



Assumption University of Thailand

**MGT 3905**  
Operations Management

**Chapter 4:**  
Product and Service Design

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1

## Learning Objectives

- Explain the strategic importance of product and service design.
- List some key reasons for design or redesign.
- Identify the main objectives of product and service design.
- Discuss the importance of standardization.
- Discuss the importance of legal, ethical, and environmental issues in product and service design.

2

## Learning Objectives (Cont.)

- Briefly describe the phases in product design and development.
- Describe some of the main sources of design ideas.

3

## Product and Service Design

- It is the major factor in
  - Cost
  - Quality
  - Time-to-market
  - Customer satisfaction
  - Competitive advantage

Product and service design—or redesign—should be closely tied to an organization's strategy

4

## Product or Service Design Activities

1. Translate customer wants and needs into product and service requirements
2. Refine existing products and services
3. Develop new products and services
4. Formulate quality goals
5. Formulate cost targets
6. Construct and test prototypes
7. Document specifications

5

## Reasons Design or Re-Design

- The driving forces for product and service design or redesign are market opportunities or threats:
  - *Economic*
  - *Social and Demographic*
  - *Political, Liability, or Legal*
  - *Competitive*
  - *Cost or Availability*
  - *Technological*

6

### Objectives of Product and Service Design

- Main focus
  - Customer satisfaction
  - Understand what the customer wants
- Secondary focus
  - Function of product/service
  - Cost/profit
  - Quality
  - Appearance
  - Ease of production/assembly
  - Ease of maintenance/service

7

### Designing For Operations

- Taking into account the capabilities of the organization in designing goods and services.
- Failure to take this into account can:
  - Reduce productivity
  - Reduce quality
  - Increase costs

8

### Legal, Ethical, and Environmental Issues

Designers must consider

- Legal
  - Agri-Food and Veterinary Authority, Health Sciences Authority
  - Product liability
  - Uniform commercial code
- Ethical
  - Releasing products with defects
- Environmental
  - Pollution
  - Toxic materials

9

### Regulations and Legal Considerations

- *Product Liability*: A manufacturer is liable for any injuries or damages caused by a faulty product.
- *Uniform Commercial Code*: Products carry an implication of *merchantability* and *fitness*.

10

### Designers Adhere to Guidelines

- Produce designs that are consistent with the goals of the company
- Give customers the value they expect
- Make health and safety a primary concern
- Consider potential harm to the environment

11

### Other Issues in Product and Service Design

- Product/service life cycles
- Degree of standardization
- Mass customization
- Product/service reliability
- Robustness of design
- Degree of newness
- Cultural differences
- Global product design

12

### Product or service life cycles

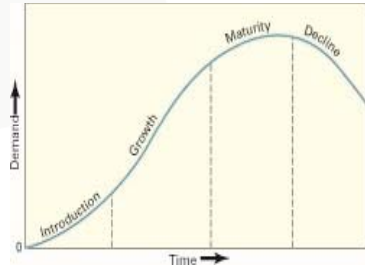


Figure 4.1  
Products or services often go through stages over time

13

### Standardization

- Standardization
  - Extent to which there is an absence of variety in a product, service, or process
- Standardized products are immediately available to customers

14

### Advantages of Standardization

- Fewer parts to deal with in inventory and manufacturing
- Design costs are generally lower
- Reduced training costs and time
- More routine purchasing, handling, and inspection procedures
- Quality is more consistent

15

### Advantages of Standardization

- Orders fillable from inventory
- Opportunities for long production runs and automation
- Need for fewer parts justifies increased expenditures on perfecting designs and improving quality control procedures

16

### Disadvantages of Standardization

- Designs may be frozen with too many imperfections remaining
- High cost of design changes increases resistance to improvements
- Decreased variety results in less consumer appeal

17

### Mass Customization

- Mass customization:
  - A strategy of producing standardized goods or services, but incorporating some degree of customization
- Tactics for mass customization
  - Delayed differentiation
  - Modular design

18

### Delayed Differentiation

- Delayed differentiation is a postponement tactic
  - Producing but not quite completing a product or service until customer preferences or specifications are known

19

### Modular Design

*Modular design* is a form of standardization in which component parts are subdivided into modules that are easily replaced or interchanged. It allows:

- easier diagnosis and remedy of failures
- easier repair and replacement
- simplification of manufacturing and assembly

20

### Reliability

- **Reliability**
  - The ability of a product, part, or system to perform its intended function under a prescribed set of conditions
- **Failure**
  - Situation in which a product, part, or system does not perform as intended
- **Normal operating conditions**
  - The set of conditions under which an item's reliability is specified

21

### Improving Reliability

- Improve component design
- Improve production/assembly techniques
- Improve testing
- Use backups
- Improve preventive maintenance procedures
- Improve user education
- Improve system design

22

### Robust Design

*Robust design:* Design that results in products or services that can function over a broad range of conditions

The more robust a product or service, the less likely it will fail due to a change in the environment

23

### Degree of Newness

- Product or service design changes:
  - Modification of an existing product or service
  - Expansion of an existing product line or service offering
  - Clone of a competitor's product or service
  - New product or service
- The degree of change affects the newness of the product or service to the market and to the organization
  - Risks and benefits?

24

### Cultural Differences

- Multinational companies must take into account cultural differences related to the product design.

