Block

4

MONITORING SERVICE OPERATIONS PERFORMANCE

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BLOCK 4: MONITORING SERVICE OPERATIONS PERFORMANCE

Emphasis on service operations attained increasing importance in view of its stakes in the national economies. Therefore, starting with strategy formulation, focus is progressing towards effective implementation and customer satisfaction. This has to happen more in a proactive manner to ensure customer retention and enhancing brand equity in the eyes of the existing and potential customers. This necessitates continuous monitoring of operations performance to strategize corrective and preventive mechanisms. This block is aimed at addressing all related issues in this vital area of service operations management.

Block 4, *Monitoring Service Operations Performance*, exhaustively covers different aspects and contemporary trends in monitoring the performance in service industry. Once service operations management system is designed and implemented, its effectiveness needs to be monitored for necessary mid-course corrections, if any. This needs an understanding of the performance parameters and tools identified.

Unit 12, *Performance Measurement and Monitoring Service Industry*, covers productivity concepts, yield management, pricing strategies in services and implementation issues and closes with a case study on yield management at motherland air.

Unit 13, *IT as an Enabler for Service Excellence*, discusses competitive role of information technology in services, economics of scalability, limits in the use of information, internet as a service enabler and a case study on ITC e-Choupal.

Unit 14, *Quality Management in Services*, explains definition of quality, difficulties in measuring service quality, the concept of cost of quality, building quality into the product, philosophies of Deming and Juran, Poke Yoke and Kaizen application for quality improvement and Phil Crosby's concept of 'Quality is Free'.

Unit 15, *Meeting Global Standards of Quality*, discusses benchmarking in service quality and productivity, six sigma for process improvement, ISO 9000 quality management system standards and ISO14000 environmental management system standards, quality awards and a case study on Ritz Carlton Company.

Unit 16, *Managing Capacity and Demand* elaborates on demand forecasting in services, forecasting methods, regression models, time series approach and factors to choose an appropriate model for each service segment.

Unit 12

Performance Measurement and Monitoring Service Industry

Structure

"In business, the idea of measuring what you are doing, picking the measurements that count like customer satisfaction and performance... you thrive on that."

- Bill Gates

12.1 Introduction

Some of the key characteristics of services are intangibility, inseparability, variability, perishability and heterogeneity. Hence, measuring and monitoring the performance and quality of service is comparably tough and needs a time tested approach for a given organization to ensure higher productivity and customer delight.

In the previous unit, we discussed the topic of front office-back office interface covering the concepts of services decoupling, decoupling & cost, and decoupling & quality, decoupling & delivery speed, decoupling & flexibility, decoupling & strategy, cost implications in decoupling and service implications in decoupling.

Performance measurement is the process of gathering, analyzing and reporting how well an organization works. As the adage goes "You cannot manage what you cannot measure", it is essential for organizations to define key performance metrics. Periodic measurement and monitoring of performance helps to know how well an organization is performing. Performance measurement helps the organization to set the direction and tune the efficiency of operations while helping in showcasing what is important. It is the way to set a focus/direction to their employees, get feedback on how the processes are performing and identify scope for improvement in them. Productivity, work-study and yield management are some of the key metrics that help organizations to understand their performance.

In this unit, we will discuss performance measurement and monitoring service industry covering productivity concepts, role of work-study, yield management, overbooking approaches, implementation issues and pricing strategies in services

12.2 Objectives

By the end of this unit, you will be able to:

- Explain the concept of productivity
- Define the concept of work-study and its application in service operations
- Establish the concept of yield management
- Identify the overbooking approaches in yield management
- Relate to implementation issues in yield management

12.3 Productivity Concepts

Productivity is the ratio of output to the number of inputs. This is a measure of how effectively the organization uses its resources. Productivity can be based on a single input factor that is also called partial productivity or factor productivity. When all input factors are taken into consideration, it is called total productivity. Productivity is used to assess performance over time at a department or organization level. In short, productivity is an overall measure of the performance of an organization, how well it can produce a service.

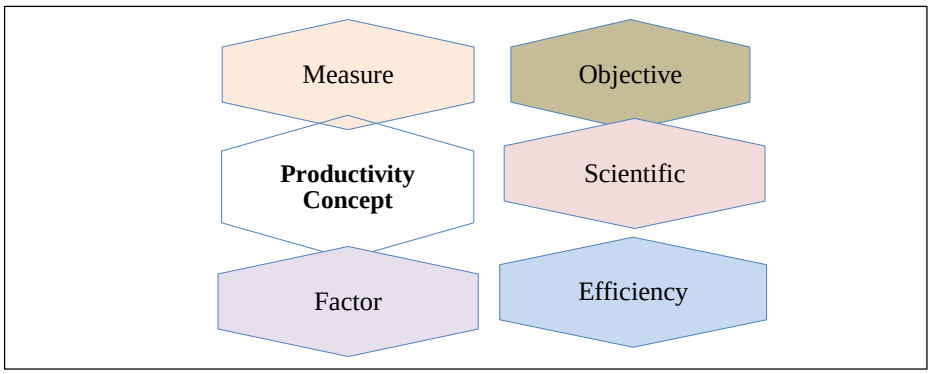
Productivity: Output/Inputs

Productivity is an index that tells with what minimum inputs, an organization can produce the maximum outputs. Hence, if the productivity has to increase, either the numerator has to increase or the denominator has to decrease.

The concept of productivity can be viewed from different perspectives. It can be considered as an "Objective", "Scientific", "Efficiency", and "Factor", and as a concept of "Relative Measure" also.

Let us see what these concepts mean as shown in Figure 12.1.

Figure 12.1: Productivity Concept



Source: ICFAI Research Center

Objective concept: Something can be called objective if it is not influenced by personal feelings and can be substantiated by facts or a reference. In this case, productivity can be compared against a standard, hence can be called an objective concept. Productivity can be a measure at different levels of the organization-strategic, tactical, or operational.

Scientific concept: Something is scientific if it is based on methods, principles, verifiable, or quantifiable. Since productivity can be measured in numerical terms, it is a scientific concept.

Relative Measure concept: This helps to understand how well the resources are being utilized, keeping the input constant, if the output can be increased, productivity increases. Productivity is a relative measure as it helps us to measure the increase/decrease of productivity as compared (relative) to a certain input actor or all the inputs or output. It can also be used to compare the output produced across a certain period. It is an indicator of how well the resources are being utilized for a given output.

Efficiency concept: Efficiency is how fast work is being done but productivity is more to do with how "well" the correct/needed service is being performed and hence productivity should not be construed as efficiency, it is more to do with effectiveness. Efficiency can help an organization understand how they compare with competitors and the possibility of productivity improvement. While efficiency is "doing things right", it is more important to "do right things" which is effectiveness.

Factor concept: Productivity is also looked at based on the number of factors considered. Partial factor productivity deals with a single factor input like people, material, or money to the total output. Multi-factor productivity deals with multiple factors like people and capital for the output. Total factor productivity considers all the inputs such as people, money, energy, etc. used for producing the output.

Example: Automation Helps Improve Productivity

Ajmera Tyres (ATPL-1968, Nagpur), the top 5 of tyre groups, automated their core human resource (200 employees) processes implementing through change approach. In manual mode, attendance gathering and computation, payroll calculations were identified with errors, necessity for recalculations and adjustments. Their search for an HR information system (HRIS) ended with Keka, a cloud based data management tool automating real-time attendance through biometrics. The user friendly automated attendance-capturing led to greater transparency and accountability making employees to be more punctual. The help desk part of the tool helped resolve HR issues in unbiased way. The result is, 32% increase in overall employee productivity, highly accessible employee data, appreciable 30 hours saving in payroll work and 8 hours saving in managing employee grievance issues.

Source: https://www.peoplematters.in/article/hr-technology/case-study-improving-productivity-and-performance-with-automation-32723, February 2022, accessed on 26th June, 2022

12.4 Role of Work-Study

Work-study is defined as 'The systematic examination of activities in order to improve the effective use of human and other resources' by the British Standards Institute. In simple terms, it is the systematic study of operations/processes to improve the effective utilization of resources. Hence, work-study helps to improve productivity.

“Work-Study” is a combination of “Method Study” and “Time Study (Work Measurement)”. Work-study is hence a powerful tool to improve productivity and is also used to reengineer business processes. It helps identify the optimal way of performing the operations and reducing non-value-added activities. It also helps in setting performance measurement standards, which in turn help the organization to understand the optimal way of scheduling, estimating the time taken to process a service request like a customer order or a loan application, and estimating the cost involved for these processes.

Method study focuses on:

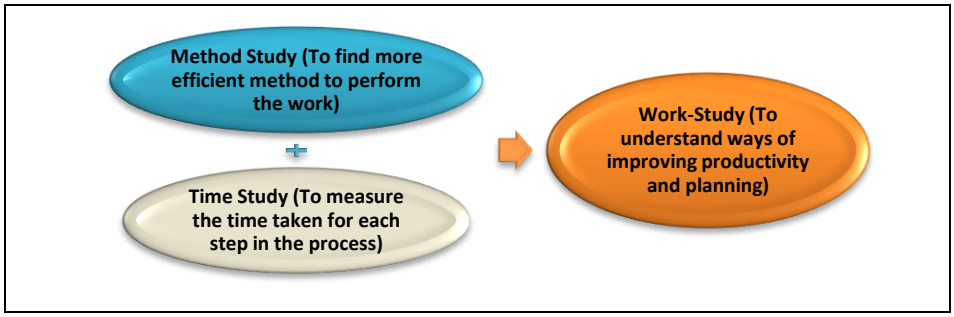
- Workflow
- Ergonomics
- Movement of material and information
- An effective way of doing a job and reducing the cost

Time study focuses on:

- Remove non-value-added activities
- Increase the efficiency of processes
- Standardization

Figure 12.2 depicts the scope of work-study.

Figure 12.2: Work-Study



Source: ICFAI Research Center

The major steps involved in work-study are:

- **Select**: What work needs to be studied
- **Record**: Note the information important for the work
- **Examine**: Analyze the information collected and recorded
- **Develop**: Come up with a better way of performing the service
- **Install**: Implement the new improved method as a standard
- **Maintain**: Manage the new standard process

For example, in a hospital, work-study can be used to select which process/work needs to be studied. For example, if patient registration is the process selected to be studied, a team can analyze what is the current way it is being done and then record the information relevant for this process. Patient registration process can then be examined to see if there are any repetitions, unnecessary activities, or bottlenecks or non-value-added. Based on the analysis, a new process can be developed by removing unnecessary activities, computerization or self-registration, or using a unique identification like Aadhaar card to capture all the mandatory information so that entering a large amount of data can be reduced. Concerned personnel need to be trained on the improved process, then the process is installed and it becomes the standard that needs to be maintained.

Role of Work-study: Work-study helps in analyzing and improving the processes in the organization. Some of the applications of work-study are given below:

- To standardize steps, material, equipment used in the operations
- Helps in better planning, training, improved communication
- Helps in designing an optimal workplace layout
- To devise incentive schemes based on performance
- Reduce costs
- Enables objective measurement of performance against pre-defined standards

Example: Work-Study at a Garment Company

Andrei Garments Company (Bustos, Bulacan) targeted improving the productivity of the company. They conducted work-study for assessing various standard times in the production environment. The primary data was collected using "direct observation, filming and interview". The data was analysed by comparing existing method with the proposed one. The proposed methods showed improvement in productivity. The benefits included: Improvement in ergonomics of the plant layout, minimization of operating time by 29.88%, decrease in delays by 14%, and minimized the overall motion in the process by 23.75%.

Source: Rañoja, Reign Atlantis and Garcia-Vigonte, Florinda (2022, February 9). Productivity Improvement: Application of Work-Study in Andrei Garments Company, SSRN, accessed on 26th June, 2022

12.5 Yield Management

Yield management is also known as revenue management or revenue optimization. Yield management can also be considered as a variable pricing strategy. Variable and fixed cost components vs. the forecasted demand are analyzed and a pricing strategy to maximize revenues is determined taking into account consumer behaviour. This name of yield management was given by the former CEO of American Airlines, Robert Crandall.

Definitions of Yield Management:

Yield management was defined by Optism (2002:1) as "an economic technique to calculate the best pricing policy for optimizing profits generated by the sale of a product or service, based on real-time modeling and forecasting of demand behavior."

Nagle and Holden (1995) defined it as "a discriminatory pricing procedure which involves setting different prices for different segments of the market so as to maximize revenue gained."

Kimes (1997a) defines yield management as "the process of allocating the right capacity or inventory unit to the right customer at the right price and at the right time so as to maximize revenue or yield."

Revenue management is more generic which focuses on optimization of prices by market segmentation, consumer behavior prediction while yield management is revenue maximization through inventory control. Smith, Leimkuhier, and Darrow (1992) defined revenue management as the application of information systems and pricing strategies to allocate the right capacity to the right customer at the right place at the right time.

The prerequisites for yield management to apply are:

- Perishable inventory
- Fixed amount of resources for sale
- Customers are ready to buy at differing prices

Example: Yield Management in Hotel Revenues

Xotels; Italy revenue management (yield management) strategies included: analysis of demand patterns, defining KPI (key performance index) for performance and identifying business areas where statistics help in better decision making. They ensured location independence in their revenue management approach while building the model. They are confronted with the usual entry hurdles like: absence of knowledge of market, not having direct experience of the locality etc. At Agora Palace Hotel, by implementing strategies like: provide hotel team training in direct sales through simulation; team management; new inventory standards and approaches implementation; dynamic rate methods for corporate contracts; new actions and changed business mix for online distribution etc., they realized increased revenues. This helped them move from negative 'REVPAR Index (measures revenue per available room in comparison to other hotels.)' to an increase of average 24% in 5 months. In addition a 27 point increase of occupancy was also noticed.

Source: https://www.xotels.com/en/revenue-management/hotel-revenue-management-in-italy-case-studies-by-xotels, 13-November-2020, accessed on 26th June, 2022

Activity 12.1

Productivity is used to assess performance over time at a department or organization level. In short, productivity is an overall measure of the performance of an organization, how well it can produce a service. There are many techniques followed by organizations to ensure optimum level of productivity as it is an essential aspect of yield management.

In supermarkets or for any matter even in any mall, store or restaurant, we find that customers' entry varies from time to time in a day and season to season. No organization can ensure 100% capacity utilization.

- You are required to study how a supermarket closer to the place of your work or stay operates.
- Specifically, find out how the employees are utilized during lean period so that productivity and customer service quality of the supermarket are not affected.

