Service Strategy, New Service Development, Locating facilities and designing layout, Service Quality

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- Service Strategy and Competitiveness
  - Development of Strategic Service Vision (SSV),
  - Data Envelopment Analysis
- New Service Development
  - NSD cycle,
  - Service Blueprinting,
  - Elements of service delivery system Service Design
  - Customer Journey and Service Design, Design Thinking methods to aid Service Design
- Locating facilities and designing their layout
  - models of facility locations (Huff's retail model),
  - Role of service-scape in layout design
- Service Quality
  - SERVQUAL,
  - Walk through Audit,
  - Dimensions of Service quality & other quality tools

Why Service Operations?

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- The word 'Operations' is defined as the transformation process in which inputs in the form of people, raw material, technology and money are transformed using some process to an output as goods, service or products

- Many service organizations are labor intensive – humans contribute the most as input factor in transformation process. The output also involves human beings.

- Involvement of customer in production and consumption of service makes service operations very dynamic.

Why Service Operations?

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- The absence of set standard practices and performance measures due to human dynamics make service operations a challenging task.

- The other dimension which brings more challenges in the services is the involvement of people from different functional areas of an organization. Eg, Finance, Mgmt, Mktg, HR, IT, etc

A Classification of Service Industry

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Degree of Labor Intensity	Degree of Interaction and Customization: Low	Degree of Interaction and Customization: High
Low	**Service Factory** *Airlines, hotels*	**Service Shop** *Hospitals, repair services*
High	**Mass Service** *Retailing, Schools*	**Professional Service** *Lawyers, accountants*

Degree of Labor Intensity:
Ratio of labor cost to capital cost

200 years ago, Machines Caused a Revolution that Transformed Agri- Economy into Industrial Economy.
Today, Computers and Information Technology is Creating a Revolution that is Transforming our Industrial Economy into a Service Economy

Service Process Matrix - Challenges

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- Low interaction/low customization: Service Factory
  - Marketing; Attention to physical surroundings

- High interaction/high customization: Professional Service
  - Cost control; Quality; Advancement of employees; Flat hierarchy; Employee loyalty

- Low labor intensity:
  - Capital decisions;
  - Technology advances;
  - Peak/Off-peak management;
  - Scheduling service delivery poses challenges for service organizations belongs to Service factory and service shop.

Service Process Matrix - Challenges

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- High labor intensity:
  - Hiring and training;
  - Development of methods and Workforce scheduling poses challenges in mass services and professional services

Pro

Challenges for managers
(low labor intensity):
- Capital decisions
- Technological advances
- Managing demand to avoid peaks and to promote off-peaks
- Scheduling service delivery

Challenges for managers
(low interaction/ low customization):
- Marketing
- Making service "warm"
- Attention to physical surroundings
- Managing fairly rigid hierarchy with need for standard operating procedure

Service factory (low labor/low interaction and customization)	*Service shop* (low labor/high interaction and customization)
Mass service (high labor/low interaction and customization)	*Professional service* (high labor/ high interaction and customization)

Challenges for managers
(high interaction/ high customization):
- Fighting cost increases
- Maintaining quality
- Reacting to consumer intervention in process
- Managing advancement of people delivering service
- Managing flat hierarchy with loose subordinate–superior relationships
- Gaining employee loyalty

Challenges for managers
(high labor intensity):
- Hiring
- Training
- Methods development and control
- Employees' welfare
- Scheduling workforces
- Control of far-flung geographical locations
- Start-up of new units
- Managing growth

What is strategy?

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- Determination of basic long-term goals and objectives of an enterprise, and adoption of courses of action and allocation of resources necessary for carrying out those goals.
- Deliberate search for a plan of action to develop business competitive advantage & compound it.
- Strategy provides a path or direction and a destination to aim for by defending and sustaining competition.
- Strategy helps the organizations to focus on core competencies
- A properly designed strategy reduces uncertainty and provides consistency in organizing and dealing with experiences.

Service strategy

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- Strategy provides guidelines for service organizations for designing services, competitive strategies and service delivery systems.
- Who will be the customers?
- What can be offered to potential customers which competitors do not?
- On what customer desires will a service organization compete?
- How will the business grow?
- Why a service organization should be the first choice of customer?
- Are customer's expectations aligned with the service concept? Do customers see value in my service product?
- How to create value?

Externally Oriented Service Vision						
Basic Element	Integrative Element	Basic Element	Integrative Element	Basic Element	Integrative Element	Basic Element
Target Market Segment	Positioning	Service Concept	Value cost leveraging	Operating Strategy	Strategy - Systemeic integration	Service delivery System
What are the common characteristics of important makes segments? What dimensions can be used to segment the market Demographic? Psychographic? How important are the various segments? What needs does each have? How well are these needs being served? In what name? By whom?	How does the service concept process proposes to meet customer needs? How do competitors meet these needs? How important are these differences? What is good service? Does the prposed service provides it? What efforts are required to bring customer expectations and service capabilities into alignment?	what are the important elements of the servie to be provided, stated in the terms of results produced for the customer? How are these elemnts supposed to be perceived by the traget segment? By the market segment? By employees as a whole? How do the customers percieve the service concept? What efforts does this suggest in terms of the manner in which the service is: Designed? Delivered? Marketed?	To what extent are thedifferences between perceived value and cost of service maximized by: Standardization of certain elements? Emphasizing easily leveraged services? Management of supply and demand? Control of quality through - Rewards? Appeal to pride? Visibility and supervision? Peer group control? Involving the customer? Effective use of data? To what extent does this effort creates barriers to entry by potential competition?	What are important elements to strategy? Opeartions? Financing? Marketing? Organization? Human Resurces? Control? On which will the most efforts concentrated? Where will the investeemnts be made? How will quality and costs be connected? measured? Incentives? Rewards? What results will be expected verses competition in terms of: Quality of service? Cost profile? Productivity? Morale and loyalty of service?	strategy and delivery system internally consistent? Can needs of the strategy be met by the deliverysystem? Including what changes must be made in: The operating strategy? The service delivery system? To what extent does the concentration of operating strategy and service delivery system ensure: High quality? High Productivity? High morale and loyalty of servers? To what extent does this integration provide barriers to entry to competition?	What are the important features of service delivery system including: The role of people? Technology? Equipment? Layout? Procedures? What capacity does it provide? Normally? At peak levels? To what extent does it: Help ensure quality standards? Differentiate the service from competittion? Provide barriers to entry by competition?

Demographics vs Psychographics

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Psychographic Segmentation and The Art of Persuasion

Demographics
- Age
- Gender
- Occupation
- Location
- Education
- Marital status

Psychographics
- Personality traits
- Lifestyle
- Attitudes
- Values
- Interests
- Beliefs

Internally Oriented Service Vision

Basic Element	Integrative Element	Basic Element	Integrative Element	Basic Element	Integrative Element	Basic Element
Target Market Segment	Positioning	Service Concept	Value cost leveraging	Operating Strategy	Strategy - Systemeic integration	Service delivery System
what are common characteristics of important employee groups?	How does the service concept proposes to meet employee needs?	What are the important elements of the service to be provided, stated in terms of results produced for the employees and the company?	To what extent are differences between returns to employees and the level of efforts they put forth maximized by:	How important is direct human contact in the provision of service?	To what extent are the strategy and the delivery system for serving important employee groups internally consistent?	What are important sources of the service delivery system?
What domensions can be used to describe theseemployees?	How do competotors meed such needs?	How are these elements supposed to be perceived by the targeted employee group?	The desing of service concept? The design of elemts of the operating strategy? Job Design?	To what extent employees have been involved in the design of service concept and operating strategy?	To what extent does theintegration of operating strategy and service delivery system ensure:	The role of the people? Technology? Equipment? Layout?
Demographic? Psychographic?	How are the relationships with employees differentiated with those between competitors and their employees?	How are these elements perceived?	The leveraging of scarece skill with support systems?	How desirable is to increase employee satisfaction?	High quality? High Productivity? Low cost? High morale andbonding of the target employee group?	What does it require of target employee groups?
How important are these groups to the delivery of the seervices?	How important are these differences?	What further efforts does this suggest in terms of manner in which the service is:	The management of supply and demand?	Increase empliyee productivity?		Normally? At peak periods of activity?
What needs does each group have?	What is good service to empoyees?	Delivered? Designed?	Control of quality through:	What incentives are provided for:		To what extent does it help employees:
How well these needs are being served?	Does the prposedservice concept provide it?		Rewords? Appeal to pride? Visibility? Supervision? Peer group control? Involving the customer in delivery of the service? Effective use of data?	Quality? Productivity? Cost?		Meet quality standards? Differentiate their sevice from competitors? Achieve expectations about quality of worklife?
In what manner? By whom?	what efforts are required to bring employee expectations and service capabilities into alignment?			How does the strategy address employee needs for: Selection, Assignment, Development, Evaluation, Compensastion, association.		

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Service Quality Wheel

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How to formulate service strategy?

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- A competitive service strategy must consider customer's expectations and the competitive environment.
- A service organization must define service value which should be aligned with the perceptions of customers.
- After capturing service value and competitive environment, a service organization must develop a strategic service vision.
- Strategic service vision needs a cross-functional approach with clear service concept to develop an appropriate service delivery system.
- Create value to achieve competitive edge.
- Incorporate Role of Information in formulating strategy to achieve Competitive Advantage.

Challenges in Formulating the Right Service Strategy

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- Unlike manufacturing, Services are not Capital-intensive. Hence, there are Low Entry Barriers for Competitors.
- It is difficult and rare to file Patents for Innovative Services. Hence, Services can be imitated by New-comers.
- Services cannot take advantage of economies of scale by keeping Buffers of Inventory.
- Unlike Manufacturing Strategy, Services cannot Focus on Low Cost Strategy thru Volume Discounts,
- Latest Technology Advancements may Lead to Introduction of some Product Innovation Rendering some Existing Services Obsolete.
- Customer Loyalty?
- Product innovation

Approach to Formulating a Strategic Service Vision

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- Analyze Proposed Service wrt 3 Generic Business Strategies
  - Cost Leadership
  - Differentiation
  - Focus
- Develop Service Value Model Based on 4 Generic Strategies, Keeping Customer View Always – Price, Convenience, Reputation, Safety
- Perform Competitive Analysis – External View thru Porter's 5 Forces Analysis
- Perform Internal Analysis to Determine Efficacy Against External View – SWOT Analysis

Approach to Formulating a Strategic Service Vision

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- **Based on Above – Generic, External, Internal, Formulate Entrepreneur's Vision of Customer's Unmet Need**
- **Information is Crucial to Service Society. Develop Information Framework for Competitive Strategy**
- **Further, Today's Service Society MUST Meet Triple Bottom Line – Profit, People, Planet – Economic, Social, Environmental Growth**

Strategic Service Vision – Southwest Airlines

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Service Delivery System	Operating Strategy	Service Concept	Target Market Segment
• Fun cabin atmosphere to differentiate service • Use only Boeing 737 aircraft to control maintenance and operating costs • Hire cabin crew based on attitude	• Quick turnaround at gate results in high utilization of aircraft • No assigned seating rewards punctuality and promotes on-time performance	• Short flights with frequent departures • Serve peanuts and soft drinks only • Use of inner-city or low traffic airports avoids congestion • Carry-on luggage	• State of Texas residents • Business traveler who drives because of inadequate service • Inexpensive family travel on weekends

Strategic Service Vision – QSR

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Service business' strategy

Strategic service vision

Service delivery system	Operating strategy	Service concept	Target market Segment
600 branches in Taiwan Fun and warm atmosphere to differentiate service Outside dining area Phone call delivery Hire employees based on attitude The use of spacious store-front shops	Provide better follow-up services Clean environment Fresh smelling quality food Affordable meals with great service Family environment providing kids friendly services Candies for kids after meals to make them happy	Fast delivery of meals with good attitude Serve only the best quality sauce, seasoning and ketchup Use of uniform for Employees to convey quality service Unique children area	local and international students, for example Yuan Ze University's students the people of Taoyuan who want to grab a quick bite instead of making breakfast or lunch passersby who want to grab a quick meal in comfort people who enjoy dining outdoors

Generic Competitive Strategies - Cost Leadership

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- **Overall cost leadership strategy can be attained by being the low cost producer in the industry while providing almost same benefits as of competitors.**
- **Sources of overall cost leadership strategy are:**
  - **Achieving economies of scale**
  - **Leveraging on learning curve effects (standardize services)**
  - **Introducing innovative techniques (ATM, self service, involving customer in the process)**
  - **Minimizing and controlling overheads (Hub & Spoke, cross docking)**

Eg. Wal-Mart has no-frills self-service stores which provide lowest prices. Wal-Mart has a very good supplier and distribution network. Wal-Mart collaborates with suppliers to develop them and help them in their manufacturing processes to minimize the overall cost and hence charge less price to the customer.

Cost Leadership

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How to achieve cost advantage?

- Provide standard services
- Routine professional services
- Offer no-frill service products
  - Spice jet is a no frill airlines in India
- Reduce transaction costs
  - ATMs have reduced the personal element in banking sector tremendously
  - ETFs
- Run service operations like factory
  - A small restaurant offering limited menu helps in quick table turnover, hence hires less skilled employee at lower wages.
- Seeking out low cost customers
  - Spice jet airlines targets price sensitive customers

Generic Competitive Strategies - Differentiation

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- Differentiation strategy is achieved by a service organization when the service provided is perceived to be unique by the customers.

- Customers generally are willing to pay a premium price for the uniqueness of a service and will become loyal customers of the service organization

- Differentiation can be achieved by offering unique features
  - Product attributes
  - Brand image
  - Delivery system
  - Technology
  - Customization
  - Location
  - Quality (warranties, reliability, after sales service)
  - Eg. Emirates Positioning as mid-point of Asia, Europe Gateway

Generic Competitive Strategies - Focus

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- Focus strategy involves concentrating on a narrow or limited customer/product segment.

- Serve narrow segment effectively and efficiently by having
  - Cost focus within a limited market
  - Differentiation focus for limited market

- Cost Focus
  - Serve set of customers which are inexpensive to serve

- Differentiation Focus
  - This strategy is best suited to situations where customers have distinctive preferences or specialized needs

- The focus can be specific to
  - Particular Buyer Group: METRO only members can access
  - Service Offered: Specialized hospitals
  - Geographic region: Nilgiris grocery chain in south India

Sources of Service Sector Growth

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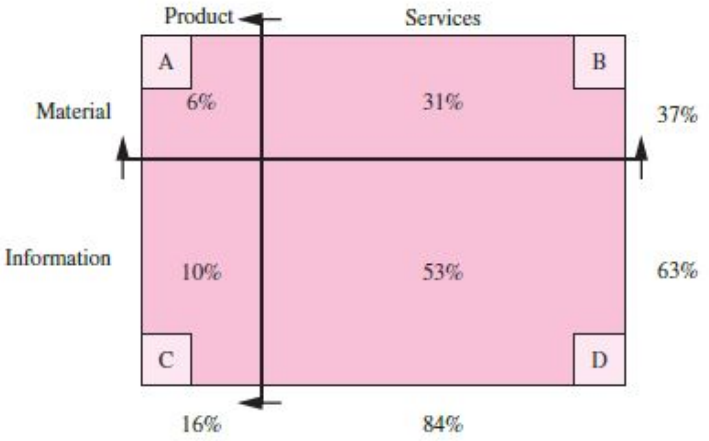
Information Technology

- **Miniaturization** of Information technology **devices**, mobile phones, hand-held devices, helps in using the IT services in **remote locations** and by **all the people** (Meesho)
- **Banking** – online has **impacted the visits** to Bank by customers
- **Healthcare** – **Evaluation** of X-ray films done at **remote locations,**

FIGURE 1.7
Distribution of GDP in the U.S. Economy

Source: Karmarkar, Uday and Uday M. Apte. "Operations Management in the Information Economy: Information Products, Processes, and Chains," *Journal of Operations Management* 25 no. 2 (March 2007), p. 440.



Sector	Description	Example
A	Physical Products	Automotive, Steel, Chemicals
B	Physical Services	Transportation, Retailing
C	Digital Products	Computers, DVDs, HDTV
D	Information Services	Finance, Telecommunications

- In future, **major** part of US **GDP** will be generated by "**information chains**" rather than supply chains.
- Information chains **will impact** the **process economics.**
- Technological developments will **drive** the **economies of process.**

Information Technology

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- Information in any Service Organization represents large percentage of cost structure to manage and store

  Example: A hospital captures, stores and process information on patient records, test results and insurance claims

- Information Technology helps achieve competitive advantage

- IT based entry barrier.

  American Airlines introduced SABRE reservation system which altered industry structure by creating switching costs among reservation agents. It helped AA achieve higher level of capacity utilization than competitors.

- IT helps in eliminating cost and time utilized for manually undertaking repetitive tasks of information processing. This helps in reducing overall cost and exhibit overall low cost strategy.

Information Technology

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- IT helps merge various services like Banking and Insurance to provide differential service products with large variety.

- IT helps in achieving lower overall costs by avoiding traditional distribution channels and physical search of suppliers and buyers.

Internet as a Service Enabler

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- E mails
- Online chat
- Industry 4.0
- Social Media
- www.
- GPRS etc.

Location does not have impact on operations

- Internet – collection of interconnected computer networks
- www – Collection of interconnected documents and other resources, joined by hyperlinks, URLs (uniform resource locators)

Internet - ideal vehicle for connecting with customers, providing location specific information. Information gets push thro notifications.

Innovation

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Push Theory of Innovation – When R&D or technology breakthrough drives the launch of new product. The new product concept gets formed in laboratory with a scientific theory.

- **3M Post-it notes – poor adhesive issue**
- **Quartz**

DVD – DVD Players – Rentals (*) – Internet – Free Downloads – OTT Platforms (no DVD)

*** - demand for old movies**

Pull Theory of Innovation - If an organization identifies a real customer problem/need first, and then search for a solution,

- **Miniaturization of digital cameras**
- **Floating interest rates for loans**

New Product development & Technology upgradation has impact on service innovation

Innovation

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Unexpected events can generate innovative practices

- **Ola Boats during Chennai floods**
- **Vaccination with Hotel stay during pandemic**
- **Luxury hotels taking villas during pandemic**
- **Instituting an airport shuttle since the hotel is far away from airport or 24*7 receipt and dispatch of customers**

Service innovation can arise from exploiting information available from other activities

- **Sale of spares can help in analysing the problem areas in the product**
- **Bank transaction statement can help in filing IT returns or review by IT personnel regarding wealth of a person?**

Service innovations face problems in testing the idea. Building prototypes.

- **Burger King – acquiring a warehouse in Miami to create replica of their outlets**

Innovation

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Innovation can be defined as successful exploitation of new ideas. Innovation is essential because:

- **Low entry barriers in service**
- **Few patent protection**
- **Lower capital investments**
- **Shorter service product cycles**

Innovation

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Challenges to Service Innovation:

- **Innovation is dismissed as mere imitation or Facilitation**
- **Service Innovation may not be result of deliberate activity at all**
- **Recognition is Post-Facto after Customer Starts Enjoying Benefits**
- **Service Innovation more difficult, as it requires both Product, process and technology integration.**
- **Even Service Organizations may not recognize Innovation and confuse with just quality service or client request**
- **Are incremental as the customer also participates in the process, can not be tested in a laboratory.**

Innovations in Services – levels of service innovations

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New Service Category	Descriptions	Examples
Radical Innovations		
Major Innovations	New services for markets as yet undefined. Those innovations are usually driven by information and computer based technologies.	Wells Fargo internet banking launched in 1995.
Start-up Business	New services in a market that already is served by existing services	AIRBNB
New Services for market presently served	New service offerings to existing customers of an organization (although the services might be available from other companies)	ATMs getting located in malls etc.
Incremental Innovations		
Service line extentions	Augmentation of existing service lines such as adding new menu items, new routes, new courses	Singapore Airlines's first class airport check-in in a special, exclusive lounge, adding the local taxi services.
Service improvements	Changes in features of services that are offered currently	Indigo using ATM like kiosk to issue boarding pass.
Style Changes	Most common of all "new services". These are modest forms of visible changes that have impact on customer perceptions, emotions, attitutdes. Style changes do not change the service fundamentally, only its appearance.	Theme based retaurants, full services flower shops

Technology in Service Innovation

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Innovation is destroyer of tradition.

Productivity of new technology changes the nature of work.

Challenges

- Making employees familiar with new technology (computerization, New programs)
- Making customer familiar with changes, train them to adopt, taking feedback
- How to avoid problems in the future (security, fail safe)

- Airport Check-in
- CC TV cameras at ATMs
- Google pay – Jan-dhan Accounts
- Remote access in Fiat Stilo
- Tapping the credit card @5000
- Self check-out in malls

Challenges in adopting New Technology in Services

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Success of any technological innovation, particularly for front office depends on customer acceptance.

- **Customer might have to do few additional activities (Self check-in at Airports, depositing checks or cash in ATMs, generating PIN)**
- **Customer may require training (Self service Petrol Pumps, Self check-out in retail stores, self check-in at airports)**
- **Customer might have to forgo some benefits (early check-in for Indigo)**

Challenges in adopting New Technology in Services

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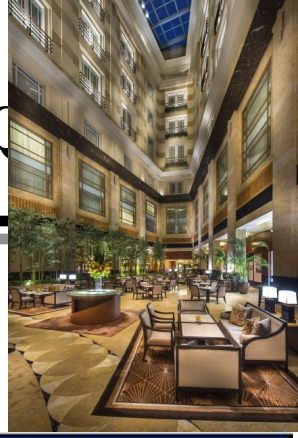
Back office innovation

Does not impact the customer directly, can create complications of different sorts.

GST – required, acceptance by all the states, implementing the process with all companies, computerization, training. Convenience GST offered to all the organizations. Government was pushing this concept as it made sense to them.

Since technology is available to all, the initiatives of one company is adopted by others very fast.

New Service Development



Technology – Driven Service innovation

Source of Technology	Service Example	Service Industry Impact
Power/Energy	Jet Aircraft	International flights are feasible
	Nuclear Energy	Less dependence on fossile fuel
Facility Design	Hotel Atrium	Feeling of grandeur / spaciousness
	Enclosed sports stadium	Year round use
Materials	Photochromic Glass	Energy conservation
	Synthetic Oil Engine	Fewer oil changes
Methods	Just-in-Time	Ereduce supply chain inventories
	Six Sigma	Institutionalize quality effort
Information	E-commerce	Increase market to worldwide
	Satellite TV	Alternate to cable TV

Drivers of Innovation

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- Financial pressures or increased competition to decrease costs, increase efficiency
- The changing economy
- Stricter government regulations
- Need for sustainable development
- Shorter product life cycles
- Community and social expectations and pressures
- Demographic, social, and market changes
- Rising customer expectations regarding service and quality
- Greater availability of potentially useful and inexpensive new technologies
- New ideas from customers, strategic partners, and employees

Changing Demographics

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An important issue on service operations management

- Number of restaurants in a locality as compared to 10 years back
- Zomato, swiggy
- E-commerce
- Aging population in US, Japan – Old age homes, financial services, health care services
- Investment advisors
- Leisure activities – adventure sports etc.

New Service Development

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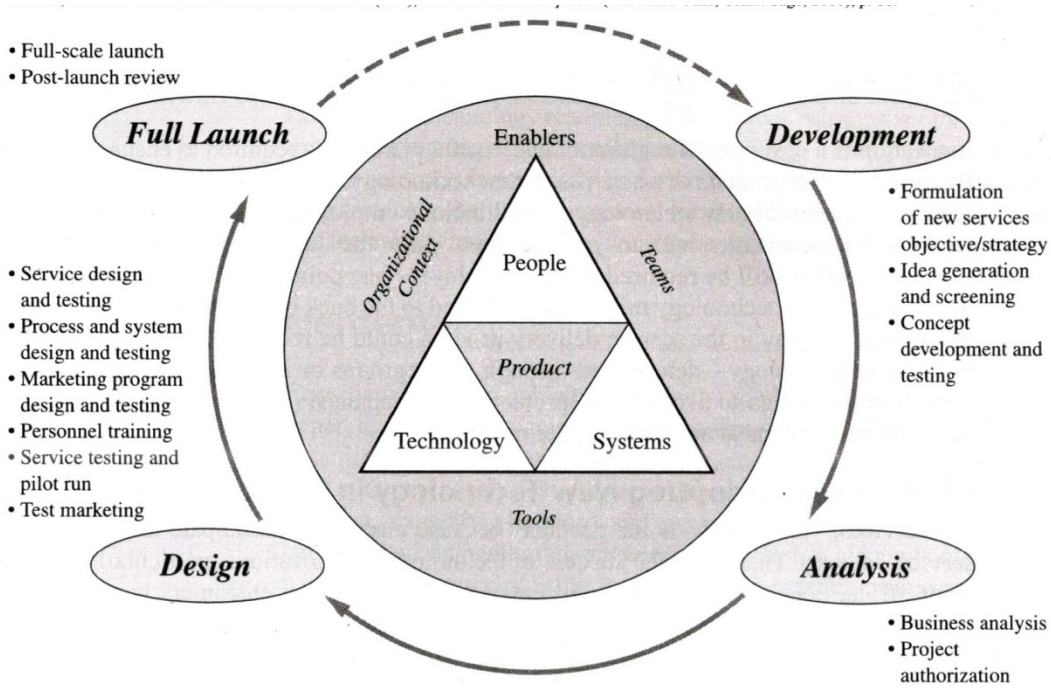
Enablers: people, systems and technology

People: Employees and Customers

Employees: to be recruited, trained and empowered: computers, decision making?

Role of customer in the process needs to be defined: self check-in?



- Customer suggestions (on menu card)
-Employees can be trained to listen customer concerns
-Mining of customer database (loan by bank)
-Trends in customer demographics
-Technology

Idea screened, winning concept developed, tested. If passed, concept goes to Analysis stage

To define appropriate systems for the process: loan records will be in back office, to support front office?, On-line booking?

New Service Development

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Formulation of New Service Objective / Strategy

- Align Service Strategy with Organization's overall strategy
- How customers value new service and how customers evaluate competing services

Idea Generation

- Gather ideas from customers, employees, customer complaints, feedback, stakeholders and competition

Idea Screening

- Only viable and promising ideas considering corresponding potential profits are separated and selected from gathered ideas

Concept Development & Testing

- Service concept, a description of benefits, solutions and value, which a service is supposed to provide, is developed.
- Concept testing is done to verify potential customer's response to service concept
- Have customers understood the idea of proposed service so that they can evaluate the service on value and benefits

Business Analysis

- Economic viability of new service after concept testing
- Whether there is large enough market and if so, the service will be able to generate reasonable profits.
- Revive projections and cost analysis are done, recommended to top management for implementation, if found viable.

Project Authorization

- Approval of Top Management
- Allocation of resources for design and delivery of new service

New Service Development

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Service Design & Testing

- Detailed description of service with specific features and characteristics of the service
- Its important to analyse and present how new service would be different from competition
- The whole set of service features require all the functional areas to work in parallel

Process, system design and Testing

- Service can be treated as process and product both
- Each new service process is designed by capturing the following points
  - If the customer will be in direct contact with service employee
  - Participation of customer in service delivery
  - Facilitating goods and equipment's in service delivery

Marketing program design & testing

- Develop & Test marketing program for introduction, sales and distribution of new service

Personnel Training

Service Testing & Pilot Run

- Offer Service on a limited basis with live testing
- Determine customer acceptance, feedback fro customer for refinement in service

Test Marketing

- Investigate the scalability of the new service by offering service on limited basis but larger scale than pilot run

Full Scale Launch

Post Launch Review

- Determine degree of achievement of objectives
- Conduct reviews on regular intervals
- Make improvement

Service Design Elements

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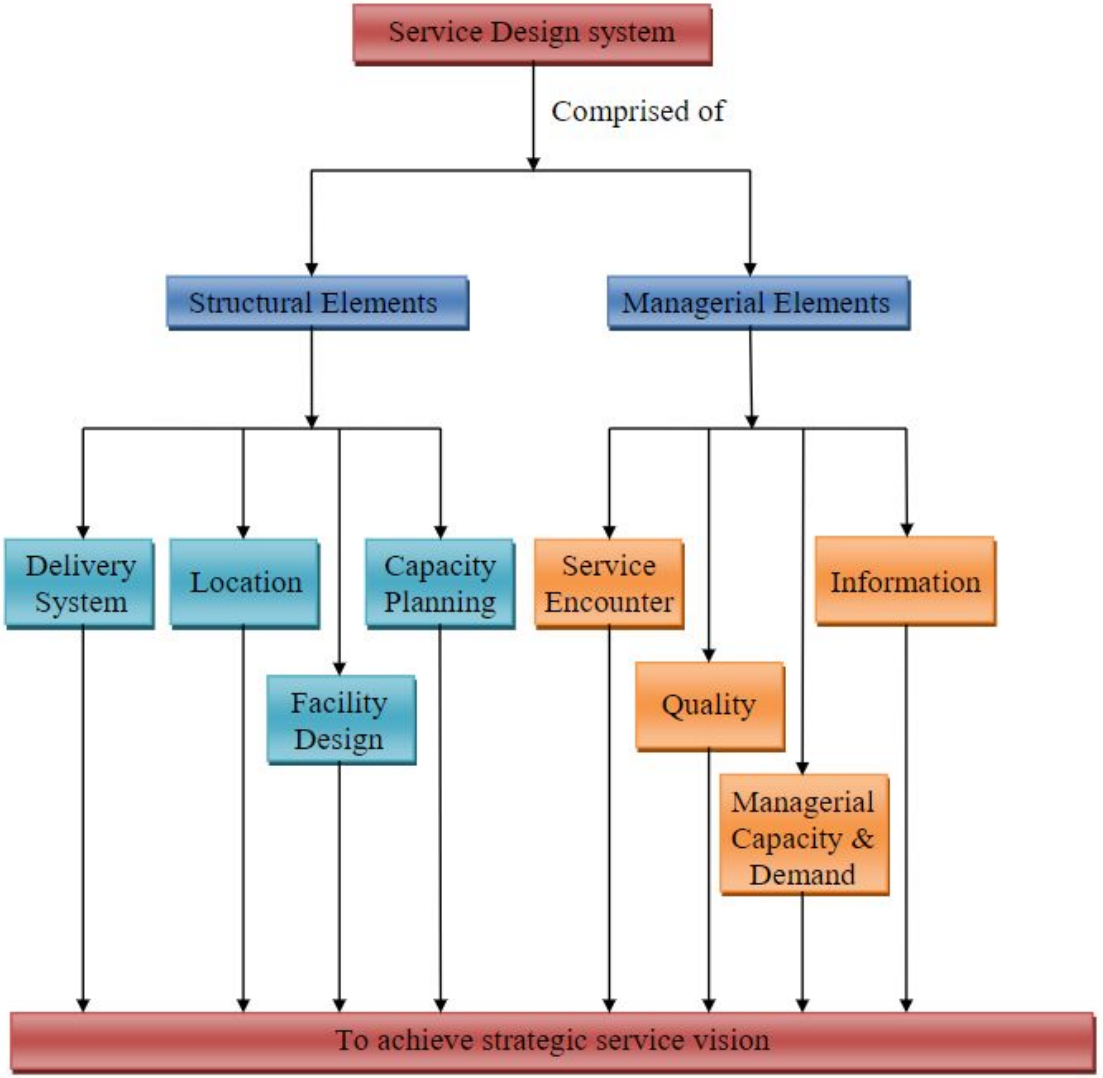
- Hardware (structural) and software (managerial) of service elements
- A service design elements become a template that communicates to customers and employees alike what service they should expect to give and receive.



