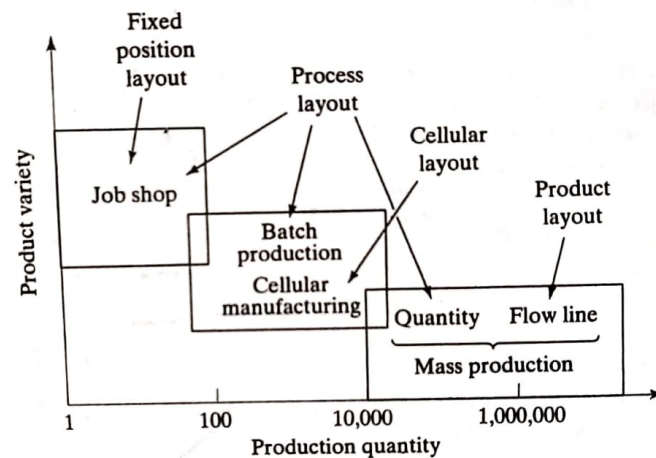


# Automation

L-2

# Production system facilities

1. Low production - quantities in the range of 1 to 100 units per year
2. medium production – quantities in the range of 100 to 10,000 units annually
3. High production- Production quantities are 10,000 to million units



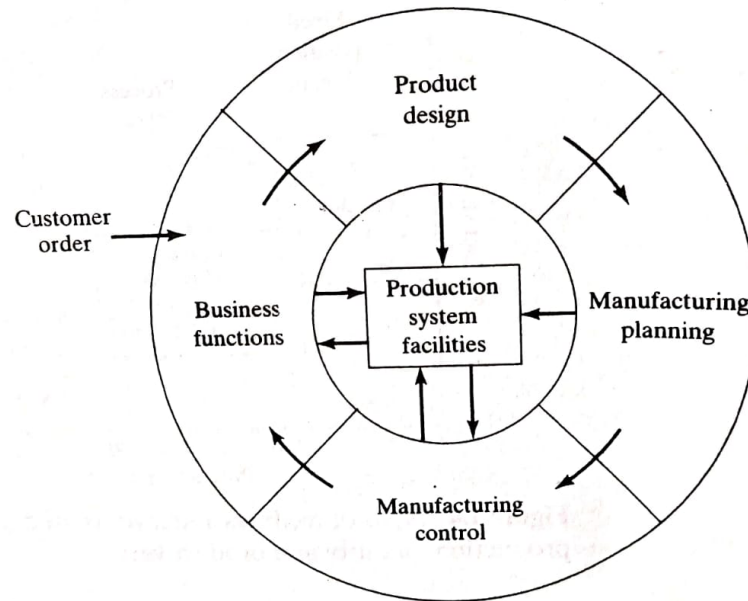
**Figure 1.4** Types of facilities and layouts used for different levels of production quantity and product variety.

# Manufacturing Support System

Manufacturing support involves a cycle of information-processing activities. It consist of four functions

- (1) Business functions
- (2) Product design
- (3) Manufacturing planning- Process planning, master planning, master scheduling, requirement planning, capacity planning
- (4) Manufacturing control