Check Your Progress - 1

1. Which of the following is not the main purpose of performance measurement and monitoring?
   a. To know how well an organization is performing.
   b. To set the direction and tune the efficiency of operations
   c. To fire employees
   d. To set a focus/direction to the employees
   e. Identify scope for improvement in them.
2. Which of the following is not the purpose of work study?
   a. To improve productivity
   b. To reengineer business processes
   c. To reduce non value-added activities
   d. To set performance measurement standards
   e. To exit a product/service line
3. Which of the following is the main focus of method study in IT industry where employees complain about discomfort in working for long hours?
   a. Ergonomics
   b. Cost reduction
   c. Quality improvement
   d. Customer engagement
   e. Movement of material and information
4. Work-study in a hospital is primarily aimed at which of the following?
   a. Comfort of support staff
   b. Convenience of doctors
   c. Comfort of the visitors
   d. Convenience of suppliers of medicines etc.
   e. Comfort of the patients.
5. Which of the following is the main focus of yield management in a service industry?
   a. Revenue optimization
   b. Resource optimization
   c. Productivity optimization
   d. Ambience optimization
   e. Public Relations

12.6 Overbooking Approaches

Capacity planning in services is different from product/manufacturing as the inventory is perishable, making timing/scheduling the services difficult. Some of the components in yield management are:

Overbooking: Companies sell beyond available capacity that is called overbooking to take care of last-minute cancellations. This typically happens in the travel and tourism industries- airlines, hotels, etc. The costs involved in this are the cost of stock-out/underage (having a reservation but no seats/rooms, etc.) and the cost of overage (no advance reservation and seats/rooms empty). Taking these two costs into consideration, the extent of overbooking is calculated.

The overbooking approaches used are:

Average: The average number of no shows is calculated. The number of No-shows (customer books but does not appear) and the % of times it happened is captured over a certain period, based on which the number of overbooking is determined. If 2 people did not show up 15% of the time, 3 people 10%, etc., average is calculated as (3*0.15+3*0.2). This would be the requirement for overbooking.

Marginal cost: Marginal cost of the wasted capacity (p-c) is equal to the overage cost that is the difference between the price at which each unit is sold (p) and the cost of using or producing the unit(c). If 'b' is the cost of backup in case of shortage, the marginal cost of capacity shortage or cost of underage is the difference between the cost of backup in case of shortage and the cost of using or producing the unit. (b-c) For airlines, this is done by calculating the cost of a dis-satisfied customer and the cost of an empty seat/room, show, etc. In general, marginal cost is the ratio of the total cost to total output.

Spread-sheet analysis: The number of overbooking can also be calculated using a spread-sheet by taking the number of no-shows, probability, and calculating the cost for a specific number of overbookings (1-10).

Static Methods:

Fixed time rule: Deals with the time frame within which a discount is allowed to use the capacity. Ex: Airlines offer discounted fares until a specific date or a month before the flight.

Fixed number rule: The discounts are offered for a fixed number of seats/rooms/units or a quota. Ex: Airlines will offer 20 tickets/seats at a discounted price while the rest are at a premium.

Managing capacity: Supply can be managed by multiple shifts, increasing customer involvement, sharing the capacity, and cross training the people.

Benefits of Yield Management:

- Maximize revenues within the available capacity to the demand
- Improve sales through variable pricing
- Increase the competitive advantage

Example: Overbooking in the Hotel Industry

"Marriot International Hotels Company" adopted a 'revenue management system' by dividing market segments of leisure/ business travelers. This facilitated a detailed understanding about behavior of reservation, sensitivity about prices, stay patterns etc. Integrating with various reservation approaches of Marriott and a security software, they optimized the room revenue. With complex inventory approach, good forecast on demand, uniform rate details, suggestions for 'overbooking', the system facilitated revenue maximization.

Source: https://www.ukessays.com/essays/leisure-management/tourism-enterprise-and-revenue-management-overbooking-in-the-hotel-industry-1882.php, 17th November, 2020, accessed on 26th June, 2022

12.7 Implementation Issues

The following are the few implementation issues:

- Perceived as unfair practice: Customers feel that they are being exploited based on the demand. As the prices vary when there is a shortage or in case of travel, it is closer to the time of travel, the rates shoot up which customers may perceive as unfair. The price increase is considered acceptable by customers when the input factors cost increases and not because the company wants to increase profits.
- Customers may take only at discounted prices – opportunistic behavior by customers who may want to take only when prices are low. Sometimes customers who understand the system try to use it to their advantage especially in hotels where the prices vary between weekends and weekdays. Some of them bargain for the lower weekend price and book from Thursday till Sunday but leave after Thursday paying the lower fare.
- Scope for misconception due to too many discounted prices.
- Difficult to implement a computerized yield management system. It is difficult to predict the pricing for all customer groups when a major share of capacity is taken by a large group like a travel tour group.
- Employees' morale may go down as some part of the role of employees in fixing the price of services is taken up by the yield management system
- Employees may not reach their sales goals or get their incentives as the discretion of when to lower the price is taken away from them, as yield management will not let the price to lower below a certain price.

- Lack of understanding or management skill in applying yield management can be a challenge.
- Shortage of information on internal operations, improper communication channels, and insufficient infrastructure for market segmentation can also thwart the yield management implementation.
- Measuring the effectiveness of using yield management is difficult to measure as there are many external factors that affect performance. For example, an airline (Spice jet) might use yield management but if a competitor airline (Indigo) comes up with a more attractive scheme, the effect might come down. Yield management started with American Airlines launching super saver fares to counter the low-cost People Express Airlines.

Yield management is more apt where the variable costs are low compared to the fixed costs and marginal revenue can be maximized.

Example: Performance Measurement Implementation System for an SME

The SME is a medium size enterprise in Jakarta area. The company had developed necessary 'performance indicators', adopting a 'performance prism' methodology. 'Key performance indicators' were selected applying 'analytical hierarchy process' and 'Pareto principle'. The selected KPIs were analysed using the 'traffic light system (TLS)' and 'objective matrix (OMAX)'. The results showed that these approaches can build the base for controlling and necessary identification and implementation of action plans for better performance measurement.

Source: https://www.inderscienceonline.com/doi/10.1504/IJPMB.2022.122199, March 28, 2022, accessed on 26th June, 2022

12.8 Pricing Strategies in Services

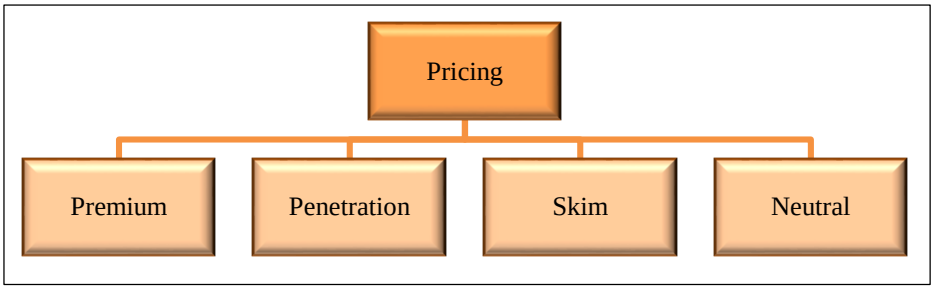
Price is the amount of payment/compensation a customer pays for the service obtained and pricing is determining what amount the service needs to be sold at by the organization. Companies can determine the price by different methods. Some of them are:

- Add a certain profit to the overall costs incurred
- Fix at a certain level to deter the competitors
- Increase/decrease the price based on the market and competition
- Fix based on the value being offered to the customers.

Since it is generally difficult to ascertain the unit cost of a service involving purely people (airlines, banks, etc.), most services go by value-based pricing. Companies also take capacity and demand management to determine the pricing strategy.

Offering lower prices in off-peak times in restaurants, pubs, and hotels is also a way of pricing. Charging a premium in high demand situations such as higher fares by airlines, hotels during festivals where more travel and stay is ensured. Weekend buffets being more expensive than weekdays are all forms of managing the demand vs. capacity using pricing. Yield management is also used to determine prices. Hotels and airlines also do overbooking to take care of last-minute cancellations. Figure 12.3 shows various pricing strategies.

Figure 12.3: Pricing Strategies



Source: ICFAI Research Center

Premium pricing: Charge a premium or high price when the business has a competitive advantage or when the service provided is unique, or by associating high price with high quality or value. *Example:* Apollo hospitals charging a higher price for their services.

Penetration pricing: To enter into a market, charge very low prices initially and after establishing themselves, hike the prices. Mobile apps are also initially given as free and then a subscription fee is charged after gaining the market.

Skim pricing: As a first mover, companies charge high prices initially and get the maximum advantage, as they know that there will be other players soon and this pricing cannot sustain. It is like trying to gather as much cream (skimming) on the top as possible. For skimming, the service needs to be unique and be perceived as high quality by the customers. Training institutes will charge a high price for a new training initially as there are no other players in the market but eventually, they need to bring down, as it is inevitable for other players to enter. (SAP training, CRM training, Big Data were initially highly priced but now are being offered by many at much lower prices). Similarly, digital X-rays were initially highly priced as very few players could offer the services.

Neutral pricing: Prices are comparable to competitors. This is used when the services are being offered by many and the company wants to differentiate themselves by providing some other value add. By doing this, they need not cut down their prices every time there is a cut by some other competitor. For example, training institutes will offer training and certification exam support or placement assistance to differentiate themselves from giving discounts.

Some of the pricing methods used commonly are:

- Forward pricing which is calculating the cost and adding a mark-up for the profit
- Backward pricing is done when an idea of how much the market is willing to pay is known, based on which the cost of inputs can be worked out.
- Contribution pricing is used when the provider knows the actual cost incurred for all the variable components of the service provided and will price the service to cover the costs at the minimum.
- Psychological pricing is used to work on the psychology of customers, the buffets being priced as ₹ 395 instead of ₹ 400 or promoting as under 500/1000, etc.
- Bundling pricing is to group a few good and not so good and offer as a package. Typically seen in healthcare, tests, diagnostics being bundled as "Executive Health Check-up" or Women Health where some inexpensive tests are added to show that many tests are coming at a lower price.

Example: Pricing Strategy Approach

World popular Walmart practices 'Penetration pricing' in their business operations. Penetration pricing is an approach to pricing, which helps to easily penetrate in to market and gain the market share. The method is guided by fixing prices of the product at a 'below-market level'. After gaining the noticeable market share, the prices are readjusted. For ex: A SME soap maker company X, sells bath soap at $10. Walmart, with higher production capability, gets into market with sale price of $5(with very low margin profits) for the soap. This may likely drive out company X to run out of business. Subsequently Walmart can re-fix prices. Such extreme methods of 'penetrative pricing' are also referred as 'predatory pricing'.

Source: https://www.sniffie.io/blog/five-good-pricing-strategy-examples/, 19-April-2021, accessed on 26th June, 2022

Activity 12.2

Covid-19 created havoc in all spheres of economy. Most affected look to be the Consumer durable industry. After the government started relaxing lockdown norms through a series of unlocks, many industries started breathing with reviving operations. Automobile industry started showing positive trends. The festival season of Dasara and Diwali gave promising opportunities. One important initiative taken by the FMCG industry, is the pricing strategy.

- You are required to identify an area of consumer goods and study the pricing strategies followed by a few competitors of say, mobile phones, refrigerators, TVs or any other item of your choice.

• Identify various pricing strategies available for service organizations to choose.

Check Your Progress - 2

6. Which of the following is not a concept of productivity?
   a. Measure
   b. Objective
   c. Subjective
   d. Scientific
   e. Factor
7. Which of the following is not relevant to yield management?
   a. Technique to calculate the best pricing policy for optimizing profits
   b. Discriminatory pricing procedure
   c. Allocating the right capacity or inventory unit to the right customer at the right price
   d. Revenue management
   e. Capacity management
8. Which step follows the "Examine" in the work-study process?
   a. Select
   b. Record
   c. Develop
   d. Install
   e. Maintain
9. Which of the following statements is incorrect?
   a. Method study focuses on increasing the efficiency of the process
   b. Time study focuses on removing non-value-added activities
   c. Time study focuses on standardization
   d. Method study focuses on ergonomics
   e. Method study and time study together are called work-study

10. Which of the following is not true about yield management?
    a. Improved sales
    b. Increased competitive advantage
    c. Maximized revenues
    d. Applicable on stockable inventory
    e. Applicable where customer segmentation is possible

12.10 Summary

- The efficiency and effectiveness of service processes need to be measured in the service industry.
- Productivity concepts such as scientific, objective, relative measure and factor can be applied in service processes to understand how to get the maximum output for the inputs.
- Work-study that is a combination of method study and time study helps in understanding the process efficiency and effectiveness and helps to redesign the process removing the non-value-added steps.
- Pricing in services is determined based on the value provided, as it is difficult to decide the cost incurred.
- Premium, penetration, skim, and neutral are some of the strategies used for pricing the services.
- Yield management is a revenue management concept that is applied in the service industry where there is the perishability of services being sold, customer segmentation, high fixed costs compared to the variable cost.
- This concept uses the overbooking and variable pricing based on segment/season/time frame especially in the airline industry to maximize the revenues.
- On the other hand, there are issues in its implementation due to it being perceived as unfair, not easy to automate all aspects, and the possibility of customers taking undue advantage of the underlying concept.

12.11 Glossary

Backward pricing is done when an idea of how much the market is willing to pay is known, based on which the cost of inputs can be worked out.

Bundling pricing is to group a few good and not so good and offer as a package.

Contribution pricing is used when the provider knows the actual cost incurred for all the variable components of the service provided and will price the service to cover the costs at the minimum.

Forward pricing which is calculating the cost and adding a mark-up for the profit.

Method Study: Analysis of ways of doing work.

Productivity: The ratio of output to the total inputs is called productivity.

Psychological pricing is used to work on the psychology of customers, the buffets being priced as ₹ 395 instead of ₹ 400 or promoting as under 500/1000, etc.

Time study: Time a job should take.

Work-study: The systematic examination of activities in order to improve the effective use of human and other resources.

Yield management: Variable pricing strategy, which is arrived at by analyzing, understanding, anticipating, and influencing their behavior to maximize the revenues.

12.12 Self-assessment Test

1. Discuss productivity concepts.
2. What is the role of work-study and how is it related to productivity?
3. What are yield management and its application?
4. Write about the major steps in the work-study.
5. Write about different pricing strategies

12.13 Suggested Readings / Reference Material

1. Chase R. B., Ravi Shankar, Jacobs F. R. (2018), Operations and supply chain management, McGraw Hill, 15th edition.
2. Haskett J. L. (1986), Managing in the service economy, Harvard Business School Press.
3. Nitin Joshi, S. Rajagopalan (2019), Service Operations Management: Towards Excellence, Himalaya Publishing House, 1st edition.
4. Mathur S. S., S Mathur and Kenyon A. (2017), Creating Value: Successful Business Strategies, Routledge, 2nd edition.
5. Robert Johnston, Michael Shulver, Nigel Slack and Graham Clark (2020), Service Operations Management: Improving Service Delivery, Pearson, 5th edition.