Structural Elements - Strategic

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Delivery System

- Front & back office operations
- Automation like self-service technologies
- Customer participation

Facility Design

- Size of facility
- Aesthetics and ambience
- Layout and expansion consideration

Facility Location

- Customer demographics
- Single versus multiple sites
- Site characteristics
- Service concepts and objectives of service deliver

Capacity Planning

- Managing waiting lines
- Accommodating average and / or peak demand
- Service –line balancing

- Case: Indigo Airlines
- Taj Vivanta Hotel

Structural Elements - Managerial

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Service Encounter

- Characteristics of service provider, employees & customer, culture, supply relationships, outsourcing

Service Quality

- Reducing gaps between customer expectation and perceptions, measurement, design quality, tools, six sigma

Managing capacity & demand

- Strategies, yield management, queue management

Information

- Technology, scalability, use of internet

Customer Value Equation

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To ensure acceptance of a new service innovation, the design process should take a customer centric view. The value of a service from customer's perspective

$$\text{VALUE} = \frac{\text{RESULTS Produced} + \text{Process QUALITY}}{\text{PRICE to Customer} + \text{COST of Acquiring Service}}$$

Results produced: The purchase of the service must result in addressing the basic need

- Eg, Even if Restaurant is pleasant, courteous, Meal must be Good

Process Quality: The way service is delivered often is as important as results produced for the customer.

- Eg, Convenience of Internet for Book Shopping vs Book Store
- New housing society installs postal boxes instead of door-to-door delivery of letters. The flat owners need to maintain keys for postal boxes, but security of their mails is assured.

Customer Value Equation

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Price to customer: Trade-off between cost and quality not a must. Consistency in quality will achieve lower costs. Customer perceptions are more aligned with expectations. Customer participation in service reduces cost.

- **Eg. Online air ticket actually saves airline money**

Cost of acquiring services: Cost of acquiring the service may sometimes be more but, avoids inconvenience to customer. Customer may be ready to pay more.

- **Eg. Tickets on book my show, make my trip (booking charges, extra amount to avoid cancellation penalty)**

Competitive strategy would be to avoid/lower such extras costs.

When developing a new service, value to the customer should be the focus.

Service Process Structure

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Structure determined by questions:

- **Are there direct customer contacts?**
- **How the service employee handles this contact?**
- **Does an employee have discretion to customize the service as per the customer requirements?**
- **Who is the actual recipient of service?**

Service Process Structure

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Classification of processes & approaches to process design

- **Degree of complexity**
- **Degree of divergence**
- **Degree of customer contact**
- **Actual recipient of service**

Degree of Complexity

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The number of steps and intricacy of steps in any service process can vary from one service organization to other service organization which can be represented by degree of complexity of the service delivery structure.

- Example: The service process steps involved in a specialist clinic like ENT are less in number than the process steps involved in designing a big hospital. OR Fast food restaurants vs a spatiality restaurant

Degree of Complexity

QLeNPro

The service process can be classified as Low complexity and High complexity

- **Low-complexity**: Narrow scope of service or specialized focused strategy. For the success of such services, the service should be of very high quality and perceived to be unique. A barber shop. Ice-cream parlor selling only ice-cream.

- **High complexity**: Increase customer base and hence to maximize revenue is the strategy followed for such services. It is applicable where objective is to gain greater market penetration. Supermarkets have evolved into superstores through addition of pharmacies, flower shops, bakery etc.

Degree of Complexity
An illustration

Full fare airline		Low cost airline
Provide alternative options & Schedules	Ticketing	Provide alternative options & Schedules
Schedule Selected		Schedule Selected
Seat Selection		Payment
Meal Preferences		
Payment or Miles Redemption		
Obtain Boarding Pass	Check in & Board	Obtain Boarding Pass
Thru Check in for onward Travel		Board Flight
Update Frequent Flier Details		
Use of Lounge Facilities		
Board Flight		

Degree of Divergence

QLeNPro

The amount of freedom an employee or a server has to customize the service is the represented by degree of divergence

Example: Call center agents are given standard instructions to answer routine questions whereas consultant has to answer varies questions.

Services can be classified as processes with Low-divergence and High-divergence

Low-divergence: Standard services generally involved routine task. It does not require specialized skill and hence provide consistent quality and reduced cost

- An employee in private bank

High-divergence: It can be viewed as niche strategy where customer is willing to pay extra money for the personalized value perceived and received by the service.

- Consultant

Degree of Divergence: Another illustration (Restaurant)

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Low Divergence	Process Description	High Divergence
No reservation	Table Reservation	Specific table selection options offered
Self seating, Menu on the board	Seating Guests, Offering Menus	Recite Menu, Describe in detail all starters & other special items in offer for the day
Eliminate	Serve Water & Starters at the beginning of the service	Assortment of salads, chips and fruit juices offered
Customer calls out his requirements	Order taking process	Order takers interact with the customers at the table in constructing the menu for the guests
Pre-prepared: Fixed set of offering	Salads, Papads	Individually prepared and served at the table as per request
Just 2 or 3 choices offered	Starters	Customers can choose from 20 alternatives
Only South Indian (Vegetarian)	Main Menu	South Indian, Jain, Tandoori, Chinese, Continental, Brazilian (Both vegetarian & non-vegetarian)
Payment at the counter while leaving (Cash only)	Cash Payment	Multiple choices of payments (Cash, Card, Coupons etc.)

Degree of Customer Contact

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Direct customer contact

A customer is physically present throughout the service encounter and may interact directly with service provider

or have no interaction with service provider such as in self-service case.

Indirect customer contact

Customer can contact a service provider via email.

No customer contact

Service is performed without any contact with customer such as calculating and crediting interest on saving accounts in the banks does not need customer contact but service is being performed for the client.

Taxonomy or classification of service process presents a way to organize the various types of processes that are encountered in service systems.

Degree of Customer Contact

QLeNPro

		Low divergence (standardized service)			High divergence (customized service)		
		Processing of goods	Processing Information	Processing of people	Processing of goods	Processing Information	Processing of people
No Customer Contact		Dry Cleaning Restocking a vending machine	Check processing Billing for a credit card		Auto repair Tailoring a suit	Computer programming Designing a building	
Indirect Customer Contact			Ordering groceries from a home computer			Supervision of a landing by an air controller	
Direct Customer Contact	No customer service worker interaction(self-service)	Operating a vending machine Assembling premade furniture	Withdrawing cash from an ATM Giving a lecture	Operating an elevator Riding an escalator	Sampling food at a buffet dinner Bagging of groceries	Documenting medical history Searching for information in a library	Driving a rental car Using a health club facility
	Customer service worker interaction	Food service in a restaurant Hand car washing	Handling routine bank transactions	Providing public transportation Providing mass vaccination	Home carpet cleaning Landscaping service	Portrait painting Counseling	Haircutting Performing a surgical operation

Design of Service Systems

QLeNPro

Examples of front-, middle- and back-office activities in selected service organizations

Part of the delivery system	Illustrations		
	Passenger airline	Hotel	Fund management
Front office – direct customer contact	• Reservation and booking changes • Check-in • Departures and arrivals lounges • In-flight attendance • Flight transfers • Airport information desk	• Sales agents • Reservations • Reception • Concierge • Restaurant and bar staff • Switchboard	• Pre-trade compliance and and decisions • Trade order management • Client reporting • Client extranets
Middle office – indirect customer contact	• Ticket pricing • Flight schedules • Self-check-in system development • Frequent flier programme • Holiday and flight offers	• Marketing • Pricing – rooms and banqueting • Menu fulfillment • Wine selection • Housekeeping • Maintenance	• Transaction reconciliation • Compliance checks • Trade support • Risk management
Back office – no customer contact	• Aircraft maintenance • Flight preparation • Accounts • Refunds • Administration • Self-check-in system maintenance	• Administration • Accounts • Human resources • Kitchen	• Custody of assets and documents • Fund accounting • Fund administration • Transfer agency

Front Office

- Structural facilities
- Lead Times
- Ease of customer use
- Staff roles

Middle office

Indirect customer contact

Back office

- Easier scheduling
- Higher Processing volumes

Service Blueprinting

QLeNPro

Service Blueprinting is a method by which the service delivery process is broken down into individual elements through a step-by-step mapping of the process. Service blueprinting helps organizations design, monitor, control and improve processes and the service delivery system on an ongoing basis.

Line of Interaction. This line separates all the activities in which the customer has to have a direct interaction with service provider as a creation of the service creation and delivery process.

Line of Visibility. This line includes all the structural, planning and interactional elements of a service delivery process that fall within eyesight of customer.

Front Office. All aspects of service delivery system that are in the line of visibility of a customer.

Back Office. All the aspects of a service delivery process that are behind the line of visibility.

Service Blueprinting

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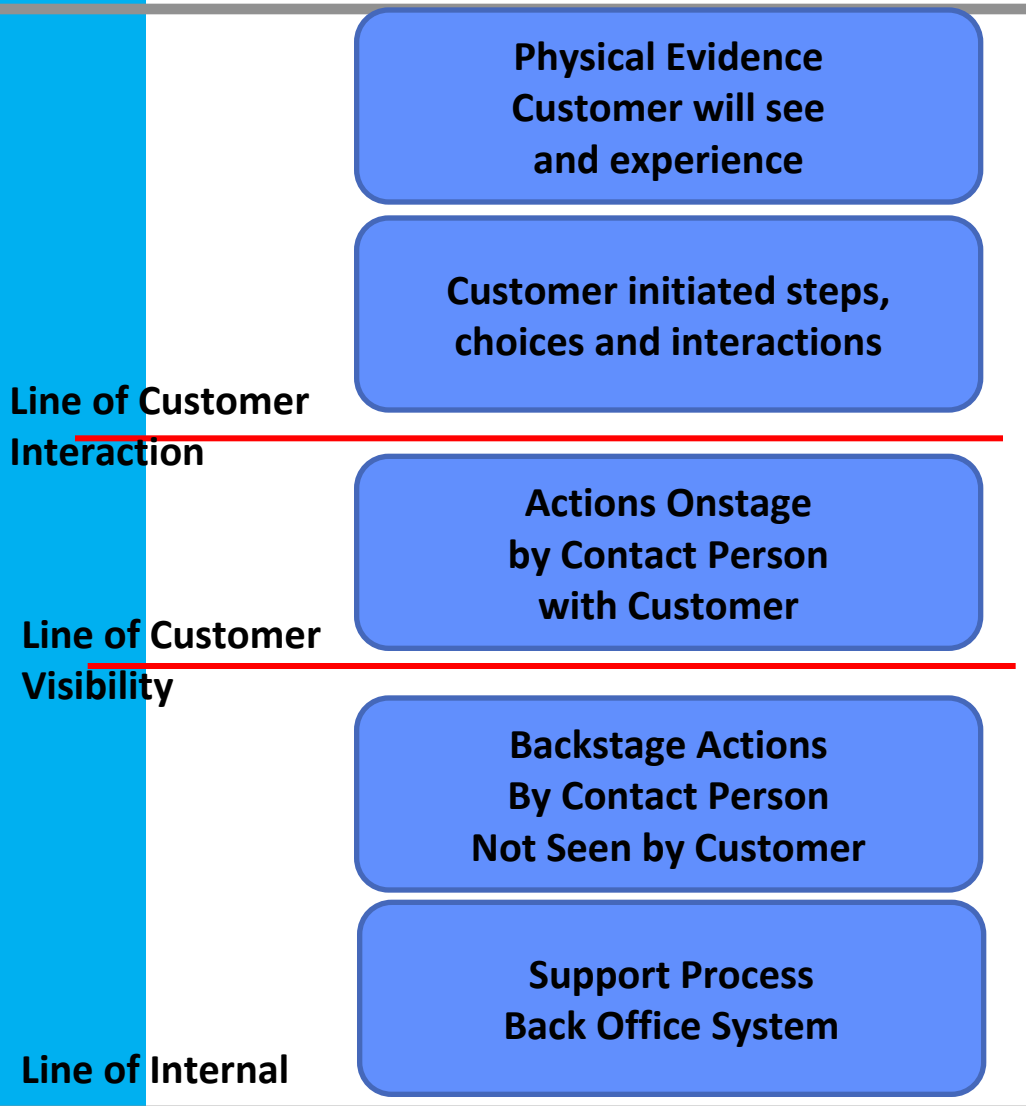

- A method by which the service delivery process is broken down into individual elements through a step-by-step mapping of the process.
- A customer focused approach for service innovation and service improvement
- Helps in visualizing the service processes and hence provide a bird's-eye view of the service system
- Identifying points of customer contact with service system
- Physical evidence associated with services from customer's perspective
- Blueprint is a precise definition of the service delivery system that allows management to test the service concept on paper before any final commitments are made.

Service Blue Printing

QLeNPro

Important issues

What signage are necessary to facilitate customer actions

Are there transactions that can be eliminated or made self serve (express check-out)

Which transactions are potential fail points (activities where mistakes can occur), taking food order, al the items in menu have numbers to avoid errors.

Above line of interaction – customer initiated steps, choices, interactions, the customer performs in the process of purchasing, consuming and evaluating the service.

Any vertical line crossing the line of interaction depicts direct contact between customer and organization (service encounter)

Service Blue Printing

QLeNPro

We can ask question, should the person interact with same person or be handed off (handling customer bags)

Are different skills required for bell person, check-in clerk, bag handler or food deliver?

Above the line of visibility are actions in full view of the customer and thus onstage(checking in and taking delivery of one's bags)

Above line of interaction are activities that are back stage and not seen by the customer.

Service Blue Printing

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Blueprint is a precise definition of the service delivery system that allows management to test the service concept on paper before any final commitments are made.

Blueprint for a Luxury Hotel

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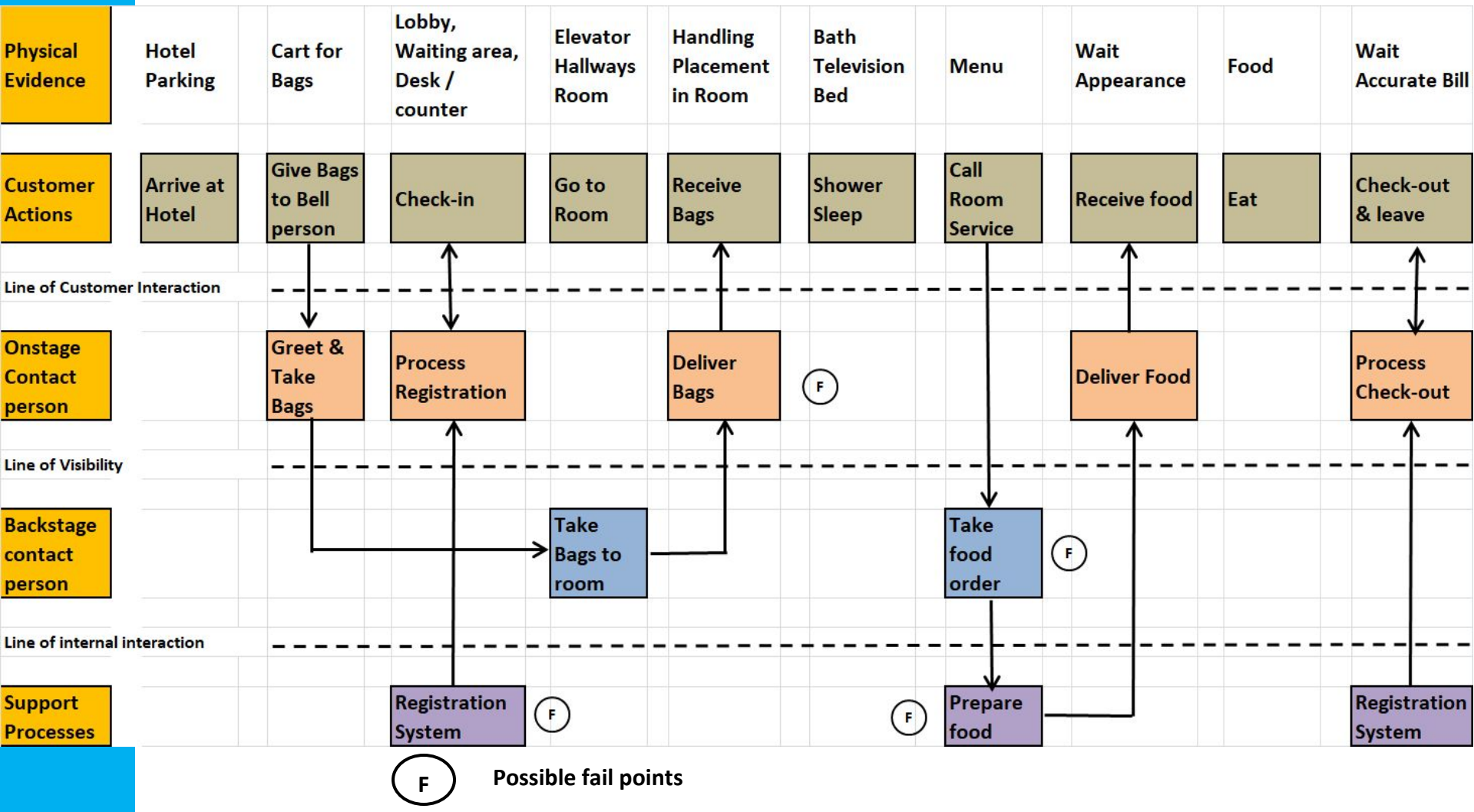

F Possible fail points

Service Blue Printing - An example from healthcare

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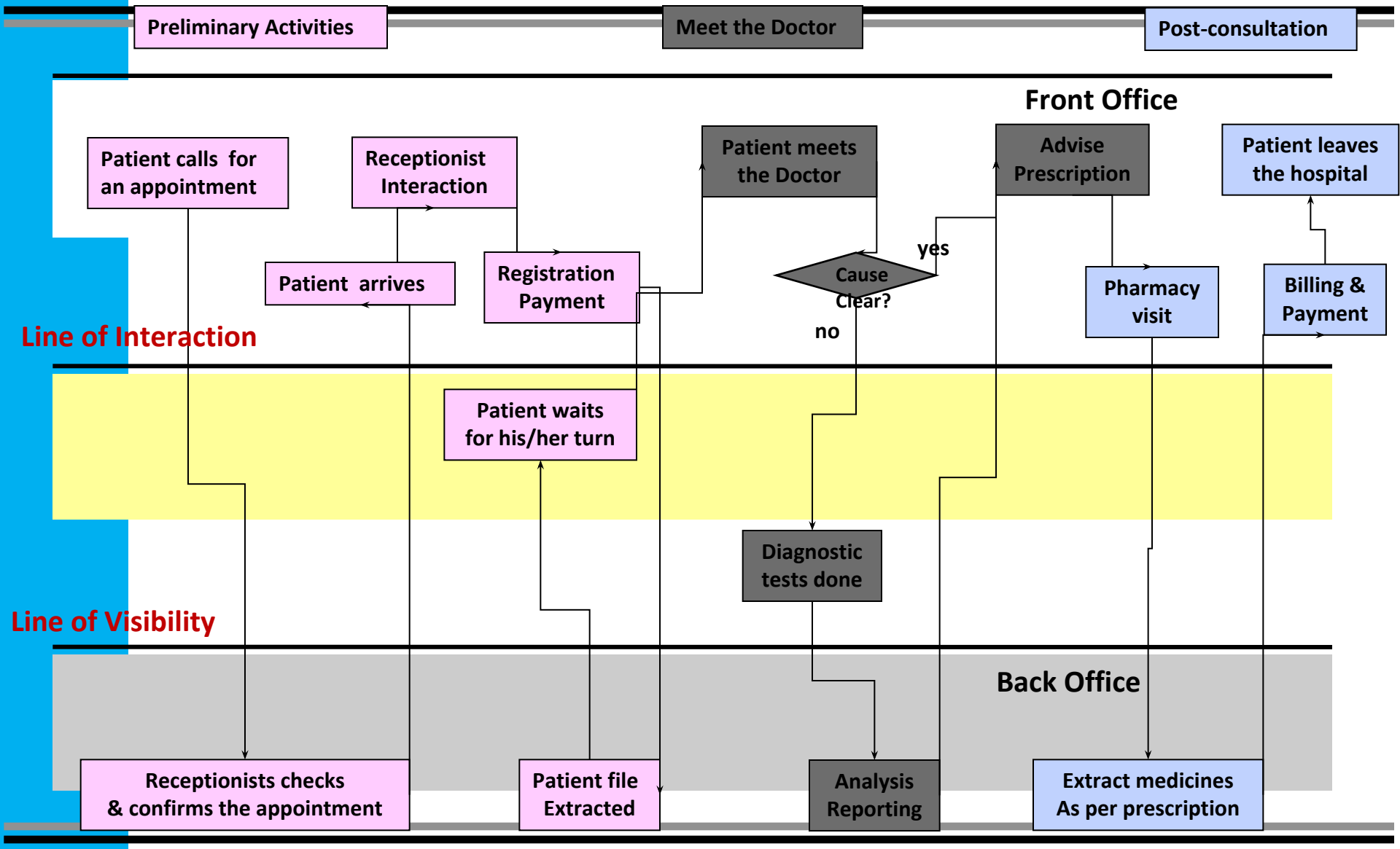

Service Blueprinting - Advantages

QLeNPro

- In the service blueprint we can visually see the activities which need direct customer contact and which activities are back-office activities. This information can be utilized to provide appropriate training to employees and to develop good communication skills.

- Service blueprint can also enhance the quality and efficiency. It gives a good scope to determine potential areas where service failure may occur, hence failure mode analysis can be performed.

- Service Blueprint facilitates problem solving and creative thinking and hence a good tool to innovate in services.

Service Blueprinting - Advantages

QLeNPro

- Considering quality issues right at the design stage will help in avoiding quality losses or service failure later.

- It provides a service process structure which can help in devising different approaches for service system design appropriate for different types of service organizations

- Blueprint provides a common platform for all stakeholders to participate in the process where everybody gain insights into how their roles fit into the integrated whole, which facilitate innovation.

Approaches to Service System Design

QLeNPro

Definition of service package is key to designing the service system.

Service design varies with the degree of divergence. The service design approach should match the ultimate objective of customization or standardization of service

Service design must account for the fact that direct customer contact services need more attention in terms of facility design and location.

Service design should consider the care required to handle the customer's objects and information on which service is processed.

Combination: Banks: 1. Check processing operations – isolated from customer. 2. Customer using ATMs. 3. provide personalized loan services.

Approaches to Service System Design

QLeNPro

Various Approaches to Service System Design

- **Production line approach – routine services**
- **Customer as co-producer – active customer participation**
- **Customer Contact Approach – low and high customer contact**
- **Information Empowerment – using information technology**

Production line approach

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- Emphasis on control of the process.
- This control comes from breaking a job into groups of small tasks. Dedicate specialized skills to these small tasks.
- The employees performing the tasks have limited discretion. The employees are not empowered enough to customize the service because production line approach focus on standardization and consistency in each service product.
- This approach is analogous to a typical assembly line in manufacturing system where the output is machine paced and jobs are designed with explicit tasks utilizing special tools to produce consistent and uniform products.

Key issues:
- Limited discretionary action of personnel
- Division of Labour
- Substitution of technology for people
- Service standardization

Production line approach

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- **Such approach improves the productivity and helps in achieving cost leadership strategy.**
  - **Example – McDonalds – Controlled execution of each process: Rapid delivery of uniform and high quality prepared burgers in a clean environment**
  - **No discretion: Size, quality and raw material consistency is preplanned pre prepared, which cannot be changed by any employee.**
  - **Size of equipment: Size of fryer is optimum so that at any point of time number of french-fries to be fried are neither too much to avoid sogginess nor too small to avoid costly and frequent frying.**

Features of Production line approach

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Limited Discretionary Action of Personnel

Similar to one product from manufacturer is indistinguishable from other

The people performing the service have limited (well defined) activities to perform, can not customize.

Example: The person taking the order at MacDonald's a will ask same question to each customer, quality of burger at any outlet is same

Division of Labour

Total job be broken into groups of simple tasks. Task grouping permits the specialization of labour skills. (Ordering, burger preparation, french-fries, housekeeping etc.)

For most of the jobs low skill is required.

Payment to people based on skills.

Can be seen in the hospitals, banks as well

Features of Production line approach

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Substitution of Technology for People

- ATM instead of teller in the bank
- 2 bin system in retail stores
- Greeting cards in the shelves of Archie's shop
- Reminders for payment of instalment coming from agents, using simple computer programs

Service Standardization

Limited menu at MacDonald's.

Give opportunity for predictability, preplanning, uniformity in quality, lowering costs

Customer as Coproducer

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Customer as co-producer means customer can also provide productive labor while service is being performed. In such approach some of the service activities or all activities are shifted from service provider to the customer

Customer participation can increase the degree of customization.

Example: Make your own salad, select your own pizza (?)

Customer in the service process can support a competitive strategy of cost leadership with some customization.

Customer as Coproducer

QLeNPro

Features of customer as Coproducer

Self service

Customer as a co-producer can customize the service as per his/ her convenience and requirements, hence participates in service production and delivery.

Customers mostly prefer self service activities when they perceive monetary and time savings.

Coproduction addresses the problem of matching supply with demand in service, as customer brings the extra service capacity when required.

Customer as Coproducer

QLeNPro

Smoothening Service Demand

Variation in number of patients in OPD, can result in loss of doctor's time.

- Variations can be reduced thro appointments and reservations. In such cases, the customer's waiting time can also reduce.

- Different pricing with different doctors and during lean and peak timings

- OR customer can expect a delayed delivery at reduced prices (Visa in British Embassy)

Customer need to be educated for such provisions, service provider's additional responsibility.

Customer as Coproducer

QLeNPro

Customer-Generated Content

Opportunities thro Internet – customer coproduction

Wikipedia – self monitoring website, as individual add the material to produce far richer material as compared to traditional published encyclopaedia.

Airbnb

Olx, Quikr, magic bricks

Customer Contact Approach

QLeNPro

How a service manager design their operations to achieve the efficiencies of manufacturing when customer participates in the process.

Can be done by separating the service delivery into high and low contact customer operations.

Customer Contact Approach

QLeNPro

Degree of customer contact

Physical presence of customer in the system.

Can be measured by the percentage of time that the customer is in system relative to total service time.

In high-contact services, customer determines timing of demand and nature of service by direct participation in the service.

High contact operations require employees with excellent interpersonal skills.

The service tasks and activity levels in these operations are uncertain, as customer dictates the timing of demand and may be service itself.

Customer Contact Approach

QLeNPro

Degree of customer contact

Low-contact operations – separated from customer, may require some communication with customer.

Airlines use this methodology

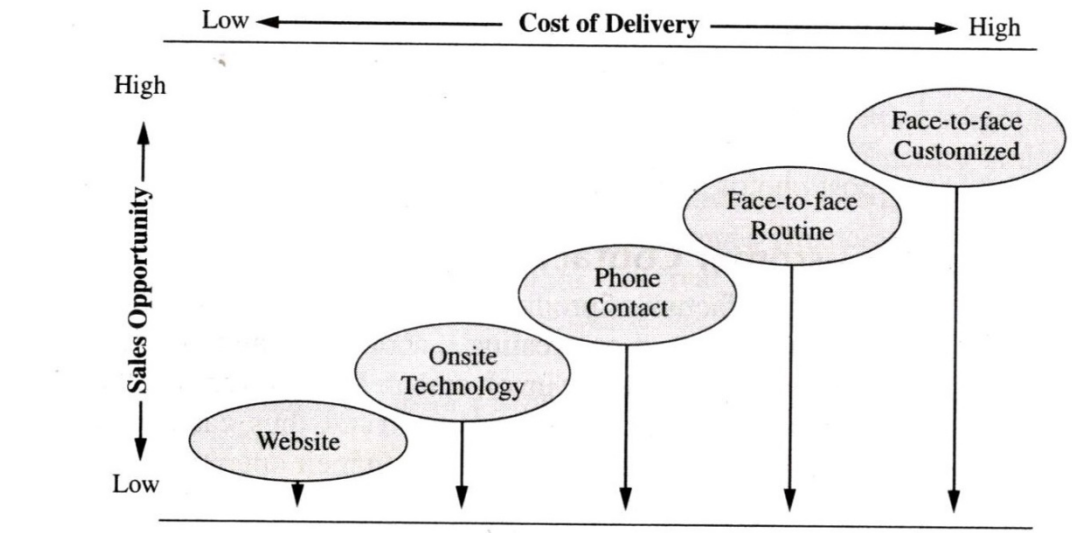
Airport reservation clerks, flight attendants vs baggage handlers, maintenance staff

Customer Contact Approach

QLeNPro

Sales opportunity and service delivery options

Retail Bank



Employee Skills:	N/A	Helping	Verbal	Procedural	Diagnostic
Customer Skills:	Computer	Self-serve	Listening	Passive	Articulate
Operations Focus:	Web design	Technology	Scripting	Queuing	Relationships

Information Empowerment

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Impact of Information Technology on Service

- **Some of the services have information as a main contributor of value generation. The information is very essential component to make decisions.**

- **In such services documents, databases, software applications, or other explicit repositories are present and essential to meeting the goals of the client.**

- **Such services have empowered service providers or employees and customers in making decisions as well choices utilizing information systems.**

  - **Examples: Data bases, Insurance Claim, Stock Exchange, Energy Trading, online tickets – seat selection, tracking the package on courier website, Magic bricks etc.**

  - **Employees empowerment**
  - **Customer empowerment**

Service Facility Location

QLeNPro

Marketing perspective

Service location focuses on attracting customers to a site because of convenience (fast-food restaurant located on a high traffic street)

Physical attributes (resort on a beautiful beach)

Also, location affects the service delivery design and has an impact on employees.

Example, Centralized vs decentralized office (many small offices in the city in different location).

Benefits due to decentralization,

- **Reduced staff requirements**
- **Reduced employee turnover and training**
- **Reduced salaries for clerical employees**
- **Elimination of a lunch program**
- **Increased income from lease of the headquarter site**

Requirement, online computer system, periodic meetings at headquarter, etc.

