

# Product and Service Design

## Chapter 4

# What Does Product and Service Design Do?

- Translate customer wants and needs into product and service requirements. (marketing, operations)
- Refine existing products and services. (marketing)
- Develop new products and/or services. (marketing, operations)
- Formulate quality goals. (marketing, operations)
- Formulate cost targets. (accounting, finance, operations)
- Construct and test prototypes. (operations, marketing, engineering)
- Document specifications.

# Reasons for Product and Service Design or Redesign

## **Economic**

(e.g., low demand, excessive warranty claims, the need to reduce costs).

## **Social and demographic**

(e.g., aging baby boomers, population shifts).

## **Political, liability, or legal**

(e.g., government changes, safety issues, new regulations).

## **Competitive**

(e.g., new or changed products or services, new advertising/promotions).

## **Cost or availability**

(e.g., of raw materials, components, labor).

## **Technological**

(e.g., in product components, processes).

# Value Analysis

Select an item that has a high annual dollar volume. This can be material, a purchased item, or a service.

Identify the function of the item.

Obtain answers to these kinds of questions:

Is the item necessary; does it have value; can it be eliminated?

Are there alternative sources for the item?

Can the item be provided internally?

What are the advantages of the present arrangement?

What are the disadvantages of the present arrangement?

Could another material, part, or service be used instead?

Can specifications be less stringent to save cost or time?

Can two or more parts be combined?

Can more/less processing be done on the item to save cost or time?

Do suppliers/providers have suggestions for improvements?

Do employees have suggestions for improvements?

Can packaging be improved or made less costly?

Analyze the answers obtained as well as answers to other questions that arise, and make recommendations.

# Objectives of Product and Service Design

Profit is the overall measure of design effectiveness.

# Legal, Ethical and Environmental Issues

## Product liability

- Produce designs that are consistent with the goals of the organization. For instance, if the company has a goal of high quality, don't cut corners to save cost, even in areas where it won't be apparent to the customer.
- Give customers the value they expect.
- Make health and safety a primary concern. At risk are employees who will produce goods or deliver services, workers who will transport the products, customers who will use the products or receive the services, and the general public, which might be endangered by the products or services.
- Consider potential to harm the environment.

# Other Issues in Product and Service Design

## Life Cycles

# Standardization

## Advantages

- Fewer parts to deal with in inventory and in 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

- 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.

# Designing for Mass Customization

- **Delayed differentiation**
- **Modular design**

# Reliability

## Potential ways to improve reliability

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

How much reliability is needed?

# Robust Design

# Taguchi's Approach

## Parameter design

# The Degree of Newness

- 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.

# Cultural Differences

# Global Product Design

# Phases in Product Design and Development

## **Idea generation.**

Product development begins with idea generation. Ideas can come from a variety of sources. This topic will be discussed in detail following this section.

## **Feasibility analysis.**

Feasibility analysis entails market analysis (demand), economic analysis (development cost and production cost, profit potential), and technical analysis (capacity requirements and availability, and the skills needed). Also, it is necessary to answer the question, Does it fit with the mission? It requires collaboration among marketing, finance, accounting, engineering, and operations.

## **Product specifications.**

This involves detailed descriptions of what is needed to meet (or exceed) customer wants, and requires collaboration between legal, marketing, and operations.

## **Process specifications.**

Once product specifications have been set, attention turns to specifications for the process that will be needed to produce the product. Alternatives must be weighed in terms of cost, availability of resources, profit potential, and quality. This involves collaboration between accounting and operations.

### **Prototype development.**

With product and process specifications complete, one (or a few) units are made to see if there are any problems with the product or process specifications.

### **Design review.**

Make any necessary changes, or abandon. Involves collaboration among marketing, finance, engineering, design, and operations.

### **Market test.**

A market test is used to determine the extent of consumer acceptance. If unsuccessful, return to the design review phase. This phase is handled by marketing.

### **Product introduction.**

Promote the product. This phase is handled by marketing.

### **Follow-up evaluation.**

Determine if changes are needed, and refine forecasts. This phase is handled by marketing.

# Designing for Manufacturing

# Concurrent Engineering

Bringing design and manufacturing engineering people together early in the design phase to simultaneously develop the product and the processes for creating the product.

