii) Control of work-in-progress through production control.

10. Quality control :

11. Maintenance and Replacement :

12. Cost Reduction and Control :

Components of Production Function

A. Planning

1. Production selection and Design - video
2. Process selection and planning process
3. Facility location
4. Factory layout and material handling - video
5. Capacity planning
6. Forecasting
7. Production

B. Organizing

8. Work study and job design

C. Controlling

9. Production control
10. Inventory control
11. Quality control
12. Maintenance and replacement
13. Stores & warehousing
14. Cost reduction and control

Production Function

1. The Production
2. The plant
3. The process
4. The programme
5. The people
6. The policy

Scope of Production Management

1. Activities relation to production system designing
2. Activities relation to analysis and control of production
   a. Production planning
   b. Production control

Organisation for Production

1. To meet objectives
2. Structural arrangement set up in a logical manner
3. Inter-related tasks
4. Receive directions, instruction
5. Proper delegation of authority
6. Span of control (The no. of subordinates which a manager can manage effectively)

Functions and Responsibilities of a Production Manager

1. Product selection and design
2. Process selection and planning
3. Facilities location
4. Capacity planning
5. Production planning
6. Production control
7. Quality control
8. Method analysis
9. Inventory control

Functions and Responsibilities of a Production Manager

10. Plant layout and material handling
11. Work measurement
12. Maintenance and replacement
13. Cost reduction and cost control
14. Other functions

Production Management Strategies

I. Long range Strategies

1. An imaginative and pragmatic national policy
2. A strategic goal of manufacturing
3. An effective leadership
4. Technological excellence
5. Innovation in production - video
6. Globalization of industry
7. Effective management of technology
8. Marketing strategy and risk taking ability
9. Goodwill

Production Management Strategies

II. Medium range Strategies

1. Location and layout
2. Product selection and technology
3. Capital selection and investment
4. Capital investment and planning
5. Flexible strategy of production
6. Standardization of design
7. Rationalization of product line
8. Economy of size and variety
9. Aggregate production planning
10. Inventory policy and planning
11. Organization development
12. Performance budgeting
13. Flexible organization structure

Production Management Strategies

III. Short range Strategies

1. Production scheduling
2. Make or buy decisions
3. Purchase, stock control and verification
4. Quality control and audit
5. Value analysis and cost reduction steps
6. Maintenance, safety and replacement
7. Vendor rating and evaluation
8. Stress and time management
9. Incentive and motivation

Decisions involved in Production Management

I. Long-run Decisions

1. Selection of the product
2. Design of the product
3. Selection of equipment and process
4. Production design of items processed
5. Job design
6. Site of the industry and business
7. Facility layout