Strategic Location Consideration

QLeNPro

Considerations

Flexibility

- Flexibility of a location is a measure of the degree to which the service can react to changing economic situation.
- Location decision – long term, capital intensive – essential to select location that are responsive to future economic, demographic, cultural and competitive changes.
- Need to focus on location with inelastic demand (hotel near convention center, hospital on highways to treat accident cases)

Strategic Location Consideration

QLeNPro

Considerations

Competitive positioning

- Refers to methods by which the firm can establish itself relative to its competitors.
- Multiple locations can serve as a barrier to competition thro building firms position and establishing market awareness (Maruti – service centers)
- Creating facilities in prime location can keep the competition from gaining access.

Strategic Location Consideration

QLeNPro

Demand Management

- Ability to control quantity, quality and timing of demand.
- Hotel can not manipulate the capacity because of fixed nature of the facility.
- However, hotel can be constructed near diverse set of market generators that supply a steady demand regardless of economic conditions or period of the year.

Focus

- Can be developed by offering the same narrowly defined service at many locations. Many companies develop standard facility, which is duplicated at many locations.
- Such approach makes the expansion easier.

Strategic Location Consideration

QLeNPro

Competitive Clustering

Competitors having their showrooms in a common locality.

In case of many products, customers tries with many competitor offerings before taking any decision. Example, dealers for cars.

Most of the dealers of passenger cars are located near each other so that customers can try their products and compare.

Similar is the case with budget hotels. Being near to each other, ensures better occupancy.

Strategic Location Consideration

QLeNPro

Saturation Marketing

When same brand café is having many outlets in same locality or building.

Kills competition as for customer same line of restaurants everywhere, customer is forced to use them. Hides the defects in the brand. Works best in the high density areas.

Another one, many Ice-cream vendors with same brand moving on a busy street.

Strategic Location Consideration

QLeNPro

Marketing intermediaries

Services are created and consumed simultaneously.

Services are intangible, can not be stored, can not be transported.

Therefore, the geographic area for services is quite limited.

How to enlarge the geographic spread?

In some cases by developing franchisee example, wealth management, insurance, pathology (blood collection centers) etc.

Strategic Location Consideration

QLeNPro

Separation of Front Office and Back Office

For many services the front and back offices need not be co-located.
Dry cleaning, ATMs, Collection centers
Ordering Domino's pizza thro phone
Analyzing x-ray films at Bangalore, taken for patients in US.

Impact of Internet on Service Location

Internet

E-commerce – Amazon vs Barnes & Noble

Now location of Amazon warehouse does not matter nor there is limit to market area

Amazon warehouse + Fedex – means every thing

E-learning

OTT platforms

Strategic Location Consideration

QLeNPro

Site Considerations

Many physical attributes

- **Access – connectivity with highways etc., connected thro various means of transport**
- **Visibility – Set back from street, sign placement**
- **Traffic – Traffic volume on the street that may indicate potential impulse buying, traffic congestion that could be a hindrance**
- **Parking – adequate parking space**
- **Expansion – room for expansion**
- **Environment – adequate surroundings should complement the service**
- **Competition – Location of competitors**
- **Government – Zoning restrictions, Taxes**
- **Labor – Available labor with appropriate skills**
- **Complements – Complementary services nearby**

Facility Location Modelling Considerations

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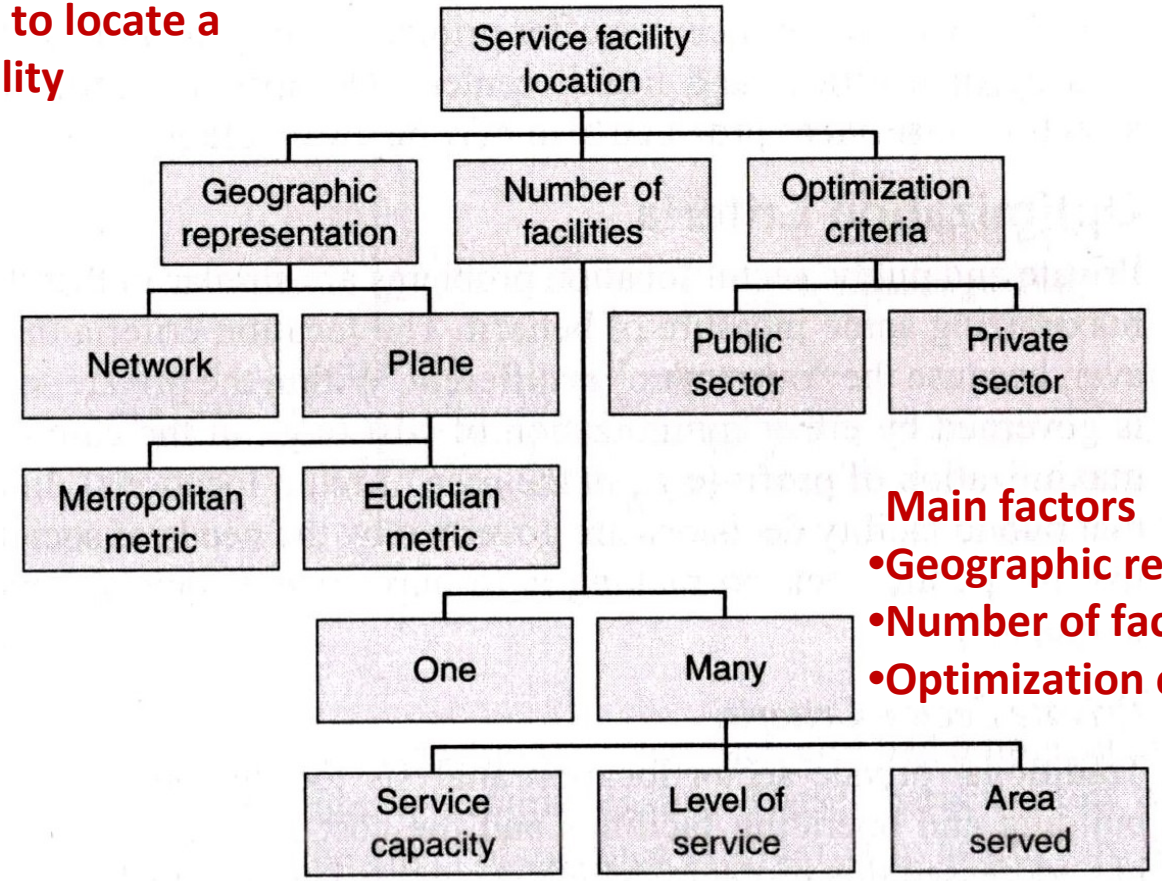
Many factors to be considered to locate a service facility



Main factors

- **Geographic representation**
- **Number of facilities**
- **Optimization criteria**

Geographic Representations

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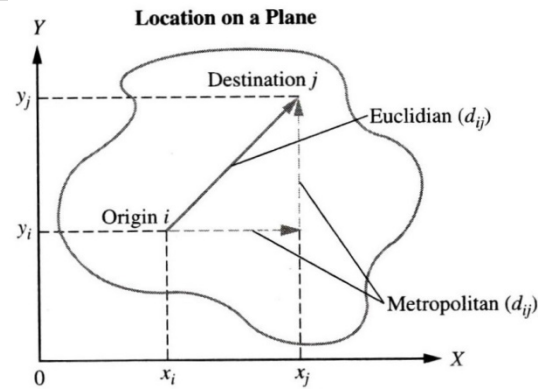
Location options and travel distance can be represented on either a plane or networked.

Facilities on a plan can be identified by xy Cartesian coordinates.

The distance between two points can be measure by Euclidian metric.



$$d_{ij} = [(x_i - x_j)]^2 + (y_i - y_j)^2]^{1/2}$$

where

d_{ij} = distance between points i and j

x_i, y_i = coordinates of the ith point

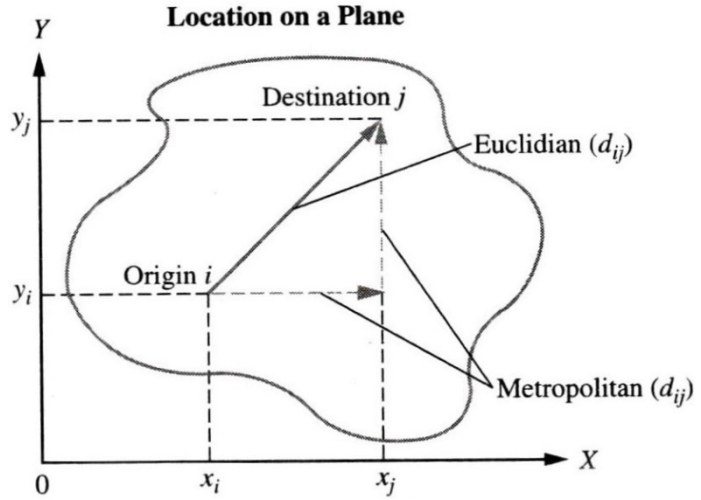
x_j, y_j = coordinates of the jth point

For example, if

the origin $x_i, y_i = 2,2$ and the destination $x_j, y_j = 4,4$

then

$$d_{ij} = [(2-4)^2 + (2-4)^2]^{1/2} = 2.83$$



The other method is the *metropolitan metric*, or rectangular displacement, travel distance (i.e., north-south and east-west travel in urban areas), which is defined as

$$d_{ij} = |x_i - x_j| + |y_i - y_j| \qquad (2)$$

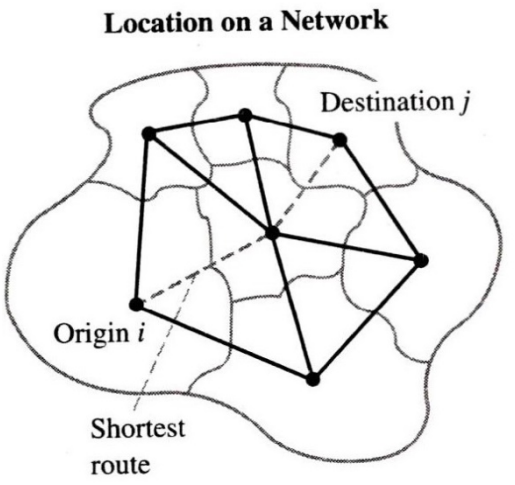
Using the same example from above for the metropolitan metric:

$$d_{ij} = |2 - 4| + |2 - 4| = 4.0$$

Geographic Representations

QLeNPro

- Location is restricted by the nodes of that network.
- Highway system can be considered as network with major highway intersections as nodes.
- The arcs of the network represent travel distance between the pair of nodes, calculated as the shortest route.
- Network can represent accurately the geographic uniqueness of the area (example, travel restrictions due to river, bridges, mountains).
- Also require the average speeds on these networks to convert distances into time.



Number of facilities

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Location of single facility generally can be treated mathematically with little difficulty.

However, same solution is not applicable to multisite location issue

Problem further complicates, if different sites have different capacities and capabilities

Example, multispecialty hospital and private clinics

Selection of services provided may also be a variable in multisite location studies.

Optimization criteria

QLeNPro

Private and Public sector location problems are similar in that they share the objective of maximizing some measure of benefit.

Private Sector – location decision is governed either by minimization of costs or maximizing profits

Public Sector – decisions are governed by the needs of society as a whole. (difficult to quantify)

Private Sector Criteria

Traditional location analysis focuses on trade-offs between the cost of building, operating facilities and transportation costs.

Appropriate for distribution of products (warehouse problems)

This model finds some application in services, when services are delivered to customer(consulting, janitorial, and other similar services)

When customer travels to facility, no direct cost incurred by the provider.

Distance can be a barrier in restricting the demand.

Retail stores are located in such a way to attract maximum customers.

Optimization criteria

QLeNPro

Public Sector Criteria

Location decisions are complicated by lack of agreement on goals and difficulty of measuring benefits to make trade-offs with facility investment.

Benefits of Public services are difficult to define or quantify directly.

The average distance travelled by the user to reach the facility is a proper measurement.

The smaller is the distance, more approachable is the facility.

Problem – minimizing total average distance traveled, with a constraint on number of facilities.

Here the user population is not fixed but is determined by location, size and number of facilities.

The greater is the demand created or drawn, more efficient is the system on filling the needs of the system.

Optimization of such location influences constraints on investments.

Optimization criteria

QLeNPro

Effect of Optimization criteria on Location

Selection of optimization criteria influences service facility location.

WJ Abernathy and JC Hershey studied the location of health centers for three city location. They note the effect of health center location with respect to following criteria.

Maximize utilization – maximize the total number of visits to the centers

Minimize distance per capita – Minimize average distance per capita to the closest center

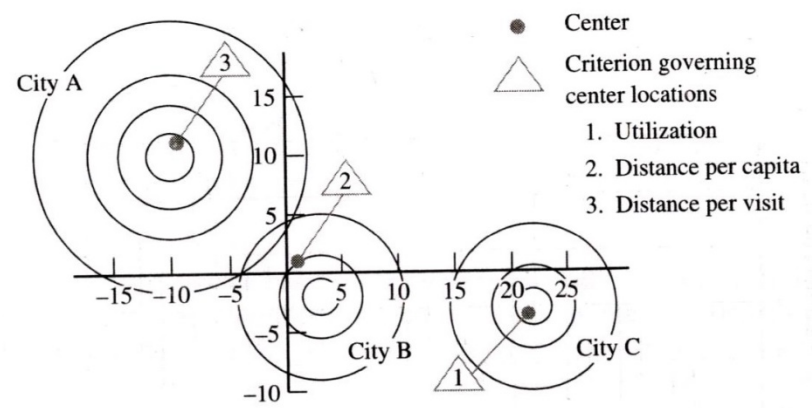
Minimize distance per visit – Minimize the average per-visit travel distance to the nearest center.

Optimization criteria

QLeNPro

These characteristics were measured along two dimensions.

1. The effect of distance as a barrier to health care use
2. The utilization rate at immediate proximity to a health center.



Map of three cities and location of one health care centre as per the criteria

1. Maximize utilization – centre is located in city C, city C contains maximum number of elderly population for whom distance is a strong barrier
2. Distance per capita – City B selected. Minimize the distance per capita. B is centrally located
3. Distance per visit – city A considered as it has largest population and most mobile and frequent users.

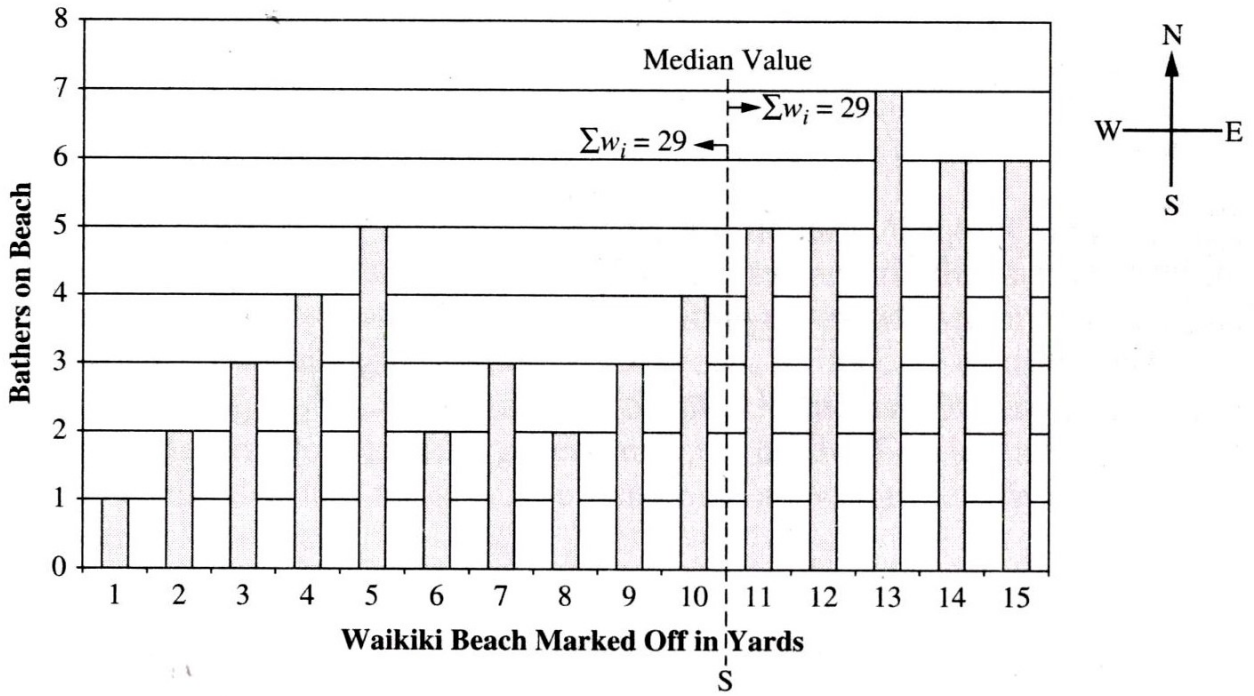
Facility Location Techniques

QLeNPro

An understanding of facility location problem can be gained from the results of locating a single facility on a line.

Problem – locating a beach mat concession along the beach front. To find a location which will minimize the average walk to concession from any where in the beach.

Data is density of bathers along the beach front.



Facility Location Techniques

QLeNPro

The objective is

$$\text{Minimize} \qquad Z = \sum_{i=0}^{s} w_i(s - x_i) + \sum_{i=s}^{n} w_i(x_i - s) \qquad (3)$$

where

w_i = weight of demand (bathers) attached to the ith location on the beach

x_i = location of the ith demand point on the beach in yards from the west end of the beach

s = site of the beach mat concession

The total-distance function Z is differentiated with respect to s and set equal to zero. This yields

$$\frac{dZ}{ds} = \sum_{i=0}^{s} w_i - \sum_{i=s}^{n} w_i = 0 \qquad \text{or} \qquad \sum_{i=0}^{s} w_i = \sum_{i=s}^{n} w_i \qquad (4)$$

Cross Median Approach for a Single Service Facility

QLeNPro

Locating a single facility on a plane to minimize the total travel distance Z by means of the metropolitan metric is straightforward using the cross-median approach. The objective is

$$\text{Minimize} \quad Z = \sum_{i=1}^{n} w_i \{ |x_i - x_s| + |y_i - y_s| \} \tag{5}$$

where

w_i = weight attached to the ith point (e.g., trips per month)

x_i, y_i = coordinates of the ith demand point

x_s, y_s = coordinates of the service facility

n = number of demand points served

Note that the objective function can be restated as two independent terms.

$$\text{Minimize} \quad Z = \sum_{i=1}^{n} w_i |x_i - x_s| + \sum_{i=1}^{n} w_i |y_i - y_s| \tag{6}$$

From beach mat concession example, the median of a discrete set of values is such that the sum of absolute deviations from it is minimum. Our optimum site will coordinates (1) X_s is at the median value of W_i ordered. And Y_s…..

Cross Median Approach for a Single Service Facility

QLeNPro

Example. A copying facility to take care of four office locations.

Locations are1, 2, 3 and 4

W values are 7, 1, 3 and 5

Median = (7+1+3+5)/2 = 8

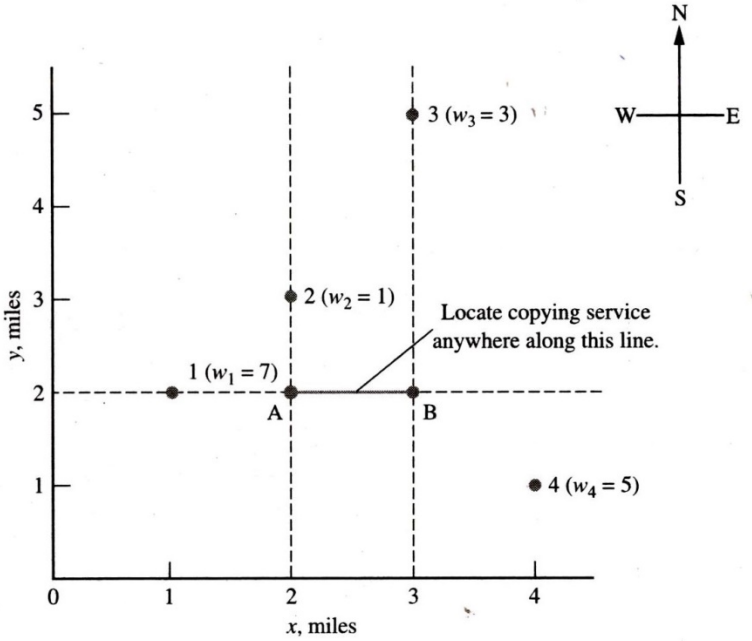
Now need to check x and y for both west to east and east to west And south to north and north to south.

In case of Xs W to E – 1, 2, 3, 4

E to W – 4, 3, 2, 1

In case of Ys S to N – 4, 1, 2, 3

N to S – 3, 2, 1, 4



Cross Median Approach for a Single Service Facility

QLeNPro

Point i	Location x_i	Σw_i
	Ordering west to east →	
1	1	7 = 7
2	2	7 + 1 = 8
3	3	
4	4	
	Ordering east to west ←	
4	4	5 = 5
3	3	5 + 3 = 8
2	2	
1	1	

Point i	Location y_i	Σw_i
	Ordering south to north ↑	
4	1	5 = 5
1	2	5 + 7 = 12
2	3	
3	5	
	Ordering north to south ↓	
3	5	3 = 3
2	3	3 + 1 = 4
1	2	3 + 1 + 7 = 11
4	1	

Location situation can be a line, a point (intersection) or a area. Cross median approach can result in some site selection flexibility.

TABLE 8.5 **Total Weighted Distance for Locations A and B**

Location A (2,2)						Location B (3,2)					
Office	Distance		Weight		Total	Office	Distance		Weight		Total
1	1	×	7	=	7	1	2	×	7	=	14
2	1	×	1	=	1	2	2	×	1	=	2
3	4	×	3	=	12	3	3	×	3	=	9
4	3	×	5	=	15	4	2	×	5	=	10
					35						35

Huff Model for a Retail Outlet

QLeNPro

Location of retail outlet – objective is to maximize profit.

A discrete number of alternative locations must be evaluated to find the most profitable site.

Gravity model is used to estimate consumer demand.

This model is based on the physical analog that the gravitational attraction of two bodies is directly proportional to the product of their masses and inversely proportional to the square of the distance that separates them.

For a service, the attractiveness of a facility may be expressed as

$$A_{ij} = \frac{S_j}{T_{ij}^{\lambda}} \qquad (8)$$

where

A_{ij} = attraction to facility j for consumer i

S_j = size of the facility j

T_{ij} = travel time from consumer i's location to facility j

λ = parameter estimated empirically to reflect the effect of travel time on various kinds of shopping trips (e.g., where a shopping mall may have a $\lambda = 2$, convenience stores would have a $\lambda = 10$ or larger)

Huff Model for a Retail Outlet

QLeNPro

David L. Huff developed a retail location model using this gravity model to predict the benefit that a customer would have for a particular store size and location.[8] Knowing that customers also would be attracted to other competing stores, he proposed the ratio P_{ij}. For n stores, this ratio measures the probability of a customer from a given statistical area i traveling to a particular shopping facility j.

$$P_{ij} = \frac{A_{ij}}{\sum_{j=1}^{n} A_{ij}} \tag{9}$$

An estimate of E_{jk}, the total annual consumer expenditures for a product class k at a prospective shopping facility j, then can be calculated as

$$E_{jk} = \sum_{i=1}^{m} (P_{ij} C_i B_{ik}) \tag{10}$$

where

P_{ij} = probability of a consumer from a given statistical area i traveling to a shopping facility j, calculated by means of equation (9)

C_i = number of consumers at area i

B_{ik} = average annual amount budgeted by consumer at area i for a product class k

m = number of statistical areas

Huff Model for a Retail Outlet

QLeNPro

	Customer Location (i)			
Site (j)	1	2	3	4
Proposed (3, 2)	2	2	3	2
Existing (2, 2)	1	1	4	3

	Customer Location (i)			
Site (j)	1	2	3	4
Proposed ($S_1 = 2$)	0.5	0.5	0.2222	0.500
Existing ($S_2 = 1$)	1.0	1.0	0.0625	0.111
Total attraction	1.5	1.5	0.2847	0.611

An estimate of M_{jk}, the market share captured by facility j of product class k sales, can be calculated as

$$M_{jk} = \frac{E_{jk}}{\sum_{i=1}^{m} C_i B_{ik}} \qquad (11)$$

Example

QLeNPro

Assume that the copying service in Example 8.1 has been established at ($x = 2$, $y = 2$), as shown by location A in Figure 8.6 at the far left end of the optimal line. Further, assume that each customer order represents an expenditure of approximately \$10. Because convenience would be an important customer criterion, assume that $\lambda = 2$. If we wish to open a competing store at location ($x = 3$, $y = 2$) (i.e., at location B on the far right end of the optimal line) but with *twice* the capacity of the existing copy center, how much market share would we expect to capture? Using the travel distances in Table 8.6 as input to the Huff model, the calculations shown in Tables 8.7 to 8.9 are obtained.

Example

QLeNPro

Probability P_{ij}

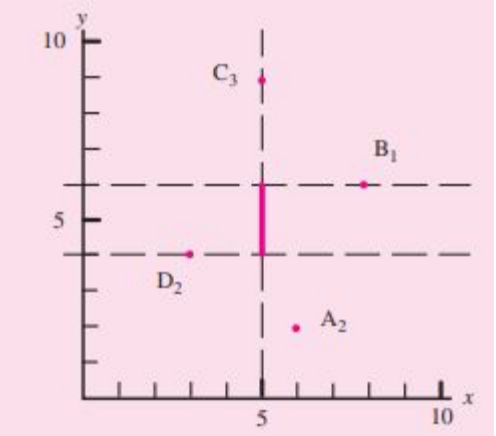
	Customer Location (i)			
Site (j)	1	2	3	4
Proposed	.33	.33	.78	.82
Existing	.67	.67	.22	.18

Monthly Expenditure (E_{jk}) and Market Share (M_{jk})

	Customer Expenditures					
Site (j)	1	2	3	4	Monthly Total	Market Share %
Proposed	$2,333	$ 333	$2,340	$4,100	$ 9,106	0.57
Existing	4,667	667	660	900	6,894	0.43
Totals	$7,000	$1,000	$3,000	$5,000	$16,000	1.00

Problem Statement

A health clinic is being planned to serve a rural area in west Texas. The service area consists of four communities at the following *xy* coordinate locations in miles: A (6, 2), B (8, 6), C (5, 9), D (3, 4), with populations of 2,000, 1,000, 3,000, and 2,000, respectively. Recommend a "cross-median" location for the health clinic minimizing the total weighted metropolitan distance traveled.



Problem Statement

The west Texas area in the plot above is served by a grocery store in community D. A proposed store with three times the floor space is being considered for location in community C. Assume that monthly expenditures per customer average about $100. Then, using the metropolitan metric for travel and $\lambda = 2$, use the Huff model to estimate the impact on monthly expenditures and market share for the existing store in community D if the proposed store in community C is constructed.

Travel Distance in Miles (T_{ij}) (Using Metropolitan Metric)

	Community (i)			
Site (j)	A (6, 2)	B (8, 6)	C (5, 9)	D (3, 4)
Proposed C (5, 9)	8	6	0	7
Existing D (3, 4)	5	7	7	0

Second, using equation (14), calculate the attraction matrix with $\lambda = 2$. For example, the attraction of community A to the proposed location at C (with $S = 3$ to account for the larger floor space) would be calculated as

$$A_{ij} = \frac{S_j}{T_{ij}^{\lambda}} = \frac{S_1}{T_{11}^{2}} = \frac{3}{8^2} = \frac{3}{64} = 0.0469$$

Note that the attraction is given a value of ∞ where the store is located in the same community ($T_{ij} = 0$ in the denominator).

Attraction (A_{ij})

	Community Location (i)			
Site (j)	A	B	C	D
Proposed $S_1 = 3$	0.0469	0.0833	∞	—
Existing $S_2 = 1$	0.0400	0.0204	—	∞
Total attraction	0.0869	0.1037		

Third, using equation (15), calculate the probability using the total attraction as the denominator. For example, the probability of residents in community A traveling to the proposed grocery store location at C would be calculated as

$$P_{ij} = \frac{A_{ij}}{\sum_{j=1}^{n} A_{ij}} = \frac{A_{11}}{A_{11} + A_{12}} = \frac{0.0469}{0.0469 + 0.04} = 0.54$$

Probability (P_{ij})

	Community Location (i)			
Site (j)	A	B	C	D
Proposed	.54	.80	1.0	0
Existing	.46	.20	0	1.0

Fourth, using equation (16), the monthly expenditures are calculated, and using equation (17), the market shares are determined. For example, expenditures from residents of community A at the proposed grocery store location at C would be calculated as

$$E_{jk} = \sum_{i=1}^{m} (P_{ij}C_iB_{ik}) = P_{11}C_1B_1 = (.54)(2000)(100) = \$108,000$$

Monthly Expenditures (E_{jk}) and Market Share (M_{jk})

	Community Expenditures					
Site (j)	A	B	C	D	Monthly Total	Market Share %
Proposed	$108,000	$ 80,000	$300,000	$ 0	$488,000	0.61
Existing	92,000	20,000	0	200,000	312,000	0.39
Totals	$200,000	$100,000	$300,000	$200,000	$800,000	1.00

Location Set Covering for Multiple Facilities

QLeNPro

The difficulty of evaluating decisions regarding public facility location has resulted in search for alternative measures of benefits of the facility location.

Could be the distance the most distant customer would have to travel to reach the facility.

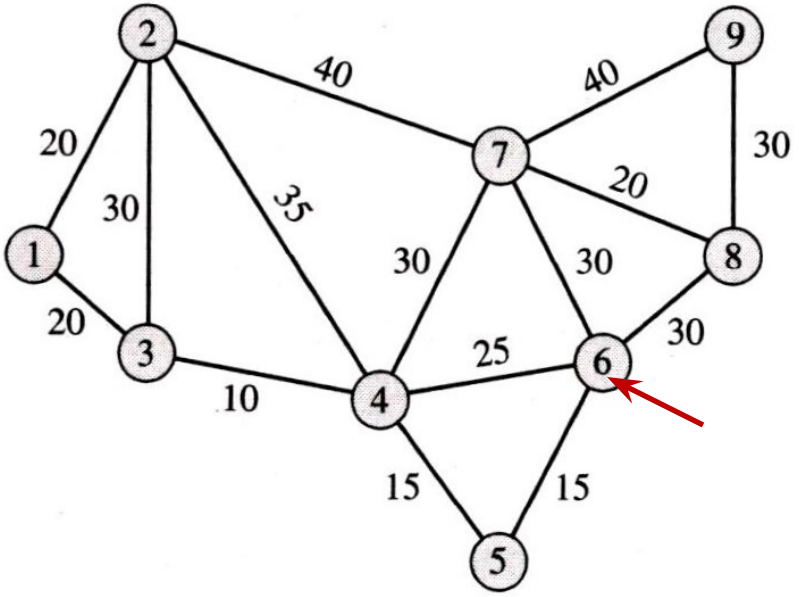
Known as maximum service distance.