12.14 Answers to Check Your Progress Questions

1. (c) To fire employees

To fire employees is not the main purpose of performance measurement and monitoring.

2. (e) To exit a product/service line

To exit a product/service line is not the purpose of Work-study.

3. (a) Ergonomics

The main focus of method study in IT industry where employees complain about discomfort in working for long hours will be on ergonomics.

4. (e) Comfort of the patients

Comfort of the patients. Work-study in a hospital is primarily aimed at comfort of the patients.

5. (a) Revenue optimization

Revenue optimization is the main focus of yield management in a service industry.

6. (c) Subjective

'Subjective' is not a concept of productivity. Productivity concepts include objective, scientific, relative measure, factor and effectiveness.

7. (e) Capacity management

Yield management is not the same as capacity management. It is managing the supply and demand for maximizing revenues with variable pricing.

8. (c) Develop

After 'Examine', developing the new process follows.

9. (a) Method study focuses on increasing the efficiency of the process

Time study focuses on increasing the efficiency of the process.

10. (d) Applicable on stockable inventory

Yield management can be applied only if there is perishable inventory and not on stockable inventory.

Unit 13

IT as an Enabler for Service Excellence

Structure

"In the world of internet customer service, it's important to remember your competitor is just one mouse click away."

– Doug Warner

13.1 Introduction

Information Technology has been a tool in innovation of many customer service oriented applications like: Voice response systems, chat boats, podcasts, online help desks etc. Organizations need to be innovating the service offers from time to time using IT as an enabler for service excellence, failing which the competitors may build better service tools and build better customer touch points.

In the previous unit, we discussed performance measurement and monitoring service Industry, covering productivity concepts, role of work-study, yield management, overbooking approaches, implementation issues and pricing strategies in services

Information technology has grown by leaps and bounds and this has opened up possibilities of faster, better, cost-effective service delivery. With the growth in the speed and availability of the internet, the service delivery has made customers more in control of some of the processes and has enabled 24x7 availability of services, anytime and anywhere. Service excellence is determined by how well

the company is able to meet and manage customer expectations while maintaining the profitability or economic competitiveness of the organization. Information technology enables automating, measuring, and optimizing the services, thereby improving the quality of service and reducing the cost. The advancement in information technology has accelerated the growth of companies helping them expand their services online eliminating the geographical boundaries and shrinking the world into one virtual market space. Technology is growing faster than the way it can be implemented and organizations need to future proof themselves and remain competitive in the market.

In this unit, we will discuss IT as an enabler of service excellence. The concepts covered include economics of scalability, limits in the use of information, internet as a service enabler, challenges in adopting new technologies in services and case study on ITC e-Choupal services.

13.2 Objectives

By the end of the unit, you will be able to

- Explain the competitive role of information technology in services
- Discuss the economics of scalability
- Identify limits in the use of information
- Examine an insight into using the internet as a service enabler
- Identify the challenges in adopting new technologies in services

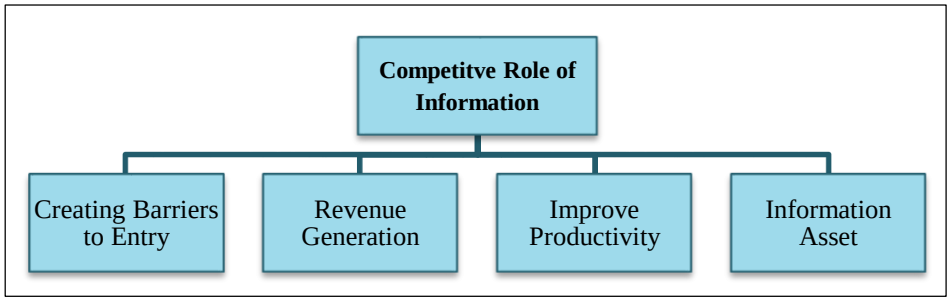
13.3 Competitive Role of Information Technology in Services

When a company has an advantage over its competitor it is known as a competitive edge that is what every company strives for. Companies need to adapt and embrace the technological advancements to future proof themselves and Information technology is being looked at as a powerful tool to gain this competitive advantage. Since most services are focused on information and its flow, investment in IT becomes a key decision for being ahead in the race and maintaining their position. Customers perceive the quality of service or excellence in service when their needs are met. Service providers are vying with each other to provide the best service at the most competitive price that is also economically viable. By automating some of the processes and involving customers in the business processes, a sense of control and flexibility is created for the customers, which is possible through information technology.

Role of information technology is prominent in such service operations like creating barriers to entry, revenue generation, improve productivity and as an information asset.

Information in services can be harnessed for creating many opportunities some of which are given below to enable companies to remain competitive as depicted in Figure 13.1.

Figure 13.1: Competitive Role of Information



Source: ICFAI Research Center

Following are brief details about these opportunities:

Creating barriers to entry: Services can remain competitive and have a strategic advantage if they can create a barrier to entry for other companies. This entry barrier can be achieved by economies of scale, increasing market share, using Information and Communication Technology (ICT) networks, and/or creating information storehouses.

Some of the ways in which ICT networks are used in online reservations, loyalty benefits and switching costs:

- Online Reservation: We have seen that companies cut costs and increase profitability by using the computerized online reservation systems. Customers become part of the process and they feel more in control. Companies can avoid some operating costs by reducing the manpower used in the reservation when an online system is available. These resources can be deployed elsewhere. This also gives a better perception of the quality of service to the customers as the services are available round the clock.
- Loyalty benefits: Organizations also offer special reward points or benefits when a customer sticks with them for their requirements. The frequent flyer benefits program is one such scheme that is possible only when a comprehensive information system is in place. When a customer registers and uses their service frequently, it can be tracked easily and reward schemes can be implemented. Other similar programs are points and discounts offered by credit/debit card companies, online shopping sites, etc. These programs help in retaining the customers and building their loyalty to the organization and make them returning customers, which is possible only when a robust information management system that can track the customers and their purchases is possible.

- Switching cost: When customers move from one company A to another B for their services, there is a cost associated with it, which is called the switching cost. For this, companies try to give added benefits or discounts by partnering with another service provider. For example, hospitals give special discounts or easy online ordering for medicines to patients when they partner with a medicine supplier or pharmacy. This will help hospitals to retain customers while customers save time and money in that the medicines are ordered along with the treatment in the hospital.

Revenue Generation: Performance measurement helps an organization to set the direction and tune the efficiency of service operations. It is the way to provide unity of command to the employees, get feedback on how the processes are performing and identify opportunities for improvement. Along with the productivity and work study, yield management is a key metric that helps organizations to understand their performance in resource management, leading to an efficient resource generation. Its main focus is on revenue maximization through inventory control. Effective deployment of advanced technologies like information and communication technology helps in revenue generation in service operations.

Improve Productivity: By the use of information technology, companies can have predictive, expert, and decision support systems, which help them to reduce the inventory carrying costs, predict the market trends so that services that are the most sought after can be provided. Employees of banks, airlines, hotels have faster access to information and are able to make informed decisions through the reports, dashboards, and analytics capabilities possible today with the information systems.

Information Asset: It is an invaluable asset to the company as the information is the power that the company has to plan its strategies at all levels. Micromarketing, selling the information, generating reports for market analysis, and other firms are all some of the ways in which information can be used by companies both for generating revenue internally and externally.

Some of the other advantages of using Information technology for competitive advantage are:

- Helps utilize knowledge about customers and enhance knowledge.
    - Information technology helps in conducting customer satisfactory surveys, taking online feedback, reviews, redressing customer complaints and in customer relationship management.
- Streamlining services
    - With the use of IT, it is possible to respond to customer requirements faster, thereby enhancing speedy service delivery.

- Customizing and personalizing services
    - It is possible to understand specific requirements of customers and incorporate them in service products before delivering to customers.
- Increasing reliability
    - Product and service quality and reliability are bound to increase as a result of reduced human intervention and faster and accurate delivery.
- Improving communication
    - Information technology facilitates online communication, thus providing seamless and continuous communication, especially at the time of service failure and customer distress.
- Facilitating services
    - All customer service provision is enhanced due to the speed, quality and cost advantages derived by using information technology.
- Reducing cost
    - Major cost reduction happens in labour and transportation costs. Other possible areas for cost reduction are attending to service quality problems and complaints at the earliest, with continuous communication with customers and service engineers.
- Involving customer
    - Selective involvement of customer is made possible by using information technology for continuous, seamless and appropriate communication. As per situational requirements, customer may be involved either directly or remotely for resolving any issues.

In effect IT helps in enhancing customer loyalty due to reliable and continuous communication with customers.

Example: Information Technology in Civic Services

Accenture had been identified by Paris authorities in 2018 to renovate the civil services for betterment of quality of life for the citizens towards building a smart city. The objective is to make transition from paper based system to mobile based and web app based connectivity to enhance productivity of the 'civil services maintenance technicians'. Accenture built a design of the solution based on the available IT infrastructure of the modern city and delivered a mobile app based digital solution. The app had potential to manage civil service maintenance like all types of orders: covering repairs, helping in automation of routing, audio reporting facilitating hands free operations, in the entire city. This system enhanced civil service workers efficiency by 20%, leading to attending of 1,40,000 repairs in a year. i.e. 600 completed average orders per working day.

Source: https://clutch.co/it-services/resources/case-studies-technology-consulting, March 2022, accessed on 8th July, 2022

13.4 Economics of Scalability

Scalability generally means the ability of a system or process to accommodate the increasing amount of work or growth. Scalability is in a financial perspective is how well a company is able to improve or sustain its profitability. Economics of scalability is determined by the lowest variable cost at which the company can serve an additional customer. Contribution margin is defined as the difference between revenue and variable cost, which the company tries to improve. Information technology helps in scaling up an organization at the lowest variable cost by cutting down on operating costs, increasing productivity, and expanding the market when services are offered online.

The scalability can be viewed from different dimensions and it is varied from companies that are exclusively into selling information (e-services) to a company selling goods (typical e-commerce). Scalability will be viewed as follows:

- With regard to the extent of customer involvement in services, self- service companies are more scalable as compared to companies where call-centers are used for order processing
- When services are standardized and can be distributed as a common service, scalability is high compared to customized personalized services.

Example: Economy of scale at Apple

Apple had thought about the use of software designer for the production units and vice-versa a production worker contributing to a software design activity. Having realized the ineffectiveness, they split their operations more into various individual skill based activities like 'design, hardware, software, manufacturing, marketing, production and assembly'. As every individual employee has specific skills they specialize in, by focusing more, it leads the company to higher productivity through greater efficiency. It helps them to plan and add people at necessary skill level function for more productivity, helping them to address the scalability issue much easy way. Thus, Apple took advantage of the 'division of labor' for scalability aspect.

Source: https://boycewire.com/economies-of-scale/ February 2021, accessed on 8th July, 2022

13.5 Limits in the Use of Information

Information is surplus for companies and it is being analyzed to understand the customer behavior and to generate a host of other reports. On the other hand, it also opens up questions as to how far it is legitimate and fair to track the customers. Where does the thin line between invading the privacy and utilizing the information for the benefit of the customer stop? Questions as to the privacy, fairness, and anti-competitiveness arise when using the information.

Anti-competitive

Companies track purchases to give loyalty points and free tickets in case of airline frequent flyer programs. However, at whose expense is the travel happening and whether this is leading to price wars.

Fairness

How far it is fair to use yield management and the purchasing power of customers to maximize revenue? Encashing the compelling need of customers raises questions of ethical practices and fairness.

Encroaching on Privacy

Customers would not like their purchase patterns to be tracked nor to get suggestions for alternatives. Sometimes, sales executives of banks calling up to suggest investments based on the savings a person is holding may also create an ill feeling that they are privy to your assets.

Some companies sell the contact information provided to them, which could be misused and created a backlash from customers about data security and reliability of the information.

Example: Violating Information Privacy

Amazon; Luxembourg revenue reached $113.08 billion. 'Luxembourg National Commission for Data Protection 'is a regulator of laws related to privacy and data protection. It had fined Amazon, for breach of the practiced protection laws to data and stated that personal data processing violates 'EU's General Data Protection Regulation(GDPR)'. Amazon was fined for 746 million euros ($887 million) penalty by watchdogs, as under the GDPR, the fine imposable was upto 4% of the annual revenue. 'Luxembourg's privacy regulator' also advised Amazon to modify some of their non stated business procedures. However, Amazon states that, the advertisements shown to users are based on untested understanding of 'European privacy laws' and was subjective.

Source: https://www.cnbc.com/2021/07/30/amazon-hit-with-fine-by-eu-privacy-watchdog-.html, July 2021, accessed on 8th July, 2022

Activity 13.2

Retail industry is booming across the world, becoming a significant part of service operations.

Explain various ways in which Information and Communication Technology (ICT) can be used for enhancing the efficiency of service operations in Indian retail sector.

Check Your Progress - 1

1. Which of the following is not a benefit of Information Technology (IT) in service operations?
    a. Automation of processes
    b. Optimizing services
    c. Improvement of quality
    d. Reducing cost
    e. Designing organization structure
2. Which of the following is not identified as a competitive role of information?
    a. Counselling employees
    b. Creating barriers for entry
    c. Revenue generation
    d. Improve productivity
    e. Information assets
3. Which of the following is most scalable?
    a. Self-service companies
    b. Call-centers
    c. Customized personalized services
    d. Low fixed cost companies
    e. e-commerce companies
4. Which of the following is the best use of information technology in hospitals?
    a. Faster bill processing
    b. Safety of patients and staff
    c. Predicting market trends
    d. Faster access to information
    e. Educating patients
5. Which of the following is not a major aspect of revenue generation using ICT?
    a. Yield management
    b. Digital Point of Sale
    c. Employee productivity
    d. Mobile applications
    e. Expert systems

13.6 Internet as a Service Enabler

Internet has thrown open many possibilities for service companies. Standard brick & mortar companies have also embraced the power and utility of the internet to expand their services, reduce the cost of operations. By enabling some of the services online, customers now have the advantage of accessing the services anywhere anytime either from the web or from mobile apps when connected to the internet. Most customers would not have physically visited their branch but they are able to perform all the transactions using the internet.

Internet has opened up vistas in education, health, retail, insurance, banking, etc. Most services are now available online and with the cost coming down and bandwidth increasing, the internet has become ubiquitous and more a necessity than a luxury for consumers and the businesses. From online psychological counseling to advice and tips on health, the internet has taken over the services industry by storm. Internet has created many successful online e-commerce sites such as Flipkart, redBus, which have brought the market to the customers' fingertips/clicks with Amazon being the pioneer in this business.