II. Short-run Decisions

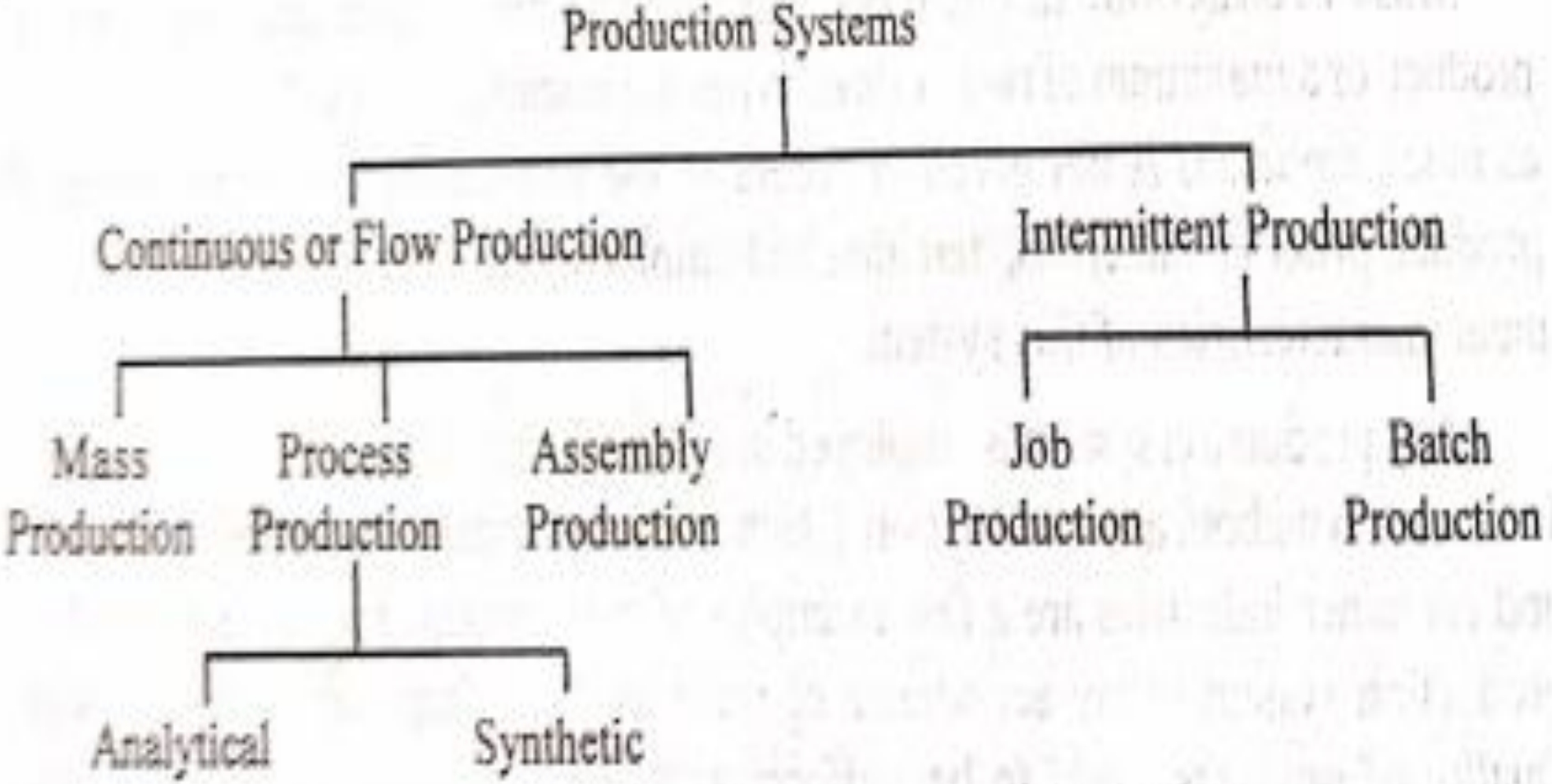
1. Inventory control
2. Production control
3. Maintenance and reliability of the systems
4. Quality control - video
5. Labour control
6. Cost control and improvement

Production Procedure

1. Sales forecast
2. Preparation of production budget
3. Preparation of drawings and bill of materials
4. Production planning activity
5. Despatching
6. Progressing
7. Inspection
8. Evaluation

Types of Production or Manufacturing Systems

There are fundamentally two types of production systems (methods of production): (i) Continuous production system. (ii) Intermittent production system.



Continuous Production System

Continuous production system involves a continuous or almost continuous physical flow of materials. It makes use of special purpose machines and produces standardized items in large quantities.

Characteristics of Continuous Production

- Standard products are manufactured
- Standardized inputs and standardized sequence of operations, machine tools and equipment are used
- Division of labour
- Minimum and constant material handling
- Minimum flow of work
- Small work in progress
- Use of productivity techniques is feasible
- Minimum cost of production
- Rigid quality control
- More maintenance

Types of Continuous Production

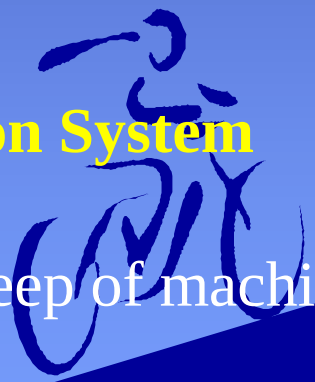
- Mass production
- Process production
- Assembly production

Advantages of Continuous Production System

- Reduced Labour
- High accuracy
- Reduced material handling
- Simple control process
- Minimum wastage
- Better materials
- Higher return on investments

Disadvantages of Continuous Production System

- Heavy loss during slack demand period
- Rigid (inflexible) maintenance and upkeep of machines
- Customers' tastes cannot be met
- Difficult to adjust to new situations
- Special purpose machine tools required.



