Design of Goods/ Services/Processes

5&7

PowerPoint presentation to accompany
Heizer, Render, Munson / Global Edition
Operations Management, Twelfth Edition
Principles of Operations Management, Tenth Edition

PowerPoint slides by Jeff Heyl

Outline

- Global Company Profile: Regal Marine
- Goods and Services Selection
- Generating New Products
- Product Development
- Issues for Product Design
- Product Development Continuum

Outline - Continued

- Defining a Product
- Documents for Production
- Service Design
- Process Analysis and Design

Regal Marine

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

Learning Objectives

When you complete this chapter you should be able to :

5.1 ***Define*** product life cycle

5.2 ***Describe*** a product development system

5.3 ***Explain*** how time-based competition is implemented by OM

5.4 ***Describe*** how goods and services are defined by OM

5.5 ***Describe*** the documents needed for production

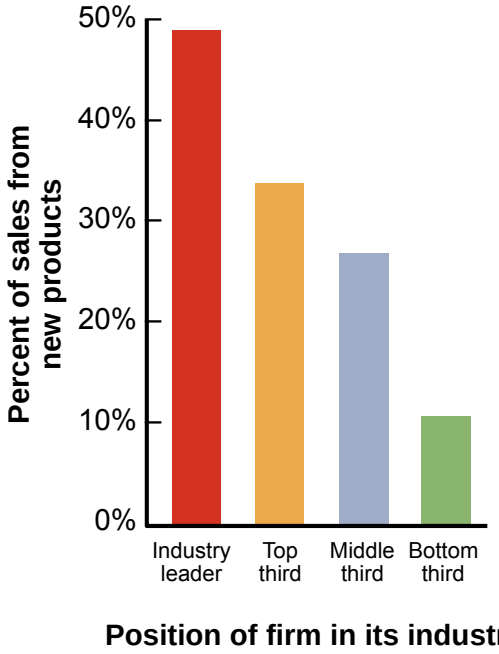
Goods and Services Selection

- 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

- Limited and predicable life cycles requires constantly looking for, designing, and developing new products
- Utilize strong communication among customer, product, processes, and suppliers
- 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

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

9

Internal Sources of New Product Ideas

8

External Source of New Product Ideas

Some possible sources of data has been listed out to give you a fair idea, and it can be altered as per your requirement

Market Research	Locating areas of consumer dissatisfaction with current products
Competitors	Learning from competition
Learning From	Overseas experience transferring foreign products
Long Range Studies	'Fallout' form predictions of changing economic and social conditions
Market Gap Analysis	Analysis of existing product perceptions
Consumer Activity Analysis	Studying activities to identify unsatisfied needs

6

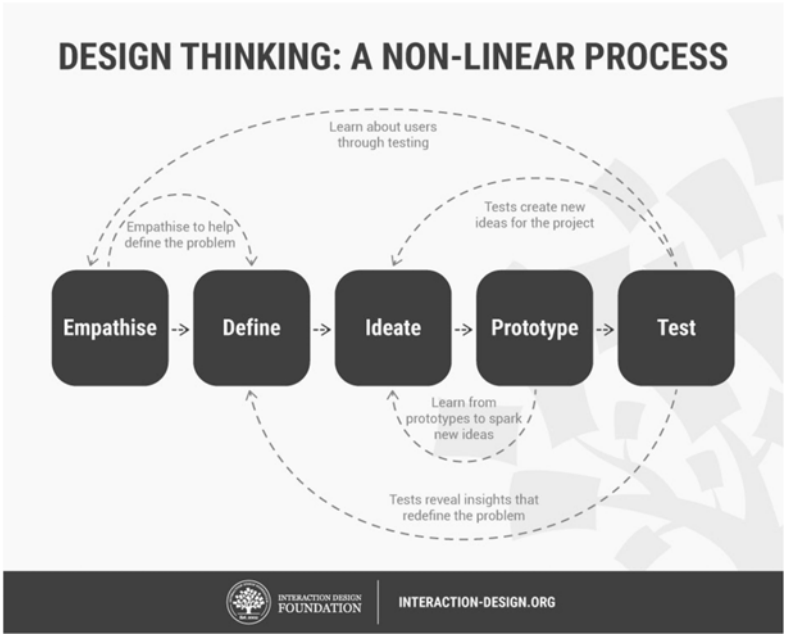
New Product Detailed Overview

Strategic	• Degree to which project aligns with business strategy • Strategic Importance
Product Advantage	• Unique benefits • Meets customer needs better • Value for money
Market attractiveness	• Market size • Market growth • Competitive situation
Synergies	• Market synergies • Technological synergies • Manufacturing/processing synergies
Technical Feasibility	• Technical gap • Complexity • Technical uncertainty
Profitability Analysis	• Expected profitability (Magnitude ; e.g. NPV) • Return(e.g. IRR) • Payback period • Low cost and fast to do

This step is crucial to ensure that unsuitable ideas are rejected as soon as possible as ideas need to be considered objectively

