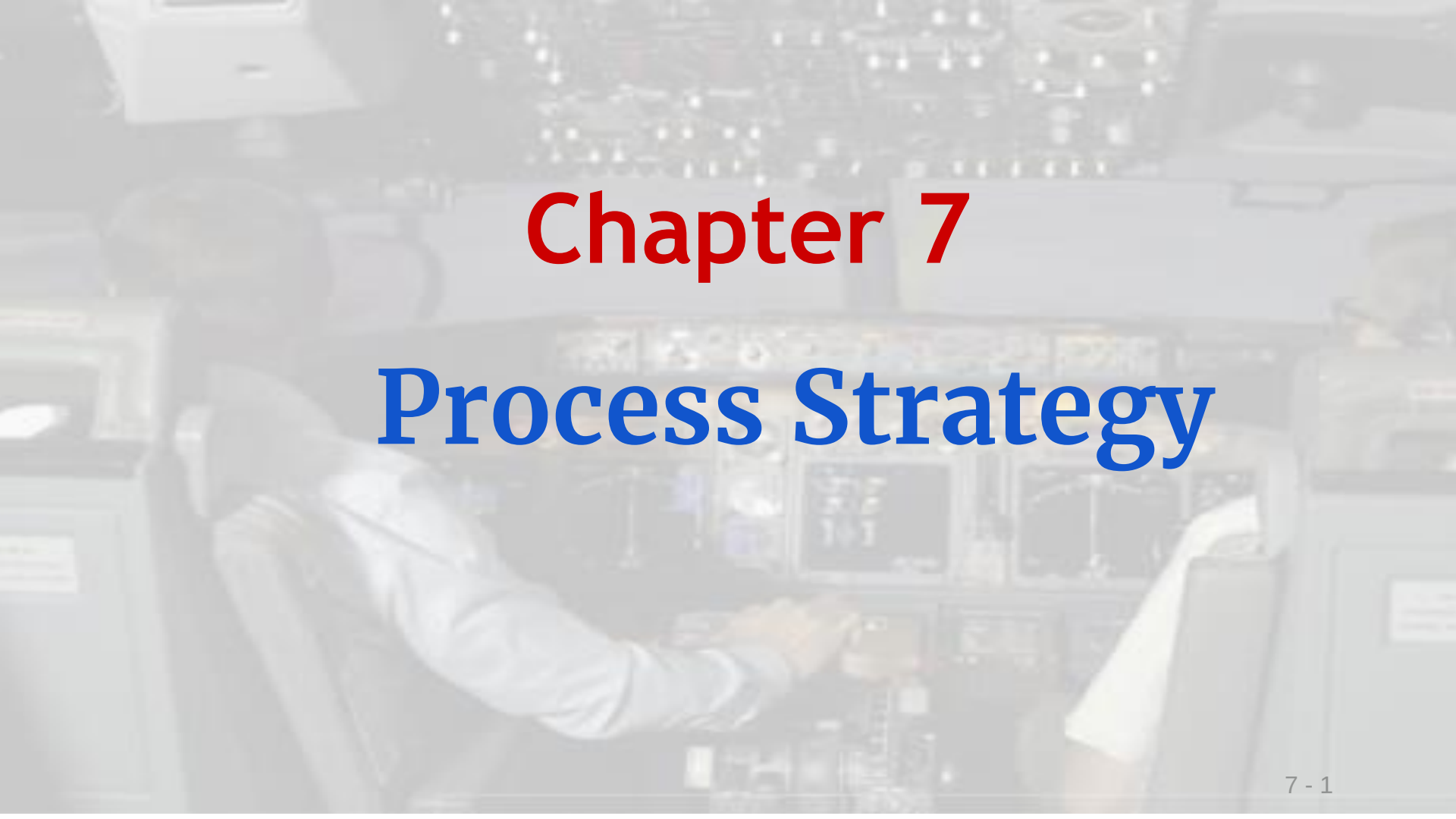


Chapter 7

Process Strategy

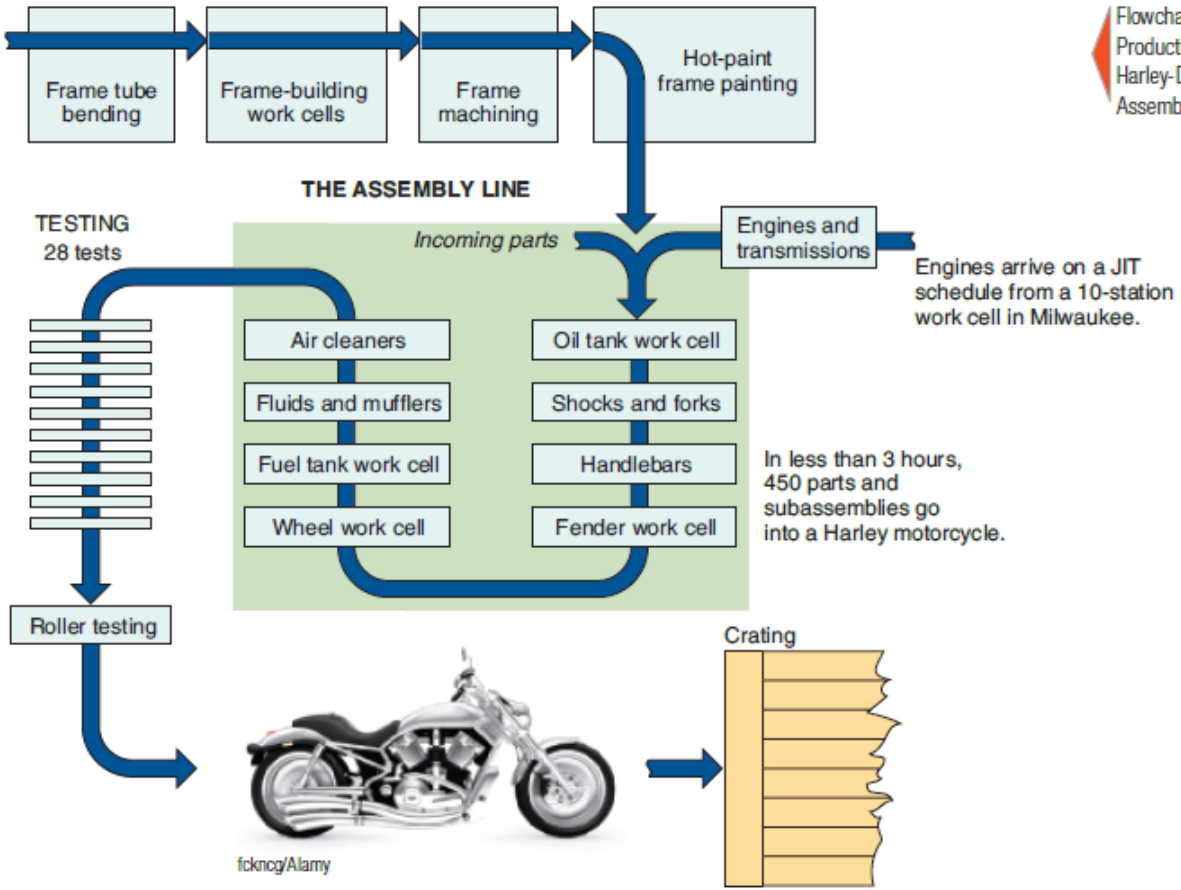
Chapter Outline

- **Global Company Profile:** Harley-Davidson

1. Four Process Strategies
2. Selection of Equipment
3. Process Analysis and Design
4. Service Process Design
5. Production Technology
6. Technology in Services

