Introduction to the Production System

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The Production System

- **Definition:**
  - The set of resources and procedures involved in converting raw material into products and delivering them to customers

- Production and delivery of products are central to the firm
  - Functions have value only if they enhance the ability to do this profitably

Value-Added-Process

The difference between the cost of inputs and the value or price of outputs.

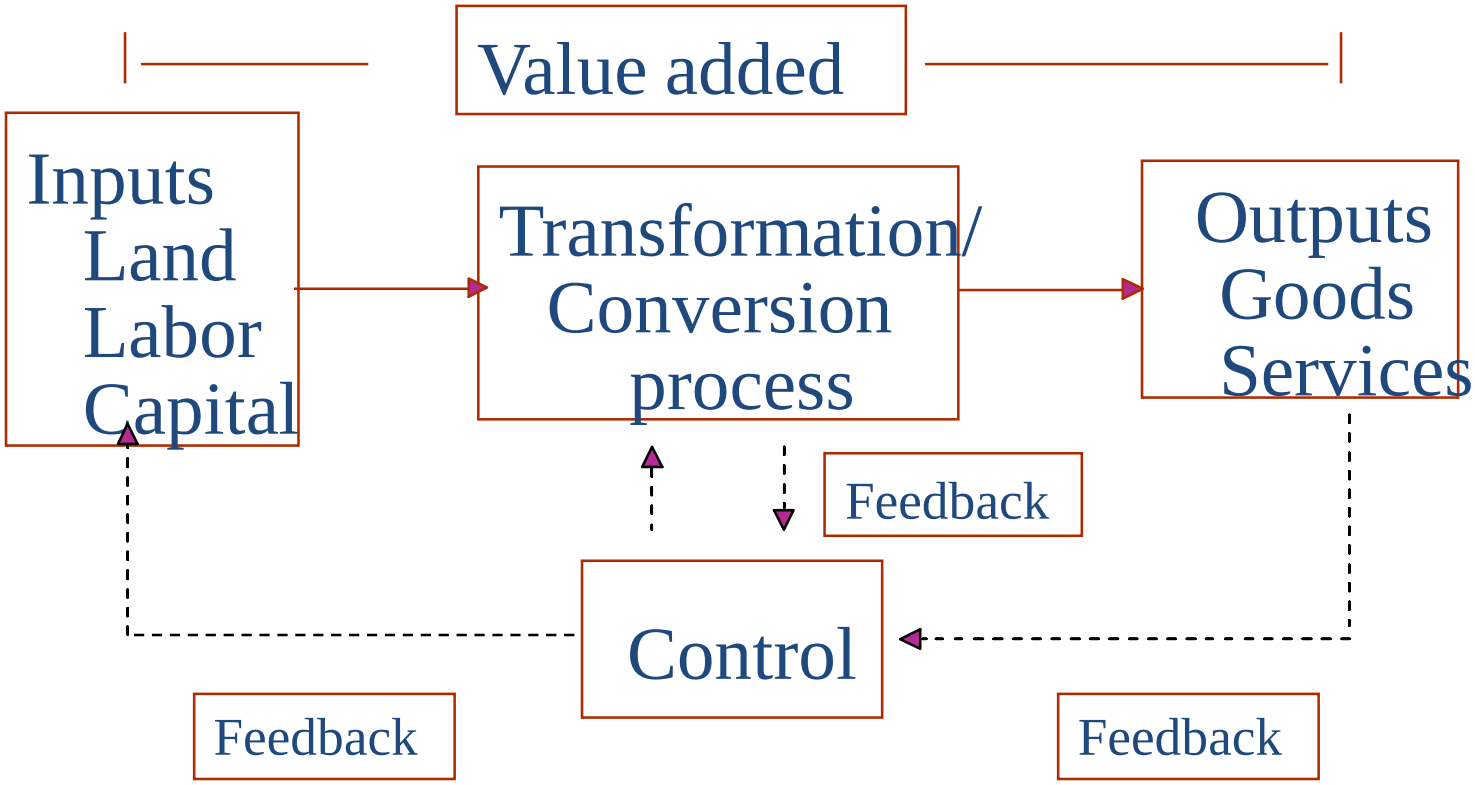
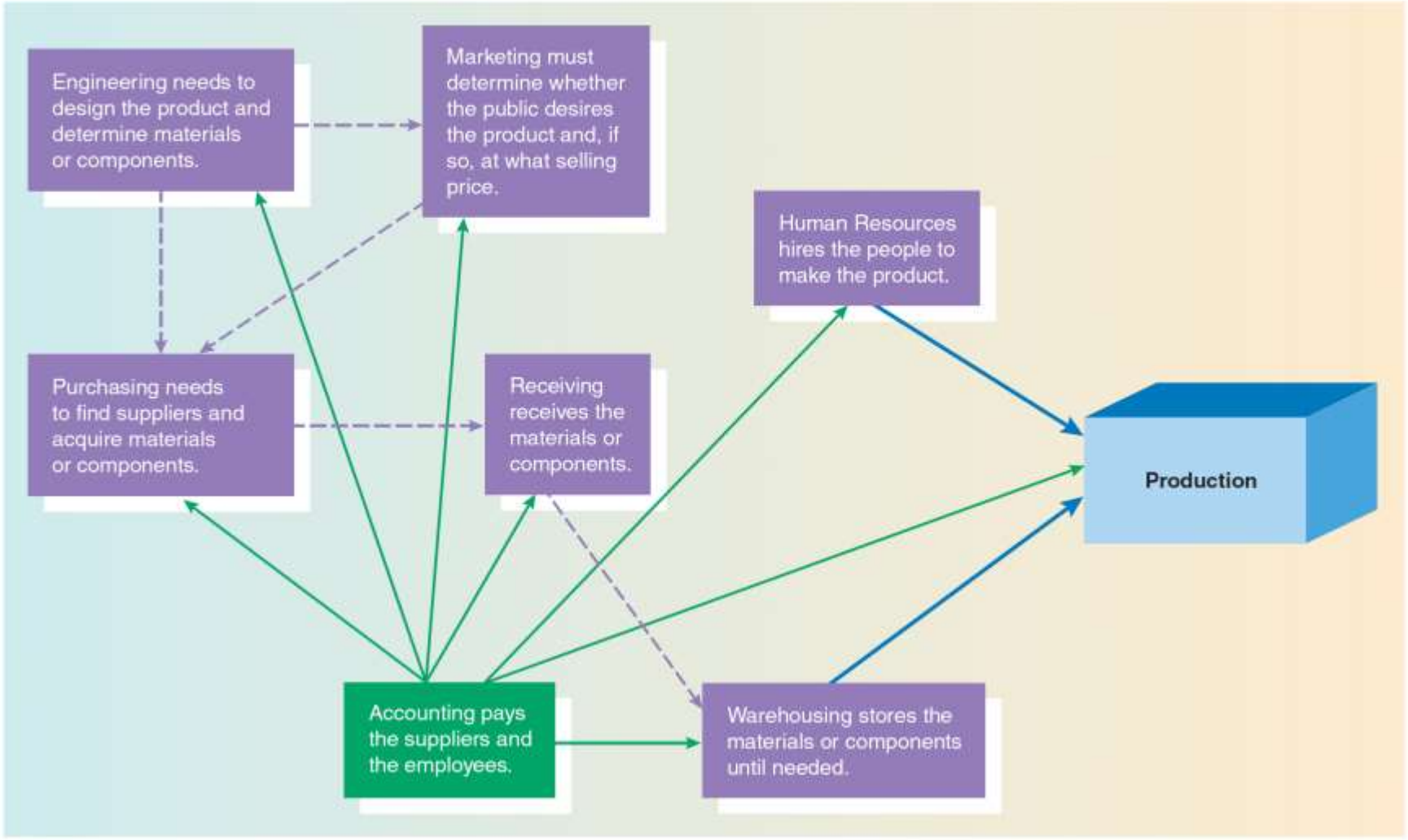