Internet has reduced transaction costs and improved service delivery. Internet has helped in trimming the fat in terms of removing redundancy, reducing extra infrastructure, and improving productivity. It has the power to empower customers and exchange information in real time while flattening the organization hierarchy, which led to innovative service delivery and business models. From simple email to teleconferencing to social media, the internet has revolutionized communication cost, ease, and delivery. While costs come down, the expectations of customers and competition between companies had grown many fold and companies are striving hard to tune their business models to offer better, cheaper, faster services to the ever-increasing demands of the customer.

Example: Internet as a Tool for Customer Services

Qantas airlines, an Australia's leading player, had focused on entire 'flow of travel' and has built apps and other solutions for optimal details related to the journey of each customer. It had personalized entire activities of airlines like: 'ticket booking, passenger check-in, stay in-lounge and experiences in-flight'. The app helps to make real-time recommendations on: right time start to the airport and the available optimal route, effective check-in, based on the current location of the passenger. Another app helps customers to earn points for adapting to healthy habits, which help Qantas to cross-sell allied products of travel and insurance to all its members. Qantas built a 'marketing messaging platform' leveraging AI and personalized library tools to ensure right channel is used for delivery of the right message, to each customer about their offerings.

Source: https://hbr.org/2022/03/customer-experience-in-the-age-of-ai, April 2022, accessed on 8th July, 2022

13.7 Challenges in Adopting New Technologies in Services

The following are some of the challenges in adopting new technologies in services:

Acceptance by Customer

Since the customer is part of the process in service delivery, any new technology needs acceptance from the customer. The recent use of mobile apps for booking cabs is a problem for some of the senior citizens and there may be a certain level of resistance from that quarter. Similarly, when ATMs, kiosks for railway information were introduced to ease the traffic and increase the availability of services, there was resistance. Customers may need some help and time to adapt to new technologies.

Resistance from Employees

While the company goes for automation of processes or advanced technology implementation, there can be resistance from the employees to adapt to the new processes and technologies and companies need to invest in training the employees to get the maximum benefits of using new technologies.

Resistance to standardization

Some of the new technology adoptions need all the institutions to adapt the standards. For example, usage of Universal Product Code (UPC) by manufacturers for the retail industry or use of Magnetic Ink Character Recognition (MICR) on cheques for banks is something that all manufacturers/banks need to use without which companies would still need to manually enter the product code instead of bar code scanning (for retail) or manually sort the cheques without MICR, which defeats the purpose.

These challenges can be addressed by:

- Orienting and educating the employees and customers
- Conduct a feasibility analysis and analyzing the impact in other industries before implementation
- Perform a cost-benefit analysis in terms of the hardware, software costs
- Follow with requirement analysis, functional and design specification, and using a project management approach to implement the plan.

Example: Challenges on Data Access Rights in Technology Based Service Applications – Ola

At Ola, drivers are defined as ‘self-employed’. Their ‘data protection policy’ indicates a great degree of ‘driver surveillance and performance management’.

Contd….

Ola's "Guardian" scheme is a technology driven tool, based on 'artificial intelligence and machine learning' and analyzes vast amount of big real time data points and automates the computation of any irregularities in trip activity and also computes the 'fraud probability score' for every driver. App Drivers & Couriers Union–ADCU has challenged Ola in court stating that, only partial data is received and date-stamped GPS data is not shared by Ola to drivers, for the appeals made as per General Data Protection Regulation (GDPR). In addition they also complained that 'ratings data at the trip level' is not being provided, to understand any unfair or discriminatory ratings. The drivers also have agony that, the data provided has "huge gaps" and does not help them to meaningfully arrive at individual own performance. Ola indicated that, it's an automated process without manual intervention and thus the computed deductions shall be correct and irreversible. The case, also has reference to 'European data access rights' act, which supports protecting individuals being affected due to 'wholly automated processing'.

Source: https://techcrunch.com/2020/09/10/ola-is-facing-a-drivers-legal-challenge-over-data-access-rights-and-algorithmic-management/ accessed on 8th July, 2022

Activity 13.2

Services have become a dominant part of national economies, contributing significantly towards Gross Domestic Product (GDP). There being direct contact with customers in service delivery, meeting customer requirements and delighting them is essential. Customer demands highest quality at least possible cost and on demand delivery.

By virtue of limitations of human beings, without resorting to technologies like IT, automation, artificial intelligence etc., it is not possible to meet the exacting requirements of customers. However, there are challenges in introducing new technologies in service operations.

Identify some important challenges in introducing new technologies in service operations with specific reference to Indian conditions

Suggest a few possible solutions to facilities introduction of new technologies, addressing the concerns of all stakeholders.

Answer:

Check Your Progress - 2

6. Which of the following is not a way to create a barrier to entry of competitors where information technology plays a vital role?
   a. Online reservation
   b. Loyalty benefits
   c. Switching costs
   d. Yield management
   e. Acceptance by customer
7. Which category of creating barriers to entry is the frequent flyer benefits program?
   a. Online reservation
   b. Loyalty benefits
   c. Switching costs
   d. Yield management
   e. Digital point of sale
8. Which of the following is not true about the internet being a service enabler?
   a. Helped to expand the market
   b. Empowered the customers
   c. Created new service models
   d. Increased transaction costs
   e. Improved service delivery
9. The challenges faced while adopting new technology in services can be addressed by all of the below options except?
   a. Training customers and employees
   b. Conducting a feasibility study
   c. Follow yield management
   d. Follow a project management methodology
   e. Perform a cost-benefit analysis of the implementation of new technology

13.9 Summary

- Information technology is enabling service companies to be more productive and create innovative strategies to remain competitive.
- IT is a tool that can help companies to be competitive by creating barriers for entry of other companies by using an online reservation, providing loyalty benefits, reducing the switching costs.

- IT also helps in revenue generation through automated yield management, point of sale applications, and usage of expert systems.
- IT is also an enabler for productivity improvement, and creating a database of information that can be used in many ways to create a competitive edge for companies.
- IT also helps in the scalability of a company by reducing costs and improving productivity with optimum utilization of resources.
- Usage of IT expands markets, shrinks the geographical markets into one virtual marketplace. Information technology puts customers more in control and provides flexibility while on the flip side it raises issues of unfair practices, privacy breaches, etc.
- Growth of the internet has given rise to more opportunities in terms of e-commerce and online services in many domains.
- While companies are putting in efforts to embrace new technologies they face challenges in terms of acceptability by customers and employees and need to take measures to overcome them.

13.10 Glossary

Competitive advantage: The attributes that help an organization to outperform competitors by providing added value through lower prices or greater benefits

Expert systems: A computer system that emulates the decision-making ability of a human expert

Privacy: Is the ability of an individual or group to seclude themselves, or information about themselves, and thereby express themselves selectively.

Productivity: The ratio of output to the total inputs is called productivity

Scalability: The capability of a system, network, or process to handle a growing amount of work or its potential to be enlarged in order to accommodate that growth.

Switching cost: The cost that a consumer incurs when he / she changes suppliers/brands/products.

Yield management: variable pricing strategy, which is arrived at by analyzing, understanding, anticipating, and influencing their behavior to maximize the revenues

13.11 Self-assessment Test

1. Discuss the role of IT for competitive advantage.
2. What are the different ways of creating barriers for entry to gain competitive advantage using IT?

3. What are the challenges in adopting new technologies in services?
4. Write about the way the internet has enabled service operations.
5. Write about the innovative ways in which e-Choupal addressed its challenges using IT.

13.12 Suggested Readings / Reference Material

1. Chase R. B., Ravi Shankar, Jacobs F. R. (2018), Operations and supply chain management, McGraw Hill, 15th edition.
2. Haskett J. L. (1986), Managing in the service economy, Harvard Business School Press.
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5. Robert Johnston, Michael Shulver, Nigel Slack and Graham Clark (2020), Service Operations Management: Improving Service Delivery, Pearson, 5th edition.

13.13 Answers to Check Your Progress Questions

1. (e) Designing organization structure

Designing organization structure is not a major benefit of Information Technology.

2. (a) Counselling employees

Counselling employees is not identified as a competitive role of information.

3. (a) Self-service companies

Self-service companies are most scalable among various service providers.

4. (b) Safety of patients and staff

Safety of patients is the best use of Information Technology in hospitals.

5. (c) Employee productivity

Employee productivity is not a major aspect of revenue generation using ICT.

6. (e) Acceptance by customer

Acceptance by the customer is one of the challenges in adopting new technologies and not a way of creating a barrier to entry

7. (b) Loyalty benefits

The frequent flyer benefits program is a loyalty benefits scheme.

8. (d) Increased transaction costs

Internet has reduced the transaction costs and improved the productivity.

9. (c) Follow yield management

Yield management is a strategy to increase the revenue and cannot address the challenges in adopting new technologies.

Unit 14

Quality Management in Services

Structure

"Quality in a service or product is not what you put into it. It is what the customer gets out of it."

– Peter Drucker

14.1 Introduction

Quality is defined as the totality of features and characteristics of a product or service that bears on its ability to satisfy implied needs. The characteristics include: performance, features, reliability, conformance, aesthetics durability and serviceability etc., which can be integrated into the product or service by the manufacturer or service provider. But the implied needs are those of the customer, when fulfilled only the customer satisfaction and delight can be achieved.

In the previous unit, we discussed the topic of IT as an enabler of service excellence. The concepts covered competitive role of information technology in services, economics of scalability, limits in the use of information, internet as a service enabler and challenges in adopting new technologies in services.

Quality comes first is the standard saying and it is those companies who not only say but imbibe this into their processes, products, and services that are able to raise and sustain in this ever-increasing competitive world. But defining quality and measuring it for services is a challenging task as the services are intangible and depend more on the perception of the customers. While quality is important, it never comes free and has an associated cost with it. Companies need to understand the importance of building quality into the process rather than inspecting and correcting. With this change, many quality gurus have come up with various concepts that help an organization make quality their philosophy and way of life. Japan has been a pioneer in this and has shown the dramatic improvement that can be brought with a quality focus. Though this concept started with manufacturing and automobile product-based companies, it is all the more pertinent in the service industry to emulate these principles and tailor them to suit the service industry.

In this unit, we will discuss quality management in services, covering the concepts of definition of quality, difficulties in measuring service quality, cost of quality---Taguchi loss function, building quality into the product: design stage precautions against defect-prone activities, Deming and Juran, Poka-Yoke and Kaizen applications for quality improvement, Philip Crosby's concept of "Quality is Free" and "Do it right first time and every time".

14.2 Objectives

By the end of the unit, you will be able to:

- Define quality and the challenges in measuring service quality
- Interpret Taguchi loss function and the cost of quality
- Explain the importance of building quality into the design and doing it right the first time
- Identify some concepts proposed by quality gurus like Deming and Juran
- Explain quality improvement concepts

14.3 Definition of Quality

The International Organization for Standardization (ISO) defined quality as: "The totality of features and characteristics that bear on its ability to satisfy stated or implied needs".

Philips Crosby states that quality is "conformance to requirements". Crosby suggested that there should be a clear and measurable definition of quality so that organizations can direct focused efforts to achieve the targets.

Joseph Juran states quality as "fitness for use" stressing on the balance between the features and the lack of deficiencies.

Edward Deming gives a more elaborate definition and states that "good quality is a predictable degree of uniformity and dependability as per the requirements of the customer"

American Society for Quality (ASQ) defines quality as " excellence in goods and services, especially to the degree they conform to requirements and satisfy customers"

Service quality can be defined as the "discrepancy between customer's service perception and expectation.

All these definitions focus on the importance of customers, their requirement, and perception of satisfaction and hence a relative term. It is not about perfection but about how well it serves the purpose of the customer and the feeling of satisfaction derived.

In services, since there is no tangible output, it is a measure of how the customer perceives the service, and hence certain tangible aspects of quality in service such as on-time delivery, the physical evidence needs to be used for measurement.

Example: An Example of Quality Redefinition at a Retail Chain

Sainsbury, a UK supermarket chain, quickly responded to an input from, three-and-a-half-year-old customer by rebranding their "tiger bread". If organization could find creative opportunities to help customers at all touch points, organizations could redefine quality and achieve customer delight. It was not only when customers had problems and complaints, organizations begin engaging, but listening to them at all occasions, sharing customers 'feel-good stories' make customers feel connected and help build a big brand family while organizations could redefine their quality. So, Sainsbury's quality orientation was: Don't be afraid to change everything

Source: https://www.qualtrics.com/blog/customer-service-examples/, 2020, accessed on 8th July, 2022

14.4 Difficulties in Measuring Service Quality

In services, there are no physical attributes like size, pressure, strength, etc. to measure. In addition to this, the customer is part of the service and you cannot separate nor have a time difference between delivery and perception. Unlike manufacturing, there is no way to control the environment nor separate the customer. So there are greater challenges in measuring service quality. We have already seen that it is the perception of the customer that defines quality. While there are certain tangible aspects such as features, size, texture, etc. in products that can be felt and quantified for defining quality, it is a challenge to define quality in services as they are intangible. Quality of service is the total experience a customer feels. This includes the physical evidence and the people involved that impact the perception of quality for a customer.

Physical evidence is all the tangible aspects such as the physical environment in which service is delivered, the brochures used to market the service, the forms used for signing up, any equipment used, websites, etc. For example, when one enters a bank, if it is well organized, has easy to understand the layout of the different offerings, seating for the customers it leaves a more satisfying experience. The other aspect that affects is the people (employees) who interact with the customer- their way of receiving, courteousness, helpfulness, promptness in addressing the queries including their dress and personal appearance. The process that is used to deliver the service is the other important component that affects the perception of quality for a customer- how quickly and efficiently the information flows.

As there is no direct metric for measuring service quality, both subjective and objective processes are, involved those include some of the above aspects, which indirectly help understand customer satisfaction. Subjective measures are the perceptions of customers that are dependent on a person, how they felt about the experience, and they can be varied with no data to support.

Service quality in terms of operations measures whether the service delivered has met the specifications. From a customer point of view, what the customer expects as service and what he/she perceives of the delivered service could be different. This gap or mismatch can occur either due to a difference between expectation and delivery or between the delivery and perception, which is called the 'Gap' model. The gap could be because of selective filtering/distortion/retention.

To sum up, the challenges in measuring service quality are:

- Problems related to the dimensions
- Characteristics
- Variations in expectation and perception of customer
- Nature of tools

Example: Quality issues at hotel industry

Ritz Carlton, with around 24 resorts, 80 hotels globally, focused a lot on their customer service perfection. They ensured 'no chance of error' to achieve high-quality rating in their services. Being a hotel industry environment, customers had no product to purchase, but every touch point was a service experience they enjoy. Thus, many times it may not be easy to arrive at a quantifiable measure for quality of the service being provided for varied customer profiles, needs and demography. Also, one cannot average, a single digit value across various measured parameters. The best strategy was to achieve highest customer satisfaction in every aspect of every service at the hotel.

