Chapter 5

Design of Goods and Services

Learning Objectives

At the end of this lesson, you should be able to:

1. **Define** product life cycle

2. **Describe** a product development system

3. **Explain** how time-based competition is implemented by OM

4. **Describe** how products and services are defined by Operations Management

Learning Objectives

At the end of this lesson, you should be able to:

4. **Describe** the documents needed for production

5. **Explain** how the customer participates in the design and delivery of services

Regal Marine

- Global market
- 3-dimensional CAD system
  - Reduced product development time
  - Reduced problems with tooling
  - Reduced problems in production
- Assembly line production
- JIT

Goods and Services Selection

- Organizations exist to provide goods or services to society
- Great products are the key to success

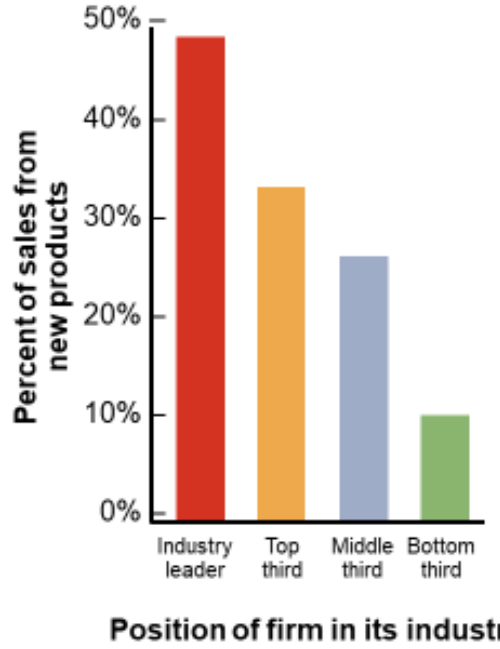
- Top organizations typically focus on core products
- Customers buy satisfaction, not just a physical good or particular service

- Fundamental to an organization's strategy with implications throughout the operations function

Goods and Services Selection

- Goods or services are the basis for an organization's existence
- Limited and predictable life cycles requires constantly looking for, designing, and developing new products
- New products generate substantial revenue

Goods and Services Selection



The higher the percentage of sales from the last 5 years, the more likely the firm is to be a leader.

Figure 5.1

Innovation and New Products

Goods and Services Selection

- Products - covers tangible goods and service products - Insurance products, Bank Home Mortgages, Healthcare services
- Effective product strategy links product decisions with investment, market share, product life cycle and product lines

Product Decision

What is product decision?

Product decision - The selection, definition and design of the products

What is the objective of product decision?

The objective of the product decision is to develop and implement a product strategy that meets the demands of the marketplace with a competitive advantage

Product Strategy Options

- **Differentiation**
  - Shouldice Hospital
- **Low cost**
  - Taco Bell
- **Rapid response**
  - Toyota

(a) Markets: In its creative way, the market has moved athletic shoes from utilitarian footwear into fashionable accessories.

(b) Technology: Samsung's latest technology: radical new smart phones that are bendable.

(c) Packaging: Sherwin-Williams' Dutch Boy has revolutionized the paint industry with its square Twist & Pour paint container.

Product Innovation Can Be Driven By Markets, Technology, and Packaging. Whether it is design focused on changes in the market (a), the application of technology at Samsung (b), or a new container at Sherwin-Williams (c), operations managers need to remind themselves that the creative process is ongoing with major production implications.

Product Life Cycles

- Products born, live and die
- May be any length from a few days (concert t-shirt) months (seasonal fashion) to decades (Boeing 737)

- The operations function must be able to introduce and produce the new products successfully

What are the 4 stages of Product Life Cycle?