25

### Global Product Design

- Virtual teams
  - Uses combined efforts of a team of designers working in different countries
  - Provides a range of comparative advantages over traditional teams such as:
    - Engaging the best human resources around the world
    - Possibly operating on a 24-hr basis
    - Global customer needs assessment
    - Global design can increase marketability

26

### Global Product Design

- *Original Equipment Manufacturer (OEM)*
  - Designs and manufactures a product based on its own specifications and sells to another company for branding and distribution
- *Original Design Manufacturer (ODM)*
  - Designs and manufactures a product according to purchaser's specifications

27

### Phases in Product Design and Development

1. Idea generation
2. Feasibility analysis
3. Product specifications
4. Process specifications
5. Prototype development
6. Design review
7. Market test
8. Product introduction
9. Follow-up evaluation

28

### Idea Generation

29

### Supply-Chain Based

- Ideas can come from anywhere in the supply chain:
  - Customers
  - Suppliers
  - Distributors
  - Employees
  - Maintenance and repair personnel

30

### Competitor Based

- By studying how a competitor operates and its products and services, many useful ideas can be generated
- **Reverse engineering**
  - Dismantling and inspecting a competitor's product to discover product improvements

31

### Research Based

- Organized efforts to increase scientific knowledge or product innovation, and may involve:
  - *Basic Research*: advances knowledge about a subject without near-term expectations of commercial applications.
  - *Applied Research*: achieves commercial applications.
  - *Development*: converts results of applied research into commercial applications.

32

### Designing for Manufacturing

Beyond the overall objective to achieve customer satisfaction while making a reasonable profit is:

#### Design for Manufacturing (DFM)

The designers' consideration of the organization's manufacturing capabilities when designing a product.

33

### Concurrent Engineering

- **Concurrent engineering**
  - Bringing engineering design and manufacturing personnel together early in the design phase
    - Also may involve marketing and purchasing personnel
    - Views of suppliers and customers may also be sought

34

### Computer-Aided Design

- *Computer-aided design (CAD)* is product design using computer graphics.
  - increases productivity of designers 3 to 10 times
  - creates a database for manufacturing information on product specifications
  - provides possibility of engineering and cost analysis on proposed designs

35

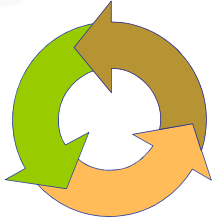
### Production Requirements

- Designers must take into account production capabilities
  - Equipment
  - Skills
  - Types of materials
  - Schedules
  - Technologies

36

### Manufacturability

- Manufacturability is the ease of fabrication and/or assembly, which is important for:
  - Cost
  - Productivity
  - Quality



37

### Reduce: Costs and Materials

- **Value analysis**
  - Examination of the function of parts and materials in an effort to reduce the cost and/or improve the performance of a product
  - Common questions used in value analysis
    - Could a less expensive part of material be used?
    - Is the function necessary?

38

### Reduce: Costs and Materials (Cont.)

- **Value analysis (Cont.)**
  - Can the function of two or more parts be performed by a single part?
  - Can a part be simplified?
  - Could product specifications be relaxed?
  - Could standard parts be substituted for non-standard parts?

39

### Remanufacturing or Re-use

- **Remanufacturing:** Refurbishing used products by replacing worn-out or defective components.
  - Remanufactured products can be sold for 50% of the cost of a new producer
  - Remanufacturing can use unskilled labor
  - Some governments require manufacturers to take back used products
- **Design for Disassembly (DFD):** Designing products so that they can be easily taken apart.

40

### Recycling

- Recycling: recovering materials for future use
- Recycling reasons
  - Cost savings
  - Environment concerns
  - Environment regulations

41

### Component Commonality

- When products have a high degree of similarity in features and components, a part can be used in multiple products
- Benefits:
  - Savings in design time
  - Standard training for assembly and installation
  - Opportunities to buy in bulk from suppliers
  - Commonality of parts for repair
  - Fewer inventory items must be handled

42

### Service Design

- Service is an *act*
- Service delivery system
  - Facilities
  - Processes
  - Skills
- Many services are bundled with products

43

### Service Design

- Service design involves
  - The physical resources needed
  - The goods that are purchased or consumed by the customer, or provided with the service
  - Explicit services
  - Implicit services

44

### Differences Between Product and Service Design

- Tangible – intangible
- Services created and delivered at the same time
- Services cannot be inventoried
- Services highly visible to customers
- Services have low barrier to entry and exit
- Location is important to service design
- Range of service systems
- Demand variability

45

### Service Systems

- Service systems range from those with little or no customer contact to very high degree of customer contact such as:
  - Insulated technical core (software development)
  - Production line (automatic car wash)
  - Personalized service (hair cut, medical service)
  - Consumer participation (diet program)
  - Self-service (supermarket)

46

### Service Demand Variability

- Demand variability creates waiting lines and idle service resources
- Service design perspectives:
  - Cost and efficiency perspective
  - Customer perspective
- Customer participation makes quality and demand variability hard to manage
- Attempts to achieve high efficiency may depersonalize service and change customer's perception of quality

47

### Service Blueprinting

- Service blueprinting
  - A method used in service design to describe and analyze a proposed service
- A useful tool for conceptualizing a service delivery system

48



# MGT 3905 - Chapter 4: Product and Service Design