To find minimum number and location of facilities that will serve all demand points within some specified maximum service distance, known as location set covering problem.

Example – Rural Medical Clinics

QLeNPro

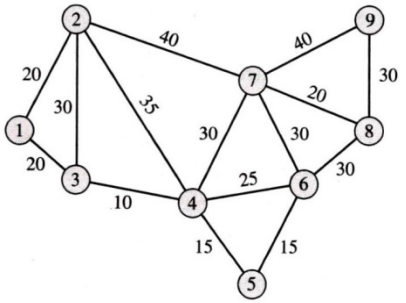
A state department of health is concerned about the lack of medical care in rural areas, and a group of nine communities has been selected for a pilot program in which medical clinics will be opened to serve primary health care needs. It is hoped that every community will be within 30 miles of at least one clinic. The planners would like to determine the number of clinics that are required and their locations. Any community can serve as a potential clinic site except for community 6, because facilities are unavailable there. Figure 8.7 shows a network identifying the cities as numbered circles; lines drawn between the sites show the travel distances in miles.



Example – Rural Medical Clinics

QLeNPro

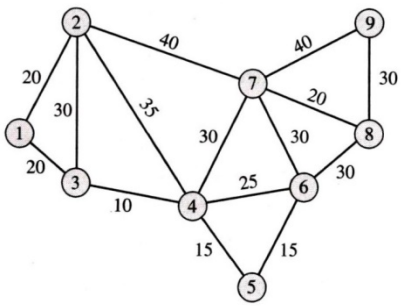
The problem is approached by first identifying for each community the other communities that can be reached from it within the 30-mile travel limit. Beginning with community 1, we see in Figure 8.7 that communities 2, 3, and 4 can be reached within the 30-mile distance limit. The results of similar inspections for each community are reported in the second column of Table 8.10 as the set of communities served from each site. An equivalent statement could be made that this set, less any communities that could not serve as a site, represents the set of sites that could cover the community in question for service within 30 miles. Thus, for community 5, a clinic located at site 3, 4, or 5 meets the maximal travel limit.



Community	Set of Communities Served from Site	Potential Sites That Could Serve the Community*
1	1,2,3,4	1,2,3,4
2	1,2,3	(1,2,3)†
3	1,2,3,4,5	1,2,3,4,5
4	1,3,4,5,6,7	1,3,4,5,7
5	3,4,5,6	(3,4,5)†
6	4,5,6,7,8	4,5,7,8
7	4,6,7,8	(4,7,8)†
8	6,7,8,9	7,8,9
9	8,9	(8,9)†

Example – Rural Medical Clinics

QLeNPro



The third column of Table 8.10 represents the set of potential sites that could cover a given community. Several of these sets have been placed in parentheses, however, because they represent subsets of other potential locations. For example, because community 2 can only be served by sites 1, 2, and 3, one of these sites must be selected for a clinic location. Identifying these subsets reduces the problem size while ensuring that restrictions are satisfied.

Community	Set of Communities Served from Site	Potential Sites That Could Serve the Community*
1	1,2,3,4	1,2,3,4
2	1,2,3	(1,2,3)†
3	1,2,3,4,5	1,2,3,4,5
4	1,3,4,5,6,7	1,3,4,5,7
5	3,4,5,6	(3,4,5)†
6	4,5,6,7,8	4,5,7,8
7	4,6,7,8	(4,7,8)†
8	6,7,8,9	7,8,9
9	8,9	(8,9)†

- **- community 6 can not serve as a clinic site**
- **† - Subsets of potential sites**

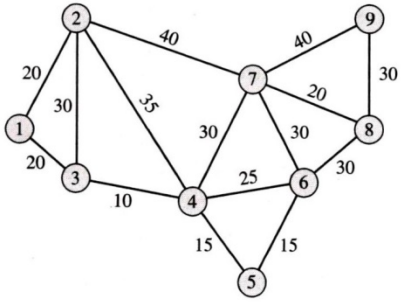
Example – Rural Medical Clinics

QLeNPro

Note that because of our desire to minimize the number of clinics to cover all the communities, any site common to two or more of these subsets is an excellent candidate for selection. In this case, sites 3, 4, and 8 are candidates. From inspection, we see that if sites 3 and 8 are selected, all subsets are accounted for; thus, all communities can be covered with just these two clinics. We also have identified the service region for each clinic; the clinic located at community 3 will serve communities 1 through 5, and the clinic located at community 8 will serve communities 6 through 9.

The location set covering problem often can yield more than one solution. In this example, if the maximal travel distance were set at 40 miles, the following five pairs of clinic site locations would provide coverage: (3, 8), (3, 9), (4, 7), (4, 8), and (4, 9).

Community	Set of Communities Served from Site	Potential Sites That Could Serve the Community*
1	1,2,3,4	1,2,3,4
2	1,2,3	(1,2,3)†
3	1,2,3,4,5	1,2,3,4,5
4	1,3,4,5,6,7	1,3,4,5,7
5	3,4,5,6	(3,4,5)†
6	4,5,6,7,8	4,5,7,8
7	4,6,7,8	(4,7,8)†
8	6,7,8,9	7,8,9
9	8,9	(8,9)†



Regression Analysis in Location Decisions

QLeNPro

When a firm with many facilities wants to expand

It can rely on wealth of information about existing facilities to forecast the performance of a candidate location.

A regression model based on several independent variables, such as size, competitors nearby, traffic etc. can be constructed to forecast performance.

Example, La Quinta Motors Inn, a chain of hotels

Commissioned a study for expansion.

Wanted to know the factors which determine a profitable hotel location and that would allow management to screen available real estate for new Hotel site.

The data collection from existing sites: traffic count, profitability, types pf neighboring businesses, distance to central business districts etc.

Total 35 variables considered

Regression Analysis in Location Decisions

QLeNPro

The operating margin, obtained by adding depreciation and interest expenses to profit and then dividing by the total revenue was chosen to be the most reliable factor.

Four crucial factors identified.

State, Price, Income and College, to be used in the forecast model

State: State population per Inn, a measure of brand exposure. A smaller number represents a high number of Quinta hotels in the state, meaning high brand exposure.

Income: Defined as average family income, a measure of affluence in the area

Since Quinta targets business travelers, the location in nonresidential area is preferred.

Operating margin Y = 39.05 + (-5.41) STATE + (5.86) PRICE + (-3.09) INCOME + (1.75) COLLEGE

Regression Analysis in Location Decisions

QLeNPro

Name	Description
Competitive factors	
INNRATE	Inn price
PRICE	Room rate for the inn
RATE	Average competitive room rate
RMS1	Hotel rooms within 1 mile
RMSTOTAL	Hotel rooms within 3 miles
ROOMSINN	Inn rooms
Demand generators	
CIVILIAN	Civilian personnel on base
COLLEGE	College enrollment
HOSP1	Hospital beds within 1 mile
HOSPTOTL	Hospital beds within 4 miles
HVYIND	Heavy industrial employment
LGTIND	Light industrial acreage
MALLS	Shopping mall square footage
MILBLKD	Military base blocked
MILITARY	Military personnel
MILTOT	MILITARY + CIVILIAN
OFC1	Office space within 1 mile
OFCTOTAL	Office space within 4 miles
OFCCBD	Office space in central business district
PASSENGER	Airport passengers enplaned
RETAIL	Scale ranking of retail activity
TOURISTS	Annual tourists
TRAFFIC	Traffic count
VAN	Airport van
Area demographics	
EMPLYPCT	Unemployment percentage
INCOME	Average family income
POPULACE	Residential population
Market awareness	
AGE	Years inn has been open
NEAREST	Distance to nearest inn
STATE	State population per inn
URBAN	Urban population per inn
Physical attributes	
ACCESS	Accessibility
ARTERY	Major traffic artery
DISTCBD	Distance to downtown
SIGNVIS	Sign visibility

Service Facility - Introduction

QLeNPro

Facility design comprises physical environment, space requirements, aesthetic factors and flexibility aligned with the service concept.

Competitors in home furnishing, repair

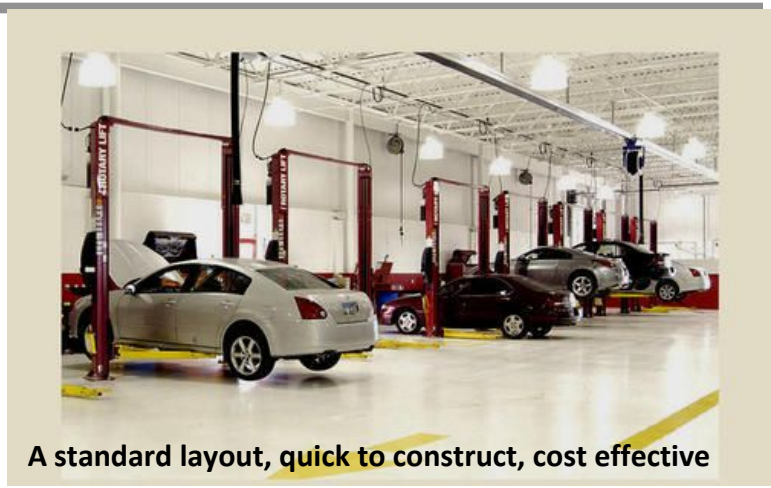
A standard layout, quick to construct, cost effective

Barbeque nation

Service Facility - Introduction

QLeNPro

Focus strategy, targeting particular customer, creating unique ambience



A standard layout, quick to construct, cost effective

Apple store, like a museum, touch, experiment, training

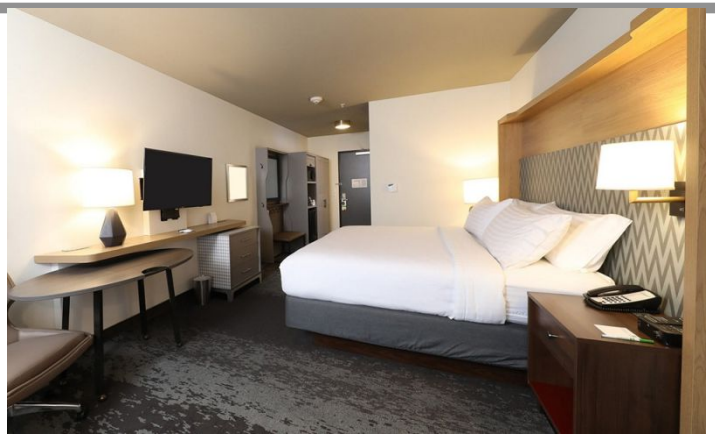
Functional, eye catching, pleasant environment

Service Facility - Introduction

QLeNPro

Hotel lobby - atrium

Holiday Inn – no surprises



Golden Arches

Service Facility - Introduction

QLeNPro

- **Facility design** - Important where Customer Contact Prevails – Home depot..
- **Uniform Presentation** encourages Customer Comfort and Ease – HP, Holiday Inn..
- **Thematic Design** – User Friendly – Pub, Apple, MacDonald's, Retail store…
- **Orientation** - Color Coded Subway Platforms, where am I?

All this helps in better connect with customer

Importance of Service Facility Design - Servicescape

QLeNPro

Servicescape (physical environment)

Influences customer as well as employees behavior

In line with service concept

Consist of,

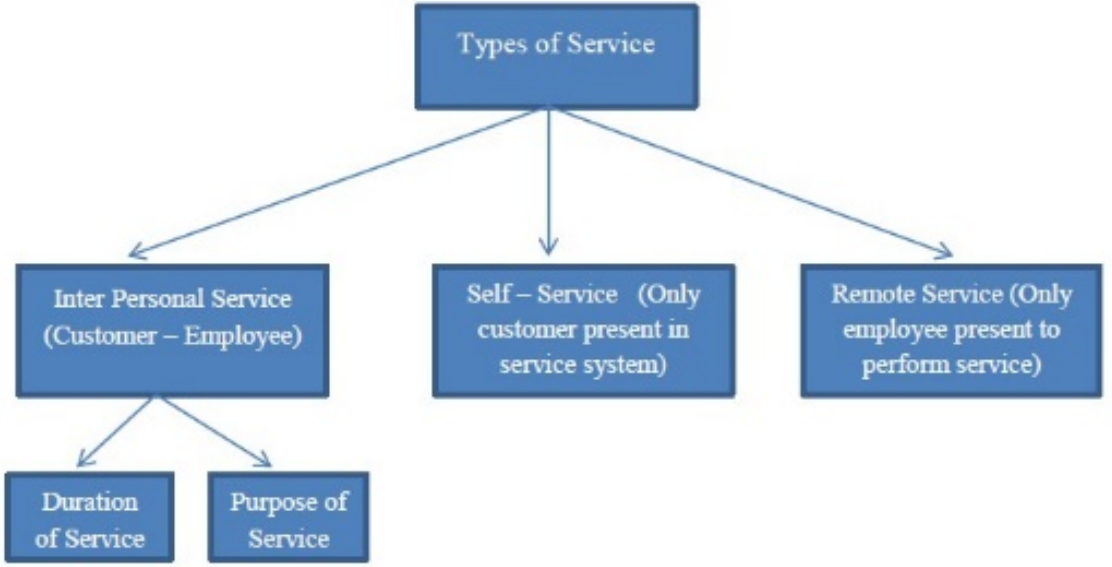
- **Ambient conditions – Temp, Noise, Air Quality, Music, smell,**
- **Space/ functions – Layout, Equipment, Furnishing**
- **Signs, symbols and artefacts – Signage, Décor and Style**

Servicescapes are uniquely designed by each business to create an atmosphere that aims to enhance their customer's experience, and ultimately have an impact on their behaviour.

The model acts as a framework for businesses to understand the elements at play in a Servicescapes and how they can begin to build their own.

Types of Service and Servicescapes

QLeNPro



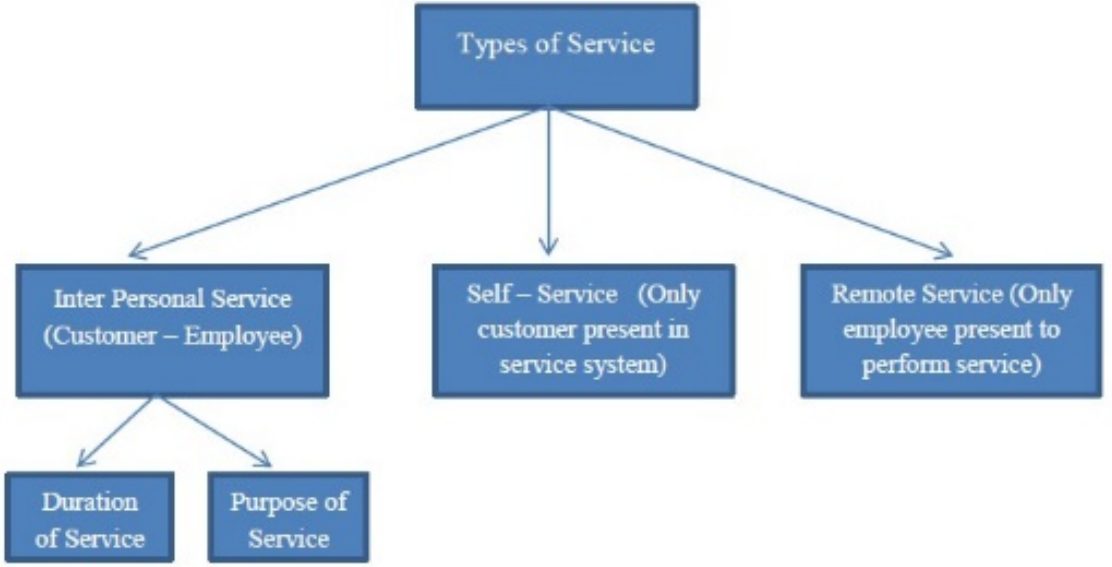
- In **Inter Personal Interactions**, the Servicescape must **Encourage Social Interaction**
  Example – Banks, Hospitals, Luxury hotel, Disneyland, Airline terminal etc.

- In **Self-Service systems**, Instructions, Steps, Diagnostics, etc. **Must be very clear**
  Example– ATMs and Vending Machines, Golf course, etc.

- In **Remote Services**, **Ambience** must be **comfortable for employees** spending long time, employee satisfaction, operational efficiency. Call centers, tele marketing

Types of Service and Servicescapes

QLeNPro



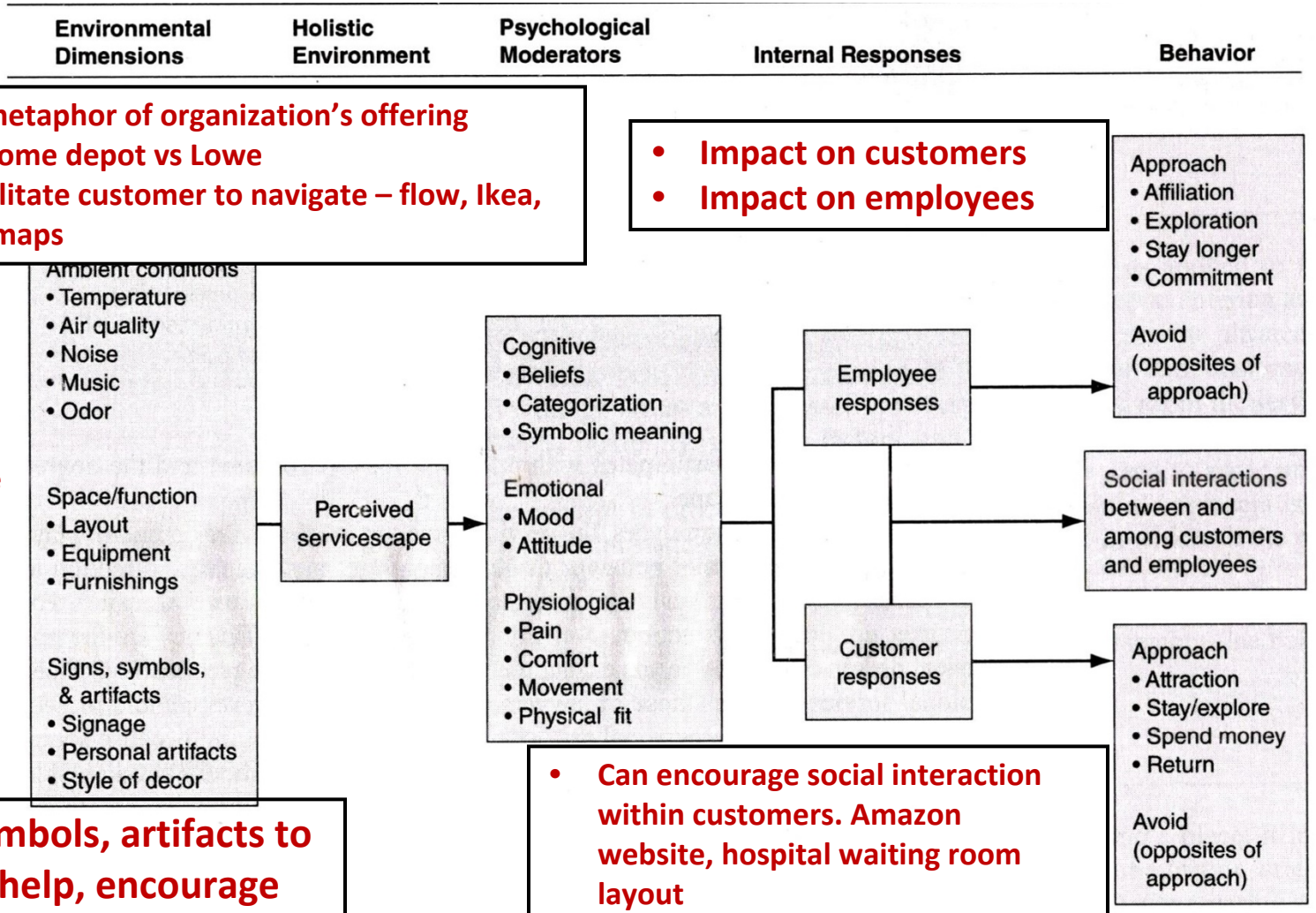
- In **Inter Personal Interactions**, the Servicescape must **Encourage Social Interaction** Example – Banks, Hospitals, Luxury hotel, Disneyland, Airline terminal etc.
- In **Self-Service systems**, **Instructions, Steps, Diagnostics**, etc. Must be very clear. ATMs and Vending Machines, Golf course, etc.
- In **Remote Services**, **Ambience** must be **comfortable for employees** spending long time, employee satisfaction, operational efficiency. Call centers, tele marketing

Servicescape Framework

QLeNPro

- Visual metaphor of organization's offering
  - Home depot vs Lowe
- Can facilitate customer to navigate – flow, Ikea, google maps

- Impact on customers
- Impact on employees



- Self service
- Employee customer
- Back-office

Signs, symbols, artifacts to caution, help, encourage

- Can encourage social interaction within customers. Amazon website, hospital waiting room layout
- To focus employee behaviour

Servicescape to e-Servicescape

QLeNPro

Today, most service encounters occur on Internet

Websites are convenient for buying goods / services as they eliminate Travel Time and are accessible from anywhere.

Important Elements under e-Servicescape:

- **Visual appeal of website in terms of aesthetics and graphics**
- **User friendly (easy navigation)**
- **Relevance of visual and technical information**
- **High interactivity**
- **Importantly, financial security in payment systems**

Service Facility Design

QLeNPro

Design of facility can affect the service operations.

Important aspect of service operations management.

Design and layout part of supporting facility component of service package.

Few examples – A restaurant with inadequate ventilation will discourage nonsmoking diners to come.

Design of a hospital will require – reception, OPD, access to radiography, physiotherapy, blood test, other investigation rooms, types of patient rooms with facilities like bed, toilets, TV or no TV, accompanist requirements, food for patient and accompanist, emergency ward, access to ambulance to emergency, operations theater, lighting, overall atmosphere etc. All the design to be in line with business strategy.

Few urgent factors like – toilets in multiplex. It's a challenge.

Good design and layout can enhance the service from attracting customers, making them feel comfortable, ensuring their security, privacy, sense of well being etc.

Service Facility Design

QLeNPro

Factors influencing facility design

- Nature and Objectives of service organization
- Land availability and space requirements
- Flexibility
- Security
- Aesthetic factors
- Community and environment

Service Facility Layout

QLeNPro

- Layout refers to Service Facility Arrangement – Area, Workstations, Website, Machines, etc.
- Important for Smooth Flow of Work and Efficient Flow of Information, Material and People.
- Layouts are also designed to maximize the space utilization to eliminate waste or redundant movement.
- Good Layout Increases the capacity of Service Facility, Reduces the Customer Waiting and Service Time.
- Proper Facility Layouts also Facilitate Entry, Exit and Placement of Merchandise in Super Markets.
- Facility Layouts are Designed to Facilitate Maintenance Activities and to Incorporate Safety and Security

Facility Layouts - Process Layout

QLeNPro

- In Process Layout, similar activities are grouped together according to the process or function they perform
- Appropriate for many, low-volume and high variety but similar customer requests
- Moderate degree of customization
- Advantages – handle variety of requests and flexibility to assign employees to servers
  - Health Clinics, Hospitals with similar departments bunched together
- Difficulty in management when customers with different needs must go thru different sequences
- Flow of customers – Intermittent and high fluctuation in demand
- Customers may join different Q's, so more Waiting.
- Objective is to arrange departments with close inter-departmental flow of people next to one another

Facility Layouts - Process Layout

QLeNPro

A lifestyle store - layout

Jewelry & Cosmetics	Kid's Wear	Home Furnishings
Women's Formal	Kid's Play Area	Shoes &Bags
Women's Casual	Entrance	Men's Apparel

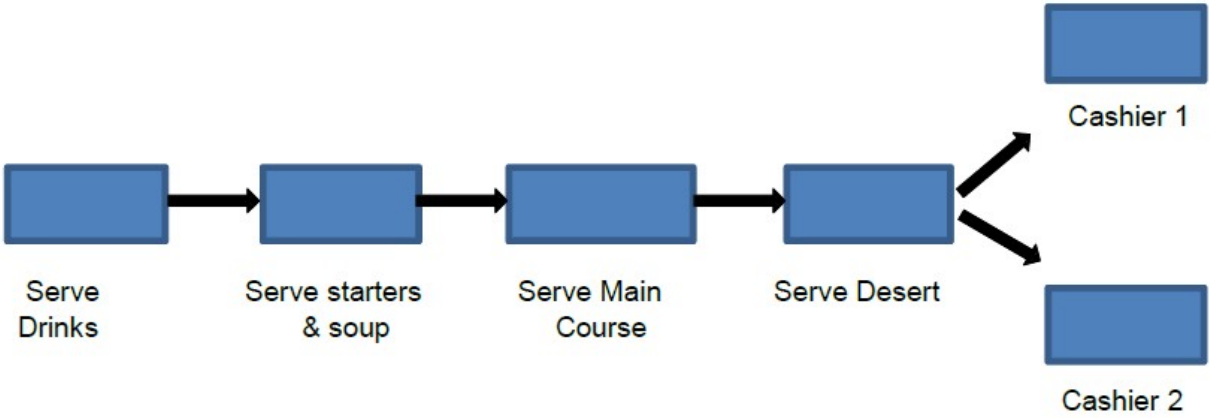
Facility Layouts – Product Layout

QLeNPro

- Workstations Located according to the Processing Sequence
- Inflexible Sequence of Steps – Customer Covers ALL Steps
- Also known as Assembly–Line Layout for product like cars
- Ideal for Limited Variety of Standard Services to Large Number of Customers
- Ensures Smooth Flow of Customers with Reduced Bottlenecks
- Helps to Equalize Time at Each Server by Balancing the Service Line. Line can be Balanced by Moving Tasks between Servers
- Ideal Balance for Continuous Flow of Customers with Minimum Idle Time at Each Server

Facility Layouts – Product Layout

QLeNPro



Server	1	2	3	4	5 & 6
Average Service Time	20 Seconds	30 Seconds	40 Seconds	15 Seconds	40 Seconds

A Standard Menu Cafeteria

Bottle neck is Station 3 with Service Time = 40 Seconds
Maximum Idle time is Station 4 with Idle time = 25 secs / cycle

Fixed-Position Layout

QLeNPro

In Fixed position layout, service is performed around a customer while he remains stationary

Example,

- Surgery performed on patient in operation theater. Different doctors perform activities on a patient, like anesthetist, surgeon, radiologist, etc.
- Beauty Parlor

Facility Layouts - Retail layout

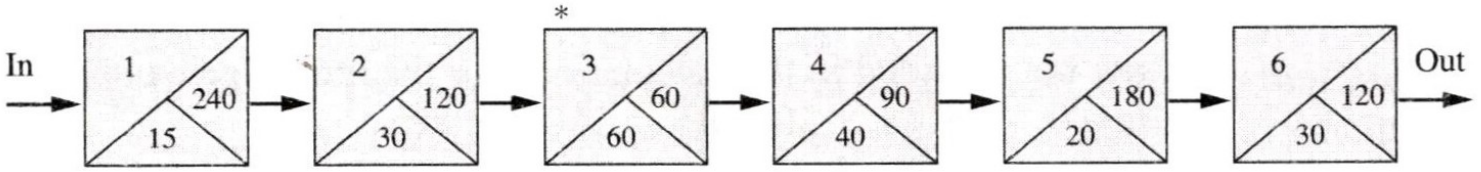
QLeNPro

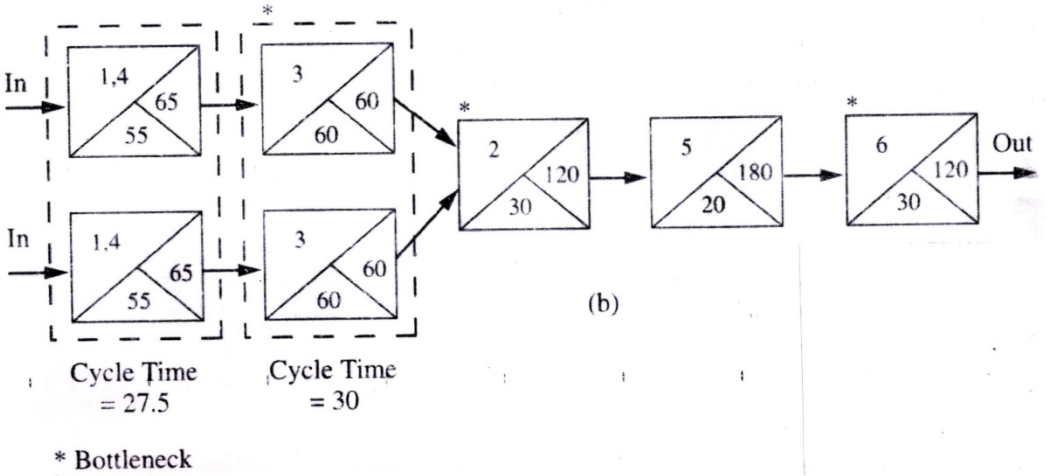
- Objective – to maximize net profit/square feet of display space
- Provide customers exposure to products with greater sales and revenues
- Arrangement and flow pattern of store to match strategy
- Example, necessary items near entrance so working people can pick up stuff quickly
- Encourage impulse buying - necessary items at the end of aisle, so you buy non-essential stuff enroute
- sufficient aisle space for free movement of trolleys
- Campaigns to promote store strategy

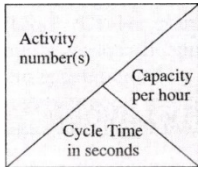
Driving School

QLeNPro

Activity	Description	Cycle Time, Sec.
1	Review application for correctness	15
2	Process and record payment	30
3	Check for violations and restrictions	60
4	Conduct eye test	40
5	Photograph applicant	20
6	Issue temporary license (state trooper)	30