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There was equal focus on both non-financial as well financial attributes while assessing customer satisfaction. Non-financial measures: retained customer base and number of repetitive customers, yearly increase or decrease in the number of customers, measured customer service ratings for the service quality, market reports on performance; rating through globally recognized third party assessment institutions and also any awards (national/ international) received. The challenges were: sharing the objectives to the employee groups and listening to creative ideas from them to put in practice, including excellence in every serving element.

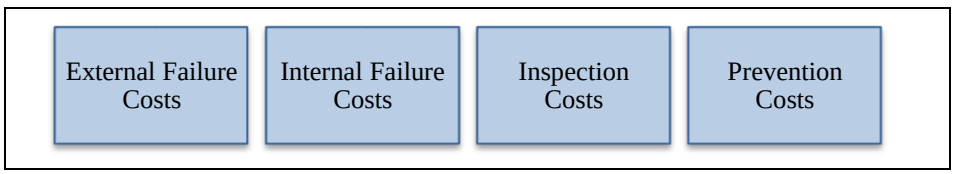
Source: https://www.wowessays.com/free-samples/free-case-study-about-quality-at-ritz/, 2020 accessed on 8th July, 2022

14.5 Cost of Quality-Taguchi Loss Function

The total costs incurred in quality-related efforts and deficiencies. It is the cost incurred for not creating a quality product/service. For example, the cost incurred when a pizza is delivered late and a free replacement has to be given or reprocessing the insurance claim since it was not done correctly. Hence, these are the extra costs that a company incurs for not doing it right the first time.

American Society for Quality (ASQ) states that "Cost of quality is a methodology that allows an organization to determine the extent to which its resources are used for activities that prevent poor quality, that appraise the quality of the organization's products or services, and that result from internal and external failures". The four categories of cost of quality are shown in Figure 14.1.

Figure 14.1: Cost of Quality



Source: ICFAI Research Center

The first two are the cost of poor quality or cost of non-conformance while the next two are the cost of good quality or cost of conformance.

External Failure Costs: The costs associated with defects found at the customer's site. Example- cost of investigating and rectifying customer complaints

Internal Failure Costs: The costs associated with defects found at the company's site before it reaches the customer. Examples- rework, delay in service, redesigning, failure analysis

Inspection Costs: The cost incurred to appraise or check if good quality is maintained- costs associated with testing, measuring, and monitoring quality-related activities. Examples- cost of service audit, process audit, process set up, etc.

Prevention Costs: The cost associated with preventing/avoiding defects/ problems occurring. Examples- design & implementation of a quality management system, adherence to standards, training, creation of specifications for service delivery, etc.

Taguchi - a Japanese expert - revolutionized the perspective on quality by correlating quality with cost and loss in monetary terms not just at the production level but including the loss to the customer and society as a whole. Taguchi said that it is not only the cost involved in rework or scrap to the manufacturer but in the long run, would lead to loss of reputation, a decline in brand value, and market share. From the customer perspective, it is reduced durability, the problem when this product interfaces with other products and comprise of safety. Taguchi says that this drop in quality is not sudden but it is experienced by the customer when there is a deviation from the defined specifications. This is mathematically shown by the loss function:

$L = k(y-T)^2$ where, L is the loss function, k is the proportionality constant

y is the actual value of the quality characteristic,

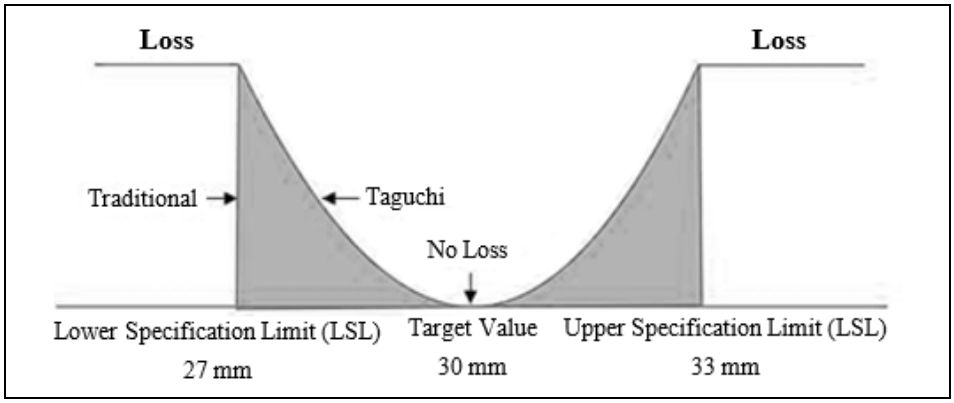
T is the target value of the quality characteristic

$k = c/d^2$, where c is the loss associated with the specification limit and 'd' is the deviation from the target value.

Value of 'c' is the quality cost

Figure 14.2 shows the concept of Taguchi's Loss Function.

Figure 14.2: Taguchi's Loss Function



Source: ICFAI Research Center

Example: Quantification of Cost of Quality

Cost of quality (CoQ) measures helped organizations to work for quality improvements, compute profit measure, and can be attributed as growth signal in the overall performance.

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An export oriented small-scale factory from Addis Ababa, Ethiopia, had realized that, it may anytime loose the export buyers owing to their high operational cost and diminishing quality standards. A set of quality analysts made an in-depth study of all the costs more so, the entire product development costs from planning to final packing stages, focusing on all the activities related to quality. The preventive costs were assessed as 4.8 %, appraisal cost was 10.2 %, internal failure cost was computed as 7.4 %, and external failure cost was comparatively low at 0.54 %. This led to the observation that, 23% of the sales revenue was against the CoQ. This showed that, measured and quantified costs against quality implementation can show light towards continuous improvement for the factories aiming at global competition.

Source: https://ojs.cnr.ncsu.edu/index.php/JTATM/article/view/17961, 2022 accessed on 8th July, 2022

14.6 Building Quality into the Product

Some of the principles involved in building quality into the product are:

- Consider the customer and market as external customers and the next step as the internal customer to the current step.
- Identify the aspects of quality needed by the external customer which means the factors that cause satisfaction and dissatisfaction
- Backward traceability of quality characteristic is maintained by building the needed quality into the component parts by understanding the quality needed in the final product
- Processes and procedures are selected depending on the capability of the process
- Range of process parameters that need to be maintained are defined

All these details are part of the design specification

Precautions to be taken at the design stage to reduce defects:

- Plan the framework carefully and detail the building blocks of the solution to sequence them
- Develop a model for the solution/service and run the simulation under various conditions to identify possible problem areas
- High risk/problem areas are analyzed using prototyping
- Conduct critical design review to identify defects
- Look at previous project historical information for lessons learned which can be incorporated into the design

- Include the inputs from Subject Matter Experts(SME) into the design
- Adhere to relevant international design standards
- Conduct a design stage Failure Mode Effect Analysis (FMEA) to identify areas to be reinforced
- Perform a Design of Experiments (DoE) to identify those components of the system that affect the product most.
- Quality assurance activities are aimed at continuous process improvement and the proactive measures are for defect prevention such as reviews, audits, and walkthroughs.

The trend in product develop is co-creation. In such situation, the developer and the organization establish design quality requirements through a process of joint quality planning to facilitate meeting end use requirements and ensure defect-free service quality.

Example: Quality Building in Financial Product Development

Revolut, London was a financial technology company, well known for offering wide range of online 'banking services, customer accounts, debit cards, fee-free currency exchange, stock trading' etc. Revolut Junior was a popular children's prepaid card. They focused on two streams: (1) developing brand platform and understand positioning the product, (2) Minimum viable product (MVP) functionality for the benefit of kids; and parents. It was aimed at the kids of age group 7-17, helping to build necessary financial skills for kids, by allowing managing their cards in their own way. On the brand platform, training main stakeholders, cross-functional teams on core values and sharing long-term direction for the product through a workshop, helped them. Discovery stage covered user interviews for collection of meaningful data for analysis of detailed insights.

This study helped the team to make four user groups: kids aged 6-10, 11-15, 16-18, and parents. The groups were represented as a persona, facilitating the team during the product development. The Definition stage covered brainstorming by the team to arrive at app's functionality, prioritize as per customer value and required development resources and effort. Development stage included the activities: building of multiple potential solutions for the MVP app version, performing usability test with the segment of youngest Revolut 'users and their parents'. The Delivery stage covered close working with the engineering team and building the product for launch.

Source: https://maze.co/collections/product-development/examples/, 2021, accessed on 8th July, 2022

Activity 14.1

In services, there are no physical attributes like size, pressure, strength, etc. to measure. In addition to this, the customer is part of the service and you cannot separate nor have a time difference between delivery and perception. Unlike manufacturing, there is no way to control the environment nor separate the customer. So there are greater challenges in measuring service quality.

You are required to identify a few critical challenges in service quality management.

How do you define service quality?

- Suggest a few popular metrics for measuring service quality.

Check Your Progress - 2

1. Which of the following is not a correct mapping of the quality definition given by different quality gurus?
   a. Fitness for use was proposed by Crosby
   b. Good quality is a predictable degree of uniformity as stated by Deming
   c. Excellence in goods and services, especially to the degree they conform to requirements and satisfy customers is given by ASQ
   d. The totality of features and characteristics that bear on its ability to satisfy stated or implied needs is the ISO definition
   e. Service quality can be defined as the “discrepancy between customer’s service perception and expectation
2. Which of the following comes under the cost of conformance?
   a. Warranty cost
   b. Rework
   c. Scrap
   d. Audit
   e. Loss of brand value

3. Which of the following factors is not making measurement of service quality difficult?
   a. No physical attributes
   b. Customer contact
   c. Immediate delivery
   d. Uncontrolled environment
   e. Selection of proper metrics
4. Which of the following is not a major factor to describe service quality?
   a. Customer satisfaction
   b. Compensation for failure
   c. Physical evidence
   d. Brochure used to sign-up
   e. Equipment used
5. Which Quality Guru defined quality as fitness for use?
   a. Crosby
   b. Deming
   c. Juran
   d. Taguchi
   e. Drucker

14.7 Principles Proposed by Deming and Juran

Deming: W. Edwards Deming is a doctorate in physics but is a statistician by experience. He is also known as the "Father of the Third Wave of Industrial Revolution" and one of the key people for economically reviving Japan after the Second World War. The Deming Prize given to individuals and organizations for exceptional work in improving quality is established in honour of Deming by the Japanese Union of Scientists and Engineers (JUSE). Among the many awards won by Deming, the Order of the sacred treasure of Japan, and the Shewhart Medal from the American Society of Quality Control. Deming is very well known for his 14 principles of management which were first quoted in his book "Out of the Crisis".

The following are Deming's 14 Principles:

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.

5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations and targets for the workforce.
11. Eliminate numerical quotas for the workforce and numerical goals for management.
12. Remove barriers that rob people of pride of workmanship, and eliminate the annual rating or merit system.
13. Institute a vigorous program of education and self-improvement for everyone.
14. Put everybody in the company to work accomplishing the transformation.

Deming's philosophy is summarized as:

Organizations can increase quality and reduce costs by following the appropriate management principles. Cost can be reduced by reducing waste, rework which also leads to customer loyalty. Focusing on continual improvement and holistic/system approach yields great benefits.

Deming proposed that all managers should have a system of 'Profound Knowledge' which has four parts:

- Appreciation of the system: Understand the interdependent parts of the system comprising suppliers, customers and producers of services
- Knowledge of variation: Know about the range, how and why the quality varies along with the statistical sampling
- Theory of knowledge: What can be known and not – limits of knowledge
- Knowledge of psychology: Know about Human nature

Juran: Joseph M. Juran is an Electrical Engineer and worked with Shewhart and pioneered the statistical process control techniques for factories when working in Bell Laboratories. He has made phenomenal contributions to quality improvement.

Juran's Quality Principles are:

Quality is "fitness for use".

Quality Trilogy is quality planning, control & improvement.

Waste must be identified and eliminated.

Spiral of progress in quality: products are produced by specialized activities and specialized departments which are interdependent.

Breakthrough sequence: Breakthrough is a "dynamic decisive movement to new, higher levels of performance" which involves policy-making, setting objectives for a breakthrough.

Project-by-Project Approach: Improvement needs to be achieved project by project. Steering arm and Diagnostic arm are two teams formed to analyze problems. He talks about the diagnostic journey that starts from symptom until the root cause is found, then the remedial journey to resolve the problem.

Example: Deming's Principles Applied in Manufacturing

Lockheed Martin Missiles and Fire Control (MFC) had applied 'Dr. Deming's 14 management principles' for increased productivity, at Texas in late 1990s. It's commitment to excellence was totally guided by and was dependant on the core principles of Deming's philosophy. The application of the Deming's principles benefitted them, with $225 million annual savings. MFC could measure improvement of customer loyalty rates by 18 percent during 2007-2012. Employee retention was at 95%, 94% in 2011, 2012 respectively. Thus they achieved "best in class" numbers among the large manufacturers. They achieved highest customer satisfaction, as 100% customers assured to definitely or probably do business with MFC as time progresses. As a result of all these efforts, they were awarded 'Malcolm Baldrige National Quality Award' in 2012 for performance excellence.

Source: https://www.worximity.com/en/blog/how-companies-have-applied-demings-14-points-in-manufacturing, 2019, accessed on 8th July, 2022

14.8 Poka-Yoke and Kaizen Applications for Quality Improvement

Shigeo Shingo - a mechanical engineer from Japan - established the Institute of Management Improvement and trained many in quality control principles. During 1961-64, Shigeo Shingo extended the quality control principles to develop Poka-Yoke or "mistake-proofing" concept. Originally it was called Poka-yoke which means idiot-proofing or fool-proofing. In Poka-yoke, variability due to human intervention or involvement on the process is to be reduced which is done by systemization of the workflow. For this, a Standard Operating Procedure (SOP) is created which focuses on reducing the defects and has to be followed by anyone working on that. Control charts are used to monitor and measure performance and the assignable causes are corrected. Poka-yoke can be used for anywhere an error is possible. Some of the possibilities are processing error, set-up error, improper or missing components, measurement error, operations error, etc. The steps in Poka-yoke are:

- Select the process based on Pareto principle
- Use 5-why to find the ways process can fail
- Select the right Poka-yoke approach- 'shut-out' type which is prevention, or an 'attention' type- focus on the error

- Prevention based Poka-yoke uses the control method and warning method
    - Control- when a problem is sensed, the process stops and corrective is action taken immediately. Example- A customer order cannot be released until the components are completely and properly filled
    - Warning- gives a warning/alert/signal when things are not correct but does not stop/shut down the process. Alerts the operator to correct where a certain range in variation is allowed
- Determine how the error occurs(detection)- due to contact/constant number/ sequence and train the one who is operating to eliminate the error
    - Contact - use of shape, size, or other physical attributes for detection
    - Constant number - error triggered if a certain number of actions are not made
    - Sequence method - use of a checklist to ensure completing all process steps is appropriate

Kaizen for quality improvement:

Kaizen means improvement in Japanese. It is the continual improvement of different functions/processes in an organization involving all people achieved in small steps with minimal cost using common sense.

