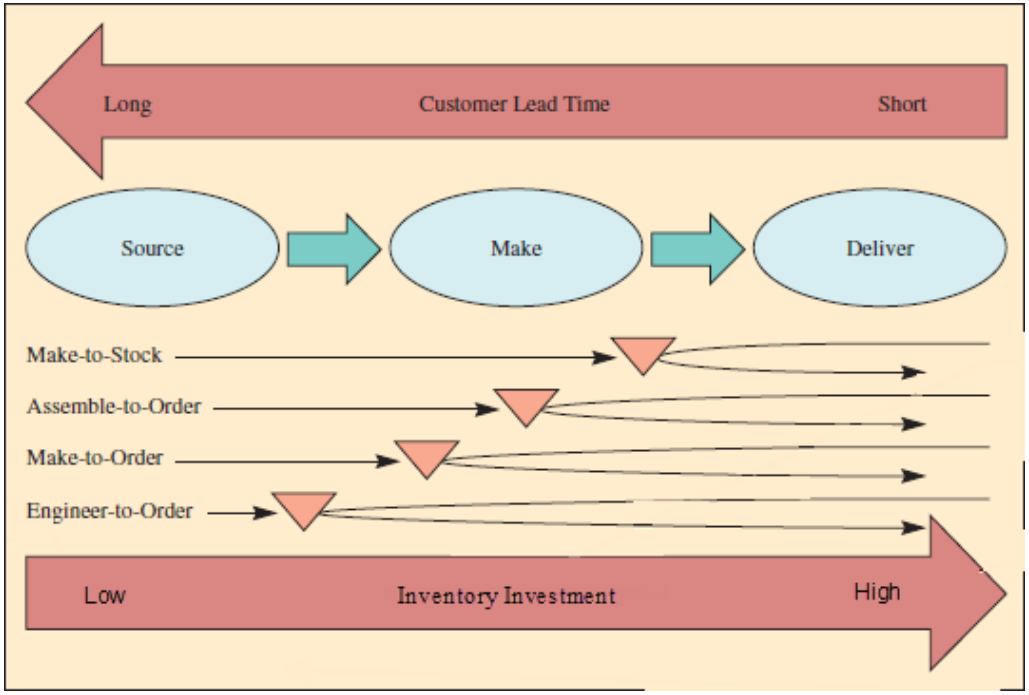
MANUFACTURING PROCESSES

Chapter Seven

McGraw-Hill/Irwin

Production Processes

- Production processes are used to make any manufactured item.
  - Step 1 – Source the parts needed
  - Step 2 – Make the product
  - Step 3 – Deliver the product



Production Process Terms

- **Lead time** – the time needed to respond to a customer order
- **Customer order decoupling point** – where inventory is positioned to allow entities in the supply chain to operate independently
- **Lean manufacturing** – a means of achieving high levels of customer service with minimal inventory investment

Types of Firms

Make-to-Stock

- Serve customers from finished goods inventory

Assemble-to-Order

- Combine a number of preassembled modules to meet a customer's specifications

Make-to-Order

- Make the customer's product from raw materials, parts, and components

Engineer-to-Order

- Work with the customer to design and then make the product

Make-to-Stock

- Examples of products include the following:
  - Televisions
  - Clothing
  - Packaged food products
- Essential issue in satisfying customers is to balance the level of inventory against the level of customer service.
  - Easy with unlimited inventory, but inventory costs money
  - Trade-off between the costs of inventory and level of customer service must be made.
- Use lean manufacturing to achieve higher service levels for a given inventory investment.

Assemble-to-Order

- A primary task is to define a customer's order in terms of alternative components because these are carried in inventory.
  - An example is the way Dell Computer makes their desktop computers.
- One capability required is a design that enables as much flexibility as possible in combining components.
- There are significant advantages from moving the customer order decoupling point from finished goods to components.