WWW.COMPANYNAME.COM

Class Assignment 2 (5%)
Design a New Product



Class Assignment 2 (5%)
Design a New Product

Instructions
1. Team up 4-5 students per group.
2. After reading the paper of “Design Thinking: A 5 Stage Process”, the group discussion is freely conducted for 50 min:
   2.1 To gain an empathic understanding of the problem you are trying to solve.
   2.2 To define a problem statement in a human-centered manner. (establishing features, functions, other elements to solve the problems)
   2.3 To think outside the box in order to identify new solutions to the problem statement. (brainstorming)
   2.4 To sketch a prototype of your new product.
3. Prepare your presentation. (10 min)
4. Present your work. (5-10 min/group)

Product Development Stages

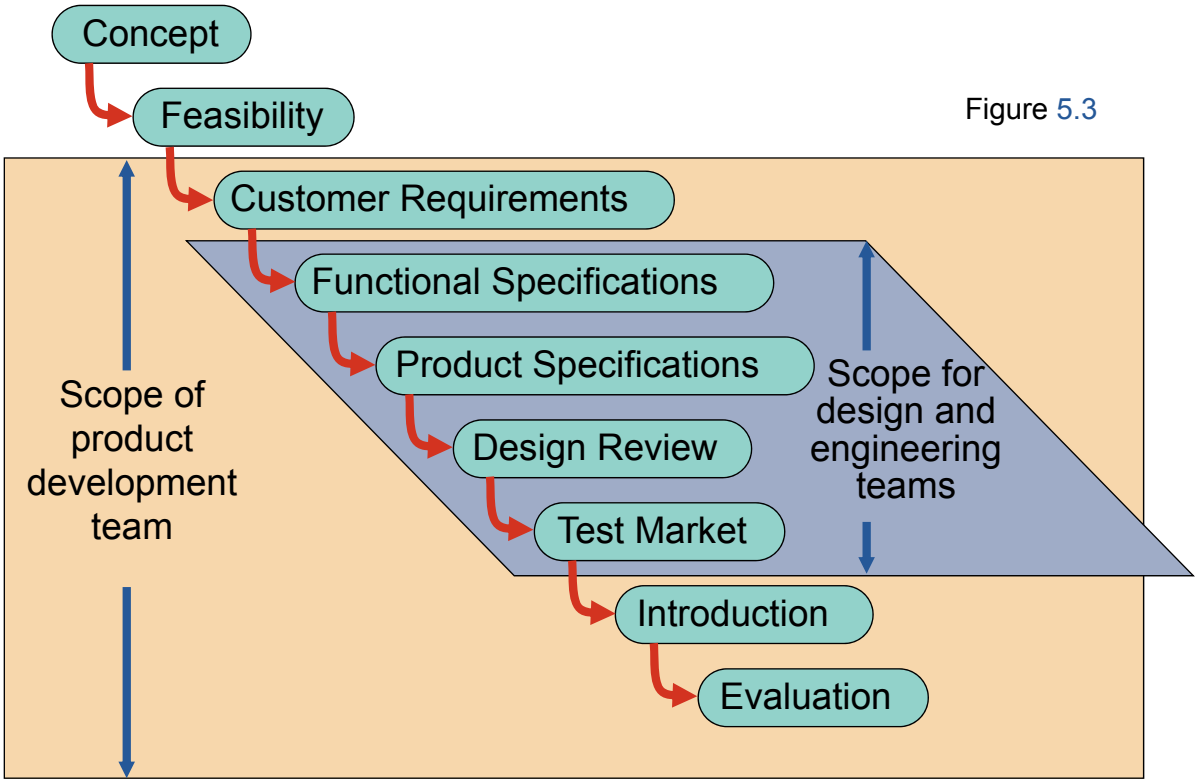


Figure 5.3

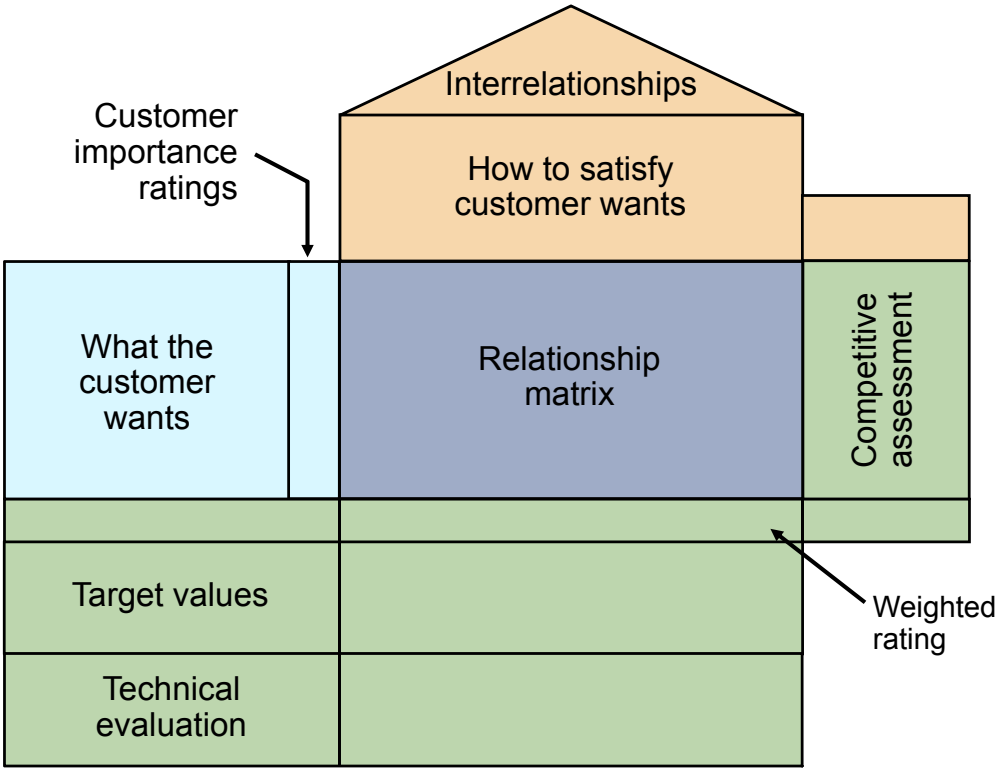
Quality Function Deployment

- **Quality function deployment (QFD)**
  - Determine what will satisfy the customer
  - Translate those customer desires into the target design
- **House of quality**
  - Utilize a planning matrix to relate customer *wants* to *how* the firm is going to meet those *wants*

Quality Function Deployment

1. Identify customer *wants*
2. Identify *how* the good/service will satisfy customer wants
3. Relate customer wants to product *hows*
4. Identify relationships between the firm's *hows*
5. Develop *our* importance ratings