Harley-Davidson

- The only major U.S. motorcycle company
- Emphasizes quality and lean manufacturing
- Materials as Needed (MAN) system
- Many variations possible
- Tightly scheduled repetitive production



Flowchart Showing the Production Process at Harley-Davidson's York Assembly Plant

Process Flow Diagram

Learning Objectives

When you complete this chapter you should be able to:

7.1	***Describe*** four types of process strategies
7.2	***Determine*** crossover (break even) points for process strategy selection
7.3	***Use*** the tools of process analysis
7.4	***Describe*** customer interaction in service processes
7.5	***Identify*** recent advances in production technology

Process Strategy

The objective is to ***create a process to produce offerings*** *that meet* ***customer requirements within cost*** *and* ***other managerial constraints***

Process Strategies

- How to produce a product or provide a service that
  - Meets or exceeds customer requirements
  - Meets cost and managerial goals
- Has long term effects on
  - Efficiency and production flexibility
  - Costs and quality

Process Strategies

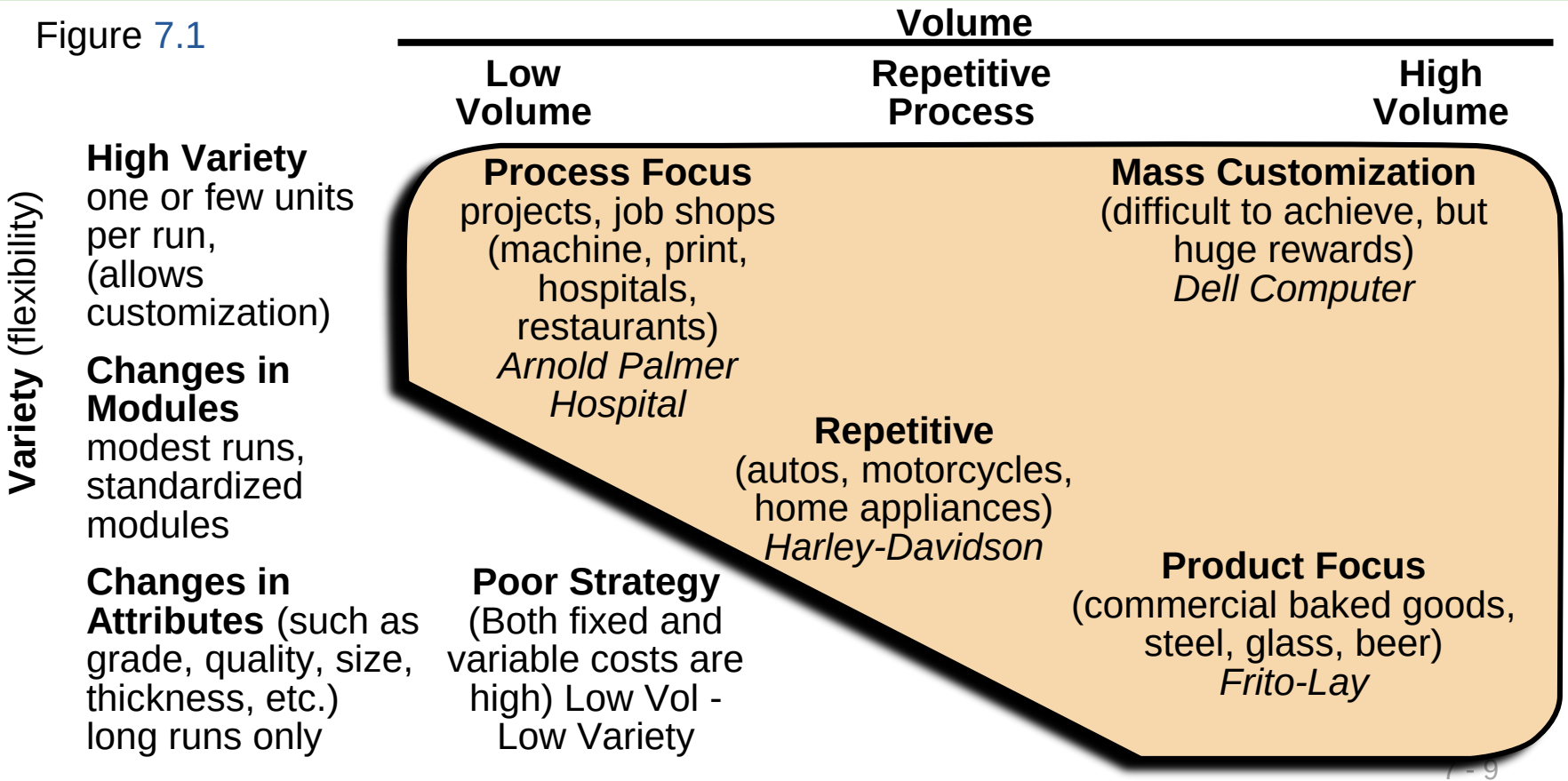
Four basic strategies

1. Process focus
2. Repetitive focus
3. Product focus
4. Mass customization

Within these basic strategies there are many ways they may be implemented

Process, Volume, and Variety

Figure 7.1



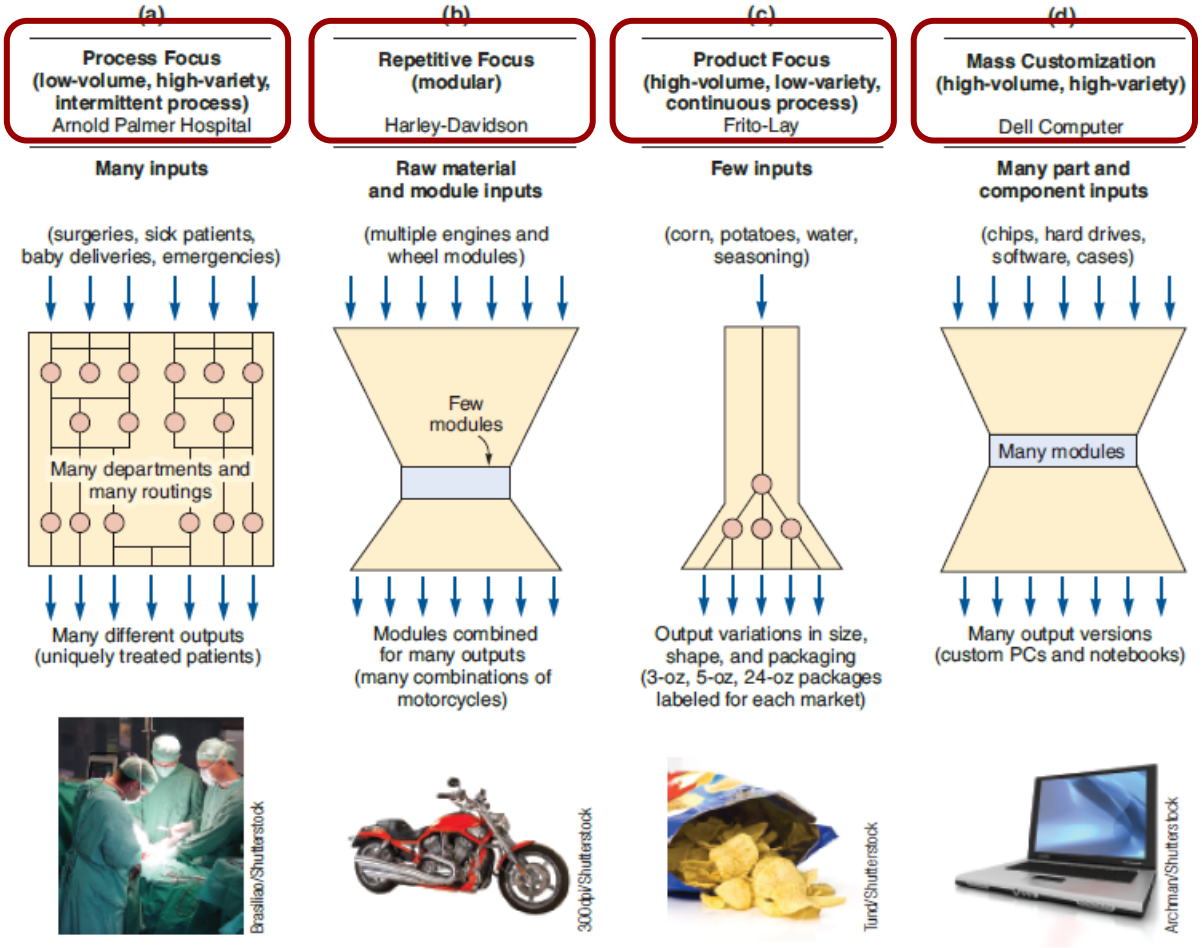


Figure 7.2

Four Process Options with an Example of Each

Process Strategies

Process Focus

- Facilities are organized around **specific activities or processes**
- General purpose equipment and skilled personnel
- High degree of product flexibility
- Typically high costs and low equipment utilization
- Product flows may vary considerably making planning and scheduling a challenge

Repetitive Focus

- Facilities often organized as assembly lines
- Characterized by modules with parts and assemblies made previously
- Modules may be combined for many output options
- Less flexibility than process-focused facilities but more efficient

Product Focus

- Facilities are organized around products
- High volume but low variety of products
- Long, continuous production runs enable efficient processes
- Typically high fixed cost but low variable cost
- Generally less skilled labor

Mass Customization