Kaizen aims to

- Humanize the workplace
- Remove unnecessary hard work ("muri")
- Identify and eliminate waste

Tools such as PDCA – Plan-Do-Check-Act help in understanding what is happening while 5S, which stand for 'Seiri (Sort)', 'Seiton (Set in order)', 'Seiso (Clean)', 'Seiketsu (Standardize)' and 'Shitsuke (Self-discipline for Sustenance)' help in decluttering the workplace.

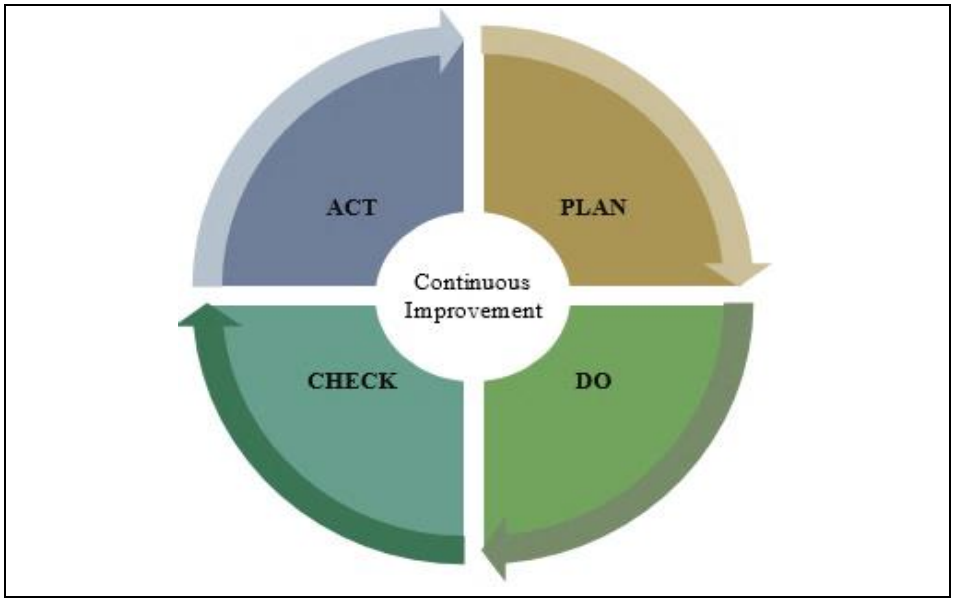
Kaizen can be used to bring improvement in customer relationships, delivery times, reliability, cost-effectiveness, etc. The five rules of Kaizen are:

- When a problem occurs go to GEMBA (the actual workplace of the employee)
- Check Gembutsu- noncoforming physical element (out of order equipment)
- Take a temporary step on the spot
- Find the root cause using the 5-Whys technique
- Standardize the process to ensure it won't recur

PDCA Cycle

The Plan-do-check-act cycle (Figure 14.3) is a four-step model for carrying out change. Just as a circle has no end, the PDCA cycle should be repeated again and again for continuous improvement. The PDCA cycle is considered a project planning tool.

Figure 14.3: PDCA Cycle



Source: ICFAI Research Center

PDCA and ISO standards

ISO 9000 series of standards are Quality Management System standards and ISO 14000 series of Environmental Management System standards are essentially centered around the the process approach, which in turn is similar to the PDCA cycle.

These ISO Standards are designed to manage and improve processes.

- First, identify key processes. (P)
- Second, define standards for those processes. (D)
- Third, decide how the process will be measured and evaluated. (C)
- Fourth, document approach to achieving the desired quality, as determined by your measurements. (A).

Example: Kaizen Implementation to Build Leanness

A popular global automotive spares manufacturer from India decided to implement 'continuous kaizen'; a short term activity with less investment, for floor shop line improvement. They set a target of 3 months and aimed 5% increase in both productivity and line efficiency. A ten member (internal) 'multi-hierarchical cross-functional team' was setup to "walk the flow, create the flow", through series of Gemba walks to assess problems related to assembly line. Towards continuous kaizen, team conducted 3M (mud, mura, muri) study.

Contd….

Different Kaizen applied included: relocate child bin parts near to the operator - save five seconds per part, provide inclined stand for easy pickup of tools - saved 0.5 seconds per part, separate bracket and cam-lever subassemblies' stands- saved 1.5 seconds per part, loctite stand at usage point - saved activity time of 0.5 seconds, reduction of 260 to 210 mm in the hand movement of workers, marker nearer assembly area – saved time by 0.5 seconds, reduction of 370 to 280 mm the hand movement of workers.

Focusing on motion waste; team decreased the length of the mandrel and thus mandrel threads, saving three seconds, reduction in hand movement and lesser operator fatigue. Thus sum of all these continuous kaizen, proved as a useful assembly line improvement method proving the 'reduction of lean wastes'.

source: https://link.springer.com/chapter/10.1007/978-3-030-44248-4_6, 2020 accessed on 8th July, 2022

14.9 Philip Crosby's Concept of "Quality is Free"

Philip B. Crosby is an engineer from America who started his career as a junior technician in the quality department and rose to the level of Vice President at ITT Corporation. He is known for his "Zero-Defect" concept and the book "Quality is Free" published in 1979.

Crosby postulated the four absolutes for quality management as follows:

i. Quality is defined as conformance to requirements and not goodness

ii. The system of quality is prevention

iii. The performance standard is zero defects

iv. The measurement of quality is the price of non-conformance

The theme of his 'Zero Defect' is doing it right the first time.

Crosby believed that

- Defects are caused by a lack of attention and a lack of knowledge.
- Attitudinal correction is needed to improve attention to detail while training can enhance knowledge.
- Quality is not a gift but it is free.
- If the defects are not put in, they don't need to be inspected and removed which is the basis for "Do it right the first time".
- Management involvement and commitment to quality are essential for quality improvement.

Crosby stated in his book "Quality is Free" that quality management system is the systematic way of guaranteeing that organized activities happen the way they are planned. He also stated that "good things happen only when planned while

bad things happen on their own". It is cheaper to do it right the first time and more expensive to rework or service the defects.

Example: Zero Defects – Process Approach

Pharma Company X (name changed) depended on zero-defect initiative for primary packaging raw material suppliers by applying the Define, Measure, Analyze, Improve and Control (DMAIC) process of Six-Sigma. The Company then listed out a predetermined process approach on measuring the supplier's processes and determined the progress made. The process followed at X: Have visual presentation of processes through GEMBA walk (tour of the shop floor), build process flows and review each of the 'Manufacturing, Quality, Shipping', analyze all deviations and product complaints, probe risk assessments to list critical quality attributes.

The data analysis helped in setting the processes like: Specifications, inspection and test methods for raw material, measurement of crucial quality attributes, set outgoing material sampling strategy for the supplier and incoming material inspection for Company X, shipping process Vs agreed requirements, supplier's approach program for zero-defects aligning with customer services. The study helped in improving functional areas: Define an implementation plan, Implement corrective and preventive actions (CAPA) and check, monitor the improvement activities and modify project timeline on need basis. These processes assured incoming material monitoring, significant reduction of number of defects, ensuring that suppliers' preventive measures were highly effective.

source; https://www.pda.org/pda-letter-portal/home/full-article/zero-defect-a-competitive-advantage, 2022, accessed on 8th July, 2022

Activity 14.2

Philip Crosby emphasised that quality is free.

But whenever we go to buy some item, shoppers say that higher prices are for better quality. This means that quality costs.

- How do you support Crosby's statement?
- For whom quality is free?
- Justify your conclusion.

Check Your Progress - 2

6. Which of the following is not a principle of Deming's Philosophy?
   a. Create constancy of purpose for improving products and services.
   b. Adopt the new philosophy.
   c. Quality means conforming to requirements.
   d. Cease dependence on inspection to achieve quality.
   e. End the practice of awarding business on price alone.
7. Which of the following is not a Prevention Cost?
   a. Cost of failures at customer premises
   b. Cost of Customer Satisfaction survey
   c. Cost of Training workers
   d. Cost of Training suppliers
   e. Cost of Quality Audits
8. Which of the following is not true about Deming and Juran and their quality philosophies?
   a. Deming's system of profound knowledge focuses on the need to know about human nature
   b. Deming proposed 14 principles of management of which providing training on the job is one
   c. Deming proposed the quality trilogy of planning, control & improvement
   d. Juran says there is a spiral of progress in quality
   e. Juran says improvement can be achieved project by project
9. Which of the following is incorrect regarding quality improvement?
   a. Shigeo Shingo came up with the Poka-yoke which means mistake proofing
   b. System will not allow an invoice to be closed until the order has been fulfilled and payment received – this is a warning method
   c. Poka-yoke involves the creation of a Standard Operation Procedure
   d. In Poka-yoke approaches, the shut-out type is used as a prevention approach
   e. In Poka-yoke, detection of errors involves usage of either contact, constant number, or sequence methods
10. Philips Crosby is a quality guru who is known for all these except?
    a. Quality is free and not a gift
    b. Zero –defect and Do it right the first time
    c. Quality is conformance to requirements and not goodness
    d. Good things happened only when planned while bad things happen on their own
    e. Defects are caused by a lack of knowledge

14.10 Summary

- Quality is ensuring that the needs of the customer are met.
- Whether it is Juran, Deming or Crosby, ISO, or ASQ, all focus on customer requirements and meeting the purpose.
- Since service is intangible, and there is variability depending on who is involved in delivery, it is a challenge to measure quality characteristics.
- Hence, the physical environment, the people and process-related parameters have to be taken for measurement.
- Taguchi quantified the quality cost that is a loss in monetary terms for not meeting the quality characteristics using a mathematical function based on the desired/targeted value and the actual, which is called the 'Loss Function'.
- Quality Gurus Deming, Juran and Crosby emphasized the management involvement and commitment to achieving quality.
- Poka-Yoke approach focuses on a mistake- proofing by making the work easier, standardized and productive.
- Kaizen is an improvement and advocates small increments in improvement that are sustainable.
- PDCA approach provides a powerful tool for improving service quality and ensuring customer satisfaction.
- ISO 9000 standards help in establishing management systems for ensuring service quality.

14.11 Glossary

Assignable cause: It is an identifiable, specific cause of variation in a given process or measurement

Control charts: It is a graph used to study how a process changes over time. A control chart always has a central line for the average, an upper line for the upper control limit and a lower line for the lower control limit.

Design of Experiments (DoE): It is a systematic method to determine the relationship between factors affecting a process and the output of that process

Failure Mode Effect Analysis (FMEA): It is a step-by-step approach for identifying all possible failures in a design

ISO Standards: The popular standards of ISO9000 and ISO 14000 relevant to service quality are the standards established by the International Organization for Standardization.

Pareto principle: Proposed by Vilfredo Pareto – also known as the rule of 80-20 or vital few-trivial many which says 80% effects are due to only 20% causes

PDCA Cycle: It is a Plan-DO-Check-Act cycle popular tool for continuous improvement of processes

Prototype: An early model of the process/product on which tests are done to understand the risks/errors/possible failure points from it

Quality: The totality of features and characteristics that bear on its ability to satisfy stated or implied needs

Standard Operating Procedure (SOP): a set of step-by-step instructions to achieve a predictable, standardized, desired result often within the context of a longer overall process.

14.12 Self-assessment Test

1. Write about the different definitions of quality.
2. Write about the quality philosophy of Deming.
3. What is Poka-yoke? Write about the steps for implementing Poka-Yoke.
4. What is the cost of quality? Write about Taguchi's loss function.
5. Write about Philp Crosby's quality is a free concept and his philosophy.

14.13 Suggested Readings / Reference Material

1. Chase R. B., Ravi Shankar, Jacobs F. R. (2018), Operations and supply chain management, McGraw Hill, 15th edition.
2. Haskett J. L. (1986), Managing in the service economy, Harvard Business School Press.
3. Nitin Joshi, S. Rajagopalan (2019), Service Operations Management: Towards Excellence, Himalaya Publishing House, 1st edition.
4. Mathur S. S., S Mathur and Kenyon A. (2017), Creating Value: Successful Business Strategies, Routledge, 2nd edition.
5. Robert Johnston, Michael Shulver, Nigel Slack and Graham Clark (2020), Service Operations Management: Improving Service Delivery, Pearson, 5th edition.

14.14 Answers to Check Your Progress Questions

1. (a) Fitness for use was proposed by Crosby

Fitness for use was proposed by Joseph Juran.

2. (d) Audit

Audits are performed to prevent defects or to ensure that quality is built-in and hence are preventive costs that are costs of conformance.

3. (e) Selection of proper metrics

Selection of proper metrics is not making measurement of service quality difficult.

4. (b) Compensation for failure

Compensation for failure is not a major factor to describe service quality.

5. (c) Juran

Juran defined quality as fitness for use.

6. (c) Quality means conforming to requirements

Quality means conformance to requirements is not a principle of Deming Philosophy.

7. (a) Cost of failures at customer premises

Cost of failures at customer premises is not a part of prevention cost.

8. (c) Deming proposed the quality trilogy of planning, control & improvement

It is not Deming but Juran who proposed the quality trilogy of planning, control & improvement.

9. (b) System will not allow an invoice to be closed until the order has been fulfilled and payment received – this is a warning method

System will not allow an invoice to be closed until the order has been fulfilled and payment received – this is a not a warning method but a control method where it will not allow the action to proceed.

10. (e) Defects are caused by a lack of knowledge

Defects are NOT caused by a lack of knowledge but because of a lack of attention to detail.

Unit 15

Meeting Global Standards of Quality

Structure

"Without a standard there is no logical basis for making a decision or taking action."

- Joseph M. Juran

15.1 Introduction

Quality evangelist Prof Deming iterated that, “if you can't describe what you are doing as a process, you don't know what you're doing." Standards help build documented process approach for all the business activities in any organization and benchmark in some situations. ISO standards iterate that: “document as you do – do as you document – look for continuous improvement”. By adapting to standards approach, one can plan and achieve global quality.

In the previous unit, we discussed quality management in services, covering the concepts of definition of quality, difficulties in measuring service quality, cost of quality---Taguchi loss function, building quality into the product: design stage precautions against defect-prone activities, Deming and Juran, Poka-Yoke and Kaizen applications for quality improvement, Philip Crosby’s concept of “Quality is Free” and “Do it right first time and every time”.