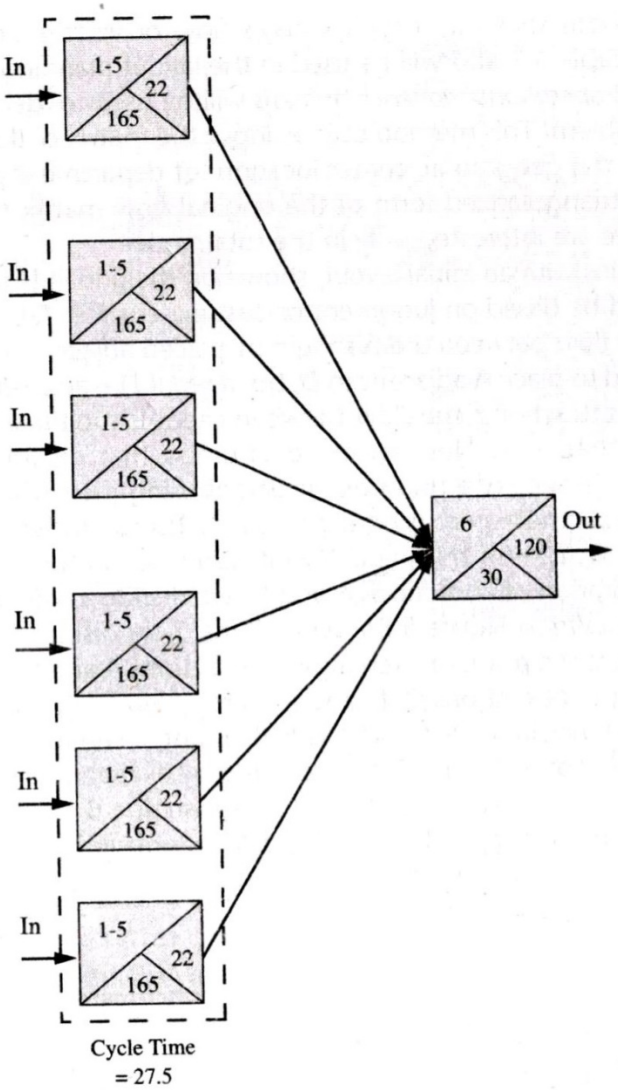






Driving School

QLeNPro



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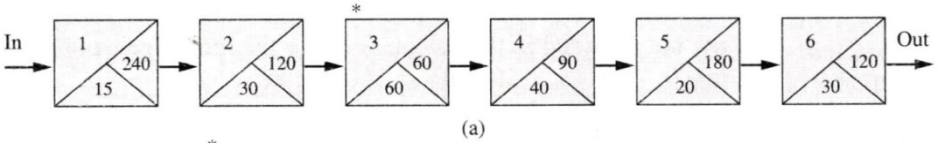


(a)

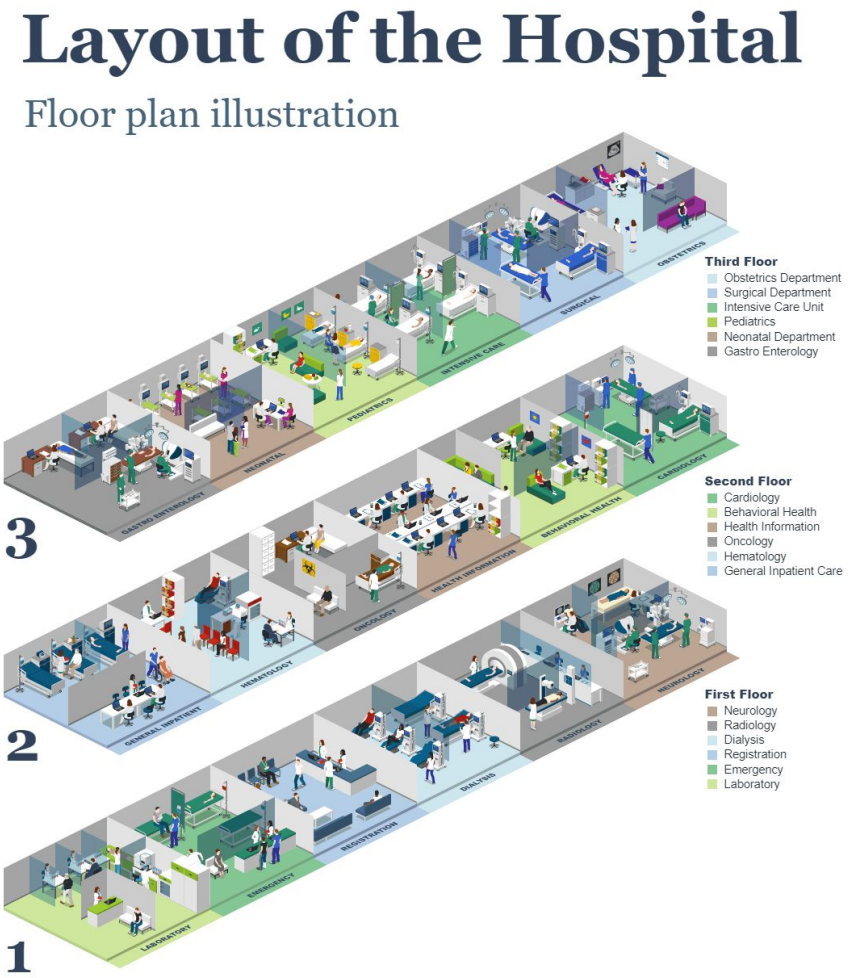
Job Shop Process Layout and Relative Location Problem

QLeNPro

- No fixed sequence of operations
- Service can be customized to meet customer's needs.
- The flexibility of layout allows the service to be customized to customer's requirements.
- Requires highly skilled service providers.
  - ❖ Consulting, law, medicine etc.
- Service provider perspective – flow of customer is intermittent.
- Need for waiting area before each department.
- Variability in demand – customers choose their different sequence of activities.
- Service in this case provided on first-come, first-basis (FCFS).
- A better layout will have frequently used departments to be as near as possible.
- Many different layouts possible.

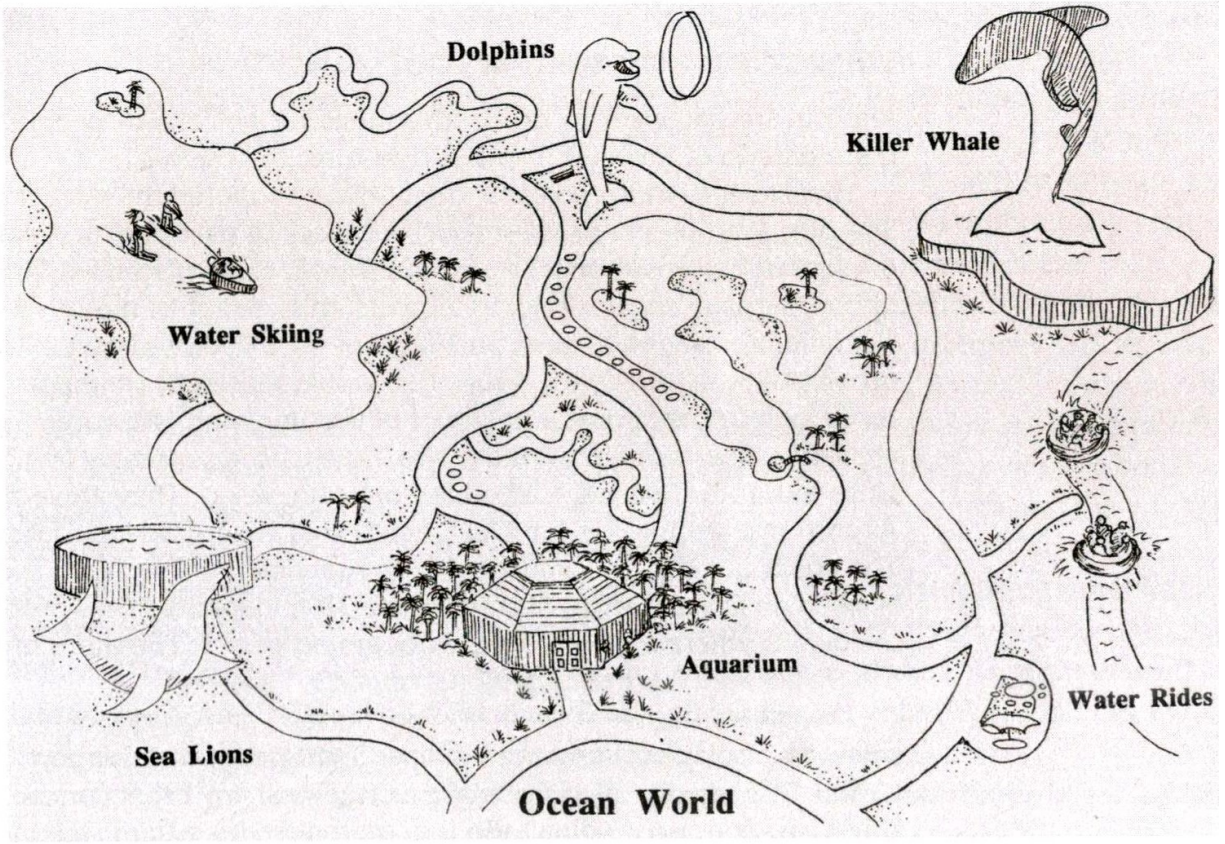
Job Shop Process Layout and Relative Location Problem

QLeNPro



Job Shop Process Layout and Relative Location Problem

QLeNPro



Service Quality - Issues

QLeNPro

Definitions

- The totality of features and characteristics of product or services that bears on its ability to satisfy given needs.

- Customer Satisfaction: Bridging gap between customer's perceptions of service received and expectations of service desired.

Difficult to define quality having many dimensions

Quality While Designing Service System

Managing Service Failures

Service Quality Gap A Good Indicator

Monitoring Variations In Service Performance

Quality – Critical For Business Survival

Benefits of Good Quality

Dimensions of service quality

QLeNPro

Reliability, Responsiveness, Assurance, Empathy, Tangibles

- **Reliability** - Perform promised service
  - Dependably and Accurately
  - Consistently
  - Correctly, the first time, every time
  - Example: Banks keeping loan related records correctly
  - Waiting time at dentist not more than promised waiting time
- **Responsiveness** – Willingness to help customers
  - Promptly
  - Recover quickly after service failure
  - Examples: In case of lost debit card/credit card, the customer care people will block the card immediately,
  - An airline provides meals at the airport in case of delayed flight
  - A service recovery satisfying a previously dissatisfied customer and making them a loyal customer

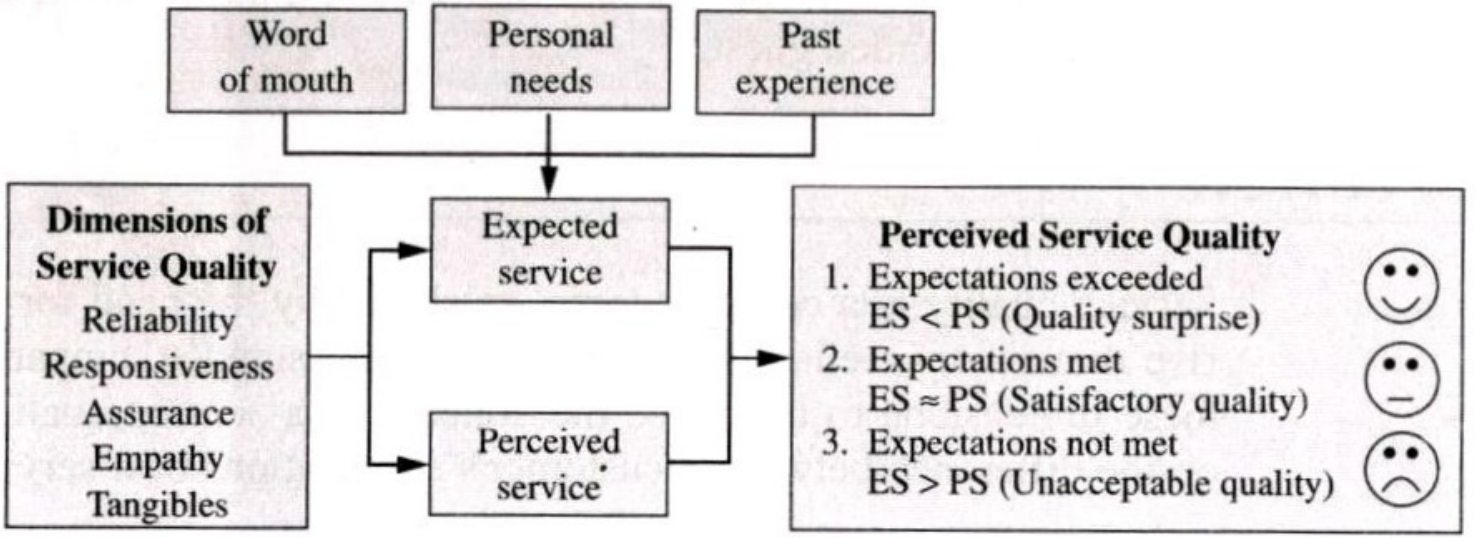
Dimensions of service quality

QLeNPro

- **Assurance**
  - Ability to convey trust and confidence
  - Knowledge and courtesy of employees
  - Competence
  - Effective communication
  - *Examples*: being polite and showing respect for customer
- **Empathy** - Approachability
  - Caring and Individualized attention
  - Understand customer's needs
  - Ease of contact
  - *Example*: Being a good listener to customer's concerns
- **Tangible** - Physical evidence of services
  - Facilities and facilitating goods
  - Appearance of service provider
  - Tools or equipment used to provide the service
  - *Example*: The new international airports in New Delhi, Hyderabad and Bangalore have been constructed at par with International standards

Conceptual Model of Service Quality

QLeNPro



Customer Satisfaction Questionnaire

QLeNPro

G.M. Questionnaire

Club Med Village: _____

Dates of your stay: From: _____ (Month/Day/Year) to: _____ (Month/Day/Year)

Name: _____ Member # _____

Address: _____

City: _____ State: _____ Zip: _____

	• OVERALL IMPRESSION	• ORGANIZATION	• TEAM OF G.O.s	• FOOD	• BAR	• SPORTS	• DAYTIME AMBIANCE	• EVENING ENTERTAINMENT	• MUSIC AND DANCE	• MINI CLUB	• EXCURSIONS	• ACCOMMODATIONS	• CLUB FLIGHTS AND TRANSFERS	• CLEANLINESS
EXCELLENT	6	6	6	6	6	6	6	6	6	6	6	6	6	6
VERY GOOD	5	5	5	5	5	5	5	5	5	5	5	5	5	5
GOOD	4	4	4	4	4	4	4	4	4	4	4	4	4	4
FAIR	3	3	3	3	3	3	3	3	3	3	3	3	3	3
POOR	2	2	2	2	2	2	2	2	2	2	2	2	2	2
VERY POOR	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Your Comments: _____

1. Did Club Med meet your expectations?
   ☐ Far below expectations ☐ Surpassed expectations
   ☐ Fell short of expectations ☐ Far surpassed expectations
   ☐ Met expectations
2. If this was not your first Club Med, how many other times have you been to a Club Med village? _____
3. How did you make your Club Med reservations?
   ☐ Through a travel agent ☐ Through Club Med Reservations
4. Quality of your reservations handling (pre-travel information):
   ☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Excellent
5. Which one factor was most important in your choosing Club Med for your vacation?
   ☐ Previous stay with us ☐ Advertisement ☐ Editorial Article
   ☐ Travel Agent Recommendation ☐ Friend/Relative Recommendation
6. Kindly indicate your age bracket:
   ☐ Under 25 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55 or over
7. Kindly indicate your marital status: ☐ Married ☐ Single
8. Would you vacation with Club Med again? ☐ Yes ☐ No
9. If you answered yes to question 8, where would you like to go on your next Club Med vacation?
   ☐ U.S.A. ☐ Mexico ☐ French West Indies ☐ Caribbean ☐ Europe
   ☐ Other: _____

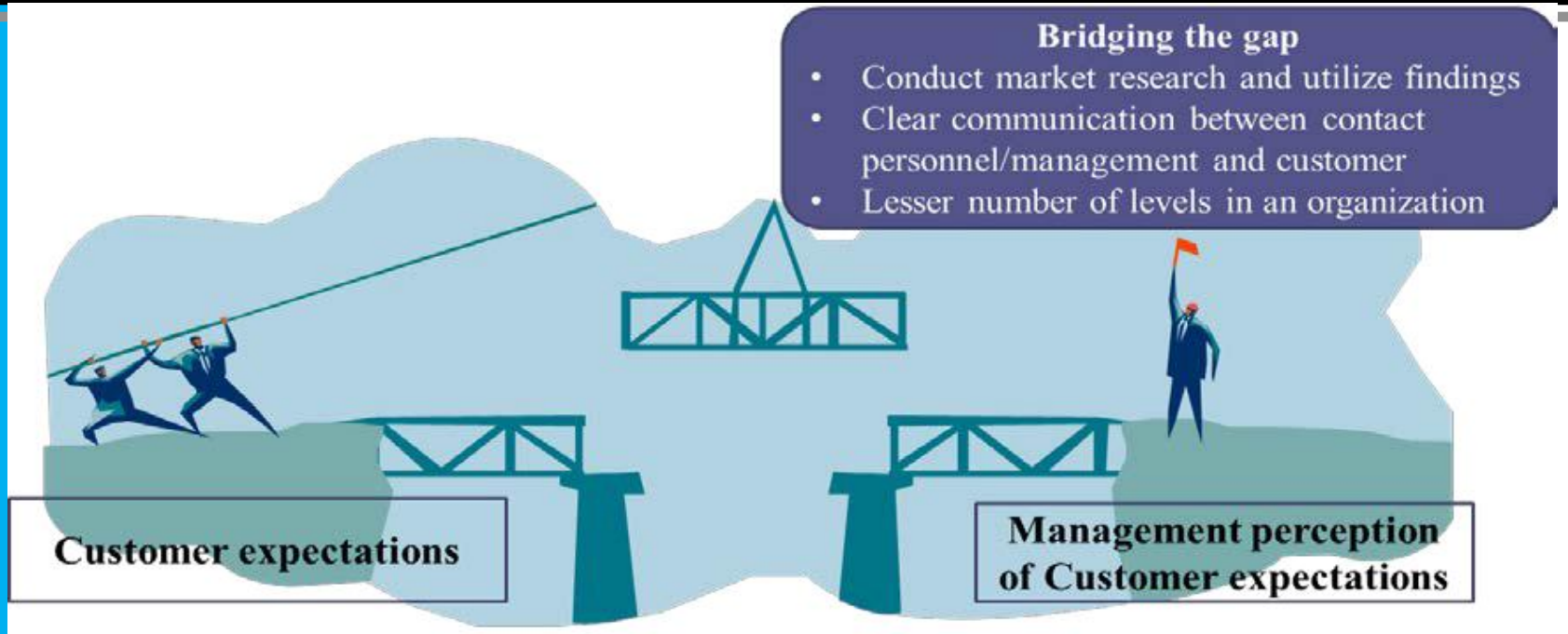
SERVQUAL – Service Quality GAP Model

QLeNPro

The gap between customer's perception and customer's expectation is represented by Gap 5 which is caused by other 4 gaps

Gap 1: Customer expectations and Management perception of Customer expectations

QLeNPro



Why this Gap?

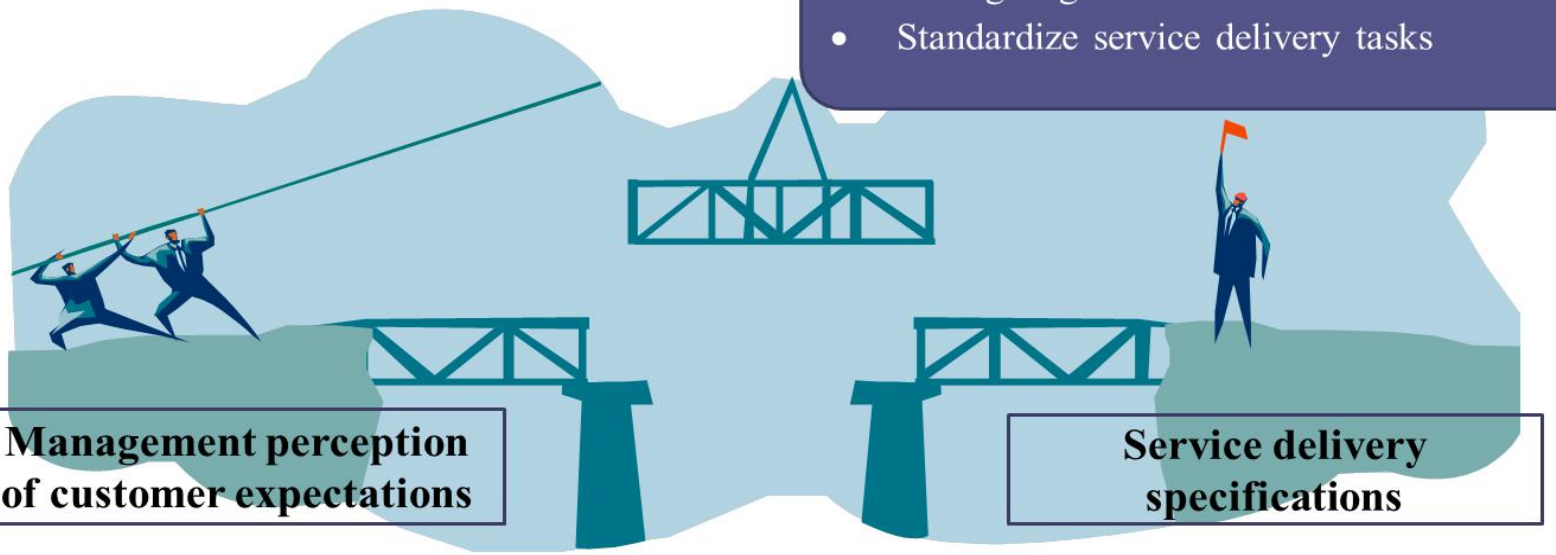
- Failure to understand the service quality attributes perceived by the customers
- Improper way of imparting the service concept which leads to formulation of expectations
- Lack of or insufficient market research
- Lack of communication between customer and management

Gap 2: Management perception of customer expectations and service delivery specifications

QLeNPro

Bridging the gap

- Setting target levels
- Standardize service delivery tasks



Why this Gap?

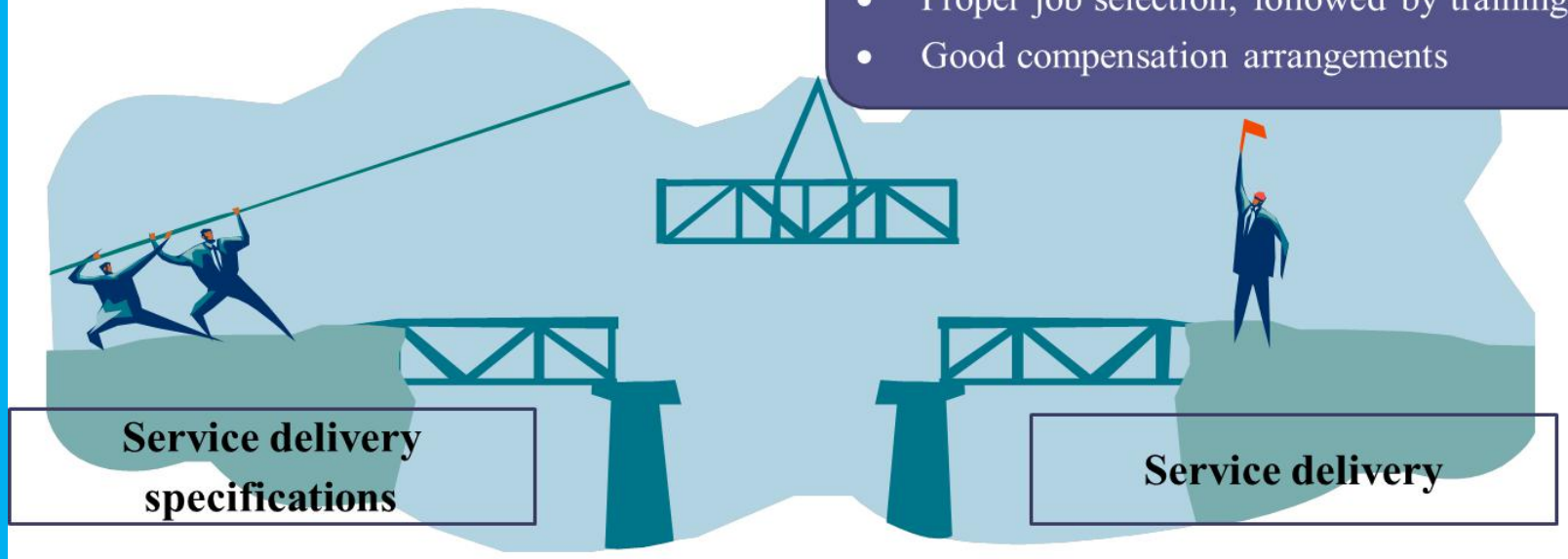
- ✓ Absence of service quality targets or goal setting
- ✓ Inadequate task standardization
- ✓ Poor understanding of service system design
- ✓ Wrong service quality standards

Gap 3: Service delivery specifications and Service delivery

QLeNPro

Bridging the gap

- Proper job selection, followed by training
- Good compensation arrangements



Why this Gap?

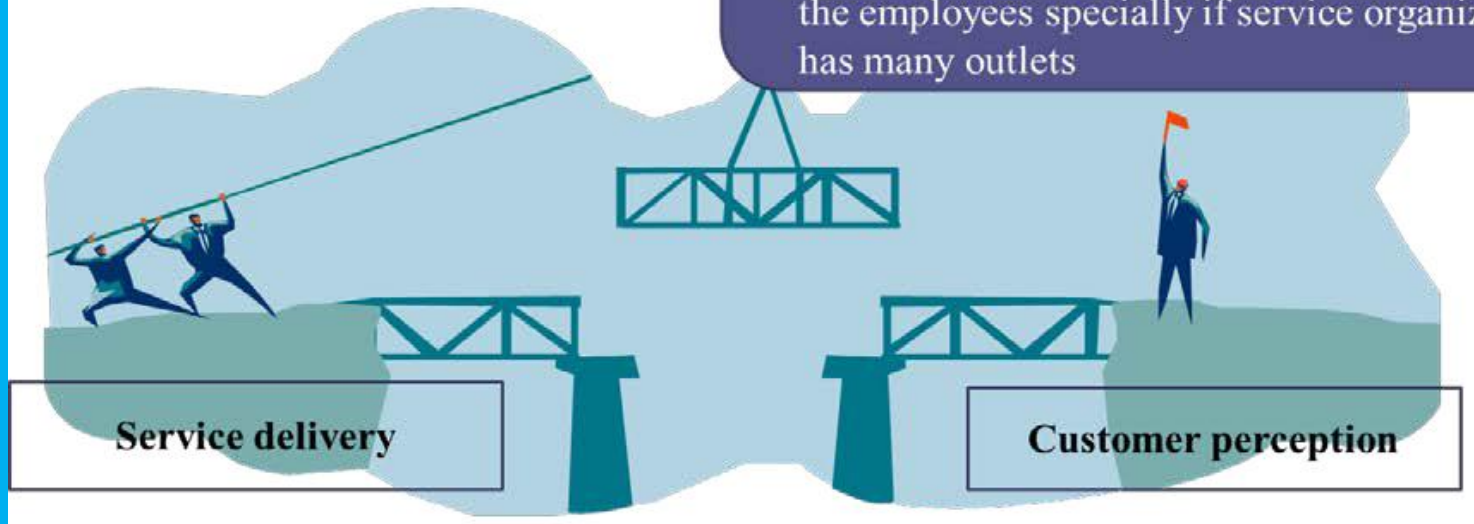
- ✓ The nonconformance due to lack of teamwork
- ✓ Inability or unwillingness of employee o perform at desired level specified
- ✓ Lack of compensation, training

Gap 4: Service delivery and customer perception

QLeNPro

Bridging the gap

- Modes communicating to the customers should be sensitized for actual service delivery.
- Standardize the services and communicate to the employees specially if service organization has many outlets



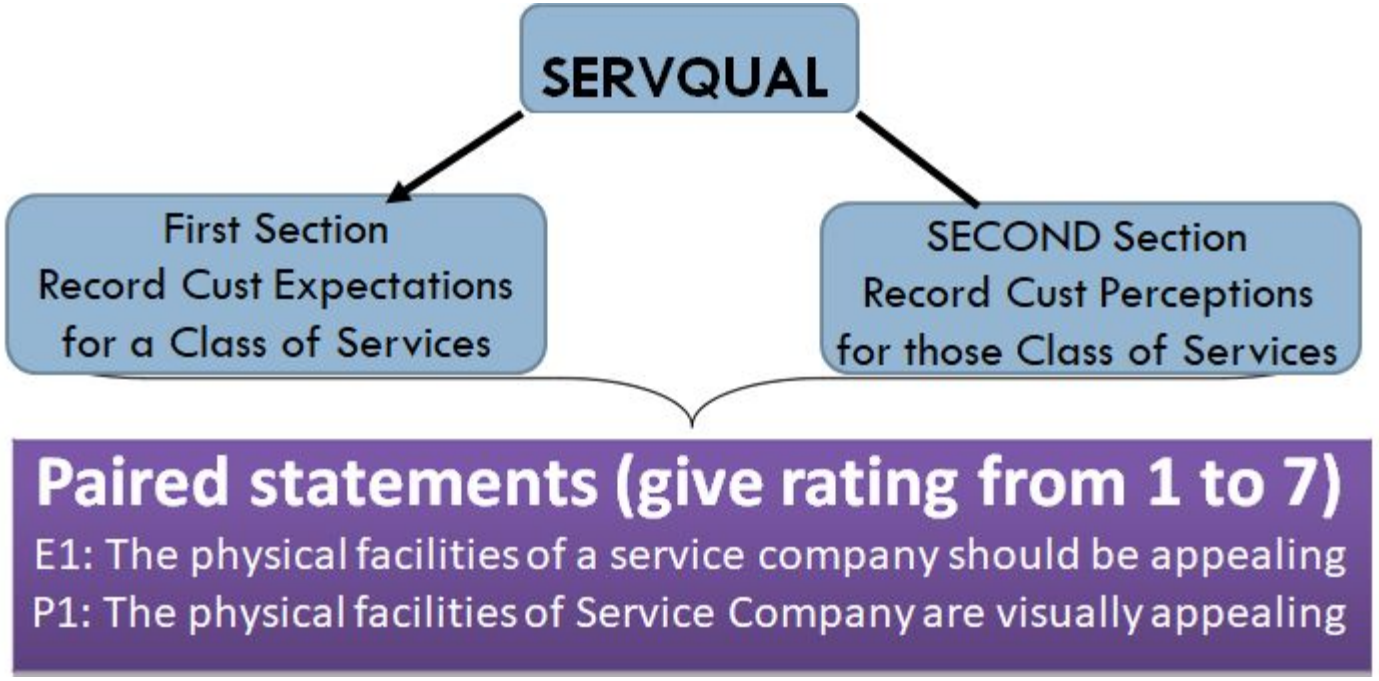
Why this Gap?