EXHIBIT 5–3

PROCESS FLOW IN AN ORGANIZATION



Cycle Time

Cycle Time	=	Value-Added Activities	+	Non-Value-Added Activities

Eliminate or minimize activities that add the most time and cost and the least value

Production Planning and Control

Purpose

Minimize non-value added activities and ***effectively*** utilize limited resources in the production of goods so as to satisfy customer demands and create a profit for investors.

Resources include the production facilities, labor and materials.

Constraints include the availability of resources, delivery times for the products, and management policies.

Efficiency Versus Effectiveness

- The difference between efficient and effective is that efficiency refers to how well you do something, whereas effectiveness refers to how useful it is.
- For example, if a company is not doing well and they decide to train their workforce on a new technology. The training goes really well - they train all their employees in avery short time and tests show they have absorbed the training well. But overall productivity doesn't improve. In this case the company's strategy was efficient but not effective.
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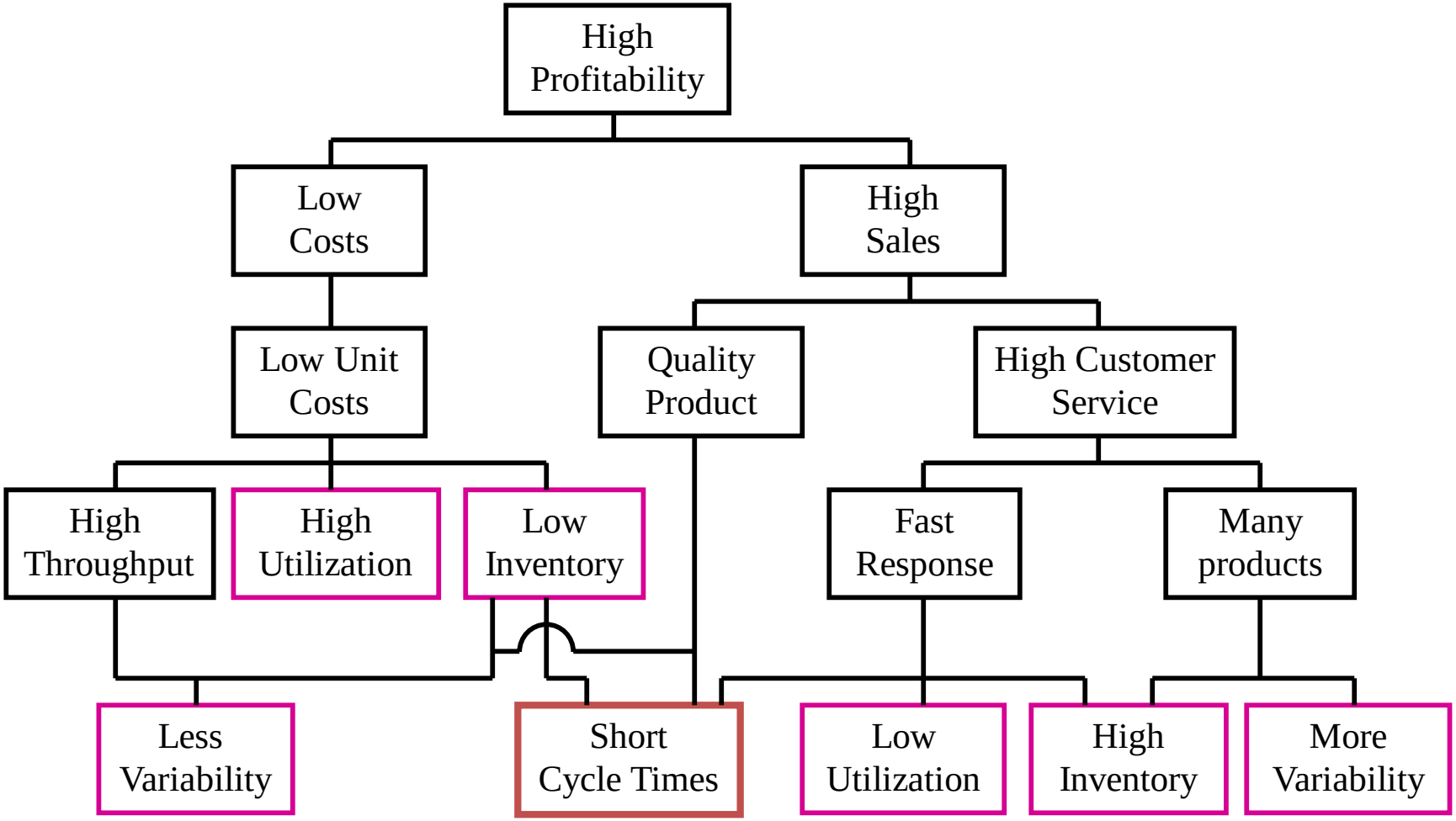
Operation of Production Systems and Production Planning Involve