6. Evaluate competing products
7. Compare performance to desirable technical attributes

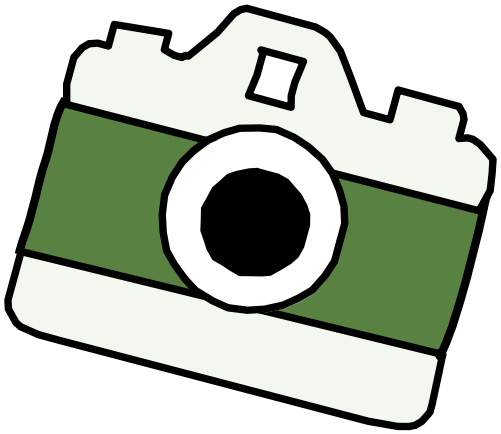
QFD House of Quality



House of Quality Example

Your team has been charged with designing a new camera for Great Cameras, Inc.

The first action is to construct a House of Quality



House of Quality Example

Completed House of Quality

		Low electricity requirements	Aluminum components	Auto focus	Auto exposure	High number of pixels	Ergonomic design	Company A	Company B
Lightweight	3	•	○				•	G	P
Easy to use	4	•		○	○	○	○	G	P
Reliable	5	○		○	○	○		F	G
Easy to hold steady	2						◉	G	P
High resolution	1					◉		P	P
Our importance ratings		22	9	27	27	32	25		
Target values (Technical attributes)		0.5 A	75%	2' to ∞	2 circuits	Failure 1 per 10,000	Panel ranking		
Technical evaluation	Company A	0.7	60%	yes	1	ok	G		
	Company B	0.6	50%	yes	2	ok	F		
	Us	0.5	75%	yes	2	ok	G		

House of Quality Sequence

Deploying resources through the organization in response to customer requirements

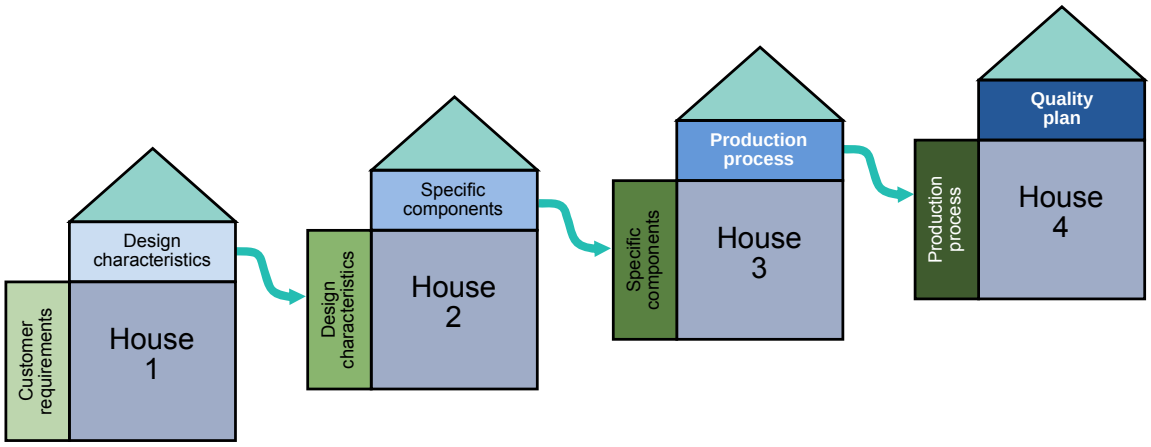


Figure 5.4

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

Organizing for Product Development

- Product development teams
  - Market requirements to product success
  - Cross functional teams often involving vendors
  - Open, highly participative environment
- Concurrent engineering
  - Simultaneous performance of product development stages