- The rapid, low-cost production of goods and service to satisfy increasingly unique customer desires
- Combines the flexibility of a process focus with the efficiency of a product focus

Making Mass Customization Works

High volume system, build to-order >>>>> customer orders, not forecast

Major challenges :

- ***Product design*** must be imaginative - variations needed
- Flexible ***process design*** - accommodate changes in design and technology
- ***Inventory management*** need to be tightly controlled
- *Tight schedules - goog planning and scheduling to track orders*
- ***Responsive partners*** in the supply-chain

TABLE 7.2 Comparison of the Characteristics of Four Types of Processes

PROCESS FOCUS (LOW VOLUME, HIGH VARIETY; e.g., ARNOLD PALMER HOSPITAL)	REPETITIVE FOCUS (MODULAR; e.g., HARLEY-DAVIDSON)	PRODUCT FOCUS (HIGH VOLUME, LOW VARIETY; e.g., FRITO-LAY)	MASS CUSTOMIZATION (HIGH VOLUME, HIGH VARIETY; e.g., DELL COMPUTER)
1. Small quantity and large variety of products	1. Long runs, a standardized product from modules	1. Large quantity and small variety of products	1. Large quantity and large variety of products
2. Broadly skilled operators	2. Moderately trained employees	2. Less broadly skilled operators	2. Flexible operators
3. Instructions for each job	3. Few changes in job instructions	3. Standardized job instructions	3. Custom orders requiring many job instructions
4. High inventory	4. Low inventory	4. Low inventory	4. Low inventory relative to the value of the product
5. Finished goods are made to order and not stored	5. Finished goods are made to frequent forecasts	5. Finished goods are made to a forecast and stored	5. Finished goods are build-to-order (BTO)
6. Scheduling is complex	6. Scheduling is routine	6. Scheduling is routine	6. Sophisticated scheduling accommodates custom orders
7. Fixed costs are low and variable costs high	7. Fixed costs are dependent on flexibility of the facility	7. Fixed costs are high, and variable costs low	7. Fixed costs tend to be high and variable costs low

Crossover Chart Example

- Evaluate three different accounting software products
- Calculate crossover points between software A and B and between software B and C

	TOTAL FIXED COST	DOLLARS REQUIRED PER ACCOUNTING REPORT
Software A	$200,000	$60
Software B	$300,000	$25
Software C	$400,000	$10