## Advantages:

- Manufacturing personnel are able to identify production capabilities and capacities.
- Early opportunities for design or procurement of critical tooling, some of which might have long lead times.
- Early consideration of the technical feasibility of a particular design or a portion of a design.
- The emphasis can be on *problem* resolution instead of *conflict* resolution.

## **Difficulties:**

- Long-standing existing boundaries between design and manufacturing can be difficult to overcome. Simply bringing a group of people together and thinking that they will be able to work together effectively is probably naive.
- There must be extra communication and flexibility if the process is to work, and these can be difficult to achieve.

# Computer-Aided Design (CAD)



# Production Requirements

## Forecasts

## Manufacturability

design for manufacturing (DFM)

design for assembly (DFA)

## Recycling

- Cost savings.
- Environment concerns.
- Environmental regulations.

design for recycling (DFR)

# Remanufacturing

Refurbishing used products by replacing worn-out or defective components, and reselling the products.

design for disassembly (DFD)

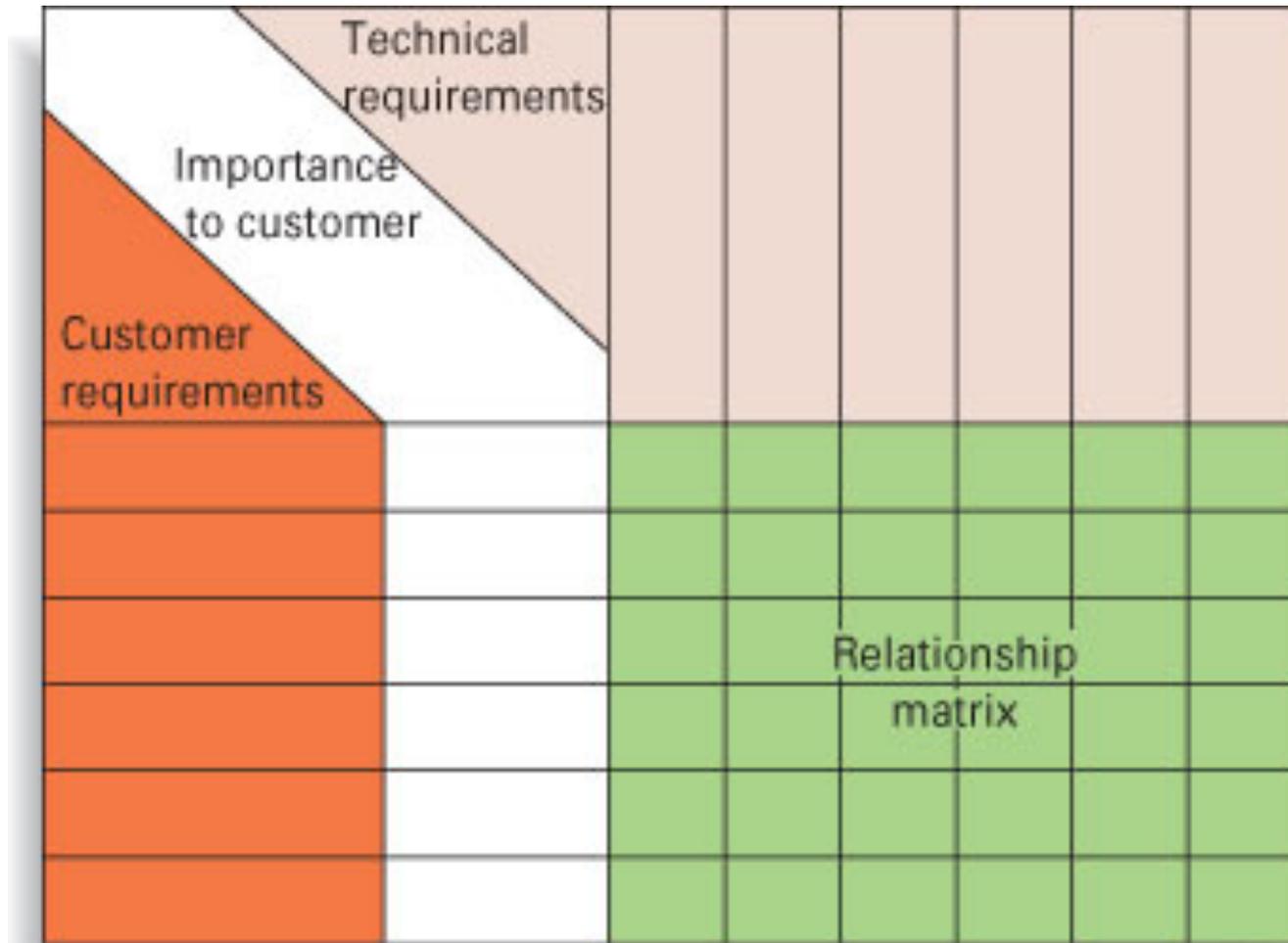
# Component Commonality

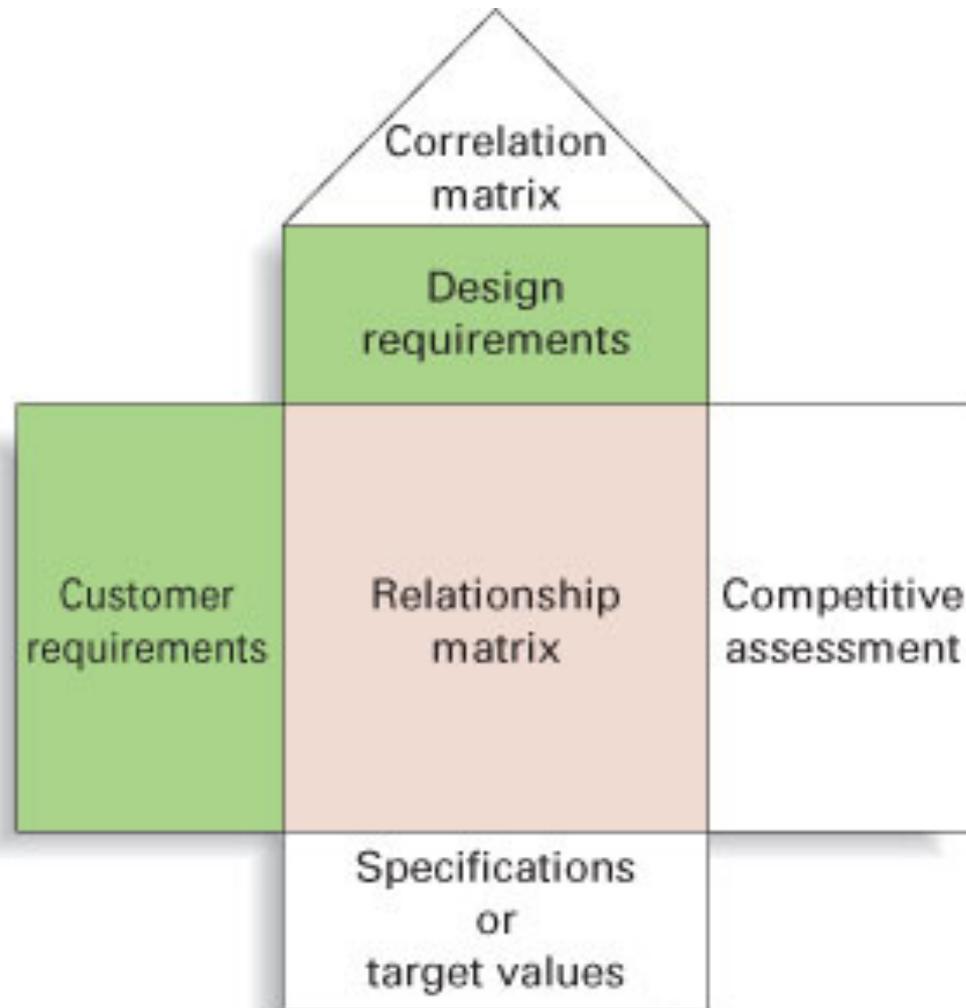
Degree of similarity of features and components.