Manufacturability and Value Engineering

- 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

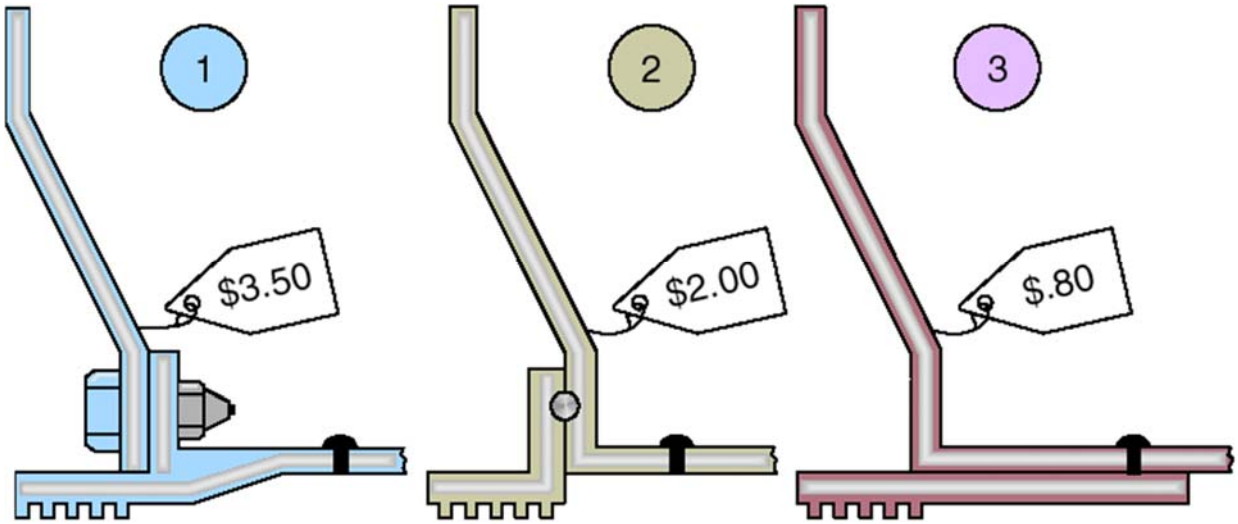


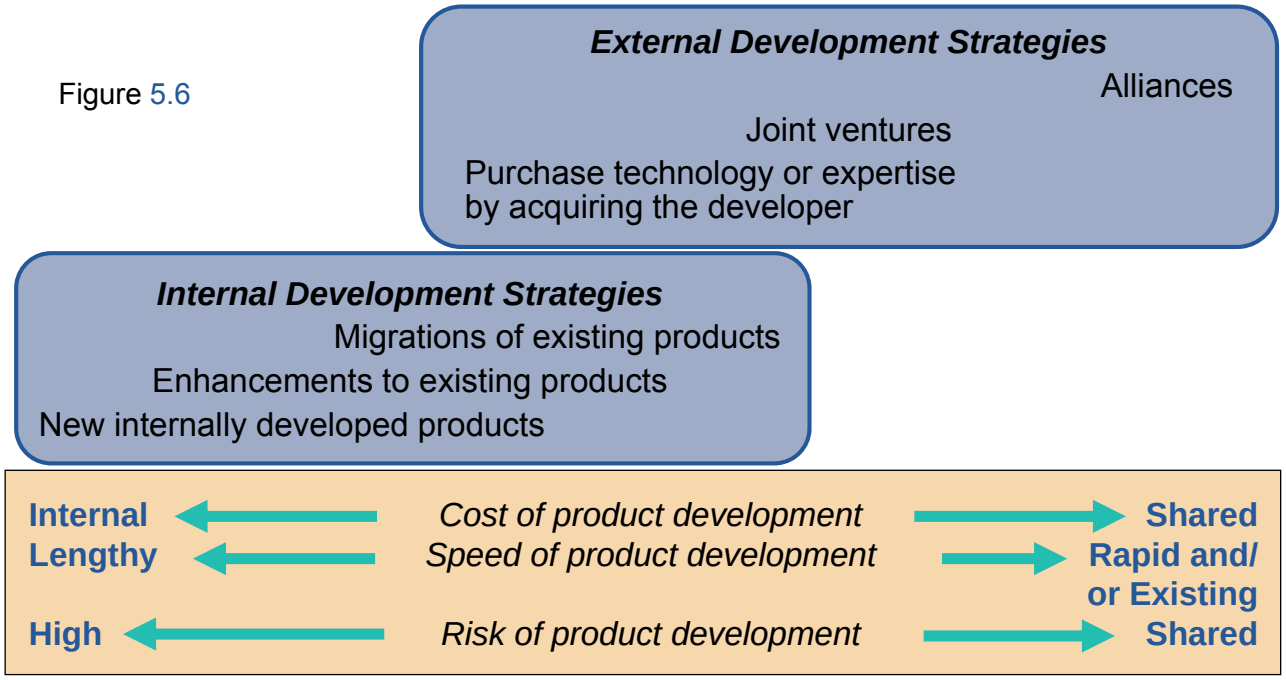
Figure 5.5

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
- **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