Quality is the focus for companies to have a competitive edge and remain profitable in the market. With companies going global in offering their services, it is no more sufficient to cater to local markets. Keeping this in view, and to be recognized as a more productive, cost-efficient, reliable and safe company, global

standards of quality are needed to be followed by companies. To be accepted worldwide, companies need to measure, analyze and improve themselves continuously. tools, methodologies, standards are reviewed here to understand what is required of a company to be a global quality player.

In this unit, we will discuss meeting global standards of quality. The concepts covered are, benchmarking in service quality and productivity, six sigma for process improvement, ISO 9000 and ISO 14000 quality and environmental management standards, quality awards and a case study on Ritz- Carlton company.

15.2 Objectives

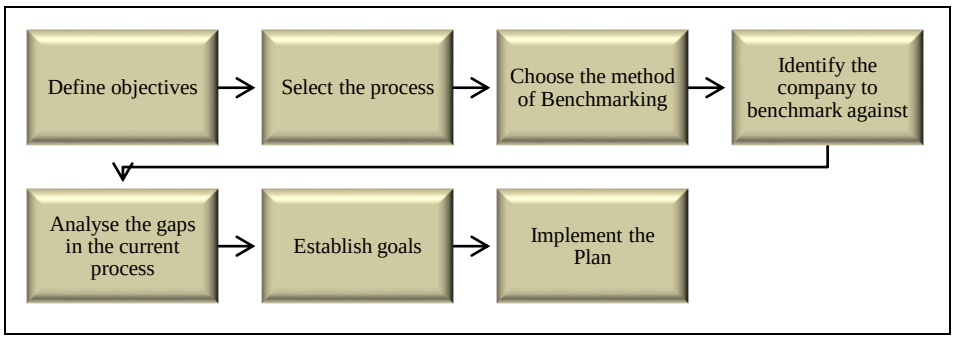
By the end of the unit, you will be able to:

- Explain the concept of benchmarking and its importance in service quality and productivity
- Define the concept of Six Sigma for process improvement
- Explain ISO 9000 and ISO 14000 Quality Management Standards and application in service quality
- Identify various quality awards

15.3 Benchmarking in Service Quality and Productivity

Benchmarking is a tool that helps companies to set standards by comparing themselves/ processes/ operations against the best in that industry so that they can meet or surpass those standards. The steps involved in benchmarking are shown in the following Figure 15.1.

Figure 15.1: Steps in Benchmarking



Source: ICFAI Research Center

Benchmarking can be Internal where the internal processes are compared against each other. Competitive benchmarking happens when a company's process is compared against a standard in the related industry. The most important performance variables are identified, measured, analyzed and compared to improve them.

Benchmarking can be classified as the "Metric" or "Practice" benchmarking based on the purpose. Metric benchmarking looks at whether the performance of a process has improved or come down. Practice benchmarking helps to know how the process can be improved by comparing it with other operations or processes. The steps involved are:

- Define objectives- what needs to be improved or changed (strategy)
- Select a process that impacts the change/achieve objective and assess it
- Choose a method of benchmarking-
    - Service probe- a questionnaire on many aspects of the drivers to compare against a database of similar service companies
    - National Customer Satisfaction Index
    - Complaints Management Excellence Program with 200 questions by Customer Service Network, in Cheddar, UK
- Identify company or data to benchmark against
- Collect data and analyze gaps in the current process
- Establish new goals for the process
- Implement the plan and Improve performance

Example: Benchmarking Healthcare Logistics Processes

A comparative analysis of the 'bed logistics' and the pharmaceutical distribution processes were conducted for Danish and US hospitals. By adopting contemporary processes through benchmarking and best practices, hospital costs can be reduced to large extent. The study helped in designing 'efficient and effective' healthcare management related logistics processes, covering quality of services and material, security, supply and hospital staff engagement. Based on these decision criteria, managers in healthcare logistics were provided with a list of decision parameters relevant for designing and benchmarking processes.

Literature had proposed a measurement instrument constructs for benchmarking. The constructs relate to: leadership at top management, overall quality policy, quality information; analysis and the empowerment to the quality department, training imparted to stakeholders with in the logistics processes at hospital, complete process management, focusing on customer, maintaining cordial employee relations and monitoring and ensuring supplier quality management, which could be easily applied as logistics practices in healthcare management.

Source:https://backend.orbit.dtu.dk/ws/portalfiles/portal/132234145/Benchmarking_healthcare_logistics_post_print.pdf, 2022, accessed on 11th July, 2022

15.4 Six Sigma for Process Improvement

Process improvement needs to be taken up within a quality management system framework. Plan-Do-Check-Act (PDCA), Lean manufacturing, Kanban, Six Sigma are methodologies for continuous process improvement. Six sigma is defined as the process in which 99.99966% of all opportunities to produce some features of a part are statistically expected to be free of defects (3.4 defective features per million opportunities). Six Sigma methodology uses DMAIC- Define, Measure, Analyze, Improve and Control. Define is the step where the defects to be reduced or process that needs to be improved is identified. Next, measure the number of defects or collect the data on defects- number, frequency, and how they occur. After that, the data is analyzed, an improved process is implemented and metrics are collected and analyzed to adjust so that it is in control. Six sigma is more relevant for services though it originated in manufacturing as the customer is part of the process and any defects in service are glaring and cannot be corrected (defect repair) or discarded as scrap as in manufacturing.

An 'As-Is' analysis of the current process is performed to understand the company's mission, strategic direction, objectives. This also helps to know how it is being viewed by external/internal customers, the teamwork, and dynamics within in addition to the outlook of the company on quality and change management.

Six Sigma methodology is focused on eliminating waste and improving efficiency. It is a structured data-driven model that defines roles for the team. Customers can feel the variation in the process and hence six sigma focuses on reducing process variation and then building capability so variance and not mean is the key here. Sigma in statistics gives an idea of deviation or process variability. Some of the concepts of six sigma are:

Critical to Quality: Those aspects most important for a customer

Process Capability: The capacity of the process

Defect: What does not meet customer requirements or creates dissatisfaction

Benefits of six sigma:

- Sustained improvement
- Goal orientation for all
- Promotes learning and cross training
- Brings strategic change
- Involves top management down to the lowest level

Example: Six-Sigma at Coca-Cola, August

Coco-Cola adopted the Define – Measure – Analyze – Improve – Control (DMAIC) principle to achieve six-sigma. 'The Definition of the problem' was totally built taking the customer's complaints as input. Based on various inputs, the major objective was defined as 'make the delay in answering to customer's query as nil'. With set objective, 'The Measure phase' paid attention to analyze various reasons for the delay in customer responses. The hotline numbers and customer care centers were inspected for measuring the delays. The study also verified automation aspects of responses to observe their role played for delay in responses. Frequently asked questions and answers were shared to customer care centers for responding with consistent answers to the customers' queries.

'The Analyzing Phase', examined quantified times for responses from hotline numbers. 'The Improvement Phase' concentrated on solving stated problems from customers. 'The Control Phase' ensured following of all the newly set standards by the relevant stakeholders. DMAIC project plan, thus had helped Coca-Cola Company, as in the case of many other companies to be a six-sigma complaint.

Source: https://www.henryharvin.com/blog/coca-cola-case-study-the-six-sigma-process/, 2020, accessed on 11th July, 2022

15.5. ISO 9000 and ISO 14000 Quality Management Standards

A standard is a document that provides requirements, specifications, guidelines, or characteristics that can be used consistently to ensure that materials, products, processes, and services are fit for their purpose. ISO is the International Organization for Standardization headquartered in Geneva, Switzerland. Quality management standards help in ensuring that products are reliable, safe, and of good quality, meeting customer requirements. Quality management systems help in the continual improvement of an organization and help it in defining how they can meet the requirements of a customer. European Committee for Standardization (CEN) has come up with standards specific to certain service sectors such as:

- CEN/TC 319, Maintenance, CEN/TC 320, Transport services, CEN/TC 329, Tourism services, BT/TF 142, Healthcare services, BT/TF 167, Security services, BT/TF 179, Services, BT/TF 180, Real Estate services, Cinematographic ISO 20022, etc.
- ISO 14452, Network services billing –to make billing clearer, more customer-friendly, and better all round.
- Financial services – Universal financial industry message scheme, defines a methodology for developing financial message standards.
- ISO/IEC Guide 76:2008, Development of service standards for addressing consumer issues.

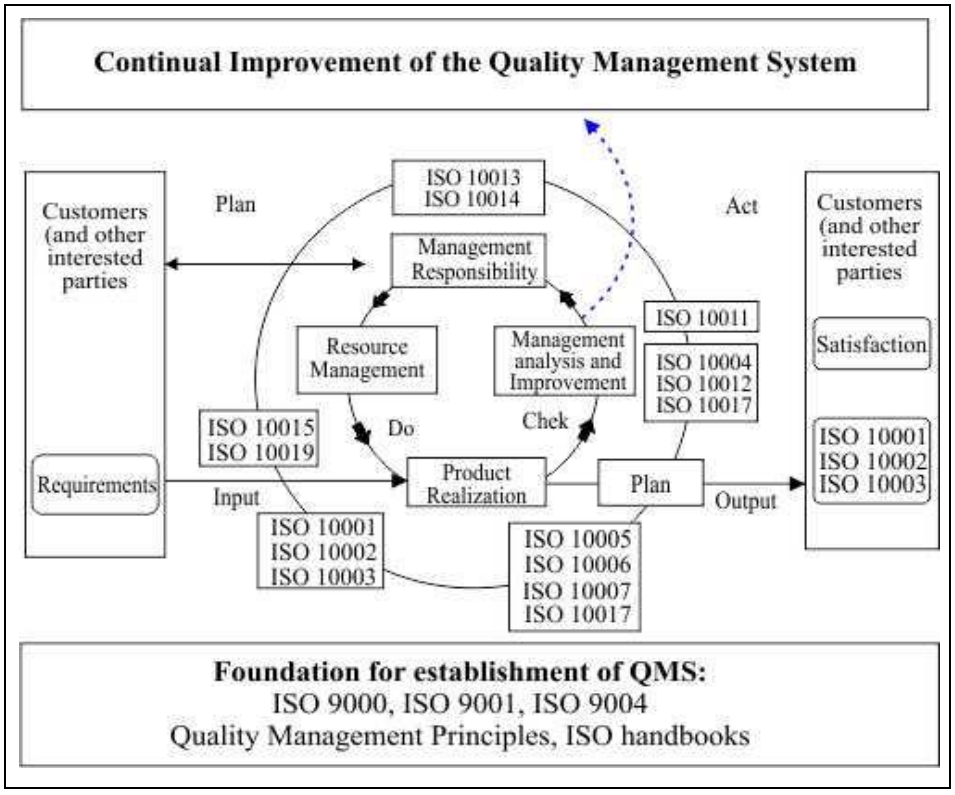
ISO 9000: 2000 is the most commonly used international standard for quality management. These standards have guidelines and tools on how quality can be maintained and improved to meet customer's expectations. It revolves around "Say what you do and do what you say". ISO standards do not prescribe any quality requirements per se but require the organization to define what they will follow to continually improve their processes. ISO 9000 is independent of the industry or size of the organization.

ISO 9000: The ISO 9000 family of standards has the following:

- ISO 9001:2015 - sets out the requirements of a quality management system
- ISO 9000:2015 - covers the basic concepts and language
- ISO 9004:2009 - focuses on how to make a quality management system more efficient and effective
- ISO 19011:2011 - sets out guidance on internal and external audits of quality management systems.
- ISO 9004: 2018 – guides to achieve sustained success

Figure 15.2 shows the process approach of Quality Management System (ISO9000).

Figure 15.2: Quality Management System



Source: http://www.iso.org/iso/iso_9000_selection_and_use-2009.pdf

Benefits of ISO 9000

- Identify new opportunities
- Compete at international level as their products/services adhere to internationally accepted standards
- Focus on customer
- Work more efficiently, reduce costs, address risks
- Meet statutory and regulatory requirements

ISO 9001: 2000 A workbook for service organizations has been released by ISO specifically to address the needs of the service providers in developing countries for implementing the ISO 9001:2000. The revised standards of 2015 now emphasize the involvement of leadership, focus on risk management, objective measurements, communication and awareness, and change management.

ISO 14000 standards

- This is the world's first environmental management standard
- Helps meet corporate social responsibility and regulatory requirements
- Consists of Organization and process evaluation standards-Environmental management system (ISO 14001, 14004), environmental auditing (ISO 14010, 14011/1, 14012) and environmental performance evaluation (ISO 14031).

Benefits

- Reduction in energy usage and waste
- Reduced operating costs
- Better environmental management
- Satisfy regulatory &compliance requirements and increased opportunities
- Address legal requirements, enhance the trust of customers and stakeholders
- Build a better image as an environmentally friendly, socially responsible organization

Example: Implementation of ISO 9001: 2015 at a Bank

A large Algerian public bank was keen to be accredited for ISO 9001. The customer being the centre of the banking industry, they needed to deliver faster, better, reliable and quality services to fulfil customer needs. The action plan identified the sheet anchor taking the greatest responsibility, for the planning, development and implementation of the QMS, identified stakeholders for the QMS; and also documented their expectations.

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Based on the action plan for each clause of the ISO 9001: 2015, they moved to carry actions, focusing on Pawn broking operations, including interested parties with influence, through brainstorming sessions. Gap analysis was conducted to obtain the compliance rates for every requirement as per ISO 9001: 2015 standard and action plan for all the gaps identified was made in the process of journey to achieve ISO 9001.

Source: https://ideas.repec.org/a/ers/ijebaa/vxy2022i1p261-286.html, 2022, accessed on 14th July, 2022

Activity 15.1
What are ISO 14000 standards known for?
Identify the benefits of ISO 14000 standards.