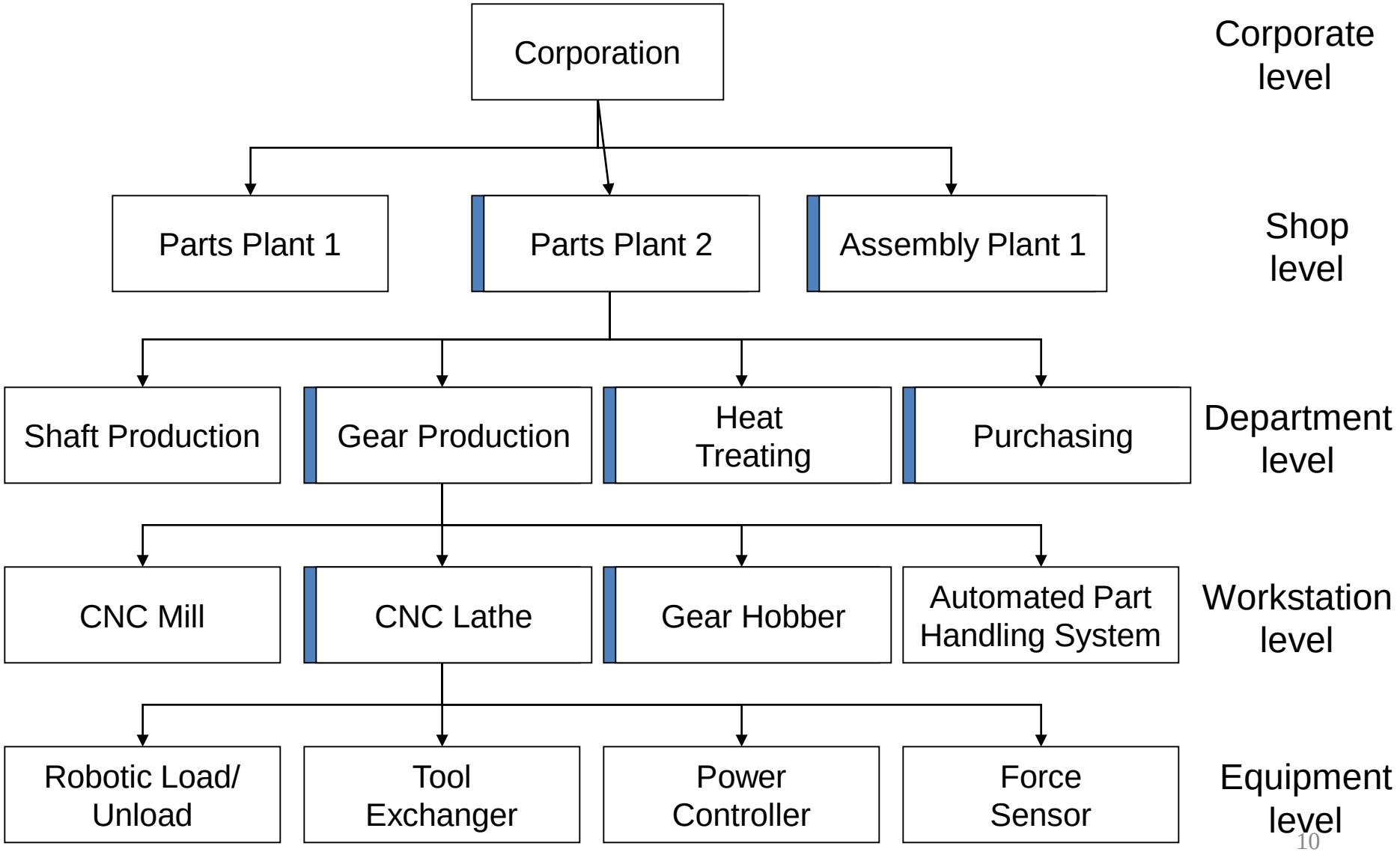
- Planning and execution of the activities that use workers, energy, information, and equipment to convert raw materials into finished products

- Delivering products with the desired functions, aesthetics, and quality to the customers at right time and with minimum cost