- 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

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 and 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

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

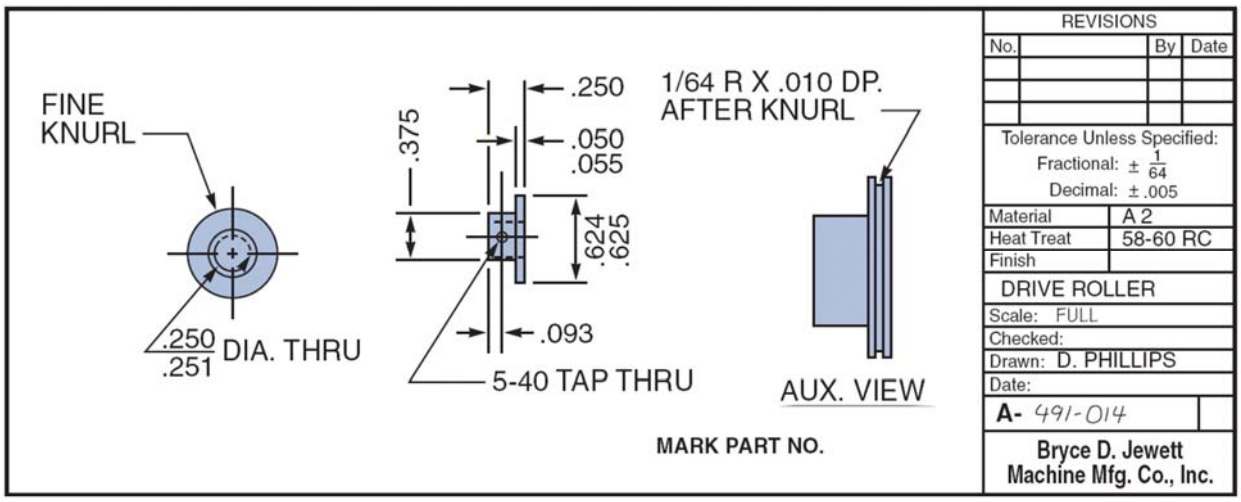


Figure 5.8

Bills of Material

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

Figure 5.9 (a)

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)

Make-or-Buy Decisions

- Produce components themselves or buy from an outside source
- Variations in
  - Quality
  - Cost
  - Delivery schedules
- Critical to product definition

Product Life Cycles

- May be any length from a few days to decades
- The operations function must be able to introduce new products successfully

Product Life Cycle

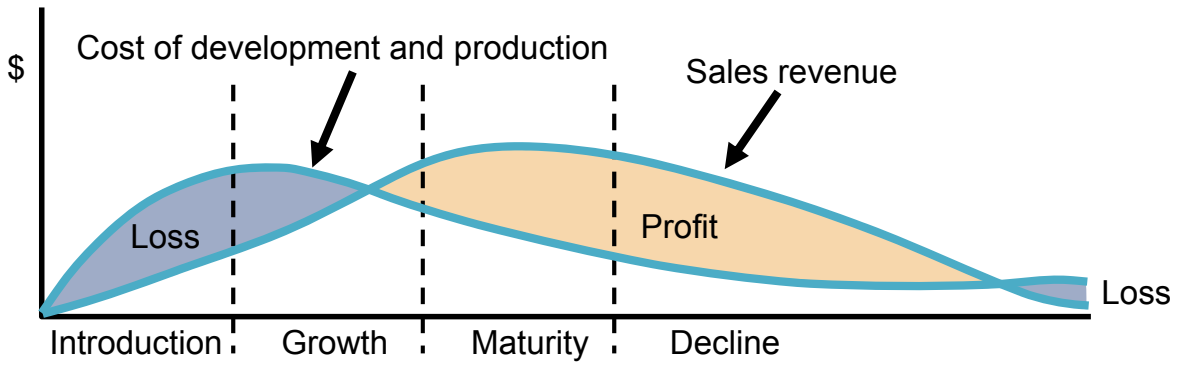


Figure 5.2

Life Cycle and Strategy

Introductory Phase

- Fine tuning may warrant unusual expenses for
  1) Research
  2) Product development
  3) Process modification and enhancement
  4) Supplier development