- Exaggerated promises due to inadequate communications to contact personnel
- Inadequate information about the service delivery aspects.

SERVQUAL – Service Quality Measurement Tool

QLeNPro

- **Effective tool for surveying customer satisfaction based on service quality gap model and exploratory and empirical research**
- **Tracks service quality trends through periodic customer surveys**
- **Helps organizations to compare customers' perceptions and expectations of service quality over time using 22 quality related items.**



Calculation of SERVQUAL Scores

QLeNPro

- SERVQUAL score is obtained with the help of statements or 22 quality related items covering five dimensions of service quality

- Respondents are asked to give ratings on a scale (1=strongly disagree to 7=strongly agree) regarding their expectations with Expectation score (E) and perceptions with Perception score (P) of a particular service for all 22 items.

- Determine the gap between perception and expectation with gap score (P-E).

- Take average of Gap score for each dimension over number of items in each dimension and finally obtain average un-weighted SERVQUAL score over all dimensions

- SERVQUAL can be used in marketing studies to compare a service with a competitor's and again identify the dimensions of superior or inadequate service quality.

Calculation of SERVQUAL Scores

QLeNPro

Reliability

1. Providing services as promised.
2. Dependability in handling customers' service problems.
3. Performing services right the first time.
4. Providing services as the promised time.
5. Maintaining error-free records.

Responsiveness

6. Keeping customers informed about when services will be performed.
7. Prompt service to customers.
8. Willingness to help customers.
9. Readiness to respond to customers' enquiries.

Calculation of SERVQUAL Scores

QLeNPro

Assurance

10. Employees who instill confidence in customers.
11. Making customers feel safe in their transactions.
12. Employees who are consistently courteous.
13. Employees who have the knowledge to answer customer questions.

Empathy

14. Giving customers individual attention.
15. Employees who deal with customers in caring fashion.
16. Having the customer's best interest at heart.
17. Employees who understand the needs of their customers.
18. Convenient business hours.

Tangibles

19. Modern equipment.
20. Visually appealing facilities.
21. Employees who have a neat, professional appearance.
22. Visually appealing materials associated with service.

Walk through Audit

QLeNPro

Customer participates in the service delivery process.

Delivery of service should conform to customer's expectations from beginning to the end of experience.

WTA is an opportunity to evaluate the service experience from the customer's perspective.

Customer satisfaction surveys are marketing oriented, seeking to measure overall customer satisfaction.

The WTA is process oriented, with an objective to uncover opportunities of improvement.

TABLE 6.1 **Comparison of Customer Satisfaction Survey with Walk-through Audit**

Source: Elsa Lai-Ping Leong Koljonen and Richard A. Reid, "Walk-through Audit Provides Focus for Service Improvements for Hong Kong Law Firm," *Managing Service Quality*, 10(1), 2000, p. 35.

	Customer Satisfaction Survey	Walk-through Audit
Purpose	Determine overall satisfaction associated with the current level of service quality.	Conduct a systematic assessment of the entire customer service experience from beginning to end.
Focus	Measure customer attitudes toward, opinions about, and perceptions of service quality.	Measure customer perceptions of the effectiveness of each stage of the service delivery process.
Process	1. Identify important customer service requirements or quality dimensions. 2. Design, test, and administer questionnaire to a sample of customers. 3. Summarize and analyze questionnaire results with emphasis on low ratings and changes relative to prior survey administrations. 4. Determine areas needing improvements and implement change designed to correct deficiencies. 5. Repeat for continuous quality improvement.	1. Flowchart the service delivery process from the customer's perspective. 2. Design, test, and administer questionnaire to a sample of customers, management personnel, and/or customers at benchmark organizations. 3. Summarize and analyze survey results with emphasis on low rating relative to benchmark firms and gaps between management and customers. 4. Determine deficiencies and implement improvements. 5. Repeat for ongoing improvement.
Features	1. Survey may be completed by customers at any time after receiving service. 2. Management, with some customer input, designs/structures the survey around common service dimensions (e.g., *availability, timeliness, responsiveness, convenience*). 3. Often performed by marketing personnel. 4. Primary emphasis is placed on assessing the determinants of the customer's overall impression of the service.	1. Questionnaire is completed by customers during or immediately after receiving service. 2. A comprehensive audit of the customer's total service experience of all five dimensions of the service package (i.e., *supporting facility, facilitating goods, information, explicit service, implicit service*). 3. Usually conducted by operations personnel. 4. Emphasis is placed on the customer's evaluation of each stage of the service delivery process and his/her overall impression of the organization's performance.

Restaurant Satisfaction Survey

QLeNPro

As Your Guest, I Would Like to Tell You . . .

_____

_____

_____

_____

	Great	Good	Fair	Poor
Food quality				
Service speed				
Service attentiveness				
Cleanliness				
Atmosphere				

Name _____

Address _____

City _____ State _____ Zip _____

Phone _____ Date _____

Walk through audit for Helsinki Museum of Art & Design

QLeNPro

FIGURE 6.5 Walk-through Audit for Helsinki Museum of Art and Design

Source: Prepared by Eivor Biese, Lauren Dwyre, Mikes Koulianos, and Tina Hyvonen under the supervision of Professor James A. Fitzsimmons.

Hello, we are from the Helsinki School of Economics and Business Administration and we are conducting a survey to find out what you think about the service experience when visiting this museum. Please answer the following questions.

All information in this questionnaire is strictly confidential!

1. Was it easy getting to the Museum? ❑ Yes ❑ No

2. Are the Museum's opening hours acceptable? ❑ Yes ❑ No

3. Did you arrive alone or with others? ❑ Alone ❑ Others Number in Party: _____

4. Where did you hear about this event: [Check all that apply]

❑ Newspaper
❑ Magazine
❑ Tourist/City guide
❑ Radio
❑ Internet
❑ Friends or relatives
❑ Passing by
❑ Other: (Specify) _____

5. Did you come here to see

❑ Brooching It Diplomacy
❑ Wine—Nectar of Gods
❑ The Holy Cross
❑ The permanent exhibition
❑ All exhibitions

continued

Walk through audit for Helsinki Museum of Art & Design

QLeNPro

FIGURE 6.5 *(concluded)*

6. Which of the following facilities did you visit? ❑ Cafeteria ❑ Gift shop ❑ Restrooms

7. How many hours did you spend in the museum? _____ hours

8. Ticketing	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
a. It is easy to find information about ticket prices.	1	2	3	4	5
b. The ticket price is a good value for the money.	1	2	3	4	5
c. You did not spend too much time by waiting in the ticket line.	1	2	3	4	5
d. You would like to purchase tickets ahead of time, via phone or Internet.	1	2	3	4	5

9. Information	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
a. Signs gave clear information about exhibits' locations.	1	2	3	4	5
b. After arriving at the exhibition, you found adequate information about the exhibition(s).	1	2	3	4	5
c. The information provided was in your language.	1	2	3	4	5
d. Guide services were available.	1	2	3	4	5
e. There was enough information about the objects.	1	2	3	4	5
f. The explanations provided on the objects were clear.	1	2	3	4	5
g. You would like to see a variety of media (video, etc.) providing explanations.	1	2	3	4	5
h. You would like to have access to self-guided material such as a cassette player.	1	2	3	4	5
i. You would like to have more information about the process for creating the objects.	1	2	3	4	5
j. You would like to learn more when visiting exhibits.	1	2	3	4	5
k. It was easy to get additional information from the staff.	1	2	3	4	5
l. The staff helping you was friendly.	1	2	3	4	5

Walk through audit for Helsinki Museum of Art & Design

QLeNPro

10. The experience	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
a. There was a clear path in which you were guided through the exhibition.	1	2	3	4	5
b. There was enough room to move around the exhibits.	1	2	3	4	5
c. Lighting was adequate.	1	2	3	4	5
d. There was pleasant background music.	1	2	3	4	5
e. The background sounds were pleasant.	1	2	3	4	5
f. The objects on display were adequately spaced apart.	1	2	3	4	5
g. There is enough opportunity for interaction with the displayed objects.	1	2	3	4	5
h. Touching, smelling, and hearing make the experience memorable.	1	2	3	4	5
i. You would also like to touch the material.	1	2	3	4	5

11. Facilities	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
a. There were clear signs giving information about the facilities.	1	2	3	4	5
b. The toilettes were easily accessible.	1	2	3	4	5
c. The toilettes were clean.	1	2	3	4	5
d. The food was of good quality.	1	2	3	4	5
e. There was enough variety of food and beverages.	1	2	3	4	5
f. The food was of good value for the money.	1	2	3	4	5
g. Smoking should be allowed in the restaurant.	1	2	3	4	5
h. The selection of gifts (including books) met your needs.	1	2	3	4	5
i. The gifts were of good value for the money.	1	2	3	4	5

12. Satisfaction	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
a. The services met my needs.	1	2	3	4	5
b. I found the overall service outstanding.	1	2	3	4	5
c. I am likely to use this service again.	1	2	3	4	5
d. I would recommend this museum to my friend.	1	2	3	4	5
e. Could we improve the service to better meet your expectations?	1	2	3	4	5

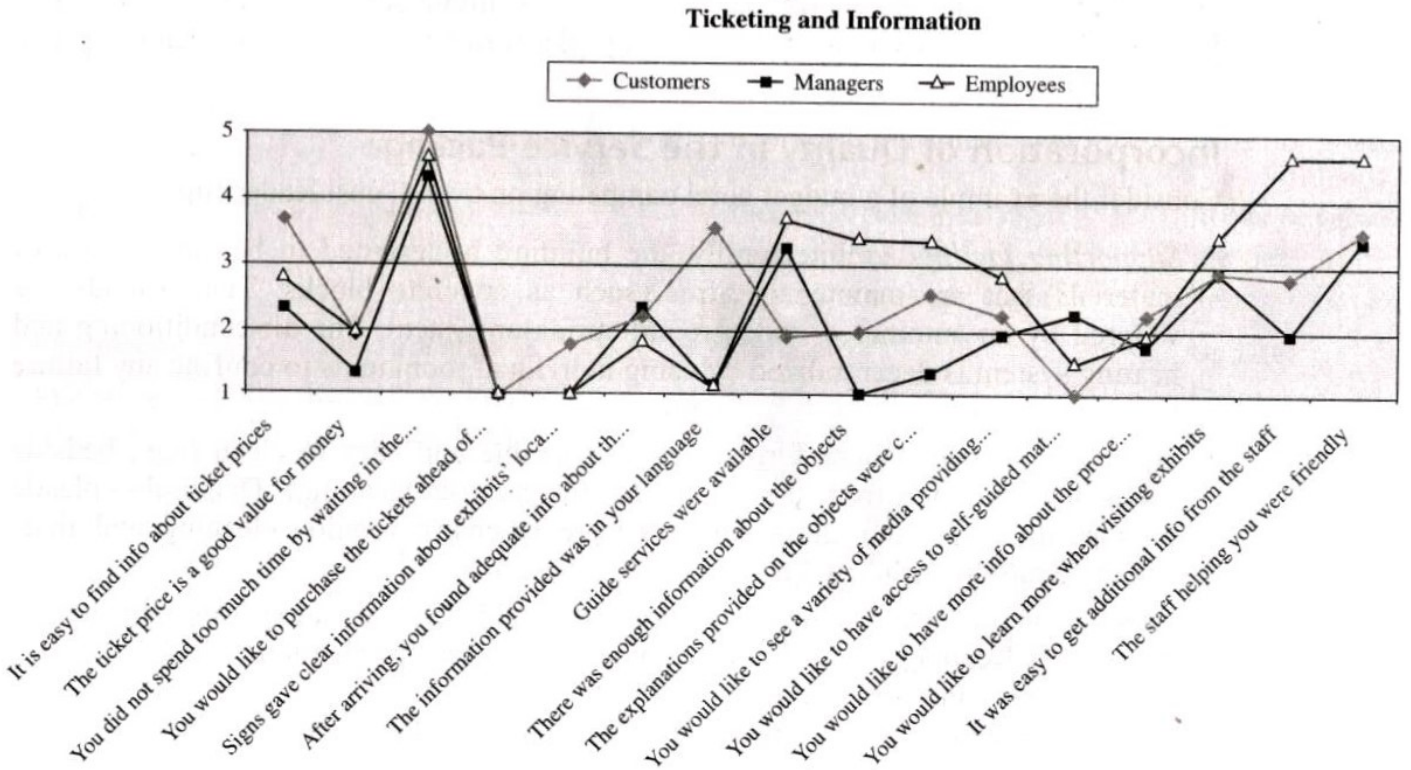
13. Comments

Helsinki Museum of Art & Design Service Audit Gaps

QLeNPro

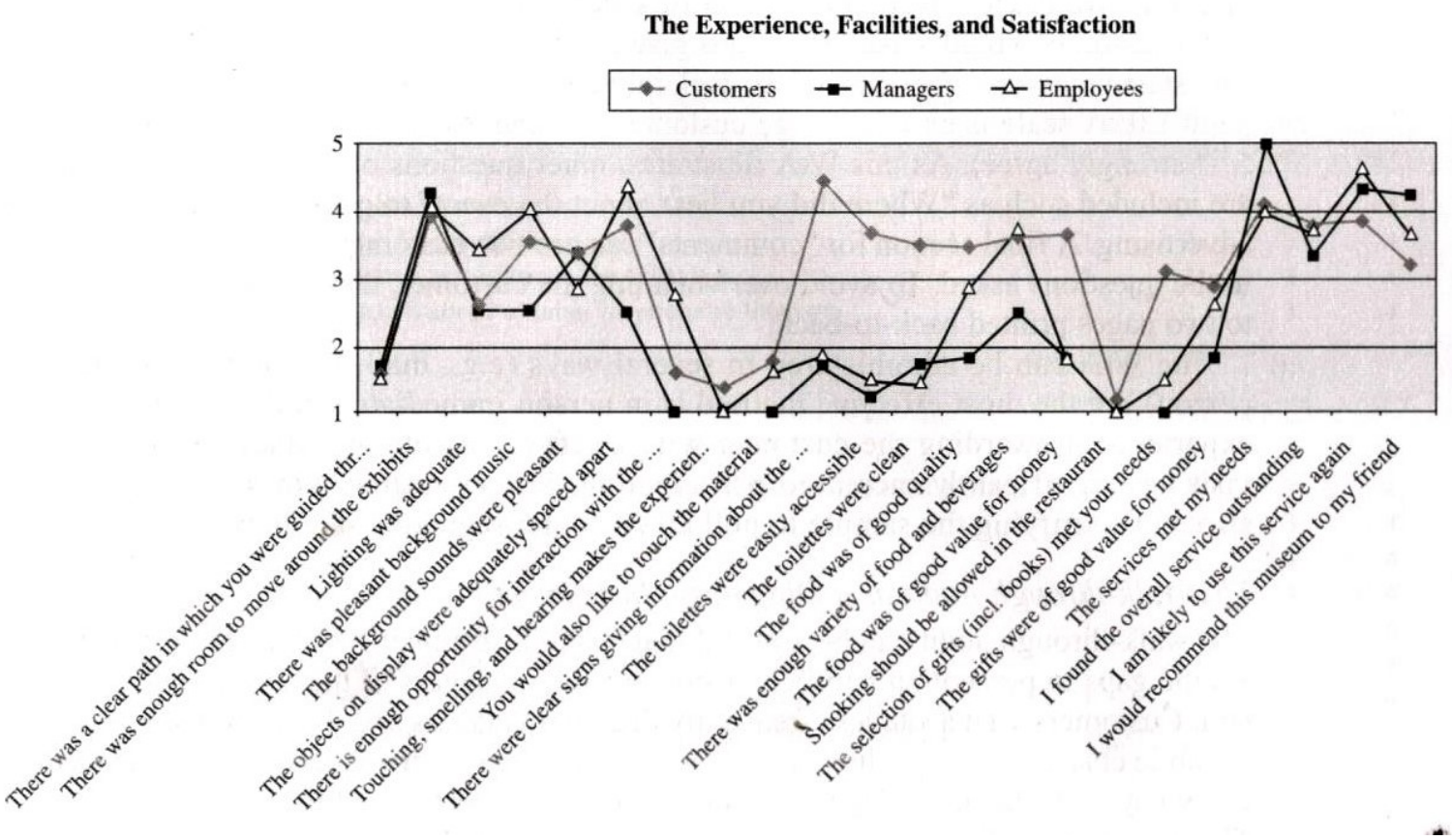
FIGURE 6.6 **Helsinki Museum of Art and Design Service Audit Gaps**

Source: Prepared by Eivor Biese, Lauren Dwyre, Mikes Koulianos, and Tina Hyvonen under the supervision of Professor James A. Fitzsimmons.



Helsinki Museum of Art & Design Service Audit Gaps

QLeNPro



Incorporating Quality in the Service Package

QLeNPro

Service Package Feature	Attribute or Requirement	Measurement	Nonconformance Corrective Action
Supporting facility	Appearance of building	No flaking paint	Repaint
	Grounds	Green grass	Water grass
	Air-conditioning and heating	Temperature maintained at 68° ± 2°	Repair or replace
Facilitating goods	TV operation	Reception clear in daylight	Repair or replace
	Soap supply	Two bars per bed	Restock
	Ice	One full bucket per room	Restock from ice machine
Information	Guest preferences	Complete	Update
Explicit services	Room cleanliness	Stain-free carpet	Shampoo
	Swimming-pool water purity	Marker at bottom of deep end visible	Change filter and check chemicals
	Room appearance	Drapes drawn to width of 3 ft	Instruct maid
Implicit services	Security	All perimeter lights working	Replace defective bulbs
	Pleasant atmosphere	Telling departing guests "Have a nice day"	Instruct desk clerk
	Lobby congestion	No customer having to wait for a room	Review room cleaning schedule

Key Ideas in Service Design

- Simpler design having fewer components leads to less number of error points.
- Considering Customer Requirements and Expectations.
- Reduce cost of Repair or Customer Loss
- Tools for designing quality in Service
- Quality Function Deployment (House of Quality)
- Poka-yoke (Fail-safing)
- Taguchi Methods (Robustness)

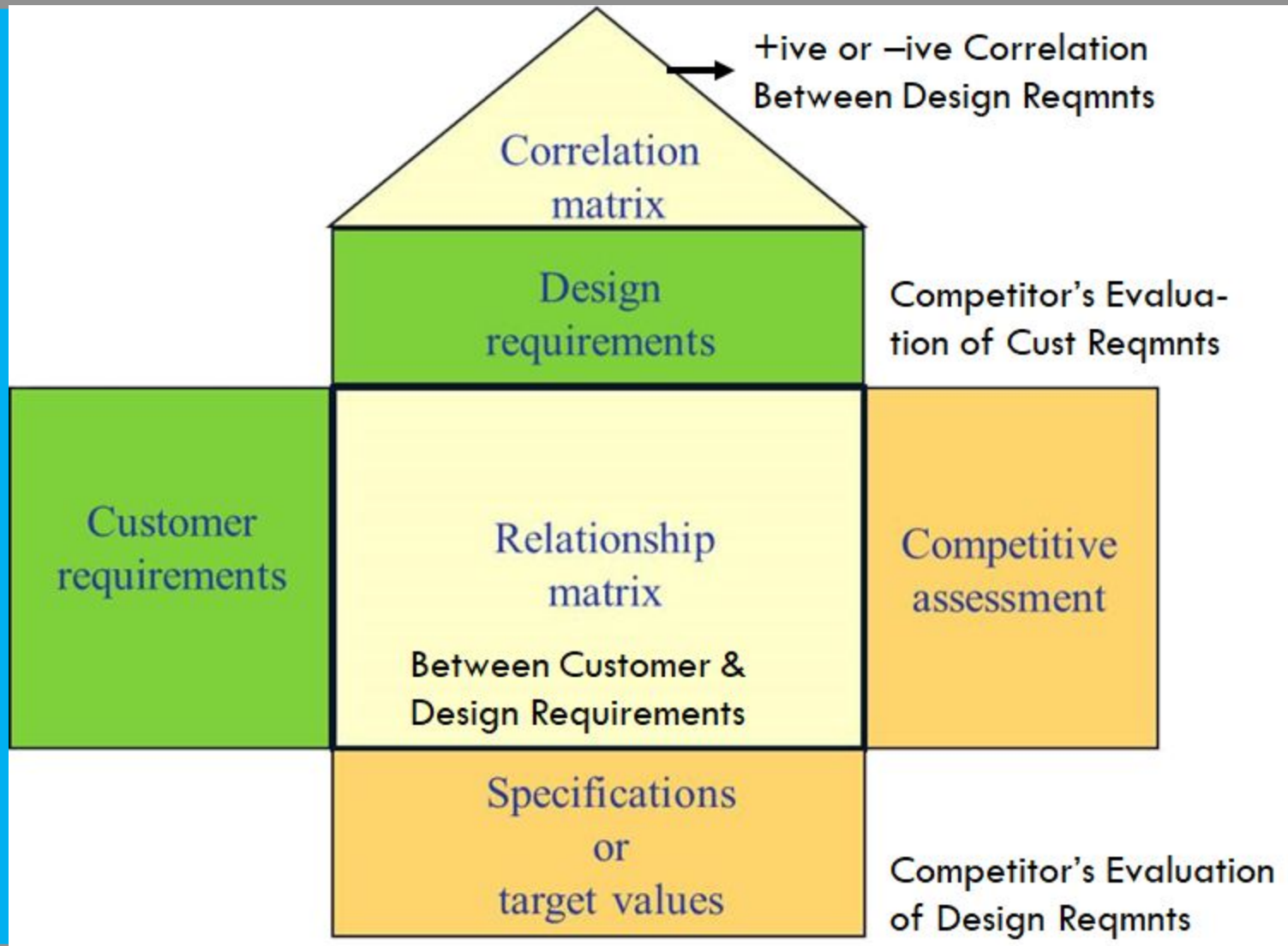
Quality Function Deployment - QFD

QLeNPro

- Quality Function Deployment (QFD) was developed by Professor Yoji Akao of Japan's Tamagawa University
- QFD ensures that customer needs and requirements "Voice of Customer" are met during the design process.
- Customer values are considered as input into the early stage of service conception.
- Develop a service as per customer's requirements in less time and with less design cost.
- It is a planning, communication and documentation technique mostly represented as "House of Quality"

House of Quality

QLeNPro



QFD Steps

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1. Identify the customer and record customer requirements or attributes.
2. Identify the service design elements and relate them with customer attributes.
3. Determine the interrelationships between any pair of service design elements.
4. Weighing service element to assess improvement requirements
5. Assessment of competition

QFD Steps

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Step 1: Identify customer requirements

- Identify who is the customer
- Record customer's requirements as 'Voice of customer' in their own language or words to avoid misinterpretation
- Customer requirements are represented as 'Whats' for example; What are the customer needs?
- Let's give the notations to the different attributes of customer requirements as A_1, A_2,…….A_m

Step 2: Identify service design elements and relate them with customer attributes

- Determine the means by which customers attributes are met with service design elements or attributes
- Interpretations of 'Whats' in terms of design requirements 'Hows'
- Let's give the notations to the service design elements as S_1, S_2, … S_n

QFD Steps – Relationship Matrix

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- **Outcome of Step 1 and Step 2: Relationship Matrix**
- **Relationship matrix represents the relation between customer attributes and the service design elements.**
- **Ensures whether the service design elements adequately address the customer requirements.**
- **Some scale can be used to determine the degree of relationship between customers attributes and service design elements. Let's give the notation for each degree of relationship as m x n for m customer attributes and n service elements.**
- **The relationship can be represented by symbol depicting degree of relationship, for example, following scheme of symbols for different degrees of relationship**
  - ∇ **Very strong relationship**
  - • **Strong relationship**
  - o **Weak relationship**
  - • **Very weak relationship**

QFD Step 3 & Step 4

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- Interrelationship between service design elements
- Represented on the roof of the house of quality as correlation matrix as shown in Figure
- Captures the effect of changing one design attribute over the other.
- Identify any trade-off between service design attributes.
- Same scale can be used to find relationship between service design elements as proposed for the relationship matrix.

QFD Step 4 & 5

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Step 4: Weighing service element to assess improvement requirments

- **This step measures the importance of a customer's assessment of the service design element.**

- **The column next to the customer's attributes presents the relative importance of each customer attribute which is given on the scale of 1 to 9 using customer surveys.**

- **Let's give the notation for relative importance of each attribute to be w1, w2,…wm.**
- **relative importance weight will be multiplied by the degree of relationship in the relationship matrix under each service element to arrive at weighted score for the element.**
- **The weighted score are presented in the basement of 'House of Quality'.**

- **The weighted score for each service element can be compared with that of competitor. It helps in analyzing for which element any service organization is doing better over competitor and which needs attention for improvement. It can also be inferred from this exercise that even though customer give high ranking to the service element for any service organization, the organization might be unable to deliver it to the extent the competitor can provide.**

QFD Step 4 & 5

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QFD step 5: Assessment of competition

- **One type of assessment of competition can be done using weighted score and comparing it that of competitor's for each service design element. The similar kind of assessment can be done using some scale like 1 to 5 for each customer's requirement or attribute. Compare it and plot on the right side of house of quality as shown in Figure**

Fig: Assessment of competition for each customer attribute

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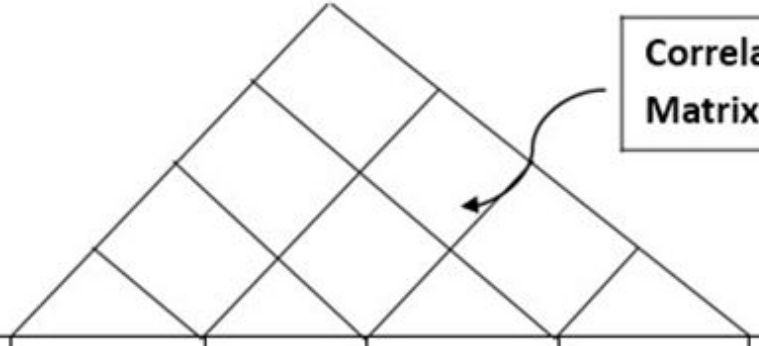
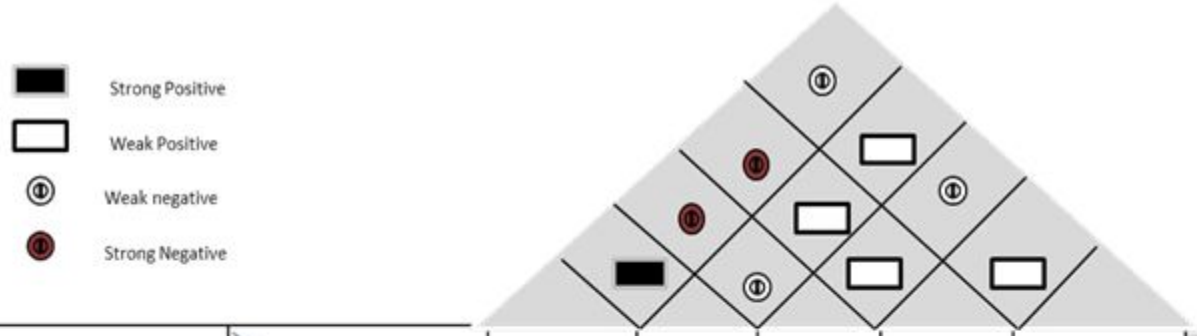


	Relative Importance	S_1	S_2	.....	S_n	1 2 3 4 5
A_1	w_1	a_{11}				+ *
A_2	w_2	a_{21}				+ *
. .	. .					+ *
A_m	w_m	a_{m1}				+ *
Weighted score						

+ indicates the importance given to each customer attribute by the service organization under study
* indicates the importance given to each customer attribute by the competitor of service organization under study

QFD – Example in Tourism Sector – Animal World

QLeNPro



Customer Attributes	Technical Requirements / Sub attributes	Ticket System	Staff Level	Staff Skill	Staff Knowledge	Issue of Cards	Assessment of Competitor Importance 1 2 3 4 5
Ease of Access	Speed of Entry	■	■	①	●	■	+ -
	Clarity of Information	●	①	■	■	□	+ -
Use of Technology	Sophistication	■	□	■	□	■	+ -
	Reliability	□	●	□	●	■	+ -
Staff attitude	Understanding	●	●	□	■	□	- +
	Help full	①	□	①	□	□	- +
	Friendly	●	□	●	●	●	- +
Competitive Evaluation							**Comments**
	Animal world	4	6	7	6	6	Animal world has to adopt better technology to improve the quality of service at the ticket counter
	Competitor	7	5	5	6	8	
	Target	8	8	8	8	8	

QFD – Animal World

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Customer Attributes

1. Ease of Access: This attributes explains ease of getting the entry card for gate
2. Use of Technology: This attributes explains the use of modern technology
   - (eg. Information technology) for assessing and navigating through the area.
3. Staff attitude: This attribute explains the approachability towards on-field staff

Service Process elements

1. Speed of Entry : The processing time at the entry point
2. Clarity of Information : When and where cards are issued and the instructions to be followed
3. Sophistication : Whether the technologies implemented at the entry gate is really helping the entry of customers and faster issuing of cards
4. Reliability : Whether the technology is performing consistently in routine circumstances for the customers.
5. Understanding : Whether the staffs are really able to understand the need of the customer.
6. Helpful : Assisting the customers in their needs.
7. Friendly : Attitude of the staffs towards the customer.