Crossover Chart Example

$$200{,}000 + (60)V_1 = 300{,}000 + (25)V_1$$

$$35V_1 = 100{,}000$$

$$V_1 = 2{,}857$$

- Software A is most economical from 0 to 2,857 reports

$$300{,}000 + (25)V_2 = 400{,}000 + (10)V_2$$

$$15V_2 = 100{,}000$$

$$V_2 = 6{,}666$$

- Software B is most economical from 2,857 to 6,666 reports

Crossover Charts

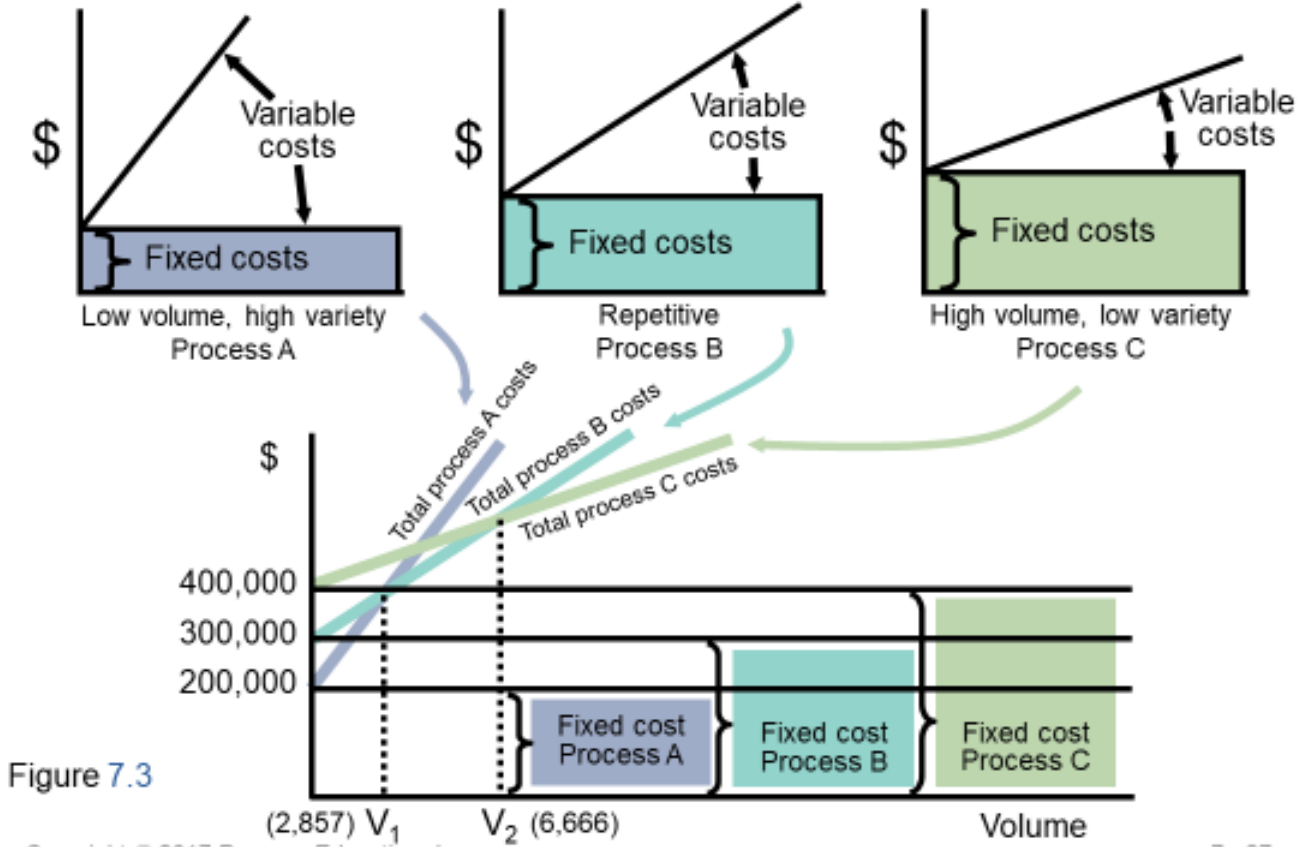


Figure 7.3

Selection of Equipment

- Process Strategies requires decision of equipment and technology
- Decisions can be complex as alternate methods may be available
- Important factors may be-

- Cost
- Cash flow
- Market stability

- Quality
- Capacity
- Flexibility

Flexibility

- **Flexibility** is the ability to respond with little penalty in time, cost, or customer value
- May be a competitive advantage
- May be difficult and expensive
- Without it, change may mean starting over

Process Analysis and Design

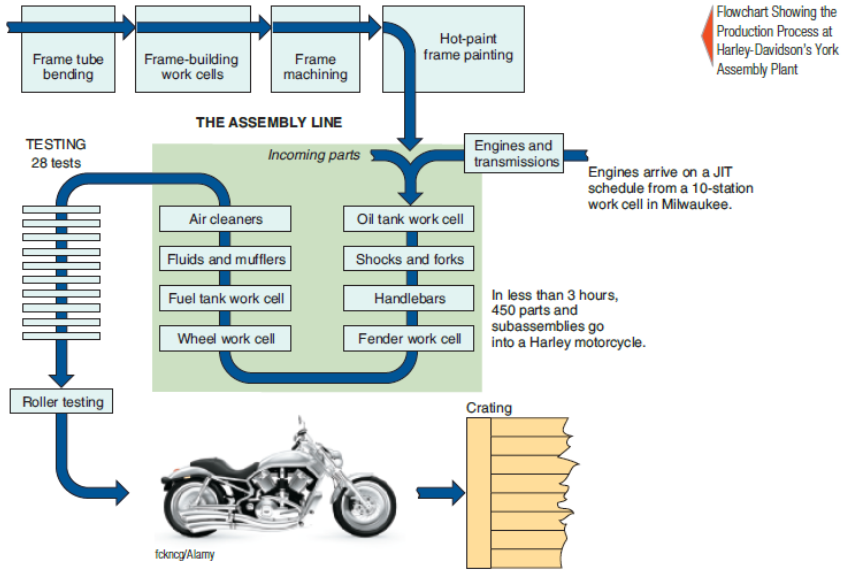
When designing and analyzing process we need to ask these questions.

- Is the process designed to achieve a competitive advantage?
- Does the process eliminate steps that do not add value?
- Does the process maximize customer value?
- Will the process win orders?

- Able to analyze throughput, costs, quality issues. Examine process and continuously improve

Process Analysis and Design

- **Flowchart**
  - Shows the movement of materials
  - Harley-Davidson flowchart



Process Analysis and Design

- **Time-Function Mapping or Process Mapping**
  - Shows **flows** and **time** frame
  - Nodes indicate activities
  - Arrow indicates flow direction
  - Time on horizontal axis
  - Can analyze waste, e.g. extra steps, duplication, delay