Suitability of Continuous Production System

- Uniform demand
- High volume of production
- Product standardization
- Process balancing

Intermittent (Irregular) Production System

In this system, the goods are manufactured specially to fulfill orders placed by customers rather than to stock.

Characteristics of Intermittent Production

- Small quantity of production - video
- Machines and equipment are laid as per process
- Unbalanced workloads
- Highly skilled workers
- Large work in progress
- Flexible to suit

Advantages of Intermittent Production

- Demand can be discontinuous
- All operational stages may not be balanced
- Adjusting to new situations and specifications is possible
- Item can be manufactured according to order

Disadvantages of Intermittent Production

- Cost per unit of production is more
- Elaborate sequencing and scheduling is required
- High investment is required.

Types of Intermittent Production

I. Job or Unit Production

Job production is the production of single complete unit by one operator or a group of operators. Eg. Ship building

Characteristics of Job Production

- The product manufactured is non-standardised
- Machines and equipment are arranged
- A wide range of general purpose
- Volume of output is generally small
- Variable path materials handling

Advantages of Job Production

- Job production involves
- It is flexible

Disadvantages of Job Production

- Most complex system
- Raw material and work-in-progress uneven
- Labour and equipment must be flexible
- Speed of work is slow

II. Batch Production

Items are processed in lots or batches and a new batch is undertaken for production only when the work on all item of a previous batch is completed.

Characteristics of Batch Production

- A large variety of products - video
- Both general purpose and special purpose
- Variable path materials handling equipment are used
- Machines and equipment are arranged

Merits and Demerits of Batch Production

- ❖Combine features of both flow production and job production
- ❖Some degree of specialization
- ❖Capital investment is low
- ❖Frequent change in product design

Demerits of Batch Production

- ❖Idle time
- ❖Wait until a particular operation
- ❖Waiting or rest time is involved
- ❖Time-lag in production
- ❖Investment is high and return low
- ❖Buffer stock maintained
- ❖A proper balance between investment in material and other resources.

Suitability of Batch Production System

It is applied when either the volume of output is increased resulting in some repetitiveness or the market demand is not uniform throughout the year.

Comparison of production-planning and control in Intermittent and Continuous Manufacturing Systems

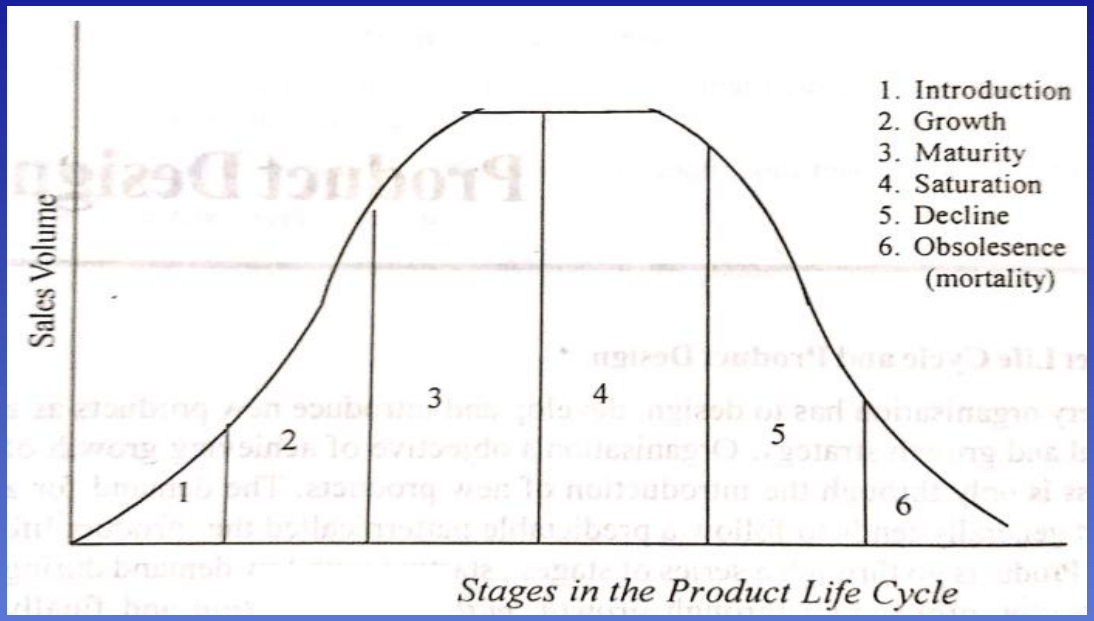
Description	*Intermittent system (Job/Batch Production)*	*Continuous System (Mass/process Production)*
1. Production planning	Complex and expensive	Easy and cheaper
2. Inventory Management	Difficult to control and manage	Relatively easier to manage
3. Machine capacities	Machine capacities are varied and are generally estimated.	Machine capacities are less varied and is known in advance from past experience.
4. Routing	Routing is done for each job/batch order	Routing is done at the initial stages of plant installation or modification
5. Scheduling	Complex	Comparatively easy
6. Despatching	Elaborate and detailed production control	Simple
7. Authority to manufacture	Done through manufacturing order.	Done through manufacturing schedule
8. Application of work study	Difficult	Easy