Product Life Cycle

Growth Phase

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

Product Life Cycle

Maturity Phase

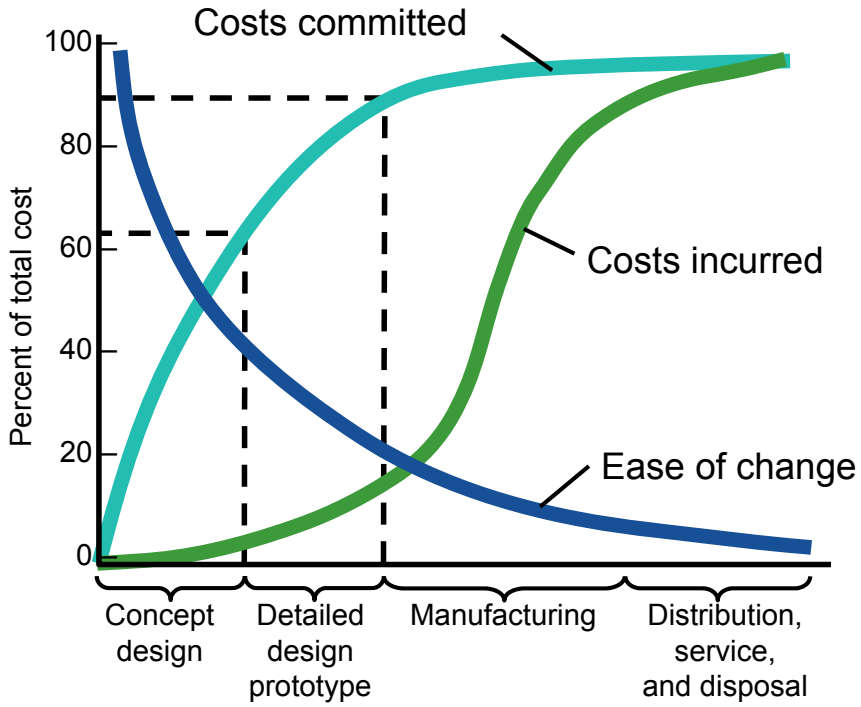
- Competitors now established
- High volume, innovative production may be needed
- Improved cost control, reduction in options, paring down of product line

Product Life Cycle

Decline Phase

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

Product Life Cycle Costs



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
  - Layout
  - Assembly
  - Maintenance
  - 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
- **Service blueprint**

Process-Chain-Network (PCN) Analysis

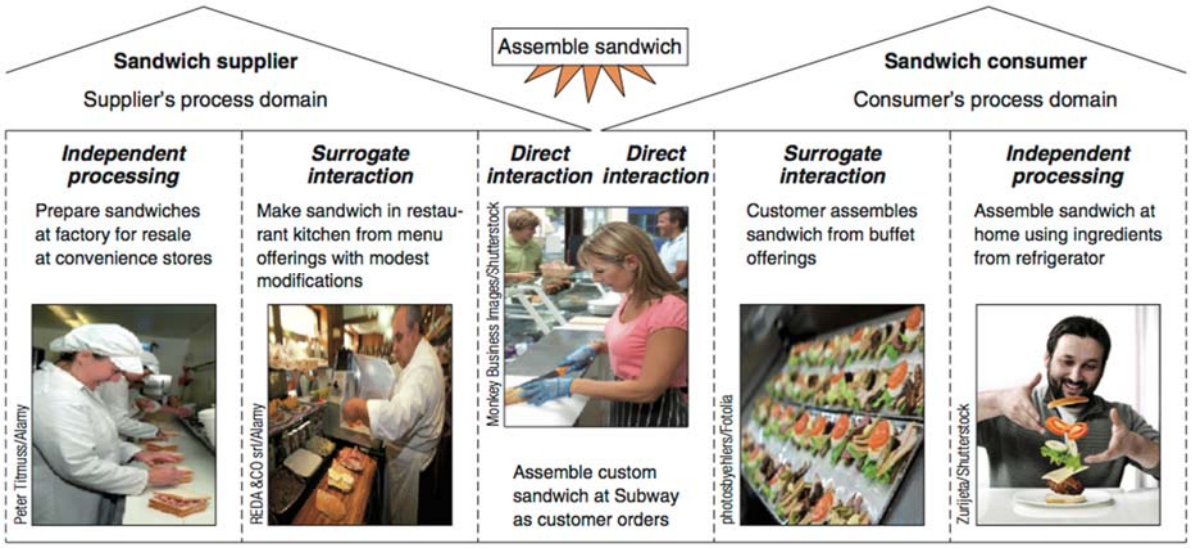


Figure 5.12

Process-Chain-Network (PCN) Analysis

1. *Direct interaction* region includes process steps that involve interaction between participants
2. The *surrogate (substitute) interaction* region includes process steps in which one participant is acting on another participant's resources
3. 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

Service Blueprint

- Focuses on the customer and provider interaction
- Defines three levels of interaction
- Each level has different management issues
- Identifies potential failure points