Product Life Cycle

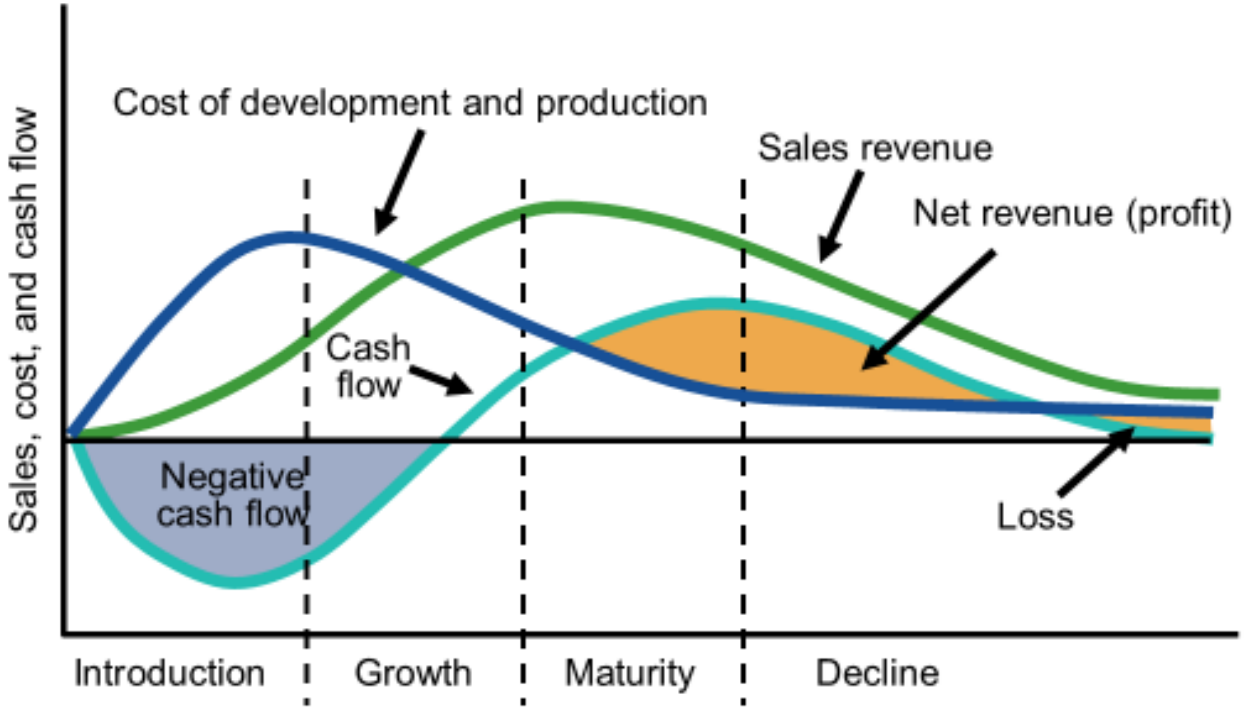


Figure 5.2

INTRODUCTION PHASE

Fine tuning may warrant unusual expenses for

1. Research
2. Product development
3. Process modification and enhancement
4. Supplier development

GROWTH PHASE

- Product design begins to stabilize
- Effective forecasting of capacity becomes necessary
- Adding or enhancing capacity may be necessary

MATURITY PHASE

- Competitors now established
- High volume, innovative production may be needed
- Improved cost control, reduction in options, paring down of product line

DECLINE PHASE

- Unless product makes a special contribution to the organization, must plan to terminate offering

Generating New Products

1. Understanding the customer
2. Economic change
3. Sociological and demographic change
4. Technological change
5. Political and legal change
6. Market practice, professional standards, suppliers, distributors