Differences between Job production, Batch production and Continuous/(Mass) production

Description	*Job Production*	*Batch-Production*	*Mass-Production*
1. Definition	Manufacture of one product as per customers' requirement. *Example:* Ship building, turbine or generator manufacture, etc.	Manufacture of items in batch lots for a number of customers. *Example:* Manufacture of Industrial Motors, Automobiles, Pumpsets etc.	Manufacture of repeated items continuously for meeting continuous demand. *Example:* Manufacture of Nuts, Bolts, Steel. Bulbs, Petrochemicals, etc.
2. Manufacturing cost per unit.	Maximum	Moderate	Minimum
3. Capital investment per unit	Highest	Moderate	Minimum
4. Plant size	Smaller	Moderate	Minimum
5. Staff requirement.	Highly technical	Moderately technical	Semi-skilled
6. Organisational structure	Functional approach (Decentralised approach)	Combination of functional and divisional approach	Divisional approach (Centralised approach)

7. Work flow	Intermittent	Intermittent	Continuous
8. Division of Labour	Very little scope	Moderate scope	Great scope
9. Material handling	Maximum	Moderate	Minimum
10. Work cycle	Very large	Moderate	Very small
11. Inventory	Maximum	Moderate	Minimum
12. Controls	Simple or manual or semi-automatic	Moderate and semi-automatic	Very sophisticated and automatic
13. Maintenance	Simple	Moderate	Very rigorous
14. Quality control	Very Strict	Moderate	Very strict
15. Application of productivity techniques	Very little scope	Moderate scope	Great scope
16. Production planning and control	Most complex	Moderate	Simple

Different Stages of Product Life Cycle



- Introduction
- Growth
- Maturity
- Saturation
- Decline
- Mortality / Obsolescence – dies out

Definition of Product Design

"Design, in its broadest sense includes the whole development of a product through all the preliminary stage until actual manufacturing begins."

Characteristics of a Good Product Design

- Function
- Reliability
- Maintainability
- Simplification
- Product standardization and variety reduction
- Quality
- Minimum cost
- Warranties
- Modular design

Types of Design

- Functional Design
- Aesthetic Design (Before production on a commercial scale is undertaken another type of design must be integrated with the functional Design)
- Production Design
- Packing Design

Objectives of Designing a Product

- To create attention
- To customers' point of view
- To produce better quality at lowest price

Factors affecting the Design of a Product

- Customers' requirement and Psychological effects
- Facility to operator
- Functionality
- Materials
- Work method and equipment
- Cost / price ratio
- Quality policy
- Process capability
- Effect on other products
- packaging