commonality

substitutability

# Quality Function Deployment





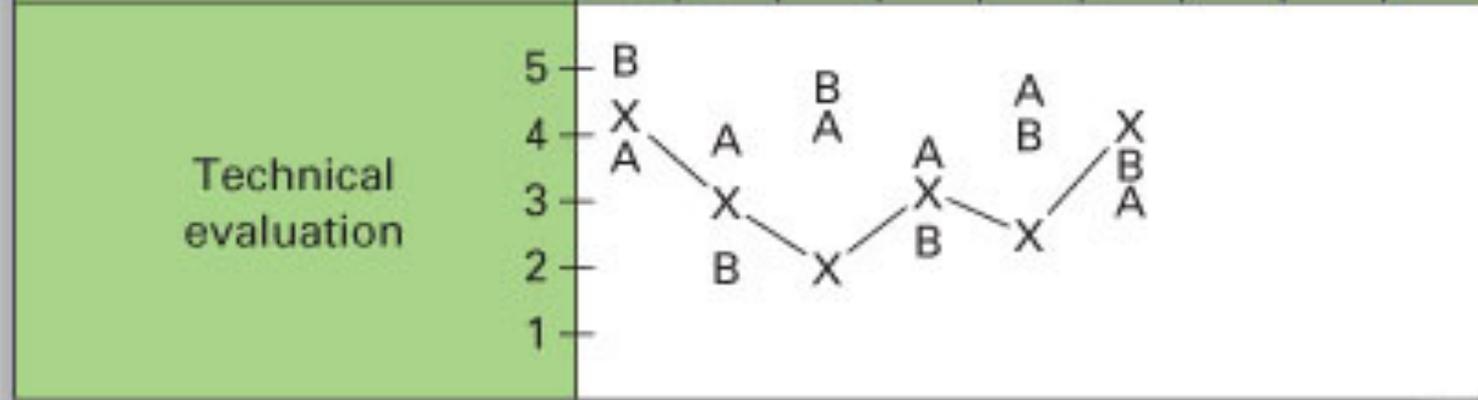


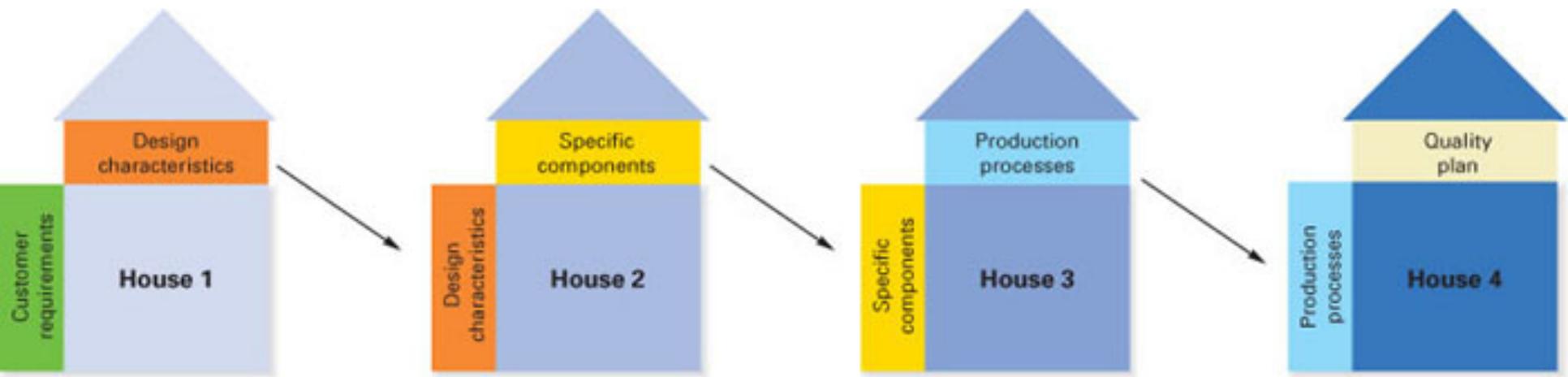
Consistent finish	1								
No ink bleed	2		●		○				
Prints cleanly	3			○	●		○		