Product Development Stages

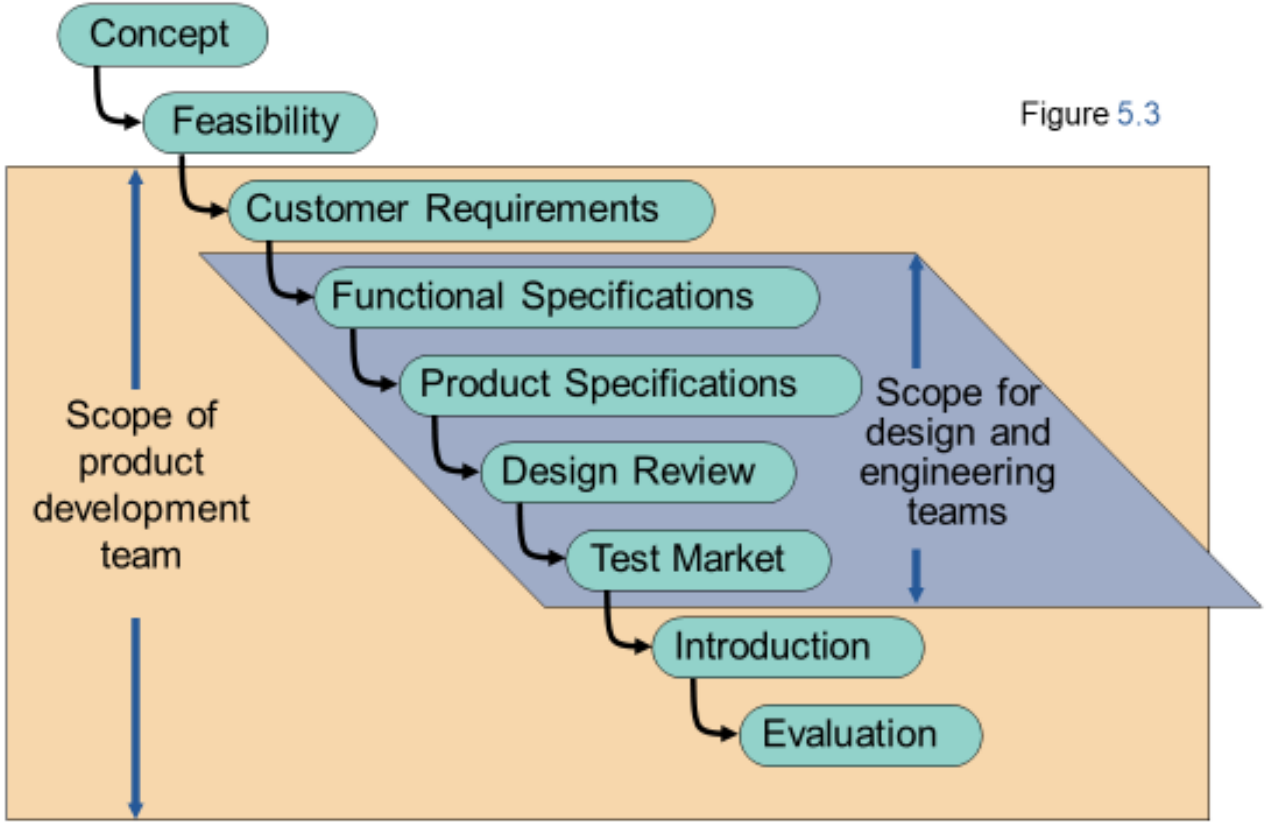


Figure 5.3

Organizing for Product Development

- **Traditionally** – distinct departments
  - Duties and responsibilities are defined
  - Difficult to foster forward thinking
- **A Champion**
  - Product manager drives the product through the product development system and related organizations

Organizing for Product Development

- **Team approach**
  - Cross functional – representatives from all disciplines or functions
  - Product development teams, design for manufacturability teams, value engineering teams
- **Japanese “whole organization” approach**
  - No organizational divisions

Manufacturability and Value Engineering

Manufacturability and value engineering - activities that help improve product's design, production, maintainability and use.

Benefits:

1. Reduced complexity of the product
2. Reduction of environmental impact
3. Additional standardization of components
4. Improvement of functional aspects of the product
5. Improved job design and job safety
6. Improved maintainability (serviceability) of the product
7. Robust design