Service Blueprint

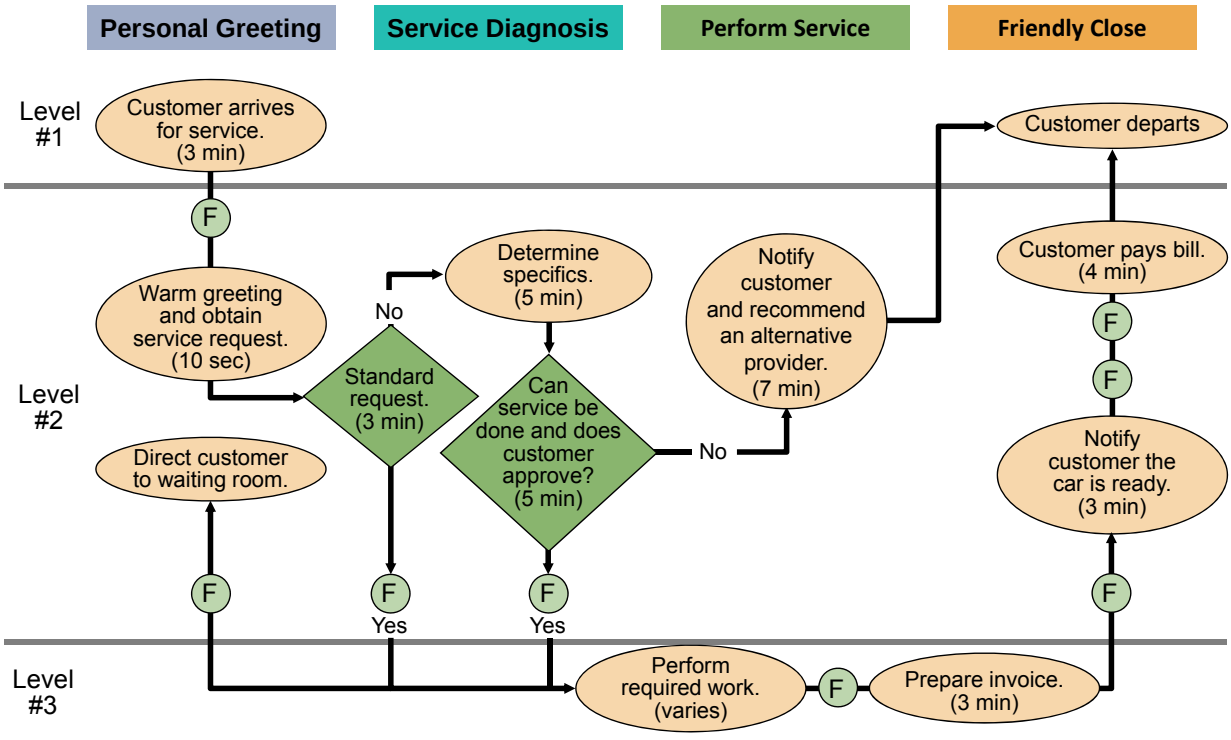


Figure 7.7

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

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

Process Analysis and Design

- 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?

Process Analysis and Design

- **Flowchart**
  - Shows the movement of materials
  - Harley-Davidson flowchart
- **Time-Function Mapping**
  - Shows flows and time frame