"Baseline" Time-Function Map

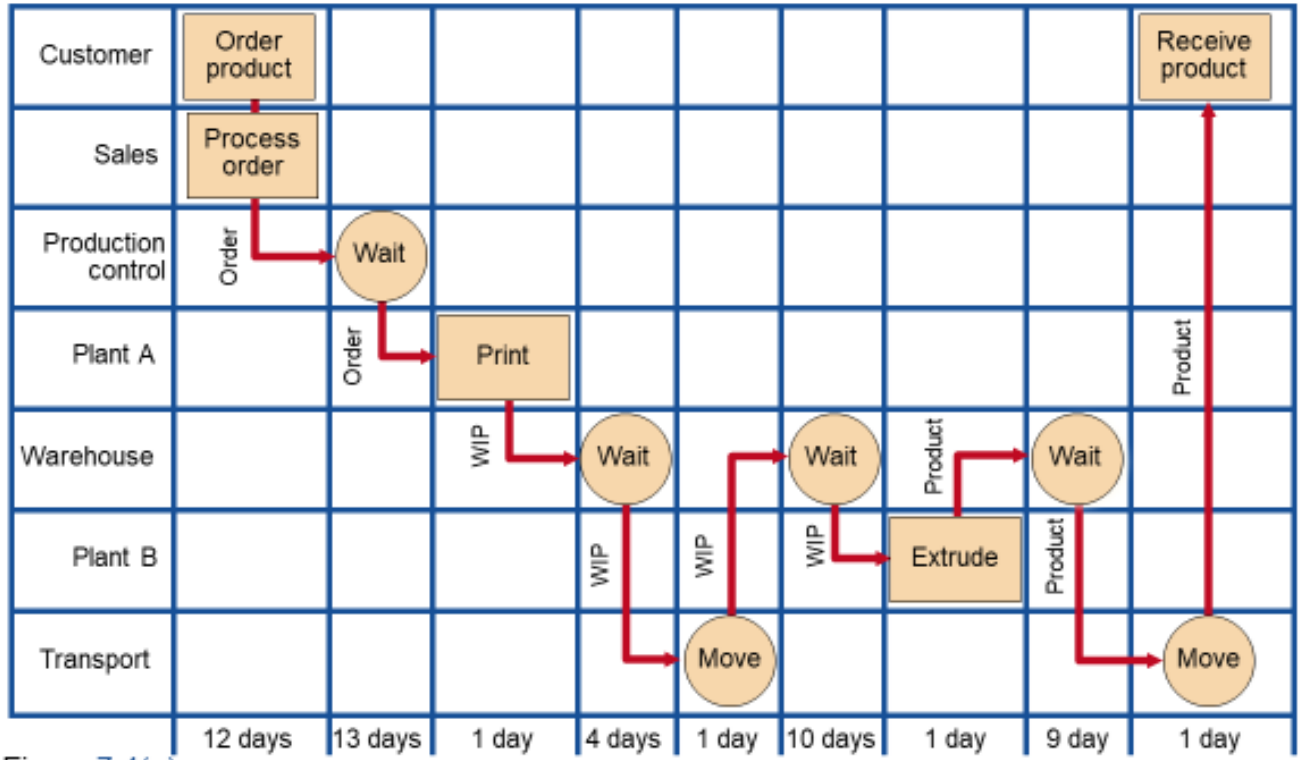


Figure 7.4(a)

How long to complete this order / process?

"Target" Time-Function Map

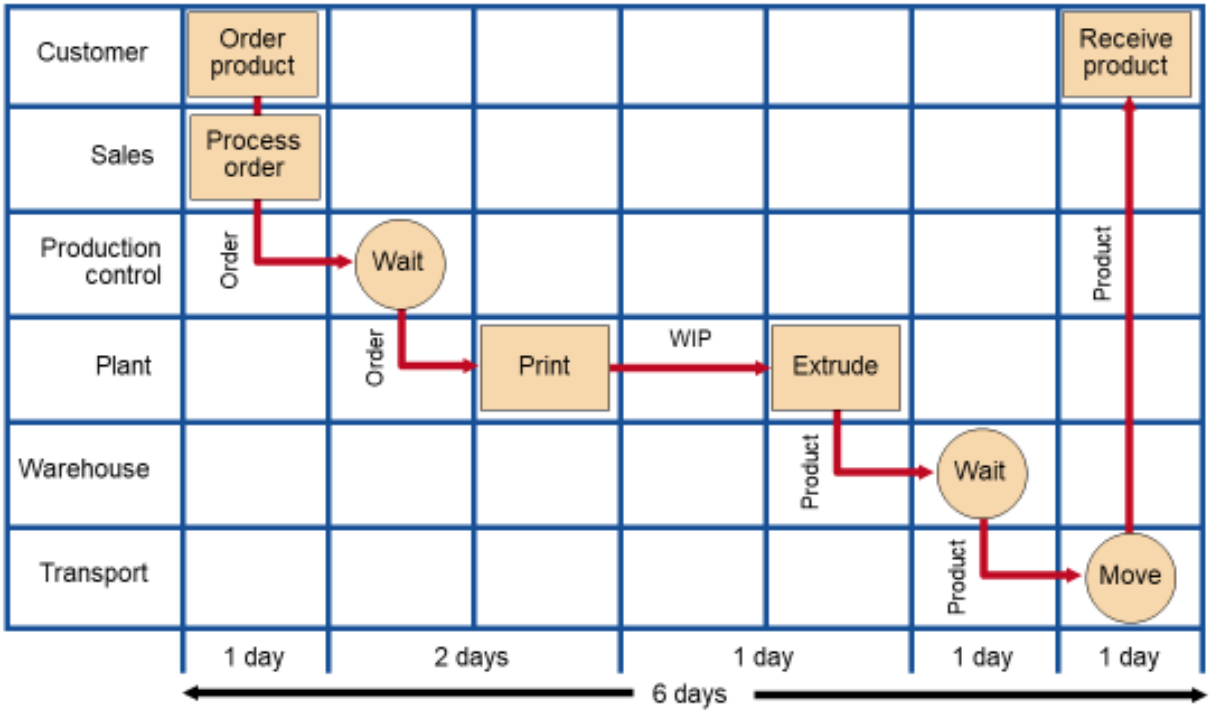


Figure 7.4(b)

How many days to complete the order after analysis?

How many days can be reduced or saved?

Process Chart

Present Method [X] PROCESS CHART Proposed Method [ ]

SUBJECT CHARTED Hamburger Assembly Process DATE 12 / 1 / 15

DEPARTMENT _____ CHART BY KH SHEET NO. 1 OF 1

DIST. IN FEET	TIME IN MINS.	CHART SYMBOLS	PROCESS DESCRIPTION
	—	○ ⇨ □ D ▽	Meat Patty in Storage
1.5	.05	○ ⇨ □ D ▽	Transfer to Broiler
	2.50	○ ⇨ □ D ▽	Broiler
	.05	○ ⇨ □ D ▽	Visual Inspection
1.0	.05	○ ⇨ □ D ▽	Transfer to Rack
	.15	○ ⇨ □ D ▽	Temporary Storage
.5	.10	○ ⇨ □ D ▽	Obtain Buns, Lettuce, etc.
	.20	○ ⇨ □ D ▽	Assemble Order
.5	.05	○ ⇨ □ D ▽	Place in Finish Rack
		○ ⇨ □ D ▽	
3.5	3.15	2 4 1 – 2	TOTALS

Value-added time = Operation time/Total time = (2.50+.20)/3.15 = 85.7%

○ = operation; ⇨ = transport; □ = inspect; D = delay; ▽ = storage.