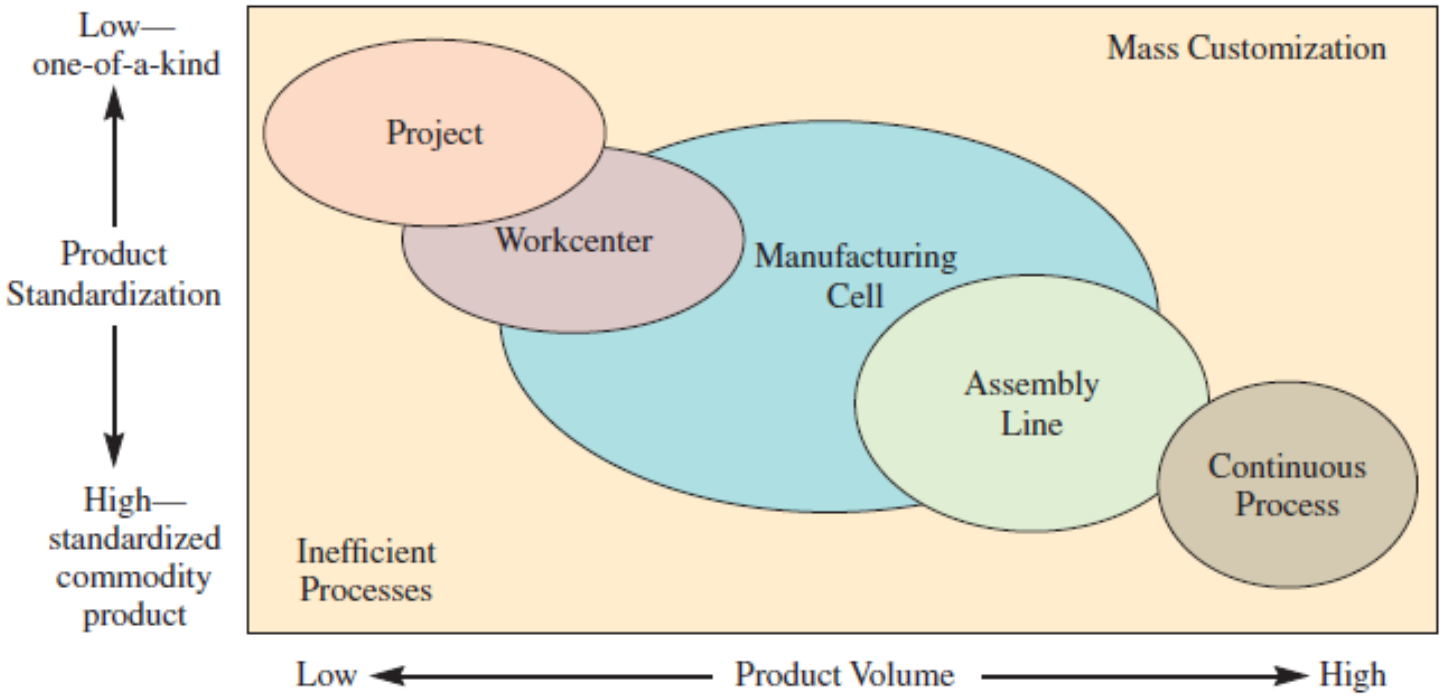
Make-to-Order/Engineer-to-Order

- Boeing's process for making commercial aircraft is an example.
- Customer order decoupling point could be in either raw materials at the manufacturing site or the supplier inventory.
- Depending on how similar the products are, it might not even be possible to preorder parts.

How Production Processes Are Organized

- **Project:** the product remains in a fixed location
  - Manufacturing equipment is moved to the product.
- **Workcenter (job shop):** similar equipment or functions are grouped together
- **Manufacturing cell:** a dedicated area where products that are similar in processing requirements are produced
- **Assembly line:** work processes are arranged according to the progressive steps by which the product is made
- **Continuous process:** assembly line only the flow is continuous such as with liquids

Product–Process Matrix: Framework Describing Layout Strategies



Production System Design

Project Layout

- The product remains in a fixed location.
- A high degree of task ordering is common.
- A project layout may be developed by arranging materials according to their assembly priority.

Workcenter

- Most common approach to developing this type of layout is to arrange workcenters in a way that optimizes the movement of material.
- Optimal placement often means placing workcenters with large interdepartmental traffic adjacent to each other.
- Sometimes is referred to as a department and is focused on a particular type of operation.

Production System Design

Manufacturing Cell

- Formed by allocating dissimilar machines to cells that are designed to work on similar products (shape, processing, etc.)

Assembly Line and Continuous Layout

- Designed for the special purpose of building a product by going through a series of progressive steps

Break-Even Analysis

- Defined as standard approach to choosing among alternative processes or equipment.
- Model seeks to determine the point in units produced where a company will start making profit on the process.
- Model seeks to determine the point in units produced where total revenue and total cost are equal.

$$\text{Breakeven Demand} = \frac{\text{Purchase cost of processor equipment}}{\text{Price per unit - Cost per unit}}$$

or

$$= \frac{\text{Total fixed costs of processor equipment}}{\text{Unit price to customer - Variable cost per unit}}$$

Manufacturing Process Flow Design

- **Manufacturing process flow design** – a method to evaluate the specific processes that material follow as they move through the plant
- Focus should be on the identification of activities that can be minimized or eliminated
  - Movement and storage
  - The fewer the moves, delays, and storage, the better the flow

The Charts

- **Assembly drawing:** an exploded view of the product showing its component parts
- **Assembly chart:** defines how parts go together, their order of assembly, and overall flow pattern
- **Operation and route sheet:** specifies operations and process routing
- **Process flowchart:** denotes what happens to the product as it progresses through the production facility

Sample Assembly Drawing