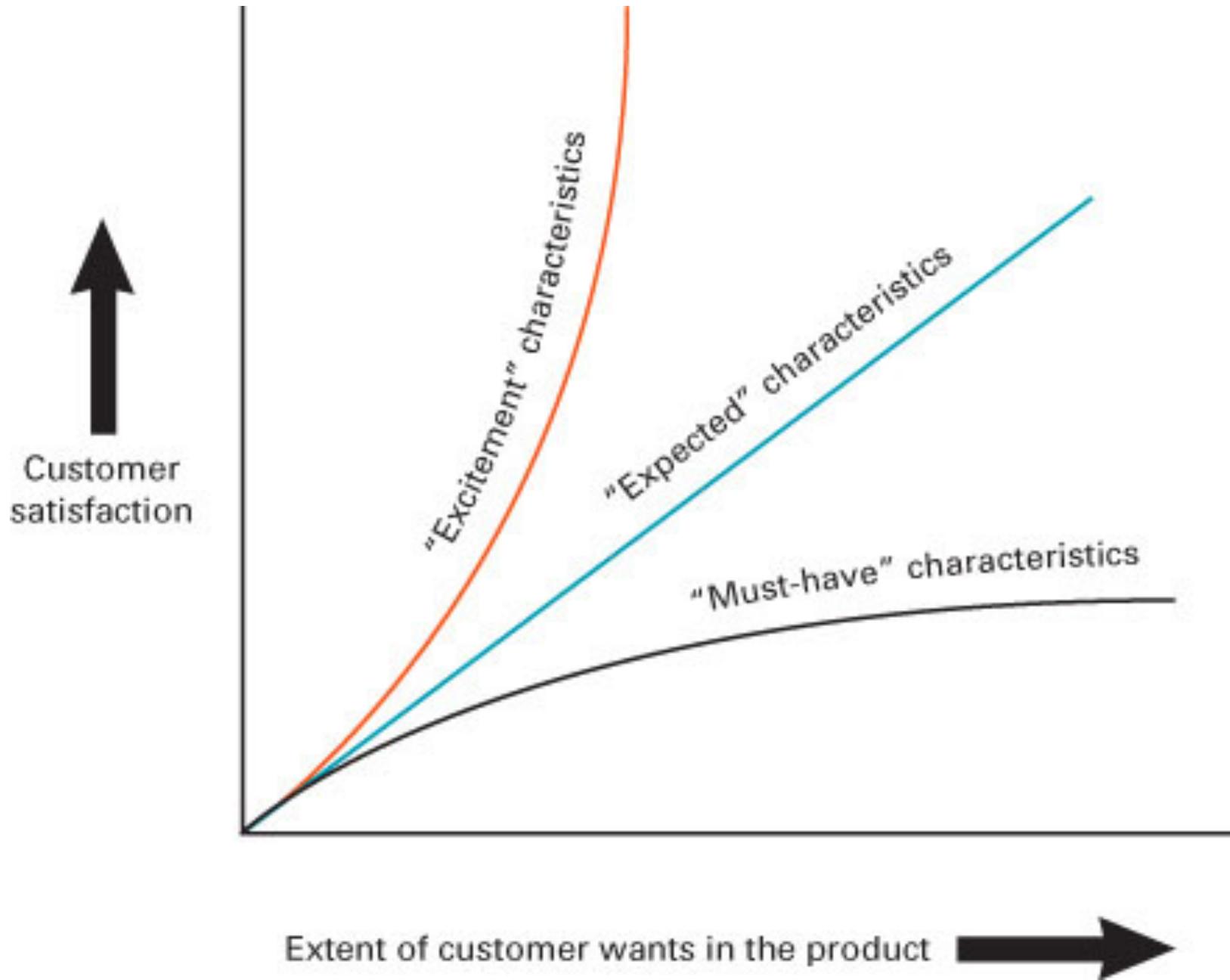
Importance weighting	3	27	36	36	27	9			
Target values	w mm	t mm	1 mm total runout	C microns	5 lbs.	within approved panel			

- Relationships**
- Strong = 9
  - Medium = 3
  - △ Small = 1





# The Kano Model



# Service Design

System design involves development or refinement of the overall service package:

- The physical resources needed.
- The accompanying goods that are purchased or consumed by the customer, or provided with the service.
- Explicit services (the essential/core features of a service, such as tax preparation).
- Implicit services (ancillary/extra features, such as friendliness, courtesy).

# Differences between Service Design and Product Design

1. Products are generally tangible; services are generally **intangible**. Consequently, service design often focuses more on intangible factors (e.g., peace of mind, ambiance) than does product design.
2. In many instances services are created and delivered at the **same time** (e.g., a haircut, a car wash). In such instances there is less latitude in finding and correcting errors *before* the customer has a chance to discover them. Consequently, training, process design, and customer relations are particularly important.
3. Services **cannot be inventoried**. This poses restrictions on flexibility and makes capacity issues very important.
4. Services are **highly visible** to consumers and must be designed with that in mind; this adds an extra dimension to process design, one that usually is not present in product design.