QFD – Animal World

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Technical Requirements

1. Ticket system: No. of customers per min.

2. Staff level: No of staff per customer

3. Staff skill: Communication skill, Handling the inner requirement of the system

4. Staff Knowledge : General Knowledge about the technology and the requirement.

5. Issue of cards: No. of cards per min.

POKA-YOKE

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A system or procedure which prevents defects from happening – Fail-safing or Mistake-Proofing

Poka-Yoke examples

- An airplane pilot may use a simple check list to make sure everything is ready before flying his airplane.
- In many hotels, lights are automatically switched on or off after inserting a magnetic card for a particular room
- Anti-theft car alarm
- Spell-checker in MS-Word
- Tags attached to the garments in an apparel store, which ensures that they are not inadvertently taken out of store.
- Before closing any document file in Microsoft office, we receive a message which asks whether we want to save a file or not

Poka Yoke – Different Types of Errors

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Server Errors

Task: Doing work

Incorrectly, not required, in wrong order, too slowly

Treatment: Failure to

Listen to customer, acknowledge the customer, react appropriately

Tangible: Failure to

Clean facilities, wear clean uniform, proof read documents

Poka Yoke – Different Types of Errors

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Customer Errors

Preparation: Failure to

Bring necessary materials, understand role in transaction, engage the correct

Service Encounter: Failure to

follow system flow, remember steps in the process, follow instructions

Resolution: Failure to

signal service failure, learn from experience, adjust expectations, execute post-encounter action

Poka Yoke – Examples

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- French fry scoop at Mc Donald's- Consistent serving of potatoes (Task)
- Tellers in Bank- enter customer's eye color, OTP (Treatment)
- Automatic spell check-Email service provider (Tangible)
- Comprehensive medical survey- Customer's information (Preparation)
- Airport check-in counters- size of carry-on luggage (Encounter)
- Trash-bin at the exits of facilities (Resolution)

Taguchi approach to design quality

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- Quality Should be designed into the product/service and not inspected into it
- Quality is best achieved by minimizing the deviation from the target
- Cost of poor quality: Square of the deviation from target
- The cost of quality should be measured as a function of deviation from the target / standard and the losses should be measured system – wide
- The cost due to loss is not limited to remanufacturing, rework due to bad quality but this cost is spread over lifetime of the goods or service product
- The cost includes goodwill cost, loss of customer and cost incurred to integrating with other parts

Quality Loss Function

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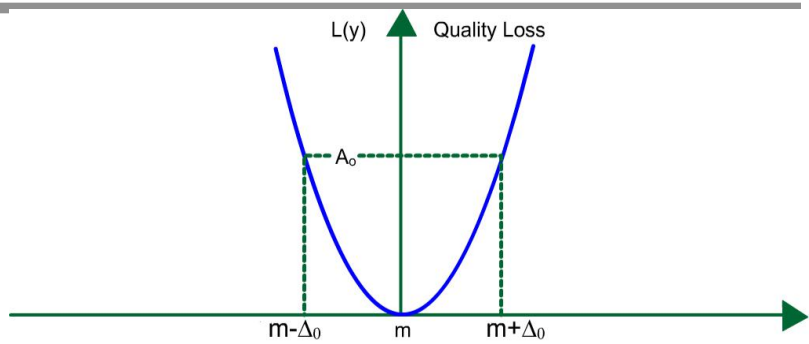
The quality loss function, L(y) can be expressed as quadratic relationship

$L(y) = k(y - m)^2$

k= Cost to correct / $(\text{Tolerance})^2$

y = reported value of associated parameter

m = mean value (average)



- Company C received an average of 10 complaints per month last year. In current month they received 15 complaints (y). Management sets an acceptable level at 2 (tolerance). It costs the company Rs.50 directly per complaint to correct the problems. They determined the cost in lost sales to be Rs.100. Total cost per complaint Rs.150. What is the quality loss to the company C?

- k =Rs.150/2^2 = Rs.37.50

- $L(y)$ = 37.50 $(15-10)^2$

- = Rs.937.50 is loss per month for company C

Cost of Service Quality

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Service organizations incur cost ranging between 25% and 40% of the operating expenses due to poor quality.

Whenever a process fails to satisfy a customer it results in loss of customer which in turn adds extra cost to an organization

Cost Category	Definition	Bank Example
Prevention	Operations/activities that keep failure from happening and minimize detection costs	Quality planning, Recruitment and selection, training programs and Quality improvement projects
Detection or Appraisal	To ascertain the condition of a service to determine whether itconforms to safety standards	Periodic inspection, process control, checking, balancing, verifying collecting quality data
Internal failure	To correct nonconforming work prior to delivery to the customer	Scrapped forms and report, rework, machine downtime
External failure	To correct non-conforming work after delivery to the customer or to correct work that did not satisfy a customer's special needs	Payment of interest penalties, Investigation time, legal judgments, negative word of mouth and loss of future business

Service Process Control - Challenges

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- **Due to intangible nature of services it is difficult to measure service performance with direct performance measures like weight and volume. Only surrogate measures can be used such as waiting time of customers and number of complaints.**

- **Due to simultaneity nature of service it is difficult to monitor the service performance. Customer feedback is collected "after the fact". Only final customer impression of overall service is gathered.**

Service Process Control - Challenges

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- For a proper control of any system, an output should be compared with standards. In services, feedback control system is used in which surrogate performance measures are identified and then actual output is compared with actual deviation. The comparison is done to identify reasons of non-conformance to customer requirements and to take corrective actions.

- Make adjustments to keep the output within a tolerable range

- Statistical process control, which is widely applied as a process control in manufacturing, can help in service control and to meet the challenges pertaining to service control system.

Service Process Control

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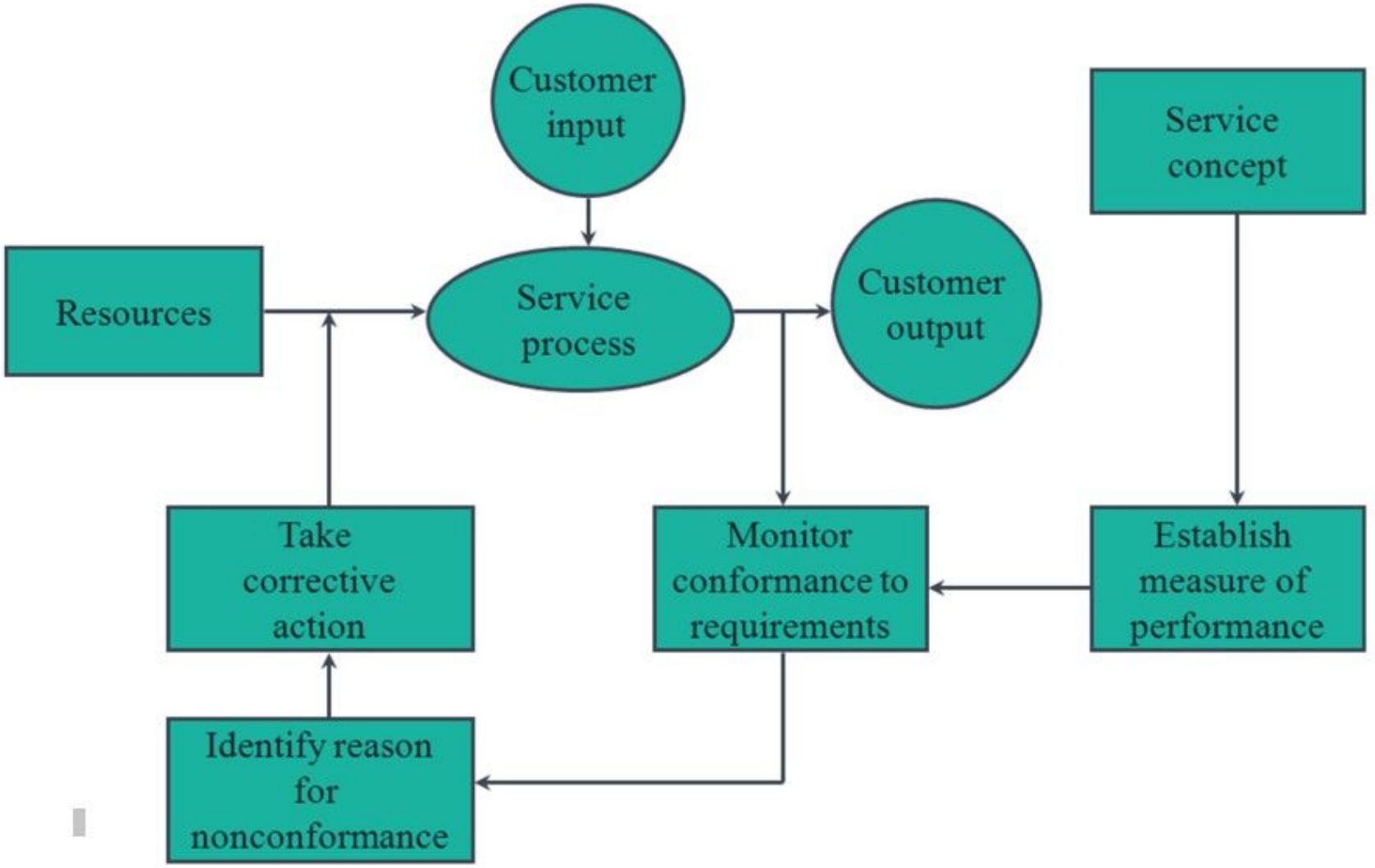

Statistical Process Control (SPC)

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- A statistical tool to determine whether the service process is performing as customer expectations?
- Tools called Control Charts (visual display) are used to measure process performance to determine if the process is in control
- Control charts helps in determining any change in the process performance
- Control charts help in monitoring the performance of processes so that corrective actions can be initiated on time.

Examples which trigger change in service process due to variations

- An increase in the time to process passport application
- An increase in number of complaints regarding delay in claims by insurance company
- An increase in number of errors in software code.

Control Charts

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- Depending on the performance measures, the control charts can be of two types; Variable control chart (X bar chart and range chart) and Attribute control chart(p chart)

Steps in using quality control chart

- Decide on some measure of service system performance or quality characteristic of service. The measure can correspond to a population proportion nonconforming (attribute data) or corresponds to the mean of a continuous random variable (variable data)
- Collect representative historical data from which estimates of the population mean and variance for the system performance measure can be made
- Decide on sample size, and using the estimates of population mean and variance, calculate ± 3 standard deviation control limits.
- Graph the control chart as a function of a sample mean values versus time

(X bar) Chart and R Chart

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- X Chart and R chart is the control chart for variables, used to monitor the mean and the variability of the process distribution.

- It may happen that the variability of the process may cause the process mean to appear off aim. It is also necessary to check that the process variability is not too large. Therefore, X chart will be accompanied by R chart (Range chart).

- The variables can take fractional value such as length, weight or time.

Example Mean ambulance response time

(X bar) Chart and R Chart

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- After Plotting Instances and Ranges, Occurrences around Center Line but within UCL-LCL limits denote Common Cause Variations

- Occurrences around Center Line but outside UCL-LCL limits denote Assignable Cause Variations and require investigation

- Occurrences on one side of Center Line show Progressively Deteriorating Trends and require investigation

Few Definitions

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Mean. The mean is just the average of numbers.

Median. The median is the middle number in a sorted, ascending or descending, list of numbers and can be more descriptive of that data set than the average. The median is sometimes used as opposed to the mean when there are outliers in the sequence that might skew the average of the values

Mode. The mode of a set of data values is the value that appears most often. If X is a discrete random variable, the mode is the value x (i.e, X = x) at which the probability mass function takes its maximum value. In other words, it is the value that is most likely to be sampled.

Variance. The average of the squared differences from the mean.

Standard Deviation. The standard Deviation (σ) is a measure of spread of numbers in the data set. The standard deviation is the square root of variance.

Normal Distribution

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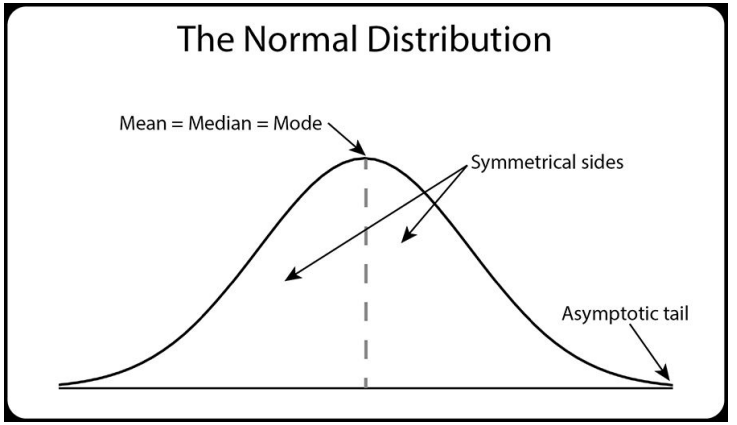
A normal distribution, sometimes called the bell curve, is a distribution that occurs naturally in many situations. The bell curve is symmetrical. Half of the data will fall to the left of the mean; half will fall to the right.

Characteristics of Normal Distribution

1. The curve is in bell shape. It has single peak. Its unimodal.
2. The mean of a normally distributed population lies at the centre of curve.
3. For a normal curve, the mean, median and mode are the same value.
4. The two tails of the curve extend indefinitely and never touch.



Examples.

- Heights of people.
- Measurement errors.
- Blood pressure.
- Points on a test.
- IQ scores.
- Salaries.

Normal Distribution

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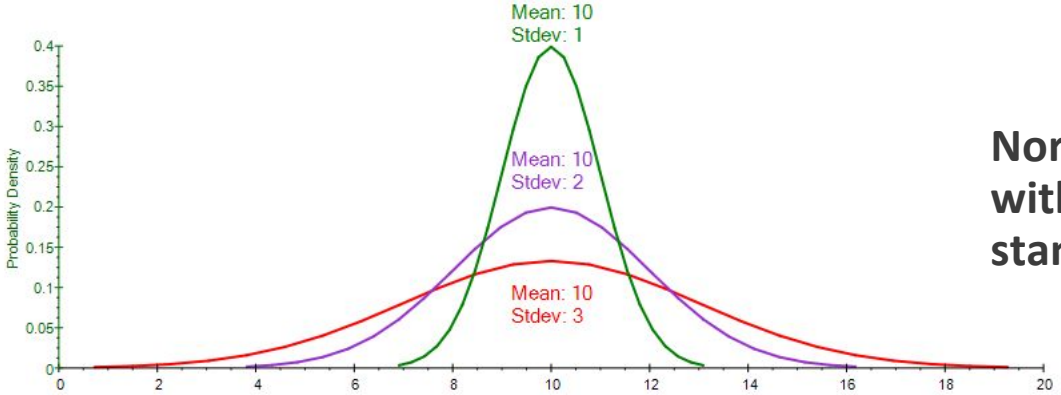
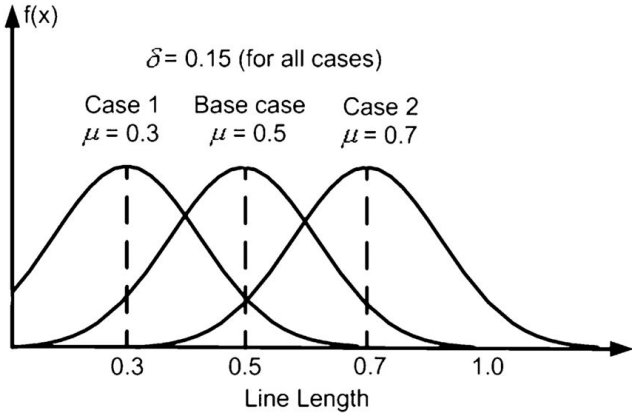
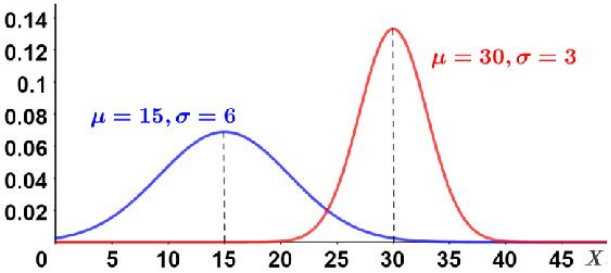


Normal Probability Distribution with identical means but different standard deviations.

Normal Probability Distribution with different mean but same standard deviation





Normal Probability Distribution each with different mean and a different standard deviation

Normal Distribution – Area Under the Normal Curve

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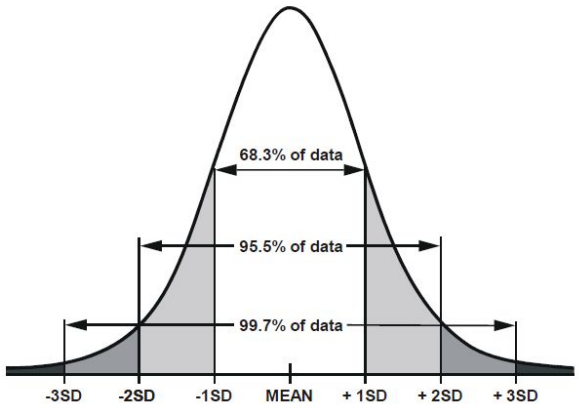
Approximately 68% area of all values in a normally distributed population lies within +1 standard deviation from mean.

Approximately 95.5% area of all values in a normally
within ± 2 standard deviation from mean.

Approximately 99.7% area of all values in a normally
within ± 3 standard deviation from mean.

Figure 3.9
Areas under the normal curve that lie between 1, 2, and 3 standard deviations on each side of the mean



Control Charts

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- Primary purpose of control charts is **to indicate at a glance when production processes might have changed** sufficiently to affect product quality.
- If the **indication** is that product **quality has deteriorated, or is likely** to, then corrective is taken.
- If the indication is that product quality is better than expected, then it is important to find out why so that it can be maintained.
- Use of control charts is often referred to as **statistical process control (SPC).**

Constructing Control Charts

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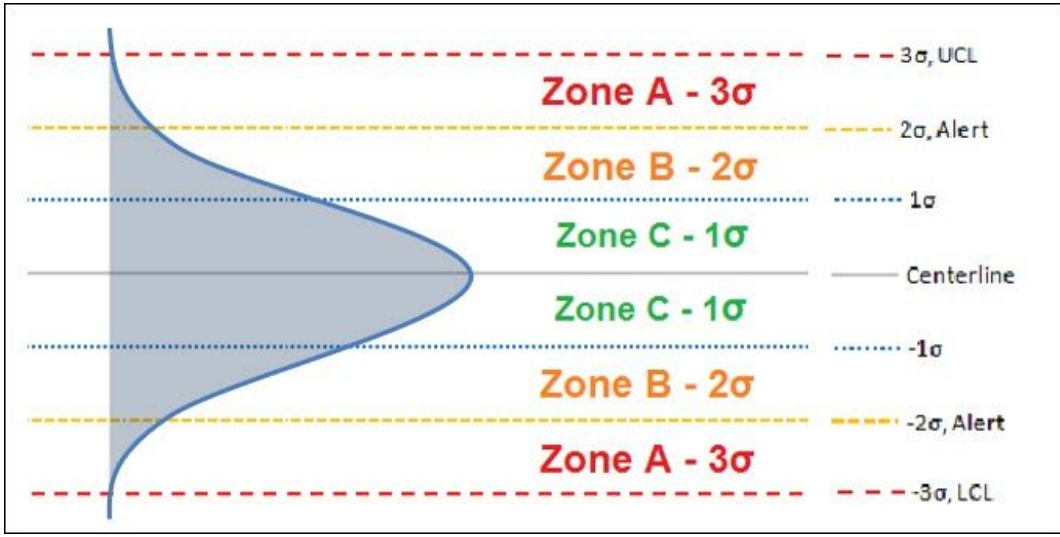
- Vertical axis provides the scale for the sample information that is plotted on the chart.
- Horizontal axis is the time scale.
- Horizontal centre line is ideally determined from observing the capability of the process.
- Two additional horizontal lines, the lower and upper control limits, typically are 3 standard deviations below and above, respectively, the centre line.

- If the sample information **falls within** the **lower** and **upper control limits**, the quality of the **population is considered to be in control**; otherwise quality is **judged to be out of control** and corrective action should be considered.



Types of Control Charts

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Control Charts for Variables

Many quality characteristics can be expressed in terms of numerical measurement. A variable is single measurable quality characteristic, such as dimension, weight, volume, temperature, pressure, tensile strength etc. Control charts for variable quite common to use as compared to Control Charts for attributes. Types

- Mean Chart X Chart
- Range chart R Chart

Control Charts for Variables

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In this case two separate control charts are used to monitor two different aspects of the process's output:

Central tendency X-chart Accuracy

Variability R-chart Precision

X & R charts are constructed and analysed together.

X Chart, developed from average of each sub group data. R Chart, developed from ranges of each sub group data.

Control Charts for Variables

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Construction of X-bar & R charts.

For construction we require

- Mean Value,
- Upper Control Limit (UCL) and
- Lower Control Limit (LCL)

Chart	Control Limits	Centerline	Plot Point	Sample Size
$\bar{X}$	$UCL = \bar{\bar{X}} + A_2\bar{R}$ $LCL = \bar{\bar{X}} - A_2\bar{R}$	$\bar{\bar{X}} = \frac{\sum \bar{X}}{k}$	$\bar{X} = \frac{\sum X}{n}$	2 to 9 but 3 to 5 preferred
R	$UCL_R = D_4\bar{R}$ $LCL_R = D_3\bar{R}$	$\bar{R} = \frac{\sum R}{k}$	R	

K = number of samples

To Calculate Plot Points:

The *X-bar* plot point is the average of the sample data. The range plot point is the difference between the largest and smallest measurement within the sample data.

Table 8.4 *Factors Used in the $\overline{X}$, S and R Quality Control Charts*

No. of Items in Sample	A_2	B_3	B_4	D_3	D_4
2	1.88	0	3.27	0	3.27
3	1.02	0	2.57	0	2.57
4	0.73	0	2.27	0	2.28
5	0.58	0	2.09	0	2.11
6	0.48	0.03	1.97	0	2.00
7	0.42	0.12	1.89	0.08	1.92
8	0.37	0.19	1.82	0.14	1.86
9	0.34	0.24	1.76	0.18	1.82

For n = 4, A2 = 0.73 D3 = 0 K = 12 D4 = 2.28

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Sample no	Sample Values				Total	Sample Mean X-bar	Sample Rang R
	1	2	3	4			
1	139	140	145	144	568	142	6
2	140	142	142	139	563	140.75	3
3	142	136	143	141	562	140.5	7
4	136	137	142	142	557	139.25	6
5	145	146	146	146	583	145.75	1
6	146	148	149	144	587	146.75	5
7	148	145	146	146	585	146.25	3
8	145	146	147	144	582	145.5	3
9	140	139	141	138	558	139.5	3
10	140	140	139	139	558	139.5	1
11	141	137	142	139	559	139.75	5
12	139	140	144	138	561	140.25	6
Total						1705.75	49

For n = 4, A2 = 0.73 D3 = 0 K = 12 D4 = 2.28

X double bar = 1705.75/12 = 142.15

R bar = 49/12 = 4.083

Control Charts for Variables

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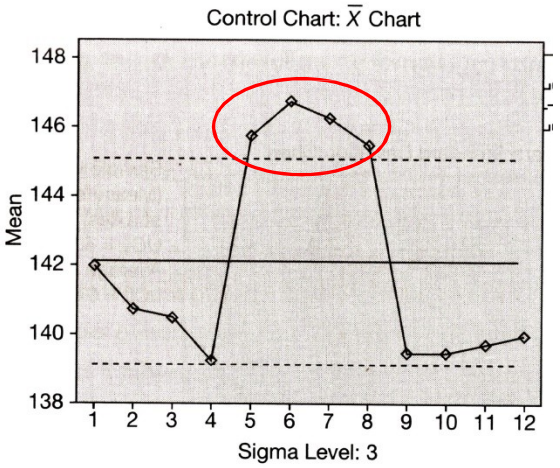
$UCL = \overline{\overline{X}} + A_2\overline{R} = 142.15 + (0.73)(4.083) = 145.13$

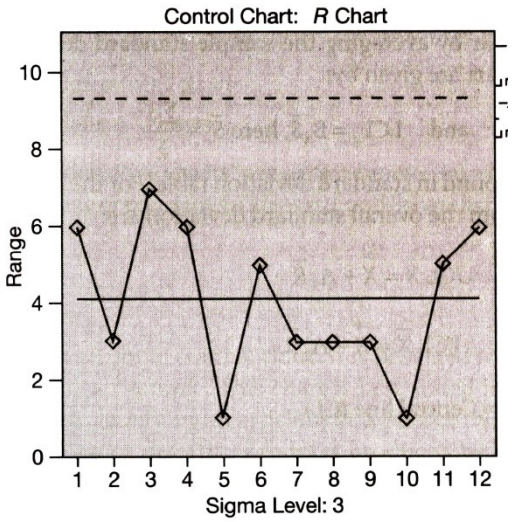
$LCL = \overline{\overline{X}} - A_2\overline{R} = 142.15 - (0.73)(4.083) = 139.17$

$UCL = D_4\overline{R} = 2.28 * 4.083 = 9.31$

$LCL = D_3\overline{R} = 0*4.083 = 0$



UCL – 145.13
LCL – 139.17
Mean – 142.15



UCL – 9.31
LCL – 0
Mean – 4.083

Mean ambulance response time

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The purpose of the $\bar{X}$-chart is to detect changes in the process mean of a continuous variable (e.g., ambulance response time). The R-chart for the continuous variable measures the process dispersion. Table 6.6 contains data on response time for an emergency ambulance collected over a historically representative seven days. Four response calls were picked at random each day, one each during the morning, afternoon, evening, and night shifts. For each day the average response (based on the sample of four observations) and range (i.e., the difference between the highest and lowest values) are calculated and noted in the last two rows.

The estimate of population mean response and range are calculated as

$$\bar{\bar{X}} = \frac{5.1 + 6.2 + 3.9 + 5.7 + 4.1 + 6.1 + 4.3}{7} = 5.0$$

$$\bar{R} = \frac{2.9 + 2.7 + 1.8 + 3.2 + 3.1 + 2.0 + 2.8}{7} = 2.6$$

The R-chart frequently is constructed prior to determining the $\bar{X}$-chart in order to ensure that the process variability is under control. The control chart for the range is constructed using the following formulas:

$$\text{Upper Control Limit (UCL)} = D_4 \bar{R} \quad (1)$$

$$\text{Lower Control Limit (LCL)} = D_3 \bar{R} \quad (2)$$

where $\bar{R}$ = estimate of population range

D_4 = UCL value from Table 6.7 for sample size n

D_3 = LCL value from Table 6.7 for sample size n

Day	1	2	3	4	5	6	7
Morning	3.6	4.5	2.9	7.1	4.3	6.7	2.8
Afternoon	5.2	6.3	4.7	6.2	2.8	5.8	5.6
Evening	6.5	7.2	3.8	3.9	5.9	6.9	3.8
Night	4.9	6.9	4.3	5.6	3.2	4.9	4.9
$\bar{X}$	5.1	6.2	3.9	5.7	4.1	6.1	4.3
Range	2.9	2.7	1.8	3.2	3.1	2.0	2.8

Sample Size	($\bar{X}$-chart)	R-chart	
n	A_2	D_3	D_4
2	1.880	0	3.267
3	1.023	0	2.574
4	0.729	0	2.282
5	0.577	0	2.114
6	0.483	0	2.004
7	0.419	0.076	1.924
8	0.373	0.136	1.864
9	0.337	0.184	1.816
10	0.308	0.223	1.777
12	0.266	0.283	1.717
14	0.235	0.328	1.672
16	0.212	0.363	1.637
18	0.194	0.391	1.608
20	0.180	0.415	1.585
22	0.167	0.434	1.566
24	0.157	0.451	1.548

Mean ambulance response time

For our ambulance case, the range control limits are calculated using the control chart constants in Table 6.7 for a daily sample size of four:

$$(\text{UCL}) = D_4 \bar{R} = (2.282)(2.6) = 6.0$$

$$(\text{LCL}) = D_3 \bar{R} = (0)(2.6) = 0$$

Because all the range values in the last column of Table 6.6 fall within the UCL and LCL of R-chart for the seven day period, the process variability is in control and thus we can proceed to the construction of the $\bar{X}$-chart.

Appropriate formulas for calculating the control limits for an $\bar{X}$-chart use A_2 found in Table 6.7 and $\bar{R}$ as a measure of process dispersion.

$$\text{UCL} = \bar{\bar{X}} + A_2 \bar{R} \quad (3)$$

$$\text{LCL} = \bar{\bar{X}} - A_2 \bar{R} \quad (4)$$

The control limits for our sample size of four are calculated as follows:

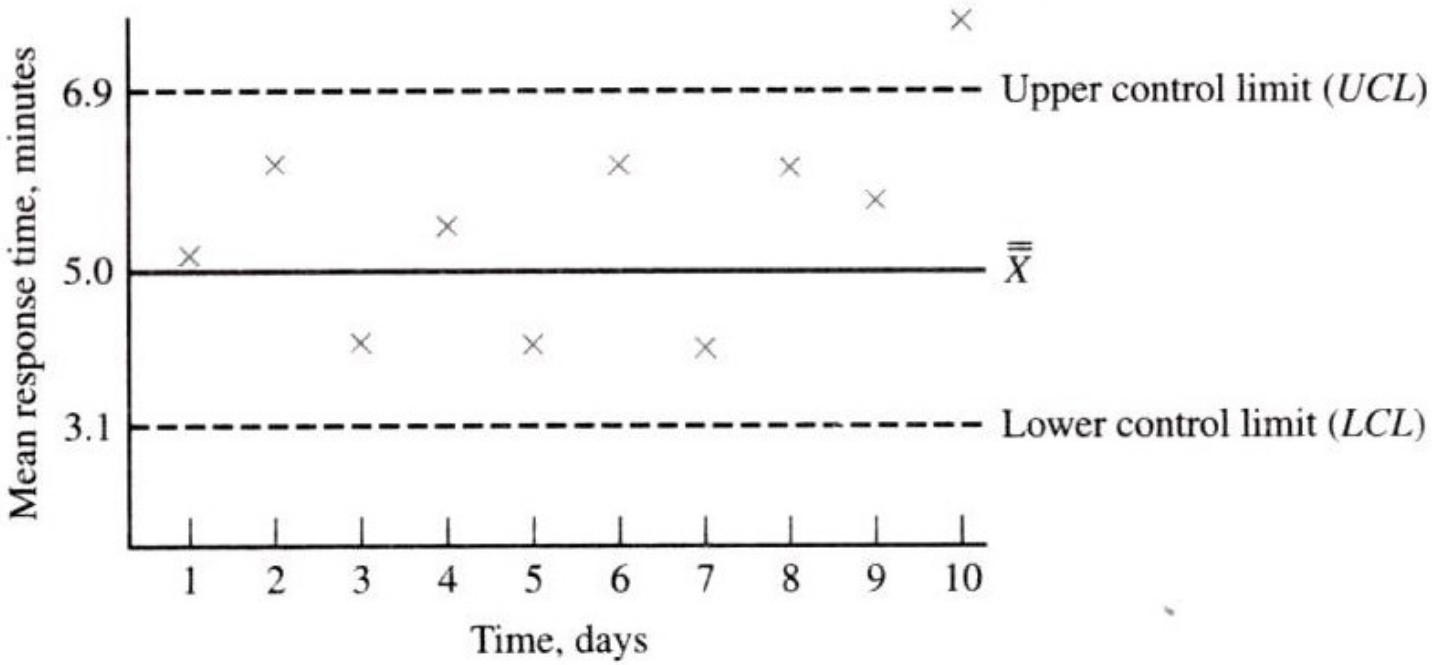
$$\text{UCL} = \bar{\bar{X}} + A_2 \bar{R} = 5.0 + (0.729)(2.6) = 6.9$$

$$\text{LCL} = \bar{\bar{X}} - A_2 \bar{R} = 5.0 - (0.729)(2.6) = 3.1$$

Figure 6.9 shows the $\bar{X}$-chart for ambulance response with the mean $\bar{\bar{X}} = 5.0$, UCL = 6.9, and LCL = 3.1. The sample means $\bar{X}$ for the first seven days from Table 6.6 are plotted on the chart to describe visually the week's performance to ascertain that the process is in control before placing the control chart in use. As seen for the first seven days all observations fall between the UCL and LCL and thus the process is in control. However, on day 10 the sample average exceeds the UCL; consequently, the system is in need of attention. Assume our ambulance example represents data from the city of Fort Lauderdale, Florida, and spring break began on day eight. The longer response times, therefore, could be explained by extended trips to the beaches. Prepositioning an ambulance on the beach during spring break might improve performance.