Cost Reduction of a Bracket via Value Engineering

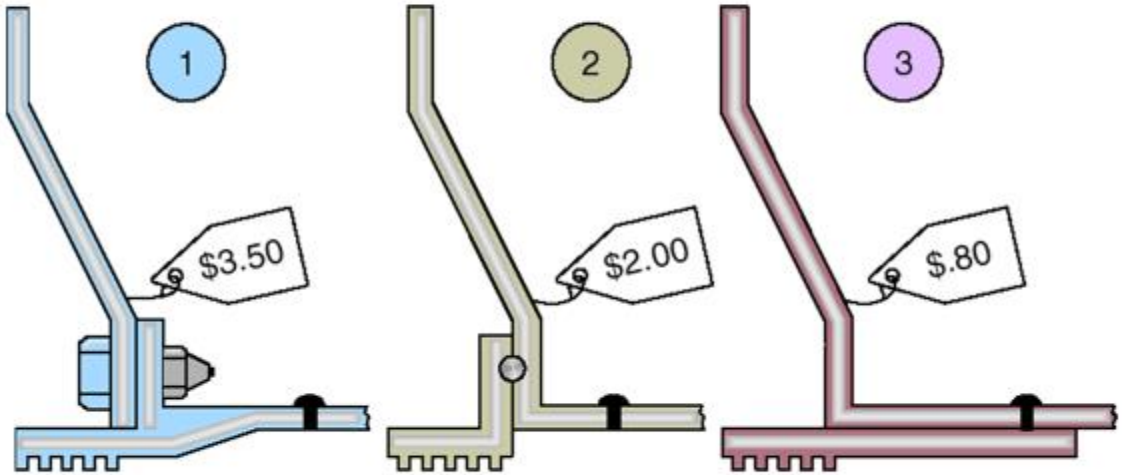


Figure 5.5

Issues for Product Design

- Robust design
- Modular design
- Computer-aided design (CAD)
- Computer-aided manufacturing (CAM)
- Virtual reality technology
- Value analysis
- Sustainability and Life Cycle Assessment (LCA)

Robust Design

- Product is designed so that small variations in production or assembly do not adversely affect the product
- Typically results in lower cost and higher quality

Modular Design

- Products designed in easily segmented components
- Adds flexibility to both production and marketing
- Improved ability to satisfy customer requirements

Computer Aided Design (CAD)

- Using computers to design products and prepare engineering documentation
- Shorter development cycles, improved accuracy, lower cost
- Information and designs can be deployed worldwide

Extensions of CAD

- Design for Manufacturing and Assembly (DFMA)
  - Solve manufacturing problems during the design stage
- 3-D Object Modeling
  - Small prototype development
- CAD through the internet
- International data exchange through STEP

Computer-Aided Manufacturing (CAM)

- Utilizing specialized computers and program to control manufacturing equipment
- Often driven by the CAD system (CAD/CAM)

Benefits of CAD/CAM

1. Product quality
2. Shorter design time
3. Production cost reductions
4. Database availability
5. New range of capabilities

Virtual Reality Technology

- Computer technology used to develop an interactive, 3-D model of a product from the basic CAD data
- Allows people to 'see' the finished design before a physical model is built
- Very effective in large-scale designs such as plant layout

Value Analysis

- Focuses on design improvement during production
- Seeks improvements leading either to a better product or a product which can be produced more economically with less environmental impact

Sustainability and Life Cycle Assessment (LCA)