# Information-Processing cycle firm

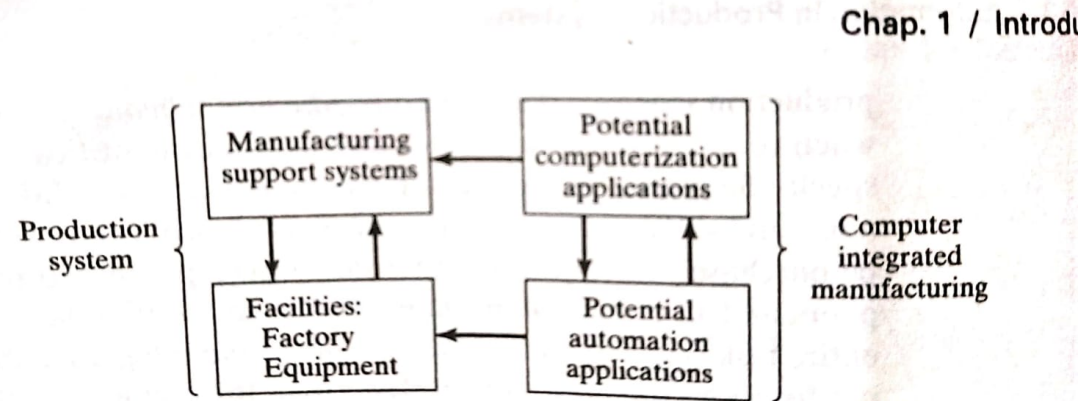


**Figure 1.5** The information-processing cycle in a typical manufacturing firm.

# Automation in Production Systems

It depends on two categories

1. Automation of manufacturing systems in the factory
2. Computerization of manufacturing support systems



**Figure 1.6** Opportunities of automation and computerization in a production system.

# Automated Manufacturing Systems

- Examples of automated manufacturing systems include:
  - a) Automated machine tools that process parts
  - b) Transfer lines that perform a series of machining operations
  - c) Automated assembly systems
  - d) Manufacturing systems that use industrial robots to perform processing or assembly operations
  - e) Automatic material handling and storage systems to integrate manufacturing operations
  - f) Automatic inspection systems for quality control

# Classification of Automated Manufacturing systems

## Fixed Automation :

- 1) In this sequence of processing operations is fixed by equipment configuration
- 2) Each operation in the sequence is usually simple, involving perhaps a plain linear or rotational motion or an uncomplicated combination of two; for example, the feeding of a rotating spindle

Typical features of fixed automation are:

- 1) High initial investment for custom-engineered equipment
- 2) High production rates
- 3) Relatively inflexible in accommodating product variety

# Programmable Automation

- 1) In this, the production equipment is designed with the capability to change the sequence of operations to accommodate different product configurations
- 2) The operation sequence is controlled by a program, which is a set of instructions coded so that they can be read and interpreted by the system

Some features that characterize programmable automation include:

- a) High investment in general purpose equipment
- b) Lower production rates than fixed automation
- c) Flexibility to deal with variations and changes in product configuration
- d) Most suitable for batch production



# Flexible automation

- 1) It is capable of producing a variety of parts with virtually no time lost for changeovers from one part style to the next
- 2) There is no lost production time while reprogramming the system and altering the physical set up ( tooling, fixtures, machine settings)

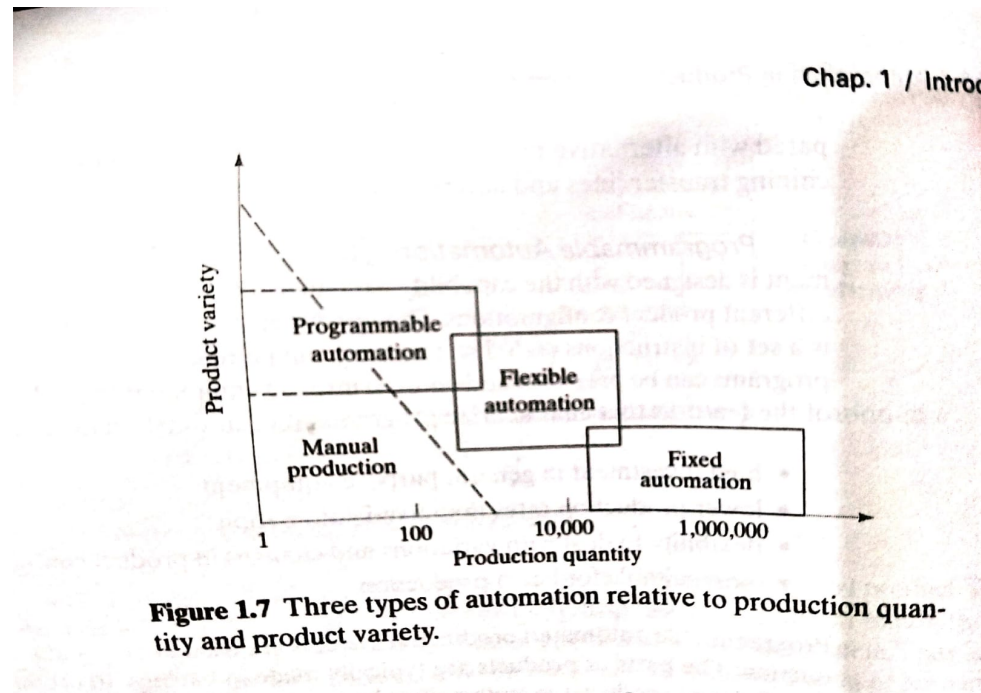
The features of flexible automation can be summarized as follows:

- a) High investment for a custom-engineered system
- b) Continuous production of variable mixtures of products
- c) Medium production rates
- d) Flexibility to deal with product design variations

