Chapter 4: Product and Service Design

Chapter 4: Learning Objectives

- You should be able to:
  - Explain the strategic importance of product and service design
  - List some key reasons for design or redesign
  - Identify the key questions of product and service design
  - Discuss the importance of standardization
  - Discuss the importance of legal, ethical, and sustainability considerations in product and service design
  - Explain the purpose and goal of life cycle assessment
  - Explain the phrase “the 3 Rs”
  - Briefly describe the phases in product design and development
### Chapter 4: Learning Objectives (cont.)

- Describe some of the main sources of design ideas
- Discuss several key issues in manufacturing design
- Name several key issues in service design
- Explain the phases in service design
- List the characteristics of well-designed service systems
- Name some of the challenges of service design

### Product and Service Design

- Major factors in strategy
  - Cost
  - Quality
  - Time-to-market
  - Customer satisfaction
  - Competitive advantage
Trends in Product & Service Design

- Increased emphasis on or attention to:
  - Customer satisfaction
  - Reducing time to introduce new product or service
  - Reducing time to produce product

Trends in Product & Service Design (Cont’d)

- Increased emphasis on or attention to:
  - The organization’s capabilities to produce or deliver the item
  - Environmental concerns
  - Designing products & services that are “user friendly”
  - Designing products that use less material
### Product or Service Design Activities

- Translate customer wants and needs into product and service requirements
- Refine existing products and services
- Develop new products and services
- Formulate quality goals
- Formulate cost targets
- Construct and test prototypes
- Document specifications

### Reasons for Product or Service Design

- Be competitive
- Increase business growth & profits
- Avoid downsizing with development of new products
- Improve product quality
- Achieve cost reductions in labor or materials
Objectives of Product and Service Design

- Development time and cost
- Product or service cost
- Resulting product or service quality
- Capability to produce or deliver a given product or service

Design For Operations

- Taking into account the capabilities of the organization in designing goods and services
### Idea Generation Sources

- Company’s own R&D department
- Customer complaints or suggestions
- Marketing research / Perceptual Maps
  - Visual comparison of customer perceptions
- Suppliers
- Salespersons in the field
- Factory workers
- New technological developments
- Competitors / Reverse engineering
  - Dismantling competitor’s product to improve your own product
- Benchmarking
  - Comparing product/service against best-in-class

### Sources of Ideas for Products and Services

- **Internal**
  - Employees
  - Marketing department
  - R&D department
  - Creativity techniques (structured and unstructured)

- **External**
  - Customers (QFD)
  - Competitors
  - Suppliers
The Design Process

- Begins with motivation for design
- To achieve goals of the organization
- Ultimately, customer is the driving force
- Must have ideas for new or improved designs

Quality Function Deployment

- Quality Function Deployment
  - Voice of the customer
  - House of quality

QFD: An approach that integrates the “voice of the customer” into the product and service development process.
Reverse Engineering

Reverse engineering is the dismantling and inspecting of a competitor’s product to discover product improvements.

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. The more general term design for operations encompasses services as well as manufacturing.
**Manufacturability**

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

**Legal, Ethical, and Environmental Issues**

- Legal
  - Food and Drug Administration (FDA), Occupational Health and Safety Administration (OSHA), Internal Revenue Service (IRS)
  - Product liability
  - Uniform commercial code
- Ethical
  - Releasing products with defects
- Environmental
  - Environmental Protection Agency (EPA)
Regulations & 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.

Research & Development (R&D)

• Organized efforts to increase scientific knowledge or product innovation & 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.
Standardization

- Extent to which there is absence of variety in a product service or process.

Advantages of Standardization

- Fewer parts to deal with in inventory & manufacturing
- Reduced training costs and time
- More routine purchasing, handling, and inspection procedures
- 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.
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.

Product Design

- Product Life Cycles
- Robust Design
- Concurrent Engineering
- Computer-Aided Design
- Modular Design
Product design

- Design for manufacturing (DFM)
- Design for assembly (DFA)
- Design for recycling (DFR)
- Remanufacturing
- Design for disassembly (DFD)
- Robust design

Design Simplification

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Sony could reshape industry with plan to cut parts by 90%. (7 Oct 2003)

Sony is planning to reduce the number of parts it uses for consumer electronics products by nearly 90 per cent in a move that could force widespread restructuring across the industry. The Japanese giant hopes to reduce the number of components used in its complex manufacturing processes from 840,000 to 100,000 by 2005.

For more than half a century, carmakers have been trying to share parts between different models to increase volumes and reduce tooling costs. But in the past two decades the push to make different cars more similar under the skin has gone faster and further than ever before as the same underlying “platform” is used for many different models. PSA Peugeot Citroen and Volkswagen are more advanced in platform-sharing than most rivals, reaping billions of euros of cost savings by producing different-looking models to sell under different names with almost identical underlying engineering.

“To produce parts in millions rather than hundreds of thousands generates huge savings for the supplier which can be passed back to the vehicle manufacturer,” said Philip Wylie, head of the automotive group at PwC, the accountants. Prof Rhys points to other gains, too. The reduction of complexity makes it far easier to manage inventories, while having fewer suppliers simplifies management of relationships.

In the case of the electronics industry, much depends on whether product designers can be encouraged to simplify new products without sacrificing product cycles and innovation rates far higher than in the automotive industry.
Can Mercedes Help Revive Chrysler? --- Daimler Is to Tie Units More Closely Together (Wall Street Journal, Feb. 6, 2007)

"We can't compete in this area [small cars] without cooperating. It's a brutally competitive market," said a person familiar with the company's internal deliberations. He added that senior executives from the company's German and American sides are mindful of the need to protect Mercedes's exclusive image and agree in principle that increased component sharing between the brands should be in areas that aren't visible to customers -- for example, sharing steering columns rather than seating materials.

Other people familiar with the matter said that Mr. Zetsche has also privately raised the idea of allowing Chrysler and Mercedes to share the platforms of some of their SUVs, such as the Mercedes M-Class and the Jeep Grand Cherokee.