Production Objectives



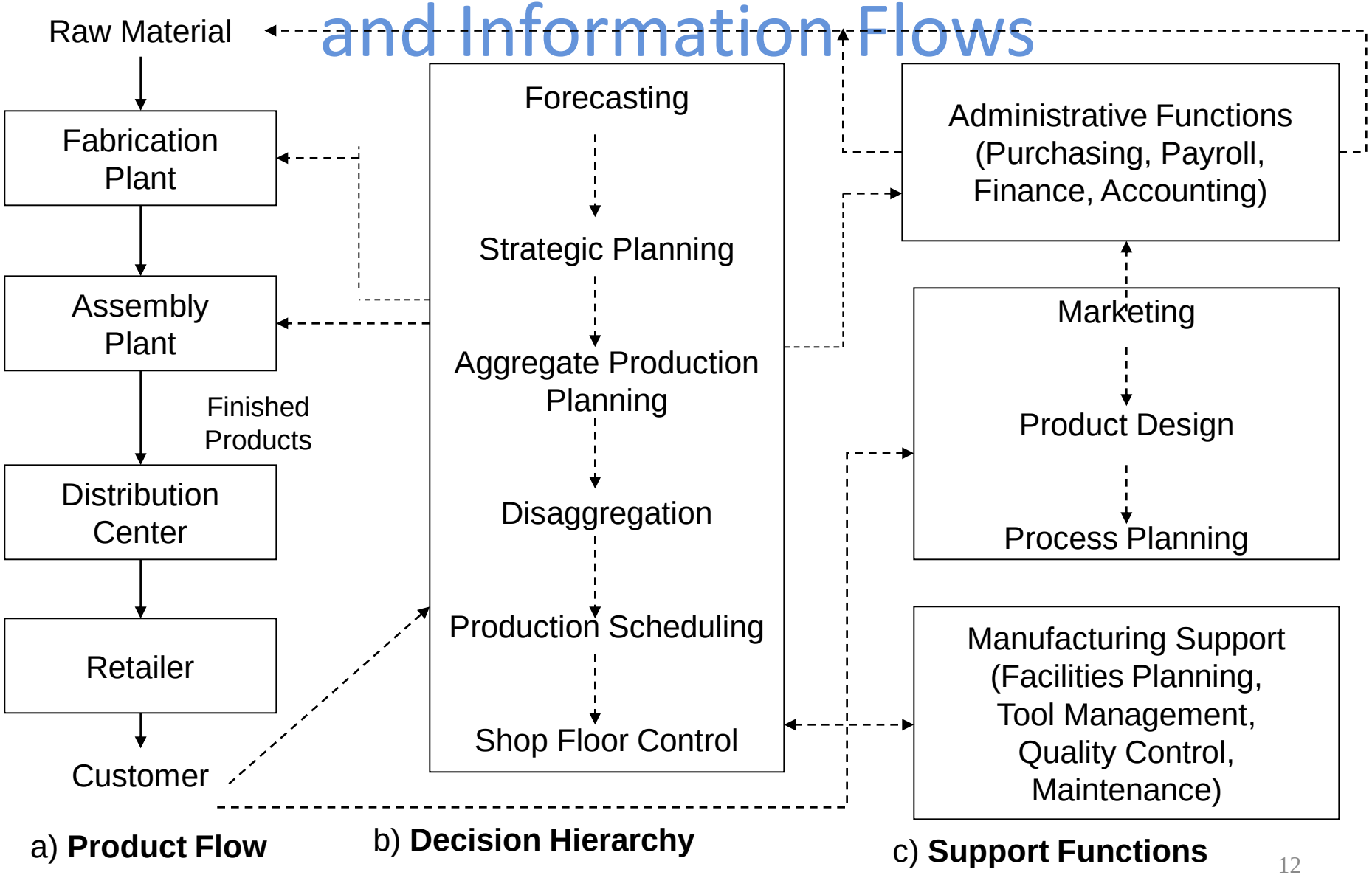
System Components and Hierarchy



Production Activity and Information Flow

- Production-planning decisions typically made in a hierarchical manner:
  1. Physical material flow from raw material through delivered product
  2. Support functions and design activities preceding production
  3. Operational decisions for production planning, scheduling, and control