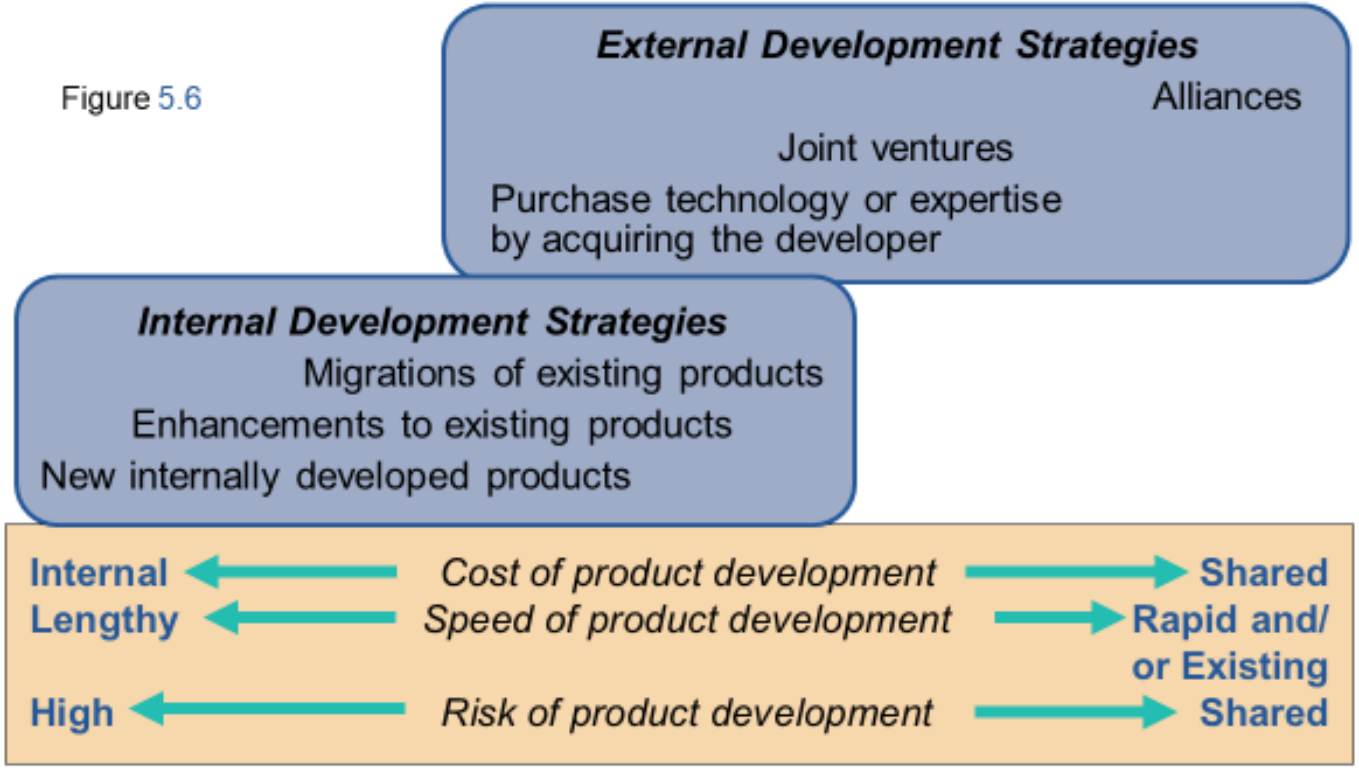
- Sustainability means meeting the needs of the present without compromising the ability of future generations to meet their needs
- LCA is a formal evaluation of the environmental impact of a product
- CIRCULAR ECONOMY

Product Development Continuum

- Product life cycles are becoming shorter and the rate of technological change is increasing
- Developing new products faster can result in a competitive advantage
- Concept is called Time-Based Competition

Product Development Continuum

Figure 5.6



Product Development Continuum

- Purchasing technology by acquiring a firm
  - Speeds development
  - Issues concern the fit between the acquired organization and product and the host
- Joint Ventures
  - Both organizations learn
  - Risks are shared

Product Development Continuum

- Through Alliances
  - Cooperative agreements between independent organizations
  - Useful when technology is developing
  - Reduces risks

Defining a Product

- First definition is in terms of functions
- Rigorous specifications are developed during the design phase
- Manufactured products will have an engineering drawing
- Bill of material (BOM) lists the components of a product

§ 58.2469 Specifications for U.S. grades of Monterey (Monterey Jack) cheese

(a) *U.S. grade AA.* Monterey Cheese shall conform to the following requirements:

(1) *Flavor.* Is fine and highly pleasing, free from undesirable flavors and odors. May possess a very slight acid or feed flavor.

(2) *Body and texture.* A plug drawn from the cheese shall be reasonably firm. It shall have numerous small mechanical openings evenly distributed throughout the plug. It shall not possess sweet holes, yeast holes, or other gas holes.

(3) *Color.* Shall have a natural, uniform, bright, attractive appearance.

(4) *Finish and appearance—bandaged and paraffin-dipped.* The rind shall be sound, firm, and smooth, providing a good protection to the cheese.

Code of Federal Regulation, Parts 53 to 109, General Service Administration.

David Murray/Dorling Kindersley, Ltd.

Product Documents

- **Engineering drawing**
  - Shows dimensions, tolerances, and materials
  - Shows codes for Group Technology

- **Bill of Material**
  - Lists components, quantities and where used
  - Shows product structure