Figure 7.5

Use symbols, time and distance to analyze and record activities that make up a process

Focus on value-added steps and try to eliminate or change non value -added steps

Process Analysis and Design

- **Value-Stream Mapping (VSM)**
  - Where value is added in the entire production process, including the supply chain
  - Extends from the customer back to the suppliers

Value-Stream Mapping

1. Begin with symbols for customer, supplier, and production to ensure the big picture
2. Enter customer order requirements
3. Calculate the daily production requirements
4. Enter the outbound shipping requirements and delivery frequency
5. Determine inbound shipping method and delivery frequency

Value-Stream Mapping

6. Add the process steps (i.e., machine, assemble) in sequence, left to right
7. Add communication methods, add their frequency, and show the direction with arrows
8. Add inventory quantities (shown with  between every step of the entire flow
9. Determine total working time (value-added time) and delay (non-value-added time)

Value-Stream Mapping

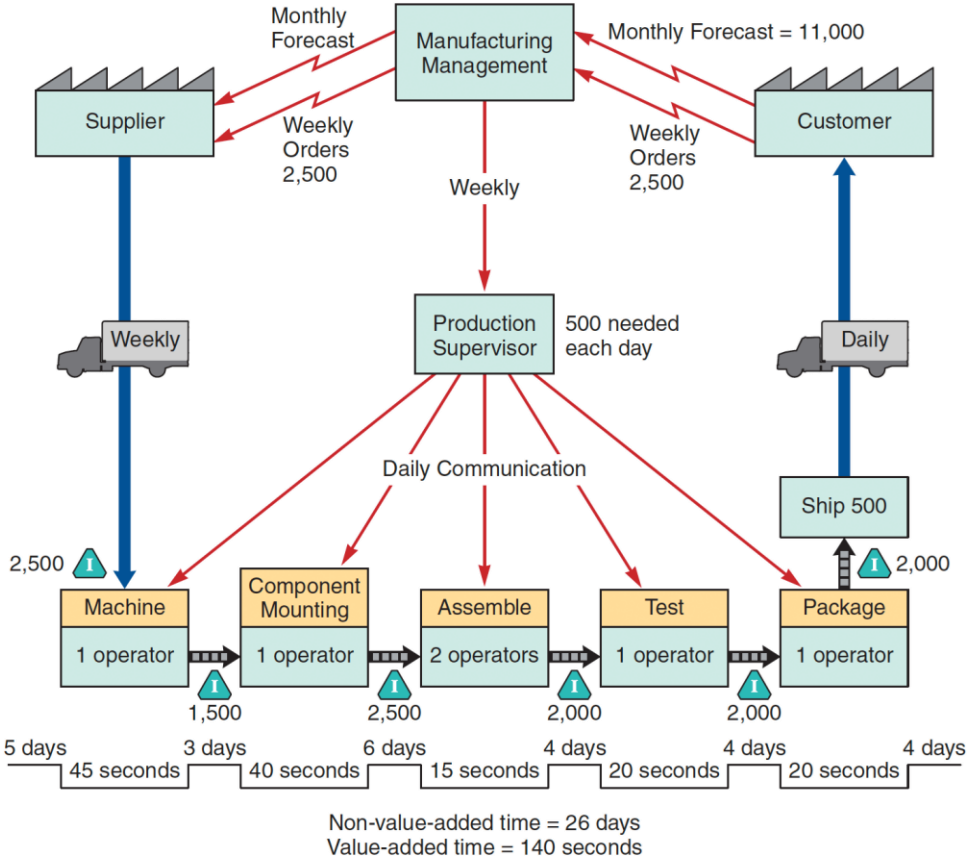


Figure 7.6

Service Blueprinting

- Products with high service contents require different technique
- Service blueprinting focuses on the **customer and provider interaction**

- Defines **three levels of interaction** - customer control, service provider interaction, service provider control (away from customer)
- Each level has different management issues
- Identifies potential failure points

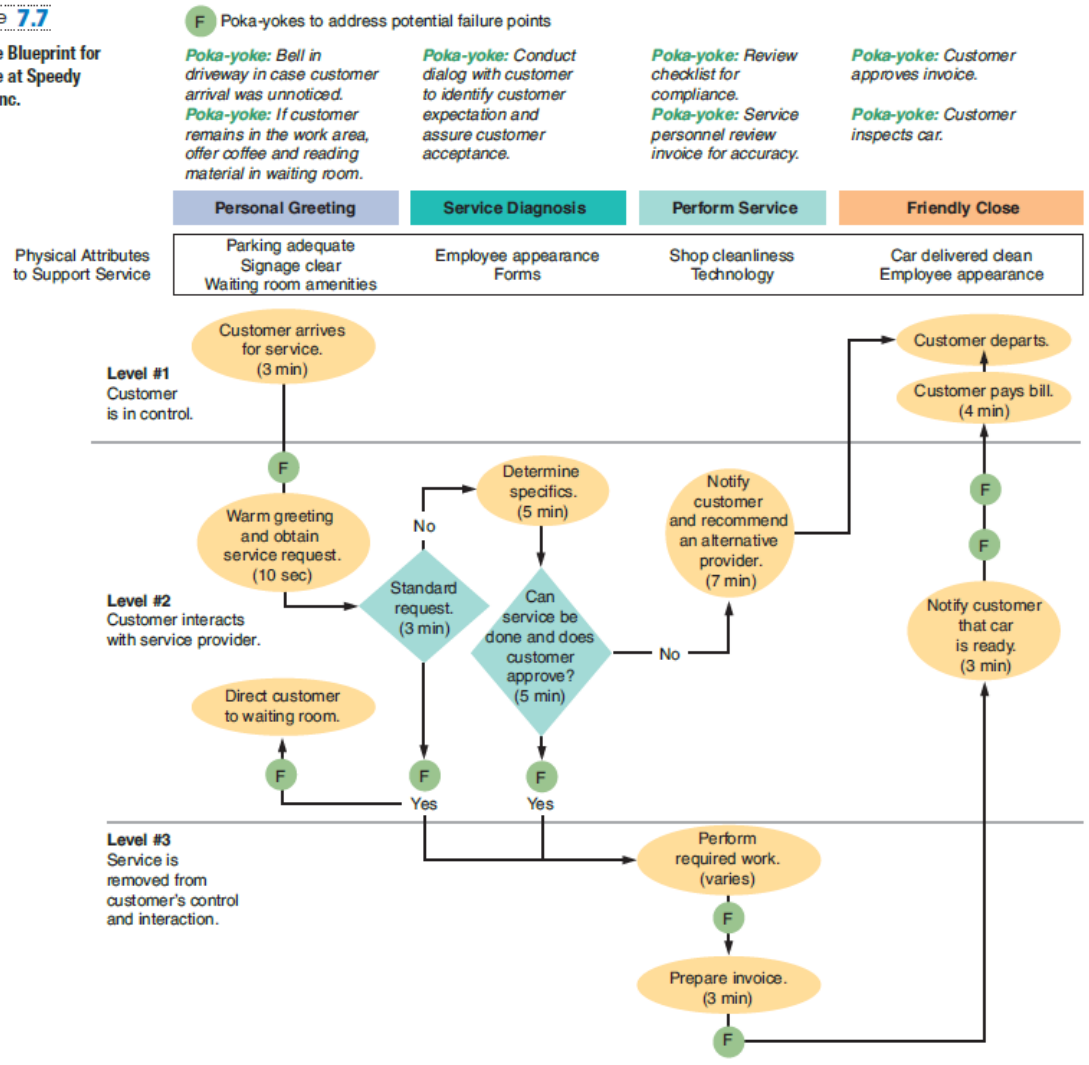
Service Blueprint

Can you identify the 3 Levels of activities? What are they?