Production Activity and Information Flows



Aggregate Production Planning

- A typical aggregated plan states the level of major product families to be produced monthly over the next year
  - Workforce levels,
  - overtime levels,
  - inventory levels

Types of Production Systems

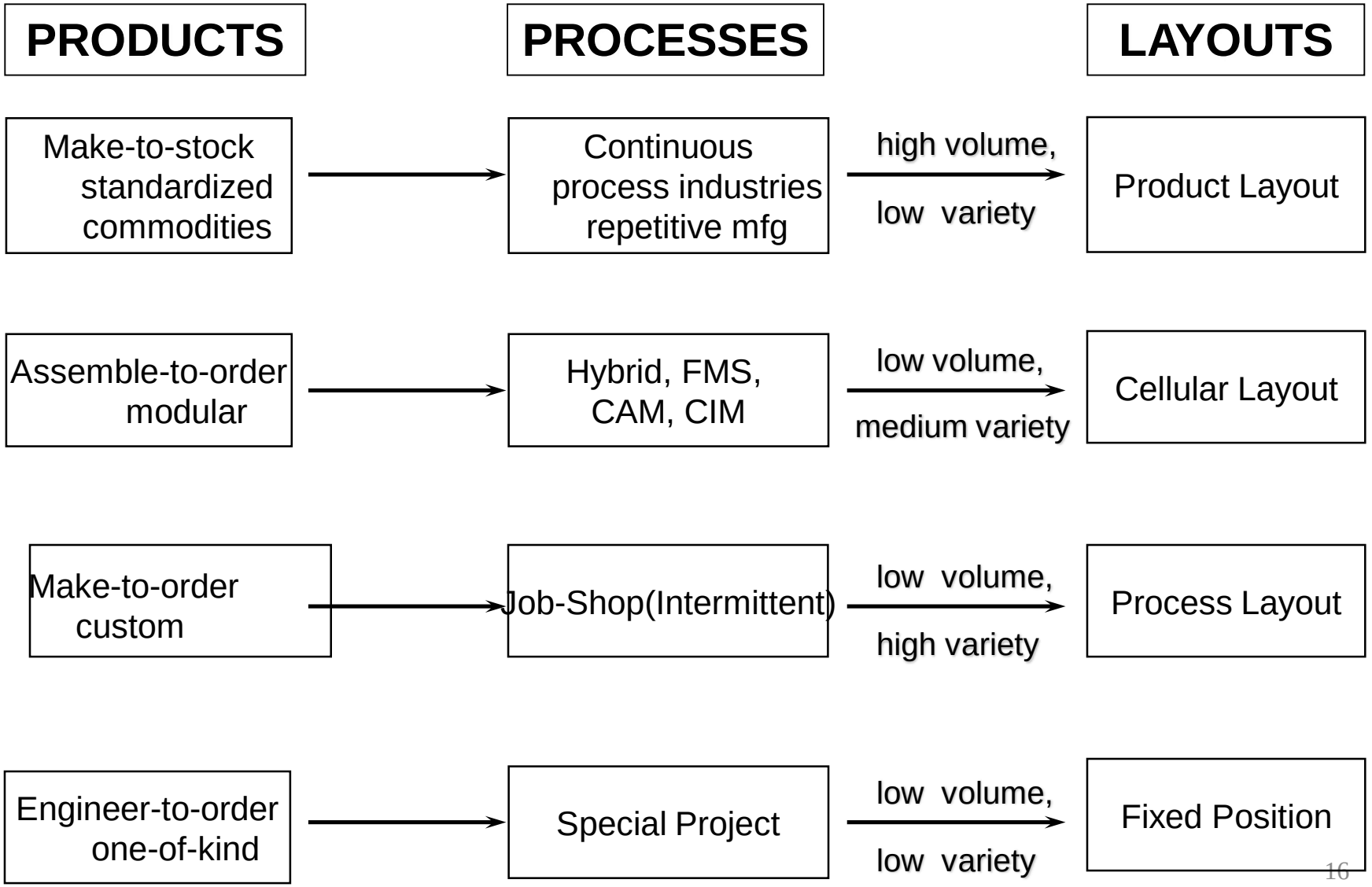
- There are four basic types of production systems:

1. Process
2. Product
3. Cellular
4. Fixed positions

Layout Goals

- Use space efficiently
- Efficient personnel movement
- Maximum equipment utilization
- Convenient / safe work environment
- Simplify repair / maintenance
- Smooth flow of work

Products, Processes, and Layouts



Fixed Position Layout

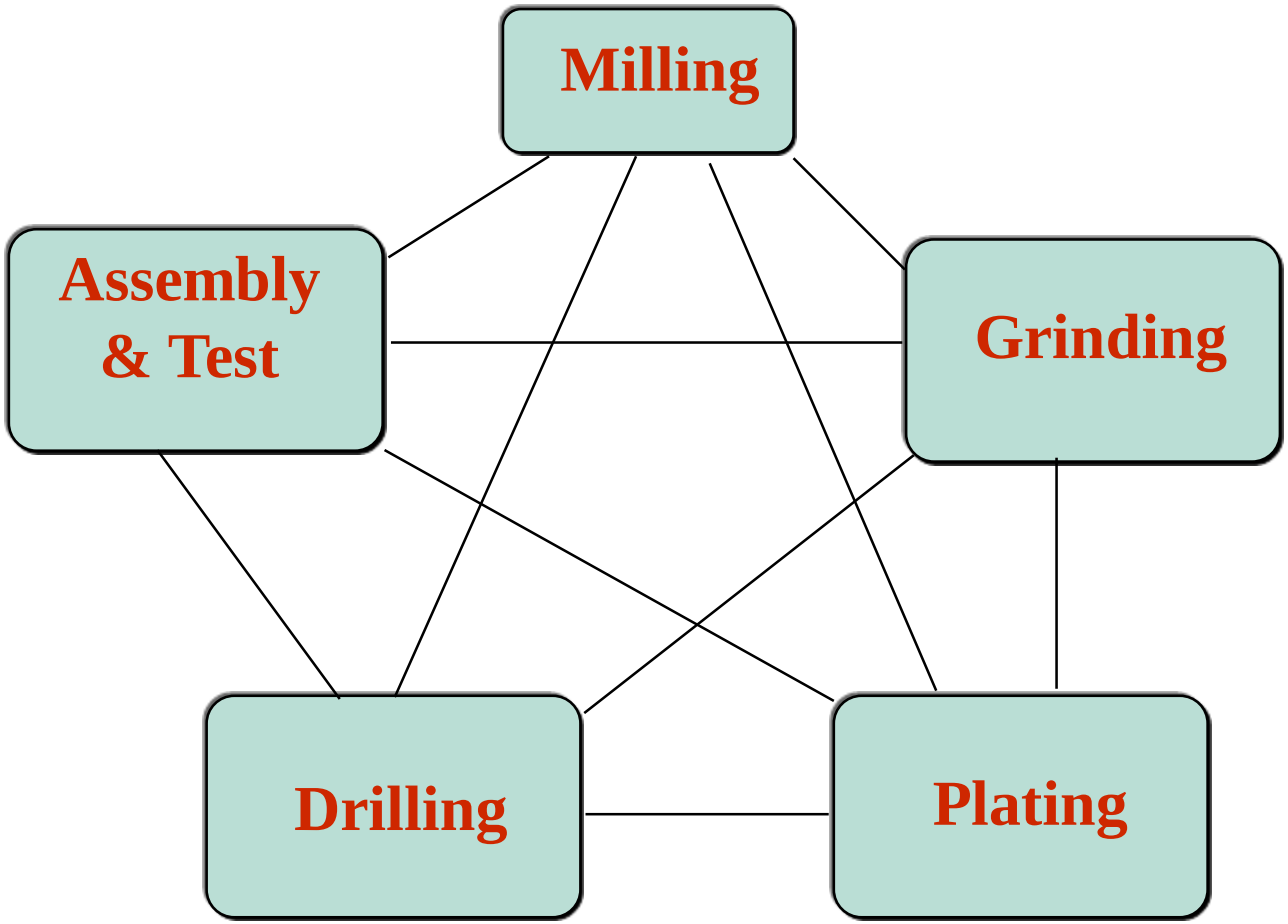
- The product or project remains stationary, and workers, materials, and equipment are moved as needed.