"Baseline" Time-Function Map

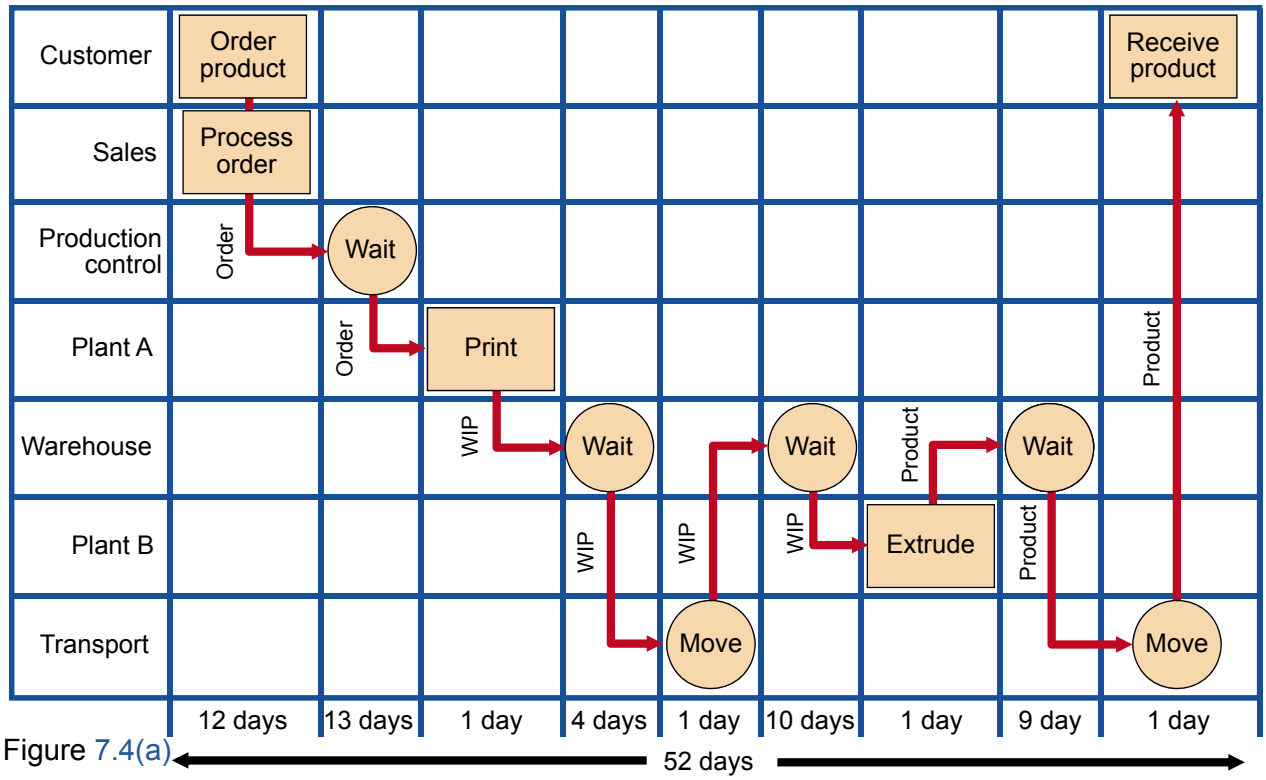


Figure 7.4(a)

"Target" Time-Function Map

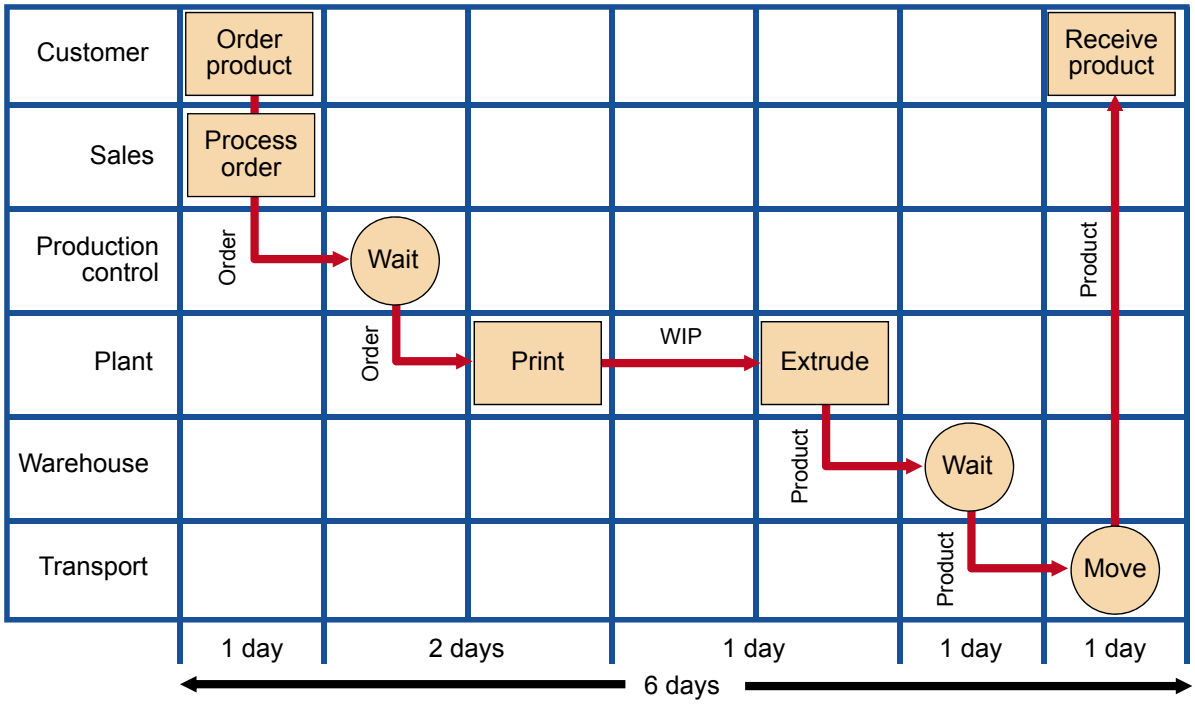


Figure 7.4(b)

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

ECRS in Process Design

Source: https://www.nairienroo.com/in-house-training/

Poka-yoke in Process Design

- Poka-yoke is a concept in total quality management which is related to restricting errors at cradle itself.
- It deals with "error proofing", fail-safing or "mistake-proofing".
- A poka-yoke is idea generation or mechanism development in a total productive management process that helps operator to avoid (yokeru) mistakes (poka).
- The technique starts by analyzing the process for potential problems, categorizing parts by the characteristics of dimension, shape & size & weight, detecting process deviation from nominal procedures and norms.

Poka-yoke in Process Design

Source: https://www.nikunjbhoraniya.com/2019/03/poka-yoke-error-proofing.html