Engineering Drawings

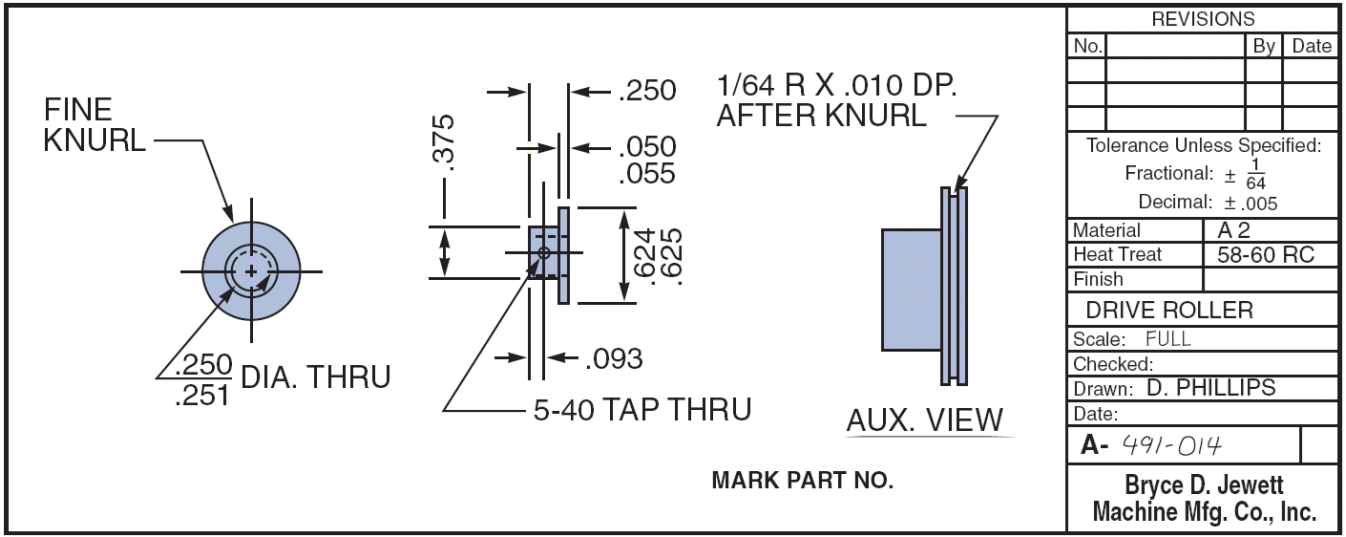


Figure 5.8

Bills of Material

Figure 5.9 (a)

BOM for a Panel Weldment

NUMBER	DESCRIPTION	QTY
A 60-71	PANEL WELDM'T	1
A 60-7	LOWER ROLLER ASSM.	1
R 60-17	ROLLER	1
R 60-428	PIN	1
P 60-2	LOCKNUT	1
A 60-72	GUIDE ASSM. REAR	1
R 60-57-1	SUPPORT ANGLE	1
A 60-4	ROLLER ASSM.	1
02-50-1150	BOLT	1
A 60-73	GUIDE ASSM. FRONT	1
A 60-74	SUPPORT WELDM'T	1
R 60-99	WEAR PLATE	1
02-50-1150	BOLT	1

Bills of Material

Hard Rock Cafe's Hickory BBQ Bacon Cheeseburger

DESCRIPTION	QTY
Bun	1
Hamburger patty	8 oz.
Cheddar cheese	2 slices
Bacon	2 strips
BBQ onions	1/2 cup
Hickory BBQ sauce	1 oz.
Burger set	
Lettuce	1 leaf
Tomato	1 slice
Red onion	4 rings
Pickle	1 slice
French fries	5 oz.
Seasoned salt	1 tsp.
11-inch plate	1
HRC flag	1

Figure 5.9 (b)

Documents for Production

- ❑ Assembly drawing
- ❑ Assembly chart
- ❑ Route sheet
- ❑ Work order
- ❑ Engineering change notices (ECNs)

Assembly Drawing

- Shows exploded view of product
- Details relative locations to show how to assemble the product