Examples: Home building, ship and aircraft buiding, drilling for oil

Process Layout

- Similar processes (or processes with similar needs) are located together
- By grouping similar processes utilization of resources is improved
- Customers, products, patients move through the processes according to their needs
- Different products = different needs = different routes
- Complex flow pattern in the operation
- **Examples:**
  - Supermarkets, job-shops, hospitals

Process Layouts

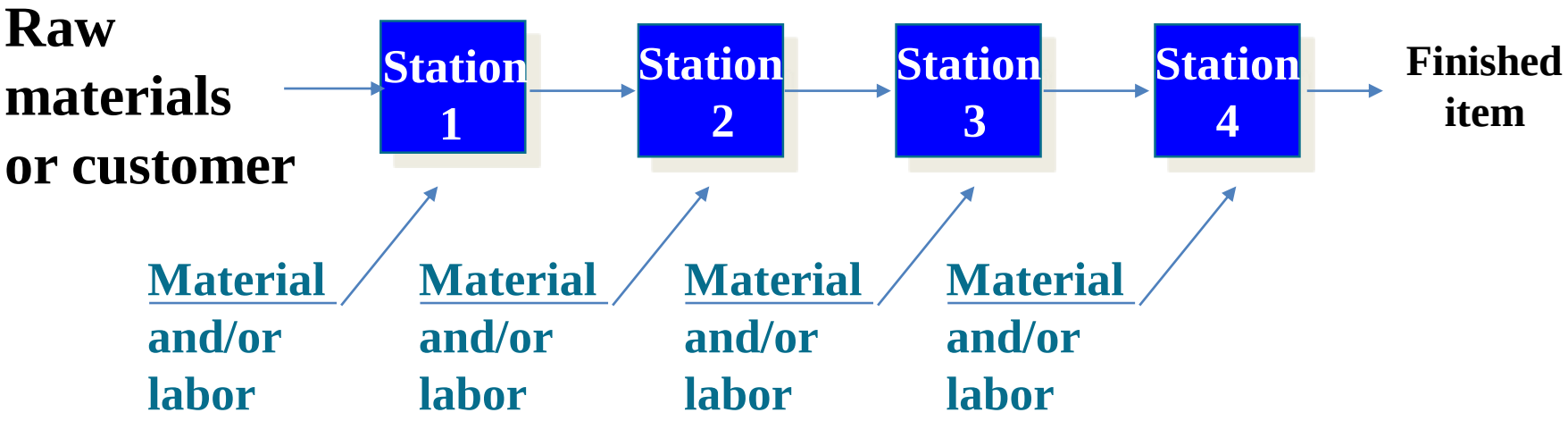


Process Layout –products travel to dedicated process centers

Product Layout

- Sometimes called line layout, flow line or assembly line
- Parts follow a specified route – the sequence of workstations matches with the sequence of required operations
- Work Flow is clear, predictable, easy to control
- **Examples:**
  - Car assembly, paper manufacture, self-service canteen