Factors that influence Product design

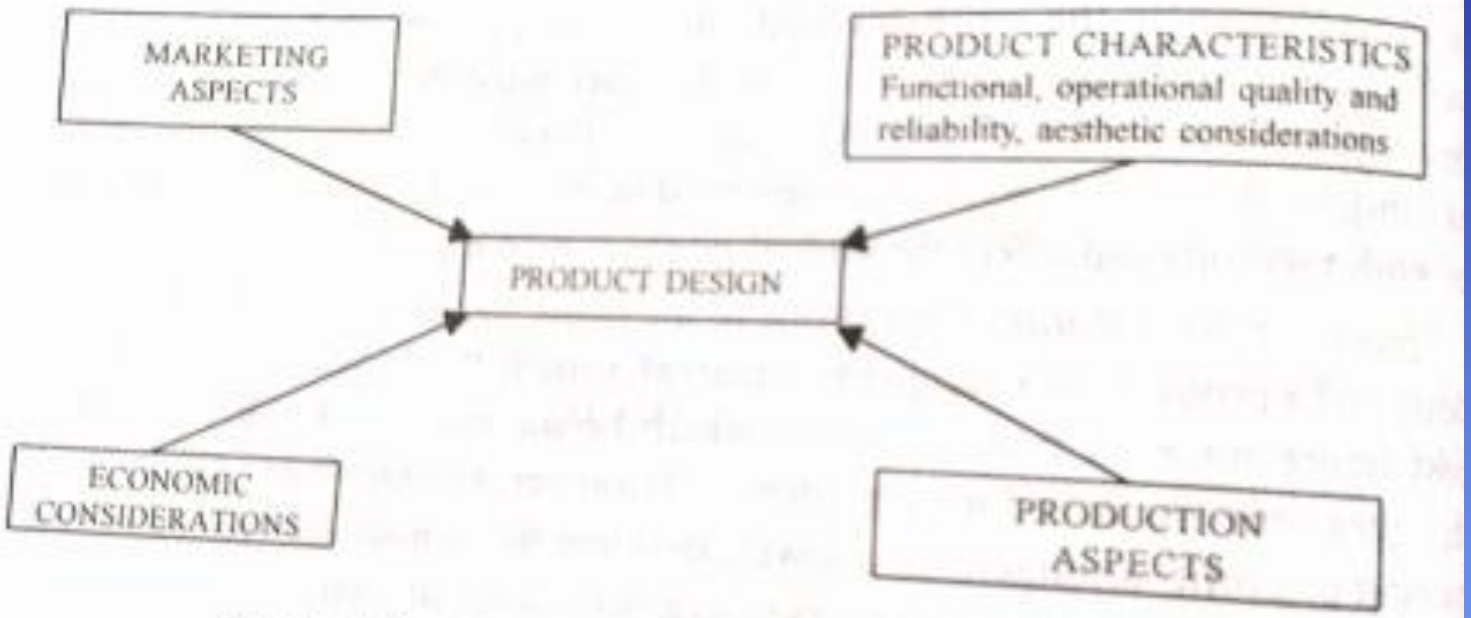


Figure 3.2 – Factors that influence product design

Stages in Product Design

- Conception – a draft specification is prepared
- Acceptance – scrutinized for its viability
- Execution
- manufacturing feasibility
- style requirements
- specific process
- reliability
- maintainability
- packaging requirements
- transportability
- feasibility
- identification of assembly problems
- refinements
- Evaluation
- Translation stage –conversion of design into a form
- Pre-production – a pilot production run is carried out

Design and Product Cost

Effect of Design on Cost

- Direct labour cost
- Direct material cost
- Direct expenses
- Indirect expenses
- **Product cost can also be reduced by considering the following aspects**
- Materials
- Interchangeable standards
- Component parts
- Tolerance
- Surface finish
- Make or buy decisions
- Redesigning
- Number of operations
- Simplicity

Design for volume production

- The sequences of operations should be integrated
- Exactness of the size of components or part
- **Production Specification**
- By the process planning department – methods of production
- By the production control department – controlling material supply & bus. Activity
- By the purchase department
- By the line and inspection management – limits to work
- By the sales department – prepare contracts for sales

The parts List

List all the different parts used in the product and gives the following information:

- Part number
- Description
- Quantity per set
- Materials

Parts list arrangement

- In assembly order
- In parts number order
- By the type of material
- By the source of supply

Drawings – second set of documents comprising the specification is the drawings.

Design Changes – it is customary to record all changes made in the design of a product.