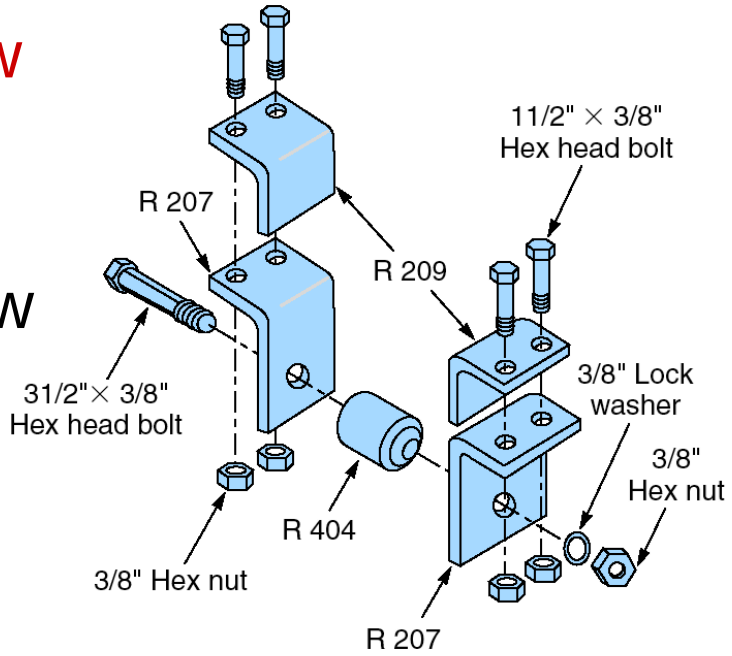
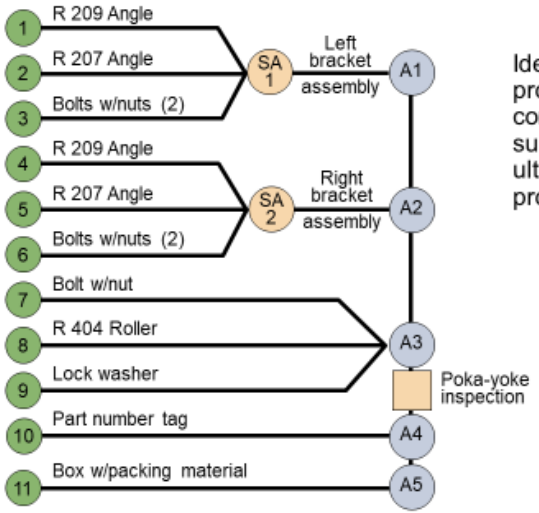


Figure 5.11 (a)

Assembly Chart



Identifies the point of production where components flow into subassemblies and ultimately into the final product

Figure 5.11 (b)

Route Sheet

Lists the operations and times required to produce a component

Process	Machine	Operations	Setup Time	Operation Time/Unit
1	Auto Insert 2	Insert Component Set 56	1.5	.4
2	Manual Insert 1	Insert Component Set 12C	.5	2.3
3	Wave Solder	Solder all components to board	1.5	4.1
4	Test 4	Circuit integrity test 4GY	.25	.5

Work Order

Instructions to produce a given quantity of a particular item, usually to a schedule

Work Order			
Item	Quantity	Start Date	Due Date
157C	125	5/2/08	5/4/08
Production Dept		Delivery Location	
F32		Dept K11	

Engineering Change Notice (ECN)

- A correction or modification to a product's definition or documentation
  - Engineering drawings
  - Bill of material

Quite common with long product life cycles, long manufacturing lead times, or rapidly changing technologies

Configuration Management

- The need to manage ECNs has led to the development of configuration management systems
- A product's planned and changing components are accurately identified and control and accountability for change are identified and maintained

Product Life-Cycle Management (PLM)

- Integrated software that brings together most, if not all, elements of product design and manufacture
  - Product design
  - CAD/CAM, DFMA
  - Product routing
  - Materials
  - Assembly
  - Environmental

Service Design

- Service typically includes direct interaction with the customer
- **Process – chain – network (PCN)** analysis focuses on the ways in which processes can be designed to optimize interaction between firms and their customers