Mean ambulance response time

QLeNPro



Control Charts for Attributes – p chart

QLeNPro

- Designed to control **percentage or fraction defectives per sample**.
- Best suited in cases **where inspection is carried out with a view to classifying an article as accepted or rejected.**
- P chart can be used when sub-groups are not of equal size.

$$\bar{p} = \frac{1}{k}\sum \hat{p}(i)$$

$$\hat{\sigma}_p = \sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

$$\text{UCL} = \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n(i)}}$$

$$= \bar{p} + 3\hat{\sigma}_p$$

$$\text{LCL} = \bar{p} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n(i)}}$$

$$= \bar{p} - 3\hat{\sigma}_p$$

<u>To Calculate Plot Points:</u>

The *p* plot point is the fraction defective in a sample. The centreline is the average fraction defective in a series of samples.

Control Charts for Attributes – p chart

QLeNPro

Example: Table 8.6 provides the data of the number of defectives in 20 samples, each sample containing 2,000 items. Construct a control chart for fraction defectives and interpret the results.

No. of Defectives = d	Fraction Defectives $p = d/n$	No. of Defectives (d)	Fraction Defectives $p = d/n$
425	0.213	356	0.178
430	0.215	402	0.201
216	0.108	216	0.108
341	0.170	264	0.132
225	0.113	126	0.063
322	0.161	409	0.205
280	0.140	193	0.097
306	0.153	326	0.163
337	0.169	280	0.140
305	0.153	389	0.195

Solution: Since we are given a fraction defective, the suitable chart will be p chart.

Here, d = number of defectives, p = fraction defectives, $n = 2{,}000$, $k = 20$, $p = d/n$

Control limits for p chart: Central line = $\bar{p} = \sum d/nk = 6{,}148/2{,}000 \times 20 = 0.154$

$$\hat{\sigma}_p = \sqrt{\bar{p}(1-\bar{p})/n} = \sqrt{0.154(1-0.154)/2{,}000}$$

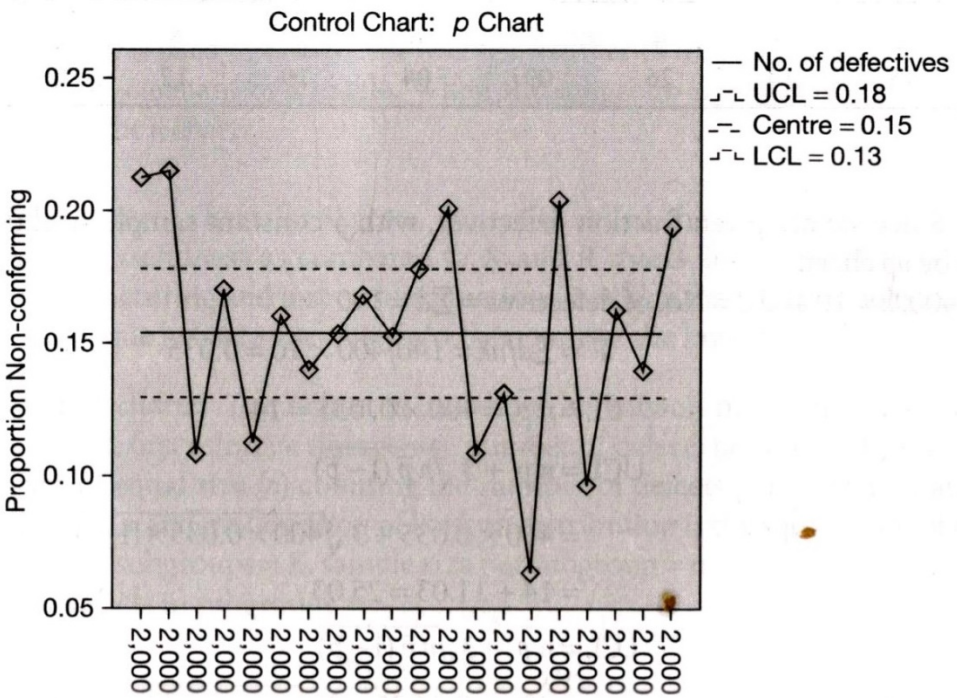
$$\text{UCL} = \bar{p} + 3\hat{\sigma}_p = 0.154 + 3\sqrt{0.154(1-0.154)/2{,}000} = 0.154 + 0.024 = 0.178$$

$$\text{LCL} = \bar{p} - 3\hat{\sigma}_p = 0.154 - 3\sqrt{0.154(1-0.154)/2{,}000} = 0.154 - 0.024 = 0.13$$

Conclusion: The process is out of control and is shown in Figure 8.10.

Control Charts for Attributes – p chart

QLeNPro



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Conclusion: The process is out of control and is shown in Figure 8.10.

*

Attribute Control Charts or p-charts

QLeNPro

- p-charts are used for performance characteristic which is counted rather than measured to control the proportion of defective services or product, p-charts are used to
- Accommodate unequal sample sizes.
- Sample sizes are usually 50 or greater
- Need 20-30 samples to construct the p-chart

Examples

- Proportion of invoices with errors at any retailer.
- Proportion of items requiring rework.
- Proportion of incorrect saving account statements sent to customers.

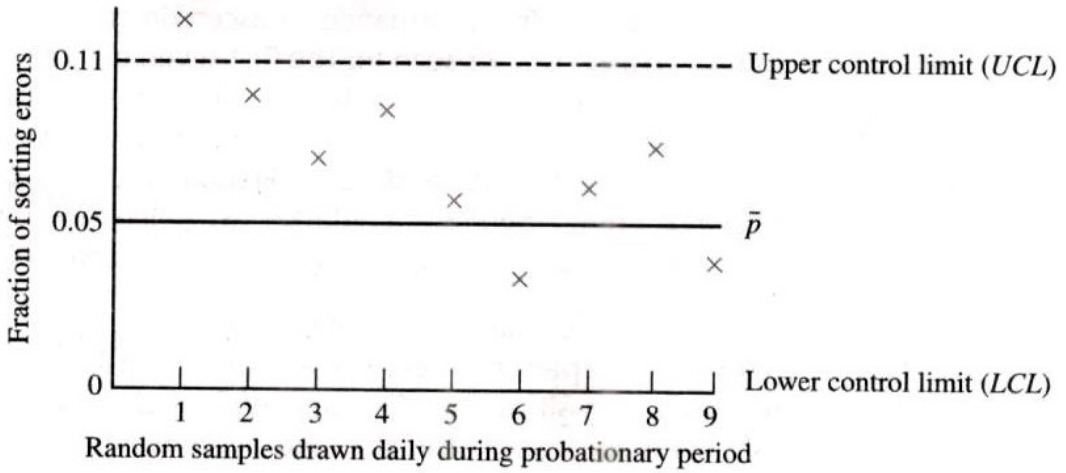
Attribute Control Charts or p-charts

QLeNPro

The *p*-chart control limits for the sorting operation are calculated using equations (5) and (6) and random samples of 100 parcels drawn from the route trucks. Note that if the calculation of an *LCL* results in a negative number, then *LCL* is set equal to zero.

$$\text{UCL} = 0.05 + 3\sqrt{\frac{(0.05)(0.95)}{100}} = 0.05 + 3(0.0218) = 0.1154 \approx 0.11$$

$$\text{LCL} = 0.05 - 3\sqrt{\frac{(0.05)(0.95)}{100}} = 0.05 - 3(0.0218) = -0.0154 \text{ [set } = 0.0]$$



Deming's PDCA cycle – Basis of All Quality Management Tools

QLeNPro

Plan

Develop an in-depth understanding of problem or process to be improved by collecting data.

Identify the root causes of the problem using gathered data.

Develop an action plan for a workable solution for improving the current process.

Set targets and develop criteria to measure success

DO

Implement the solution on a small scale or on trial basis.

Collect data and monitor the performance measures.

Check

Evaluate the data and study of some changes are happen and solution is having intended effect.

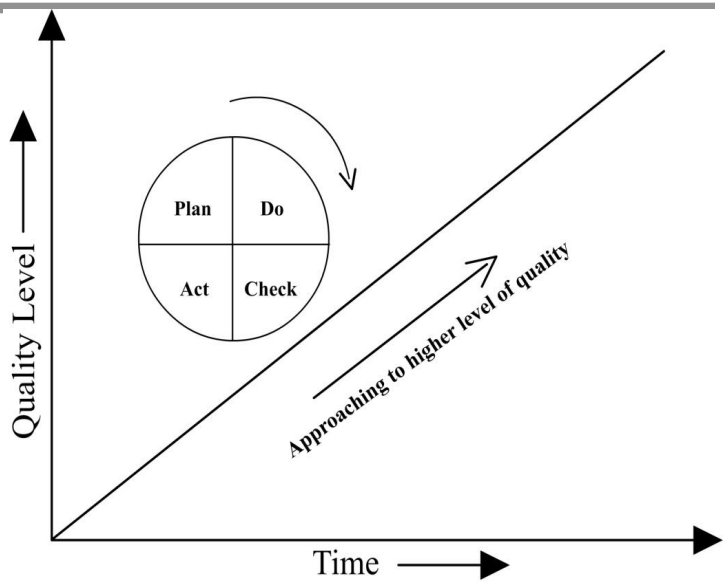
Check whether objectives have been achieved.

ACT

Reflect on and act on learning from trial.

If implementation of proposed solution is successful than standardize it and implement it to the whole system.

If implementation of solution is not successful than revise the plan and repeat the process.



TQM Tools

- Flow charts
- Check sheets
- Histograms
- Pareto diagrams
- Scatter diagrams
- Cause-and-effect diagrams
- Control charts

The Deming Philosophy

QLeNPro

- Deming emphasized that all stakeholders and all departments in an organization should be considered as a part of one whole system. The stakeholders and departments should work together towards a common goal to optimize the performance of system.

- As per Deming, variation of any form caused due to any reason can lead to increase in the costs. It is important to understand the variation, and identify the source or cause of variation. Identify the cause of variation and make changes in the process, technology, people, material, methods or measurement systems

The Deming Philosophy

QLeNPro

- It is important to understand the psychology of people. Proper nurturing of people will help employees to enjoy work by exhibiting their innate attributes, which may have quality impact on quality performance.

- Deming also suggested that management decisions should be supported with data, facts and justifiable theories.

Deming's 14 points of Quality Management

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Deming Points	Description
Consistency	• Continuous improvement in all areas of business. • Ensure that the company's vision of quality is understood by all in an organization
Learning new philosophy	• Bring new ways of thinking by learning new approaches or by encouraging innovations
Minimize cost of inspection	• Eliminate unnecessary inspections that adds to non-value added costs • Improve the process which leads to less number of defects
Price should not be only criteria for purchasing	• Purchasing decisions only based on low price may actually result in costs due to inferior materials realized during production process in the form of expensive inspection, rework, and scrap. • Encourage reduction of total cost of ownership • Emphasize on partnership with few suppliers providing good quality products or services
Improve constantly	• Understand customer needs through market surveys and feedback to incorporate service design process • Eliminate wastes in all the functional areas

Deming's 14 points of Quality Management

QLeNPro

On-the-job training	• Institute training for employees on diagnosing, analyzing and solving quality related problems on continual basis • Evaluate training programs or effectiveness of training using statistical methods
Good leadership as facilitators	• Good leadership and guidance should facilitate workforce to learn by eliminating fear and by encouraging team work
Drive out fear	• Encourage workforce to communicate their problems share new ideas without fear
Remove functional silos	• Remove barriers between individuals and between departments • Encourage team work to have common goal of meeting customer needs and improving process performance
Eliminate exhortations	• Slogans and posters may cause resentment to employees as most of the system related problems are not under their control
Eliminate numerical targets	• Setting numerical goals may result in resentment and frustration in employees and may affect quality
Instill sense of pride in workmanship	• Encourage empowerment • Provide sense of ownership to the employees work processes
Provide education	• Educate workforce outside of specific job skills like self-development
Top management commitment	• Top management should be committed of continuous improvement as any cultural change begins with top management and then percolates to whole organization

Juran's Quality Model

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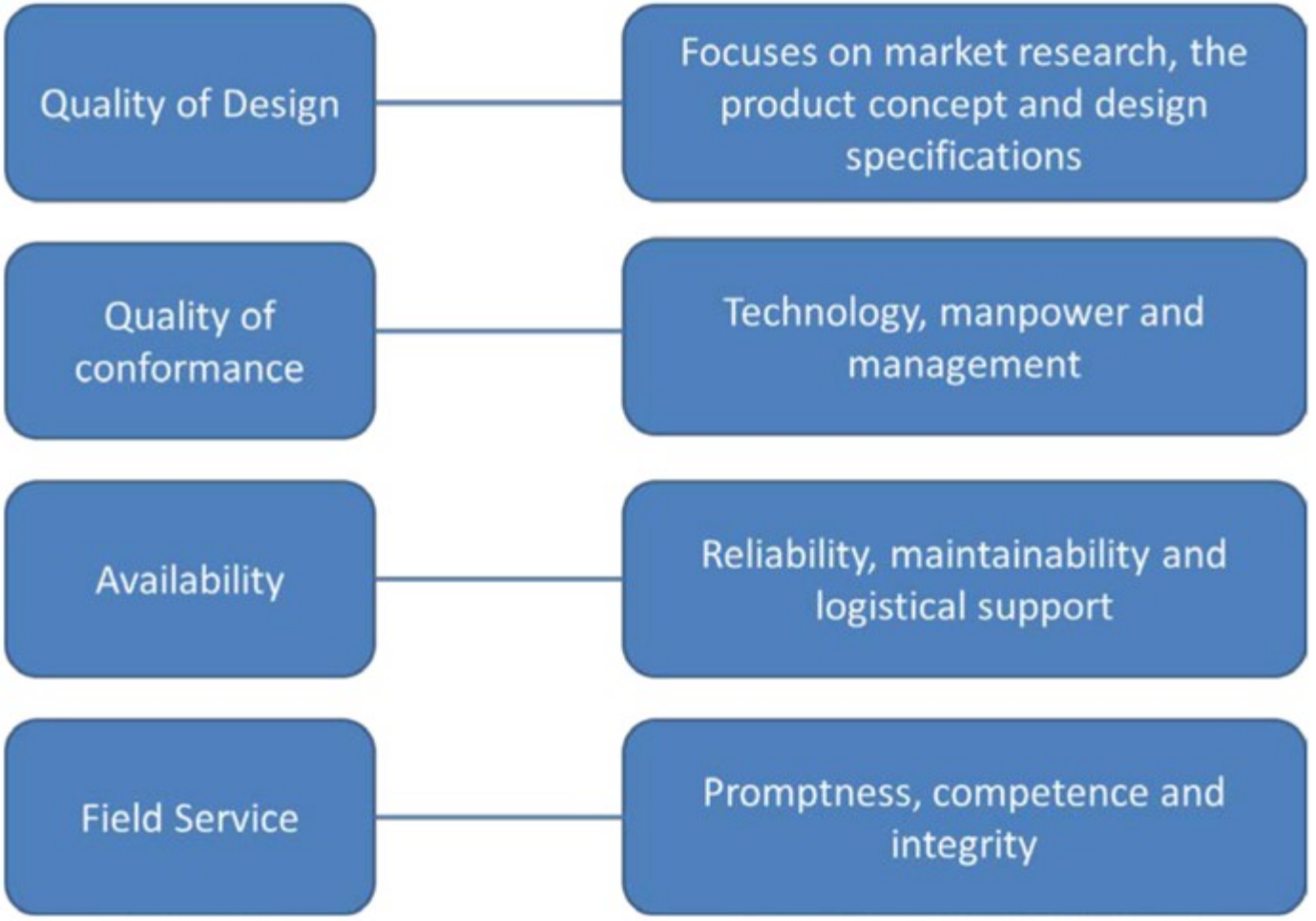

FIGURE 5.26: JURAN'S CLASSIFICATION OF QUALITY

Causes of service failure

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- **Even after due service quality, world class organizations may face service failure. Service recovery involves what a service provider does in response to service failures.**

Some Reasons for Service Failures:

- **Inexperienced employee**
- **Indifferent or rude behavior of employee**
- **Delay in service delivery or slow service delivery**
- **Equipment breakdown**
- **Power system failure**

Causes of service failure

QLeNPro

Examples of service failure in a Hotel Scenario

- **Defect in goods**: Hotel fails to provide fresh and hot food and unavailability of food items mentioned in menu

- **Failure due to facility problems**: Cleanliness of facility and absence of right and appropriate signs and directions

- **Failure due to unfriendly behavior**: Rude behavior of employee at reception, limited options of modes of payments, long waiting time at reception.

Complaint Handling System

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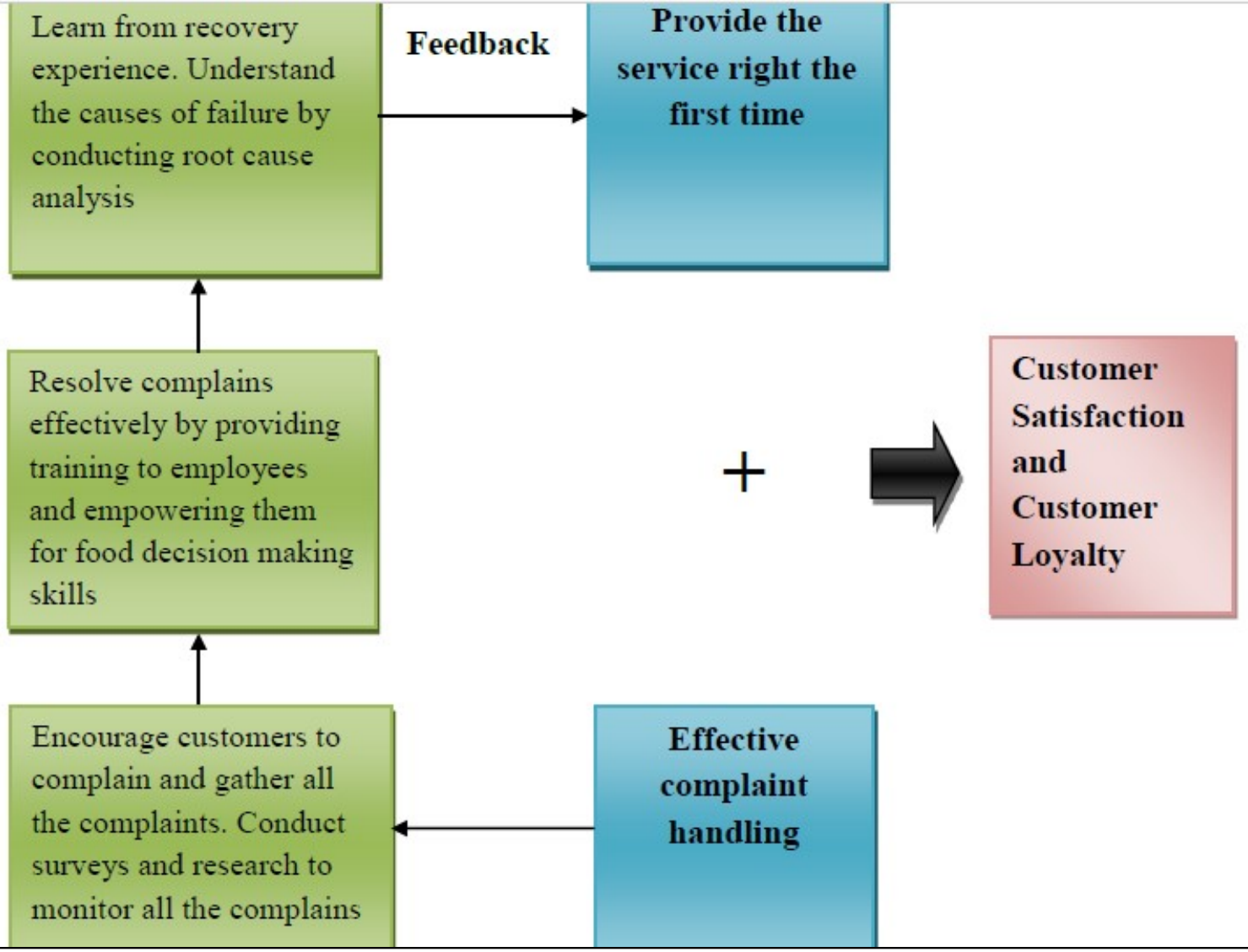

Unconditional Service Guarantee

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- A Mechanism to win Customer's Trust
- A Commitment by Service Organization about Importance given to Quality
- May also include a compensation for the customer if the commitment is not honored

Unconditional Service Guarantee

QLeNPro

Why service guarantee?

- **Focus on customer's requirements**
  - **BA customer survey results. Customers judged the airline on 4 points, care and concern, initiative, problem solving and recovery when things go wrong.**
- **Helps in setting clear standards of service**
  - **Federal Express guarantee of delivery "absolutely positively by 10.30 AM" defines responsibility of all employees.**
- **Good source of feedback**
  - **Provides valuable source of information. Dissatisfied customers can have incentives to report a complain.**

Unconditional Service Guarantee

QLeNPro

- **Helps in understanding failure points**
  - **Before guarantee is made, managers must identify the possible failure points.**
- **Act as a marketing tool**
  - **Reduces customer's risk, makes expectations explicit. Improves market share.**

Unconditional Service Guarantee

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Unconditional

Customer Satisfaction is unconditional, without exceptions.

Example: Accept all returns, no questions asked.

Easy to Understand and communicated

Customer should know precisely what to expect from guarantee in measurable terms. Example: Restaurant. If the lunch is not served in 15 minutes, Its free.

Meaningful

The guarantee should be important to customer in financial as well as in service terms.

Example:

SELLER'S
REALTY GROUP

Seller's Realty Group is so certain that our service is superior, we proudly back our services with an unconditional guarantee.

This guarantee allows you to cancel your listing agreement at any time for any reason.

Upon receiving your request to cancel our agreement, within one business day, we will remove your home from all marketing and multiple listing services and our lawn sign.

Easy to invoke

A dissatisfied customer should not be hassled with filling out forms and writing letters to invoke a guarantee.

Example: Website offering lowest fares or refund of difference.

Unconditional Service Guarantee

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Easy to Collect

The best guarantees are resolved on the spot.

Unconditional & Conditional Guarantee Factors

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	Factor	Description of factor
INTERNAL FACTORS	Process fit	Guarantees offer should aligned with the service processes of service organization
	Staff management	Support and cooperation of contact and support staff is essential for timely provision of guarantee
	Motivation of employees	Employees having clear understanding of guarantees in the form of realistic promises by service organization motivates them to honor guarantees and to participate in improvement of service delivery process
	Pricing strategy	Guarantee must be aligned with pricing strategy as the service organization has to spend on providing guarantee to customers in case of any failure, train employees and introduce and upgrade guarantee systems.
EXTERNAL FACTORS	Industry standards	Lack of industry standards in some type of services where variability in service supply is high
	Competition	Being the first one to offer guarantee provides competitive advantage
	Legal aspects	Guarantee must be treated as a legal contract considering all regulations governing any type of transaction to avoid negative implications later on
	Customer expectations	Providing guarantee is costly activity for a service organization. So it is important to understand the right customer expectations to spend the money in right direction
	Perceived image of the firm	A service organization with low perceived image can offer guarantees to attract and assure potential customers of good service quality
	Uncontrollable factors	Factors beyond the organization's control

*

Service Recovery

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- The average business only hears from 4 percent of its customers who are dissatisfied with the products or services. Of the 96 percent who do not bother to complain, 25 percent of them have serious problems.
- The 4 percent who complain are more likely to stay with the supplier than are the 96 percent who do not complain.
- About 60 percent of the complainers would stay as customers if their problem were resolved and 95 percent would stay if the problem were resolved quickly.
- A dissatisfied customer will tell from 10 to 20 other people about his or her problem.
- A customer who has had a problem resolved by a company will tell approximately 5 people about her or his situation.

Service Recovery Strategies

QLeNPro

- Encourage customers to complain when they are not satisfied with service.
  - Toll-free Nos, Surveys, offer rewards for suggestions, etc.

- The service organizations can take preventive action by anticipating the needs of service recovery
  - While designing service delivery process in service blueprint, anticipate potential failure points
  - provide training to the employees to help in effective service recovery

- Train and Empower Employees to directly handle complaints

- Close the loop from generation of complains to effective recovery of service failure
  - The service organization cannot solve the problem. If so, give full explanation and close the loop
  - The service organization can solve the problem. If so, inform customer after you have solved it.

Service Recovery Strategies

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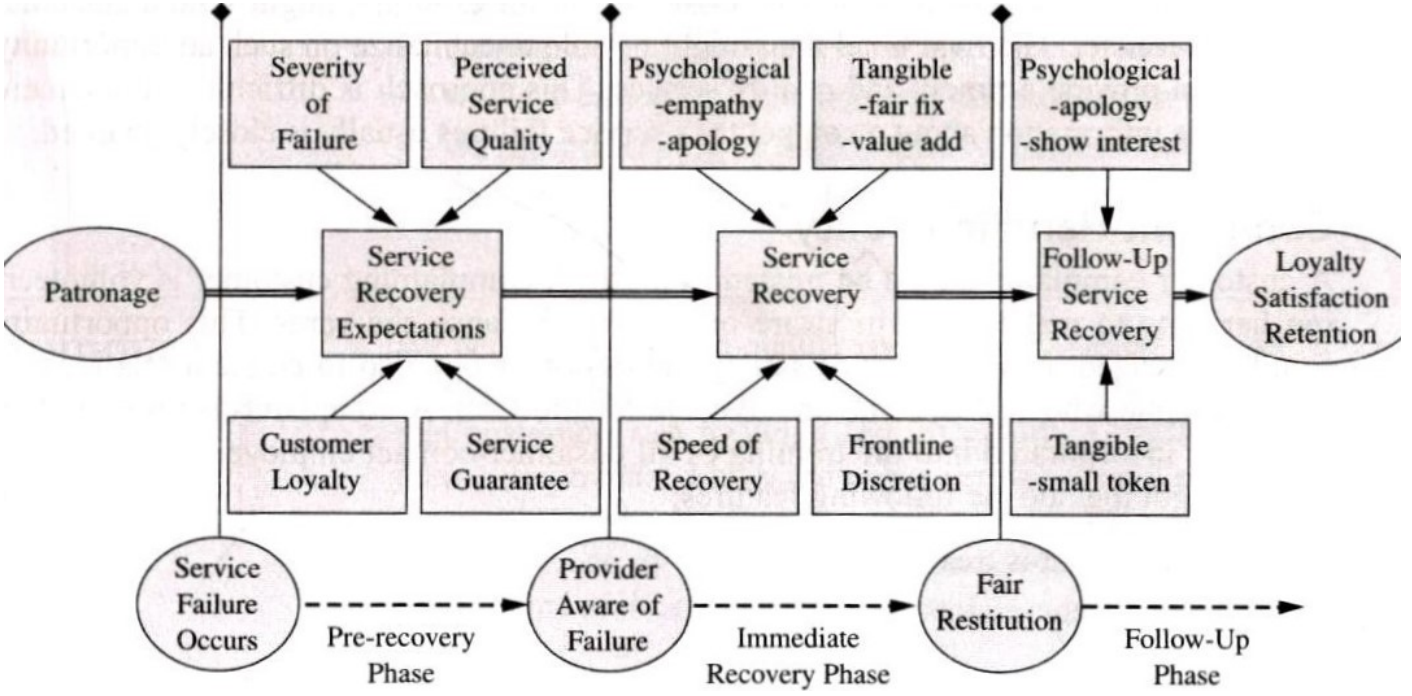
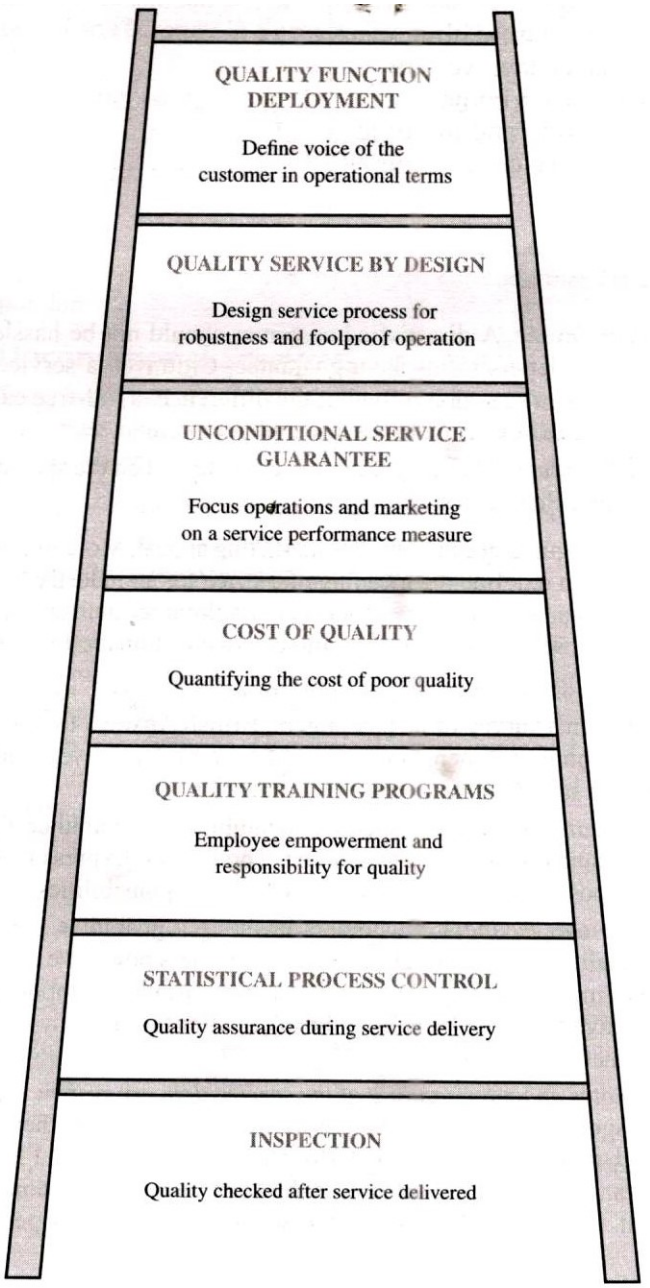
Stages in Quality Development