What are these from the chart ?

Figure 7.7

Service Blueprint for Service at Speedy Lube, Inc.



Special Considerations for Service Process Design

- Some interaction with customer is necessary, but this often affects performance adversely
- The better these interactions are accommodated in the process design, the more efficient and effective the process
- Find the right combination of cost and customer interaction

Service Process Matrix

Figure 7.8

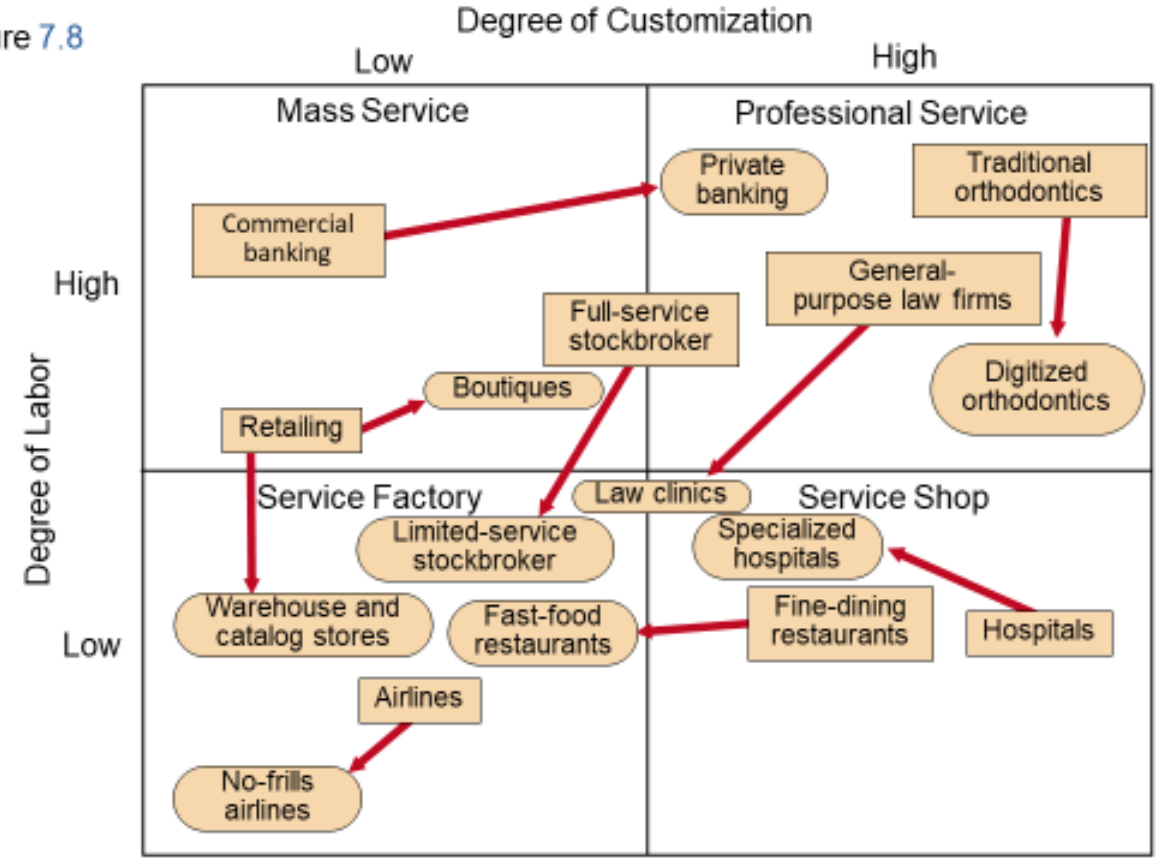
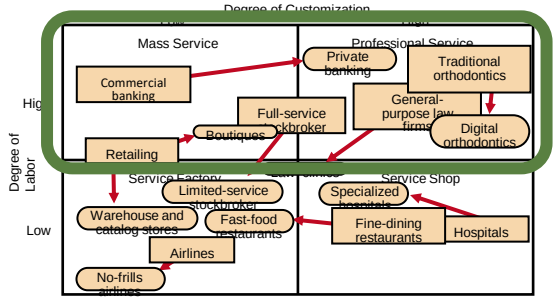


Figure 7.8

Service Process Matrix

Mass Service and Professional Service

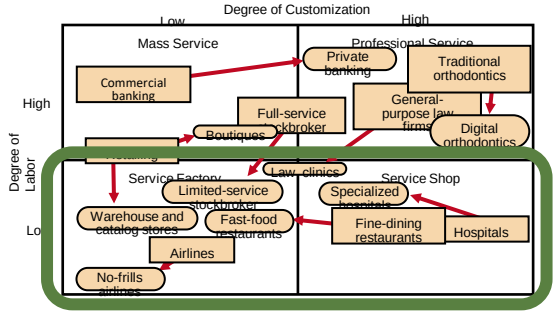
- Labor involvement is high
- Focus on human resources
- Selection and training highly important
- Personalized services



Service Process Matrix

Service Factory and Service Shop

- Automation of standardized services
- Restricted offerings
- Low labor intensity responds well to process technology and scheduling
- Tight control required to maintain standards



Improving Service Productivity

TABLE 7.3 **Techniques for Improving Service Productivity**

STRATEGY	TECHNIQUE	EXAMPLE
Separation	*Structuring service* so customers must go where the service is offered	Bank customers go to a manager to open a new account, to loan officers for loans, and to tellers for deposits
Self-service	*Self-service* so customers examine, compare, and evaluate at their own pace	Supermarkets and department stores Internet ordering
Postponement	*Customizing* at delivery	Customizing vans at delivery rather than at production
Focus	*Restricting* the offerings	Limited-menu restaurant

Improving Service Productivity

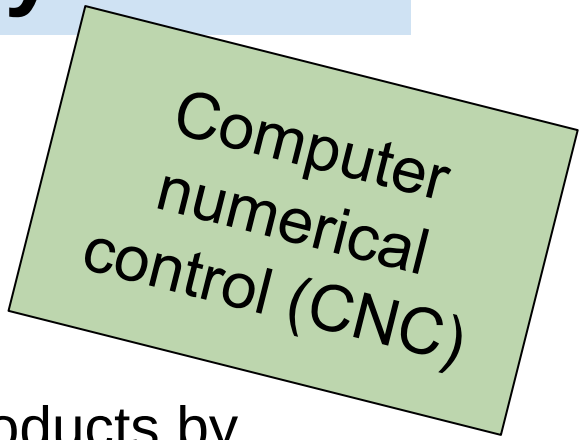
TABLE 7.3 **Techniques for Improving Service Productivity**

STRATEGY	TECHNIQUE	EXAMPLE
Modules	*Modular* selection of service *Modular* production	Investment and insurance selection Prepackaged food modules in restaurants
Automation	*Separating* services that may lend themselves to some type of automation	Automatic teller machines
Scheduling	Precise personnel *scheduling*	Scheduling ticket counter personnel at 15-minute intervals at airlines
Training	*Clarifying* the service options *Explaining how to avoid problems*	Investment counselor, funeral directors After-sale maintenance personnel