5. Some services have **low barriers** to entry and exit. This places additional pressures on service design to be innovative and cost-effective.
6. **Location** is often important to service design, with convenience as a major factor. Hence, design of services and choice of location are often closely linked.
7. Service systems range from those with little or no customer contact to those that have a very high **degree of customer contact**. Here are some examples of those different types:
  - Insulated technical core; little or no customer contact (e.g., software development).*
  - Production line; little or no customer contact (e.g., automatic car wash).*
  - Personalized service (e.g., haircut, medical service).*
  - Consumer participation (e.g., diet program, dance lessons).*
  - Self-service (e.g., supermarket).*If there is little or no customer contact, service system design is like product system design.
8. **Demand variability** alternately creates waiting lines or idle service resources.

# Demand variability

Reducing consumer choices makes service more efficient, but it can be both frustrating and irritating for the customer. An example would be a cable company that bundles channels, rather than allowing customers to pick only the channels they want.

Standardizing or simplifying certain elements of service can reduce the cost of providing a service, but it risks eliminating features that some customers value, such as personal attention.

Incorporating flexibility in capacity management by employing part-time or temporary staff may involve the use of less-skilled or less-interested people, and service quality may suffer.

# Phases in the Service Design Process

Conceptualize Idea generation

- Assessment of customer wants/needs (marketing)

- Assessment of demand potential (marketing)

Identify service package components needed (operations and marketing)

Determine performance specifications (operations and marketing)

Translate performance specifications into design specifications

Translate design specifications into delivery specifications

# Service Blueprinting

Establish boundaries for the service and decide on the level of detail needed.

Identify and determine the sequence of customer and service actions and interactions. A flowchart can be a useful tool for this.

Develop time estimates for each phase of the process, as well as time variability.

Identify potential failure points and develop a plan to prevent or minimize them, as well as a plan to respond to service errors.

<b>Customer actions</b>	<i>Arrive</i>	<i>Seated</i>	<i>Order</i>	<i>Eat</i>	<i>Pay and leave</i>	
<b>line of information</b>	<hr/>					
<b>Contact persons</b>	Greeted by hostess Hostess checks reservation Hostess escorts customers to their table	Greeted by server Server provides menus Server fills water glasses	Server describes specials Server takes orders	Dinners are served	Server occasionally checks to see if any problems Server brings the check Server receives payment	Busboy clears table
<b>line of visibility</b>	<hr/>					
<b>Backstage contacts</b>			Kitchen staff prepares food			Dishes are washed
<b>line of internal interaction</b>	<hr/>					
<b>Support</b>	Reservation system		Ordering food		Cashier	Laundry service

# Characteristics of Well-Designed Service Systems

Being consistent with the organization mission.

Being user friendly.

Being robust if variability is a factor.

Being easy to sustain.

Being cost-effective.

Having value that is obvious to customers.

Having effective linkages between back-of-the-house operations (i.e., no contact with the customer) and front-of-the-house operations (i.e., direct contact with customers). Front operations should focus on customer service, while back operations should focus on speed and efficiency.

Having a single, unifying theme, such as convenience or speed.

Having design features and checks that will ensure service that is reliable and of high quality.

# Challenges of Service Design

There are variable requirements. This creates a need for a robust design that will accommodate a range of inputs and perhaps a range of outputs.

Services can be difficult to describe. By their very nature, verbal descriptions can be somewhat imprecise.

Customer contact is usually much higher in services.

Service design must take into account the service-customer encounter. There can be a relatively large number of variables to deal with in the service-customer encounter.

# Guidelines for Successful Service Design

Define the service package in detail. A service blueprint may be helpful for this.

Focus on the operation from the customer perspective. Consider how customer expectations and perceptions are managed during and after the service.

Consider the image that the service package will present both to customers and prospective customers.

Recognize that designer familiarity with the system may give them a quite different perspective than that of the customer, and take steps to overcome this.

Make sure that managers are involved and will support the design once it is implemented.

Define quality for both tangibles and intangibles. Intangible standards are more difficult to define, but they must be addressed.

Make sure that recruitment, training, and reward policies are consistent with service expectations.

Establish procedures to handle both predictable and unpredictable events.

Establish systems to monitor, maintain, and improve service.