Product Layout

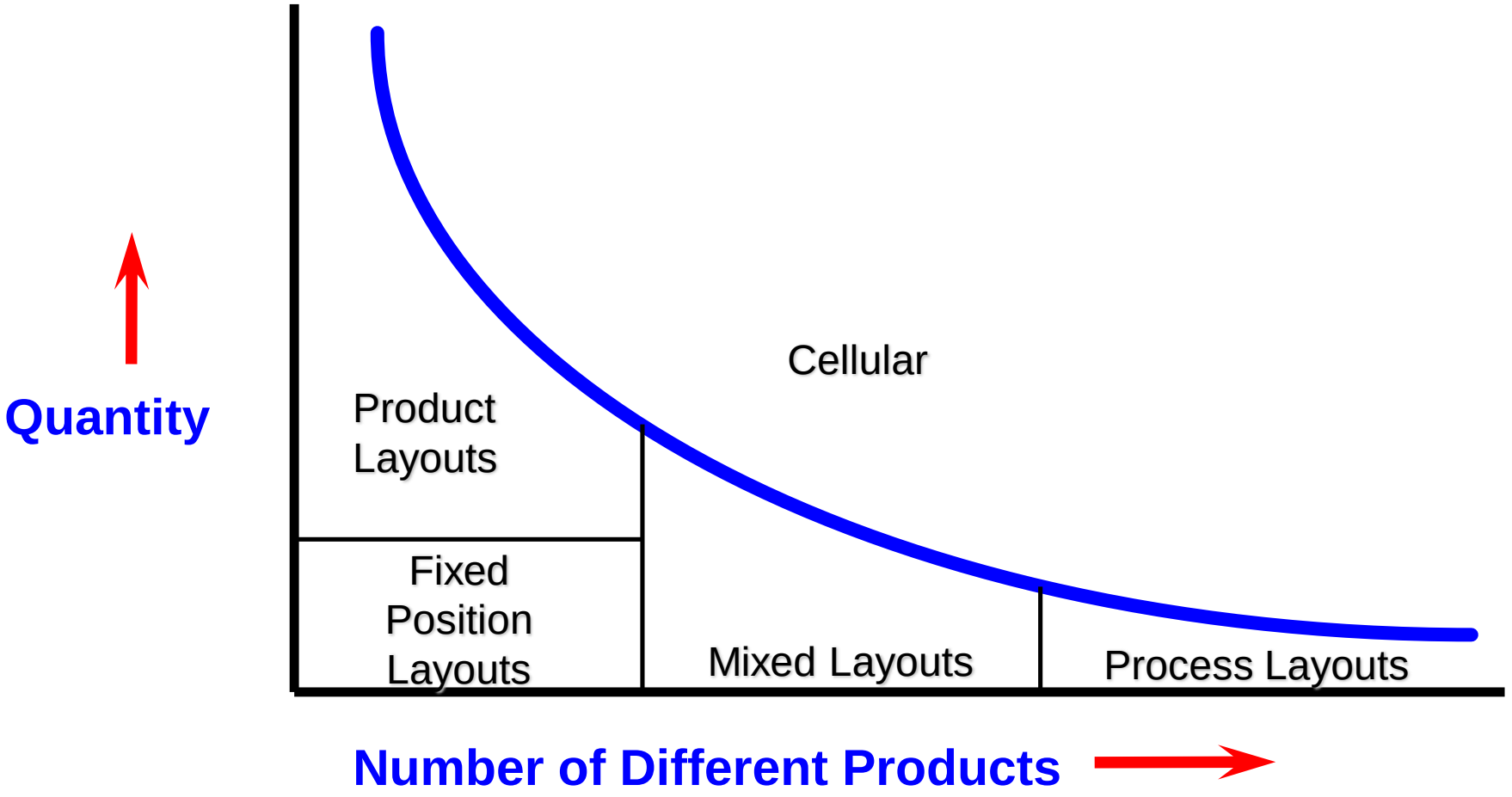


Used for Repetitive or Continuous Processing

Comparison of Product and Process Layouts

	Product	Process
Workers	Limited skills	High skills
Inventory	Low in-process, high finished goods	High in-process, low finished goods
Storage space	Small	Large
Material handling	Fixed path (conveyor)	Variable path (forklift)
Aisles	Narrow	Wide
Scheduling	Line balancing (Easier)	Dynamic (More difficult)
Layout decision	In-line, U-type	Functional
Goal	Equalize work at each station	Minimize material handling cost
Advantage	Efficiency	Flexibility

Product Volume and Variety



Product Flow Control

- **Batch Processing (Process Layout)**
  - From a couple to several thousands identical parts
  - A batch for each different part type
  - Move together through the production system
  - May split for material handling or to reduce processing time

  Examples are clothing, furniture production
- **Repetitive or Flow processing (Product Layout)**
  - **Continuous**– chemicals, foods, pharmaceuticals
  - **Discrete** – car, refrigerator production