Production Technology

1. Machine technology
2. Automatic identification systems (AISs)
3. Process control
4. Vision systems
5. Robots
6. Automated storage and retrieval systems (ASRSs)
7. Automated guided vehicles (AGVs)
8. Flexible manufacturing systems (FMSs)
9. Computer-integrated manufacturing (CIM)

Machine Technology



- Increased precision, productivity, and flexibility
- Reduced environmental impact
- **Additive manufacturing** produces products by adding material, not removing it
- Supports innovative product design, minimal custom tooling required, minimal assembly time, low inventory, and reduced time to market

Automatic Identification Systems (AISs) and RFID

- Improved data acquisition
- Reduced data entry errors
- Increased speed
- Increased scope of process automation

Bar codes and RFID

Process Control

- Real-time monitoring and control of processes
  - Sensors collect data
  - Devices read data on periodic basis
  - Measurements translated into digital signals then sent to a computer
  - Computer programs analyze the data
  - Resulting output may take numerous

Vision Systems

- Particular aid to inspection
- Consistently accurate
- Never bored
- Modest cost
- Superior to individuals performing the same tasks

Robots

- Perform monotonous or dangerous tasks
- Perform tasks requiring significant strength or endurance
- Generally enhanced consistency and accuracy

Automated Storage and Retrieval Systems (ASRSs)

- Automated placement and withdrawal of parts and products
- Reduced errors and labor
- Particularly useful in inventory and test areas of manufacturing firms

Automated Guided Vehicle (AGVs)

- Electronically guided and controlled carts
- Used for movement of products and/or individuals

Computer-Integrated Manufacturing (CIM)

- Extend flexible manufacturing
  - Backward to engineering and inventory control
  - Forward into warehousing and shipping
  - Can also include financial and customer service areas
  - Reducing the distinction between low-volume/high-variety, and high-volume/low-variety production

Computer-Integrated Manufacturing (CIM)

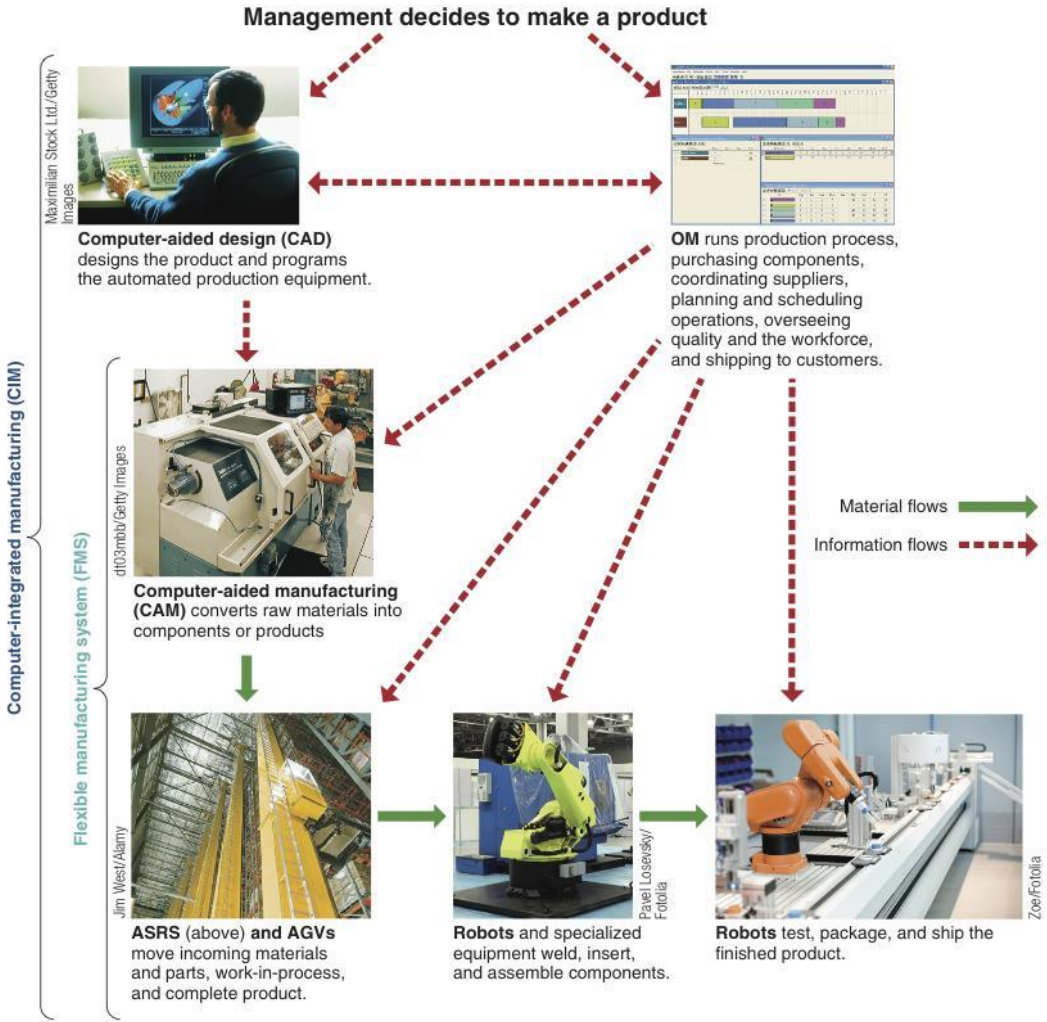


Figure 7.9

Technology in Services

TABLE 7.4 **Examples of Technology's Impact on Services**

SERVICE INDUSTRY	EXAMPLE
Financial Services	Debit cards, electronic funds transfer, ATMs, Internet stock trading, online banking via cell phone
Education	Online newspapers and journals, interactive assignments via WebCT, Blackboard, and smartphones
Utilities and government	Automated one-person garbage trucks, optical mail scanners, flood-warning systems, meters that allow homeowners to control energy usage and costs
Restaurants and foods	Wireless orders from waiters to kitchen, robot butchering, transponders on cars that track sales at drive-throughs
Communications	Interactive TV, e-books via Kindle

Technology in Services

TABLE 7.4 **Examples of Technology's Impact on Services**

SERVICE INDUSTRY	EXAMPLE
Hotels	Electronic check-in/check-out, electronic key/lock systems, mobile Web bookings
Wholesale/retail trade	Point-of-sale (POS) terminals, e-commerce, electronic communication between store and supplier, bar-coded data, RFID
Transportation	Automatic toll booths, satellite-directed navigation systems, Wi-Fi in automobiles
Health care	Online patient-monitoring systems, online medical information systems, robotic surgery
Airlines	Ticketless travel, scheduling, Internet purchases, boarding passes downloaded as two-dimensional bar codes on smart phones