Process-Chain-Network (PCN) Analysis

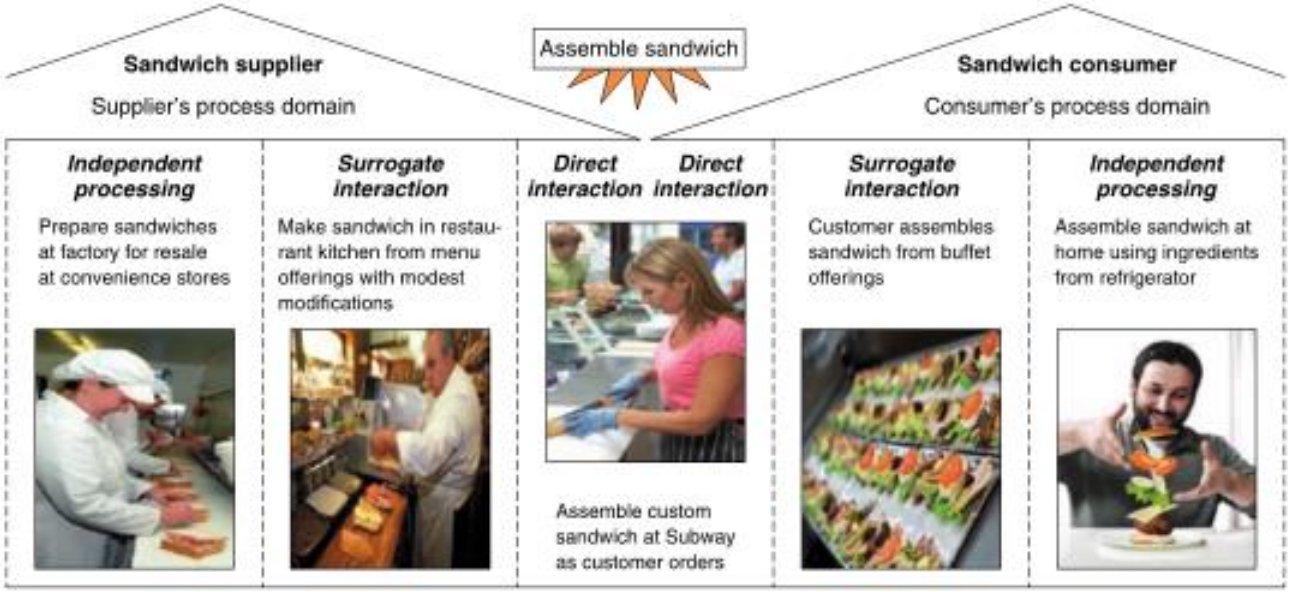


Figure 5.12

Process-Chain-Network (PCN) Analysis

- Direct interaction region includes process steps that involve interaction between participants
- The surrogate (substitute) interaction region includes process steps in which one participant is acting on another participant's resources
- The independent processing region includes steps in which the supplier and/or the customer is acting on resources where each has maximum control

Process-Chain-Network (PCN) Analysis

- All three regions have similar operating issues but the appropriate way of handling the issues differs across regions
- Service operations exist only within the area of *direct* and *surrogate interaction*
- PCN analysis provides insight to aid in positioning and designing processes that can achieve strategic objectives

Adding Service Efficiency

- Service productivity is notoriously low partially because of customer involvement in the design or delivery of the service, or both
- Complicates product design

Adding Service Efficiency

- Limit the options
  - Improves efficiency and ability to meet customer expectations
- Delay customization
- Modularization
  - Eases customization of a service

Adding Service Efficiency

- Automation
  - Reduces cost, increases customer service
- Moment of truth
  - Critical moments between the customer and the organization that determine customer satisfaction

Documents for Services

- High levels of customer interaction necessitates different documentation
- Often explicit job instructions
- Scripts and storyboards are other techniques

First Bank Corp. Drive-up Teller Service Guidelines

- **Be especially discreet when talking to the customer through the microphone.**
- **Provide written instructions for customers who must fill out forms you provide.**
- **Mark lines to be completed or attach a note with instructions.**
- **Always say “please” and “thank you” when speaking through the microphone.**
- **Establish eye contact with the customer if the distance allows it.**
- **If a transaction requires that the customer park the car and come into the lobby, apologize for the inconvenience.**

Customer Journey Mapping

Stage	Awareness		Consideration			Decision		Delight
Touch Point	**Facebook Posts**	**Facebook Page**	**Website**	**Email Enquiry**	**Phone Call**	**School Tour**	**Sign up**	**Referral**
Customer process	Browsed Facebook and stumbled upon a post by your child care centre	Browsed through the posts and photo albums on Facebook Page	Searched and arrived at your school website via mobile phone	Signed up email enquiry	Scheduled a phone call to find out more	Asked about school curriculum	Considered the location and price. Decided to enroll after comparing.	Referred a friend after 2 months.
Experience								

Blueprint for Overnight Hotel Stay Service