# Computerized manufacturing support systems

## 1) CIM

CAD & CAM + Business Enterprise



Automation in Production Systems

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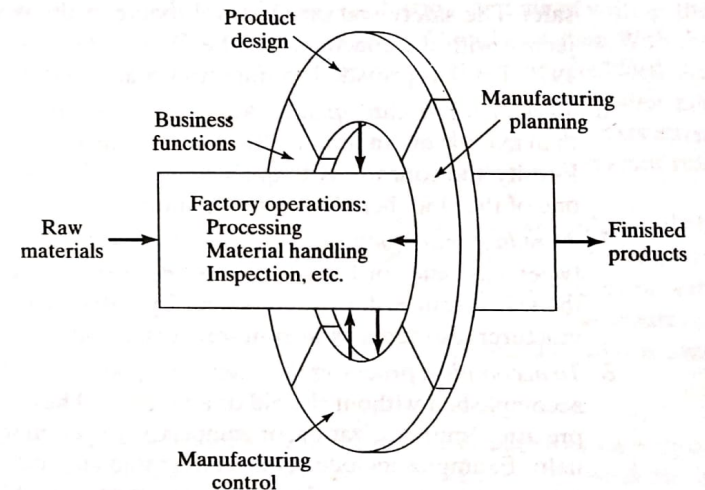
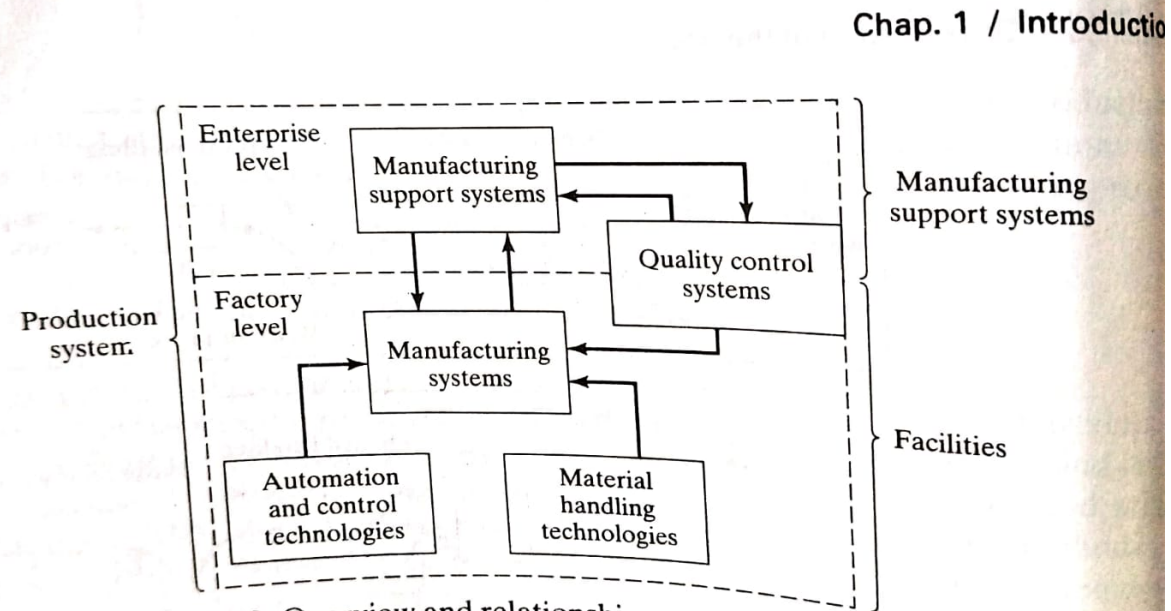


Figure 1.8 Model of manufacturing showing factory operations and the information-processing activities for manufacturing support.

# Overview and relation



**Figure 1.10** Overview and relationships among the five parts of the book.

# Automation principles and strategies

- 1) USA Principle
  - a) Understand the existing process
  - b) Simplify the process
  - c) Automate the process

# Ten strategies for Automation and Production Systems

- 1) Specialization of operations
- 2) Combined operations
- 3) Simultaneous operations
- 4) Integration of operations
- 5) Increased flexibility
- 6) Improved material handling and storage
- 7) On- line inspection
- 8) Process control and optimization
- 9) Plant operations control
- 10) Computer-integrated manufacturing (CIM)

# Manufacturing Operations

It involves four activities:

## 1) Processing and assembly operations

- a) Solidification Process
- b) Particulate processing
- c) Deformation processes
- d) Material removal processes
- e) Surface processing operations
- f) Property enhancing operations
- g) Assembly Operations

# Contd.

- 2) Material Handling and storage
- 3) Inspection and testing
- 4) Coordination and control