- To give numbers to each separate change

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Process of New Product Development

A. Exploration of New ideas

- Consumers
- Salesmen
- Competitors' products
- Scientific developments
- Universities and government research laboratories
- Employees of the enterprise management

B. Development of Ideas

- Objects of the organization
- Object of sales growth
- Object of maximizing profits
- Object of improving the image
- Idea can be implemented with the available resources
- Technical knowledge
- Financial resources
- Plant capacity
- Managerial ability

C. Business Analysis

- ❖Estimating future sales
- ❖Estimating future profits

D. Product Development

- ❖Developing model
- ❖Testing of consumers' preference
- ❖Brand name
- ❖packaging

E.Test Marketing

F.Commercialization of Product

Considerations in Product Development

- Consumer Acceptance
- Patent, copyright and Trademark Protection
- Developing and Manufacturing costs
- Complementary products
- Effects on other products
- By-products

Tools for Product Development

- Standardization
- Maintaining the standards
- Types
- Product standards
- Engineering standards
- Materials standards
- Quantity standards
- Process standards
- Equipment standards
- Safety standards
- Administrative standards
- Simplification
- Specialization
- Diversification

MAKE OR BUY DECISIONS

A common problem usually faced by a manufacturing company is whether it should itself make all the components or buy some of them from outside sources.

Functional Aspects of Make or Buy Decisions

- Financial aspects
- Technological aspects
- Marketing aspects
- Purchasing aspects
- Strategic aspects
- Intangible aspects

Strategic Considerations in Make or Buy Decisions

- Quality considerations
- Quantity considerations
- Cost considerations
- Service considerations
- Competence of know-how required
- Age of the firm
- Tax considerations
- Labour union compulsions
- Political domestic compulsions
- Sub-contracting

Significance or Importance of Production Management

- Expansion of the Firm
- Minimizes price of Production
- Accomplishment of Firm's Objectives
- Reputation, Goodwill and Image
- Helps to Face Competition
- Optimum Utilization of Resources
- Supports different useful Areas

UNIT II PLANT LOCATION

PLANT LOCATION – Meaning

- Proper and well planned industrial location and plant layout is an important managerial decision. It is a long term decision making.
- A small scale industry where market for the product is available.
- Large scale industries – huge amount of investment
- There are many considerations for plant location

Importance of Plant Location

1. It determines the operating and capacity costs
2. To allocation of capacity to respective market area
3. To physical factors of the overall plant design
4. To deliver the product at a cheaper price

Reasons for Relocation of Plant

1. Changes in location of demand
2. Changes in availability of materials / raw materials
3. Changes in availability of transport
4. Changes in cost and supply of labour
5. Changes in regulations and law
6. Changes in policy of industries to relocate on which the firm is dependent

Types of Locational Decisions

1. To conversion of inputs into finished products
2. To provide assistance to production units
3. To dispersion (distribution) of the production to the materials.
4. To assemble necessary inputs
5. To location of warehouse facilities

Objectives in Plant Location

1. Reduced capital investment and operating cost
2. Ensuring effective plant layout
3. Coordination with government policies
4. Employee welfare and public needs
5. security

Aspects of Plant Location

1. Selection of a region (regional factors)
2. Selection of a locality (community factors) –
    a. Labour,
    b. Wage rates,
    c. Existence of industry,
    d. Attitude of the people,
    e. Local taxes
    f. Living conditions
    g. Water supply
3. Selection of a Site (Site factors)
    a. Price of land
    b. Disposal of waste

Factors Relating to Buying

1. Nearness to raw materials
2. Accessibility to raw materials

Factors related to Manufacturing

1. Availability of labour
2. Nearness to source of power
3. Availability of services
4. Ready accessibility to repair shop
5. Availability of amenities
6. Transport and communication
7. Safety requirements
8. Adequate fire fighting facilities

9. Availability of educated personnel and research facilities
10. Ability to build and expand plant capacity
11. Political stability
12. Suitable soil, climate and topography
13. Association with other industries
14. The momentum of an early start
15. Regional regulations

Factors related to Selling

1. Nearness and accessibility to market
2. Characteristics of people
3. Special grants, regional taxes and import/export barriers

Recent Trends in Location of Industries

1. Priority for the suburban areas
2. Industrial development in the notified backward area
3. Establishment of industrial estate
4. Decentralization of industries
5. Increased role of the government in the decision of location of industries
6. Competition between government and institutions

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