Check Your Progress - 1

1. Which of the following is not identified as a continuous improvement methodology?
   a. Six Sigma
   b. PDCA
   c. JIT Operations
   d. Kaizen
   e. Sampling
2. Which of the following improvement methodologies uses DMAIC technique?
   a. Lean management
   b. Six Sigma
   c. Kaizen
   d. Bench marking
   e. PDCA

3. Which of the following does not fit the concept of benchmarking?
   a. It is a failure analysis tool
   b. It is a technique to compare internal processes
   c. It is a technique to compare external processes
   d. It is an improvement tool
   e. It ensure better operations planning
4. Which of the following is not the basic purpose of standards?
   a. To establish requirements
   b. To define metrics
   c. To ensure uniformity
   d. To improve quality
   e. To become global
5. Which of the following standards is exclusively identified with Environmental Management?
   a. ISO 9000
   b. ISO 14000
   c. ISO 18000
   d. ISO 22000
   e. ISO 31000

15.6 Quality Awards

Various awards for implementing and maintaining successful quality management have been institutionalized by the governments and other bodies to encourage companies to build awareness and maintain quality in their products/services and organization as a whole. Some of the quality awards as under:

Malcolm Baldrige National Quality Award (MBNQA):

Applicable to only companies in the United States

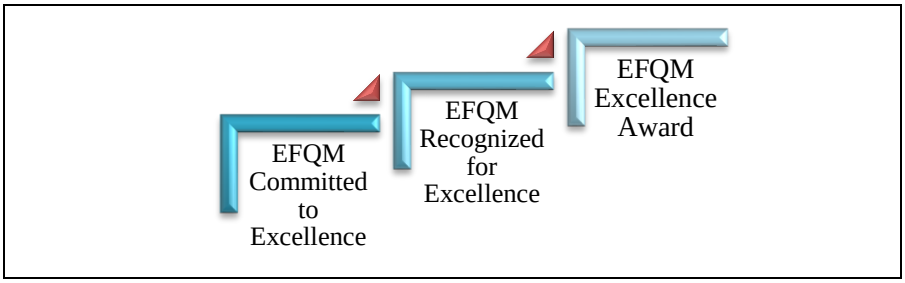
- Established by the U.S. Congress in 1987 to raise awareness of quality management and recognize U.S. companies that have implemented successful quality management systems.
- Given annually by the President of the United States
- Categories in which award is given:
  - Manufacturing, service, small business, education, healthcare, and non-profit
- Named after late Secretary of Commerce Malcolm Baldrige who advocated quality management

- U.S. Commerce Department's National Institute of Standards and Technology manages the award, while the American Society for Quality administers it.
- Focuses on customers and human resources
- Organizations are selected based on achievement and improvement in seven areas, known as the Baldrige Criteria for Performance Excellence:
    - Leadership: How upper management leads the organization, and how the organization leads within the community.
    - Strategic planning: How the organization establishes and plans to implement strategic directions.
    - Customer and market focus: How the organization builds and maintains strong, lasting relationships with customers.
    - Measurement, analysis, and knowledge management: How the organization uses data to support key processes and manage performance.
    - Human resource focus: How the organization empowers and involves its workforce.
    - Process management: How the organization designs, manages and improves key processes.
    - Business/organizational performance results: How the organization performs in terms of customer satisfaction, finances, human resources, supplier and partner performance, operations, governance and social responsibility, and how the organization compares to its competitors.

European Quality Award or European Foundation for Quality Management (EFQM):

- Established in 1989 in Brussels with a motive to increase the competitiveness of the European economy and promote business excellence. Applicable to companies in Europe.
- EFQM excellence model was launched in 1992, which is used to judge the company for European Quality Award. The different levels of European Quality Award are as shown under in Figure 15.3.

Figure 15.3: European Quality Award Levels



Source: ICFAI Research Center

- The EFQM assessment team spends about 5000 hours onsite for each applicant organization assesses their level of excellence and submits report to the jury in June every year. Awards are presented in October at the EFQM forum.
- Focuses on satisfaction

Deming Prize:

- Global quality award both for individuals and businesses for implementing Total Quality Management (TQM).
- Established in 1951in honor of Dr. William Edward Deming who was a pioneer in quality management in Japan.
- The administrative costs for the Deming prize are taken care by the Union of Japanese Scientists and Engineers (JUSE) to whom Deming donated his royalties with which this prize was started.
- Focuses on how well an organization plans & implements its organization and operations.
- Assessment focuses on
    - Organizations and operations
    - Collecting and using information
    - Analysis
    - Planning for future
    - Education and training
    - Quality Assurance
    - Quality effects
    - Standardization
    - Control
- The categories in which this prize is awarded are:
    - Prize for Individual: to those who did outstanding work in TQM study, statistical methods for TQM or dissemination of TQM.
    - Application prize: to businesses who achieved notable performance improvement using TQM.
    - Quality Control award for Operations Business Units: to operations business units that achieved performance improvement by applying quality control/management in pursuit of TQM.
- Applications from individuals need to be received by July 31st. The subcommittee examines and selects the applicants and reports to the prize committee. Award is announced in mid-October while the ceremony happens in November.

CII-EXIM Business Excellence Award:

- Established in 1994 in India by the Confederation of Indian Industries (CII) and the Export Import Bank of India (EXIM) bank to promote business excellence.
- Based on the EFQM model
- Final date for receipt of the Application Form by the CII Award Secretariat is 30 April, 15 June is the final date for receipt of the position report by CII Award Secretariat and 15 September - 10 October is for site visits.
- The three columns of the trophy represent the organization's people, processes and performance.
- Award objectives:
    - Provide and promote a holistic framework of management for excellence
    - Recognize outstanding small and medium business organizations and present them as role models and encourage others to emulate
    - Identifying and sharing best practices, performance and strategies
    - Provide an external perspective to the organizations on their practices and performance through a comprehensive feedback report

Example: Quality Award for a Construction Company

Ferrovial Construction had been accredited with the 'Gold Award by CSR Accreditation (Corporate Social Responsibility)' for their sustainable efforts in building and bringing a positive impact covering the four CSR pillars: 'Environment, Workplace, Community and Philanthropy'. The accreditation provided a platform to benchmark their contributions, towards various activities aimed at social responsibility. This assured the Ferrovial that, all aspects of customer concerns like: 'social, environmental, ethical, human rights' were integrated in their day to day working and business operations and management strategy, helping them also to identify areas of continuous improvement and progress in this area.

The major initiatives which helped in this endeavor included: minimizing environmental impact, use of innovative low carbon emitting construction machinery, low carbon emitting renewable fuels. They also worked with their vendors in supply chain, to integrate sustainable materials in all their projects, say for example: plastic-free tree guards, low carbon generating concrete mix environments. A key objective for Ferrovial Construction was to engage with and inspire, future generations in and around the project areas they were working, to consider a career in the industry.

Contd….

They introduced many training programs based on 'STEM and skills' leading to employability, 'Institution of Civil Engineering's QUEST Scholarship Programme', sharing valuable construction industry experiences and tools, by organizing 'summer work experience placements' to University students.

Source: https://newsroom.ferrovial.com/en/news/ferrovial-construction-uk-ireland-achieves-a-gold-award-by-csr-accreditation/, 2021, accessed on 14th July, 2022

Activity 15.2

Identify and explain a quality award in India applicable to service industry.

Check Your Progress - 2

6. Which of the following is a tool that helps companies to compare themselves against the best in class and set their standard?
   a. Total Quality Management
   b. Quality Management System
   c. Benchmarking
   d. Six sigma
   e. ISO 9000
7. Which of the following is a global award for quality?
   a. MBNQA
   b. EFQM
   c. CII-EXIM business excellence award
   d. Deming prize
   e. RGNQA
8. Which of the following is not true about ISO 9000 family of standards?
   a. Helps Identify new opportunities
   b. ISO 9001:2015 - sets out the requirements of a quality management system
   c. It revolves around "Say what you do and Do what you say".
   d. ISO 9000:2015 - covers the basic concepts and language
   e. ISO 9000 standard changes based on the size of the industry or size of the organization.

9. Six Sigma methodology is used for process improvement. Which is the step that follows measurement in the methodology?
   a. Define
   b. Analyze
   c. Improve
   d. Control
   e. Implement
10. Which of the following statements are true about the Deming Prize except one?
   a. Established in 1951 in honor of Dr. William Edward Deming.
   b. The administrative costs for the Deming prize are taken care by JUSE.
   c. Focuses on how well an organization plans & implements its organization and operations.
   d. Global quality award is given only for individuals.
   e. Applications from individuals need to be received by July 31st for being considered for the prize.

15.7 Summary

- Services, with the advent of the internet and advancement in technology, have gone global and will compete with one another in the global market.
- Due to this, the need for quality in services has grown in importance more than ever. Continuous improvement is the key to success and there are many tools, methodologies, standards and awards for this.
- Six Sigma methodology uses DMAIC to measure and improve the quality of processes while Benchmarking helps organizations to compare against the best processes/companies and redefine their standards to be ahead in the competition.
- ISO 9000 and 14000 help companies to compete in the international arena and establish themselves as a reliable, safe, socially responsible organization and reducing costs, wastes and improving profitability.
- Awards like MBNQA, EFQM, Deming prize, CII-EXIM business excellence have been institutionalized to bring awareness and change towards more quality-oriented processes in companies.

15.8 Glossary

A Quality Management System (QMS): A set of interrelated or interacting elements that organizations use to formulate quality policies and quality objectives and to establish the processes that are needed to ensure that these policies are followed and these objectives are achieved.

Standard: Is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose

TQM: TQM is a set of systematic activities carried out by the entire organization to effectively and efficiently achieve company objectives so as to provide products and services with a level of quality that satisfies customers, at the appropriate time and price.

15.9 Self-assessment Test

1. Discuss the importance of benchmarking.
2. What are six sigma and its application for process improvement?
3. Write a brief note on the different quality standards.
4. Write about the different quality awards.
5. Give a brief description of how Ritz-Carlton improved its performance.

15.10 Suggested Readings / Reference Material

1. Chase R. B., Ravi Shankar, Jacobs F. R. (2018), Operations and supply chain management, McGraw Hill, 15th edition.
2. Haskett J. L. (1986), Managing in the service economy, Harvard Business School Press.
3. Nitin Joshi, S. Rajagopalan (2019), Service Operations Management: Towards Excellence, Himalaya Publishing House, 1st edition.
4. Mathur S. S., S Mathur and Kenyon A. (2017), Creating Value: Successful Business Strategies, Routledge, 2nd edition.
5. Robert Johnston, Michael Shulver, Nigel Slack and Graham Clark (2020), Service Operations Management: Improving Service Delivery, Pearson, 5th edition.

15.11 Answers to Check Your Progress Questions

1. (e) Sampling

Sampling is not identified as a continuous improvement methodology.

2. (b) Six Sigma

Six Sigma uses DMAIC methodology for process improvement.

3. (a) It is a failure analysis tool

Benchmarking is not a failure analysis tool.

4. (e) To become global

Becoming global is not the main purpose of setting standards.

5. (b) ISO 14000

ISO 14000 standards are exclusively identified with environmental management.

6. (c) Benchmarking

Benchmarking helps companies to compare and define their standards

7. (d) Deming prize

Deming prize is a global award whereas others are regional awards serving the purpose of their country's interests.

8. (e) ISO 9000 standard changes based on the size of the industry or size of the organization

ISO 9000 standards are independent of the size of the organization.

9. (b) Analyze

After measuring the process, data needs to be analysed.

10. (d) Global quality award is given only for individuals

Deming prize is given to both individuals and businesses.

Unit 16

Managing Capacity and Demand

Structure

"No amount of sophistication is going to allay the fact that all of your knowledge is about the past and all your decisions are about the future."

- Ian E. Wilson

16.1 Introduction

Based on the historical data and other related factors, organizations need to take decisions for future operations.

In the previous unit, we discussed the topic, meeting global standards of quality. The concepts covered are, Benchmarking in service quality and productivity, six sigma for process improvement, ISO 9000 and ISO 14000 quality management standards, quality awards.

In this unit, we will discuss, managing capacity and demand with specific emphasis on such concepts as demand forecasting in services, forecasting methods, regression models, time series approach and the factors to choose an appropriate model for each service segment.

16.2 Objectives

By the end of the unit, you will be able to:

- Explain fundamental concepts of capacity and demand forecasting techniques which are useful in decision-making for managers in their day-to-day business life.
- Establish the importance of demand forecasting in services
- Identify different time series and regression models
- Discuss different factors that help in selecting appropriate models for various service segments

16.3 Demand Forecasting in Services

The purpose of capacity and demand management is to organize and manage all sources of demand, so that the service system can be used efficiently and the service is delivered on time. Where does the demand for an organization's product or service come from and how organizations are managing it? There are two basic sources of demand: Dependent demand and independent demand. Dependent demand is the demand for a product or service resulting from the demand for other products or services. For example, the cheese on the Pizza. This type of internal demands need no forecasting, just a tabulation. As to how many Pizzas, the Pizza shop might sell on any particular day is called independent demand, because the demand cannot be derived directly from other products.

There is not much an organization can do about dependent demand, but there is a lot an organization can do about independent demand- if it wants to.

The organization can:

- **Take an active role to influence demand.** The organization can apply pressure on its operations and sales force, it can give incentives to both customers and its own personnel, it can cut prices, etc. These actions can increase demand. On the contrary, demand can be decreased through price increases and/or reduced operations and sales efforts.
- **Respond to demand.** If an organization is running at full capacity, it may not try to change the demand, simply accept what happens. Other reasons where the organization may be ineffective to change demand because of the expenses of advertisement: the market may be fixed in size and static, or demand is beyond its control. There are other factors such as competition, legal and environmental issues, ethical and moral reasons that market demands are passively accepted.

A great deal of coordination is required to monitor these dependent, independent, active and passive demands. In this unit, our primary interest is in forecasting for independent demands.

Forecasting is critical to any business organization and for every significant management decision. Forecasting is the basis for both corporate long-term planning and short-term operations planning. Forecasting is important for all the functional areas of organization. In finance and accounting, forecasting helps in budgetary planning and cost control. Marketing activities are dependent on demand and sales forecasting, to plan new products or services, and to compensate sales personnel. Operations personnel use forecasts to make decisions involving capacity planning, process selection, and facility layout, as well as for continual decisions about production planning, scheduling, and inventory management.

Perfect demand forecasting is usually impossible. There are many factors in business environment which cannot be predicted with certainty. Therefore, rather than searching for the perfect forecast, it is far more important to establish the practice of continual review of forecasts to learn to live with inaccurate forecast. For forecasting, it is advised to use two or three methods and look at them with a rational view. Forecasting could be either qualitative forecasting or quantitative forecasting, in this unit we will concentrate more on quantitative forecasting techniques.

Example: Camper – a Global Footwear Company Uses Machine Learning for Demand Forecasting

Camper is a Spanish Footwear brand operating in around 40 countries around the world. The company operates through physical stores, online stores and e-com marketplace. The company has partnered with Invent Analytics to improve the forecast accuracy of demand for its products across the channels. The solution is based on Machine Language models. The forecast will provide location and product combination scenarios for the company to optimize product availability across channels to meet the customer demand. The result will be better inventory management and better sales and profits. Customer data, product characteristics and external factors such as weather, tourism, competitors are inputs to the forecasting model.

Source: https://www.retaildive.com/press-release/20220531-global-footwear-retailer-camper-selects-invent-analytics-for-ai-powered-omn/ accessed on 29/06/2022

16.4 Forecasting Methods

Forecasting methods can be classified as qualitative forecasting or quantitative forecasting.

Qualitative forecasting methods generally use the experts' judgments to develop forecasts.

Qualitative methods are suitable when historical data on the variable being forecast are either not applicable or unavailable. Quantitative forecasting methods are used when:

i. Historical data about the variable to be forecast is available

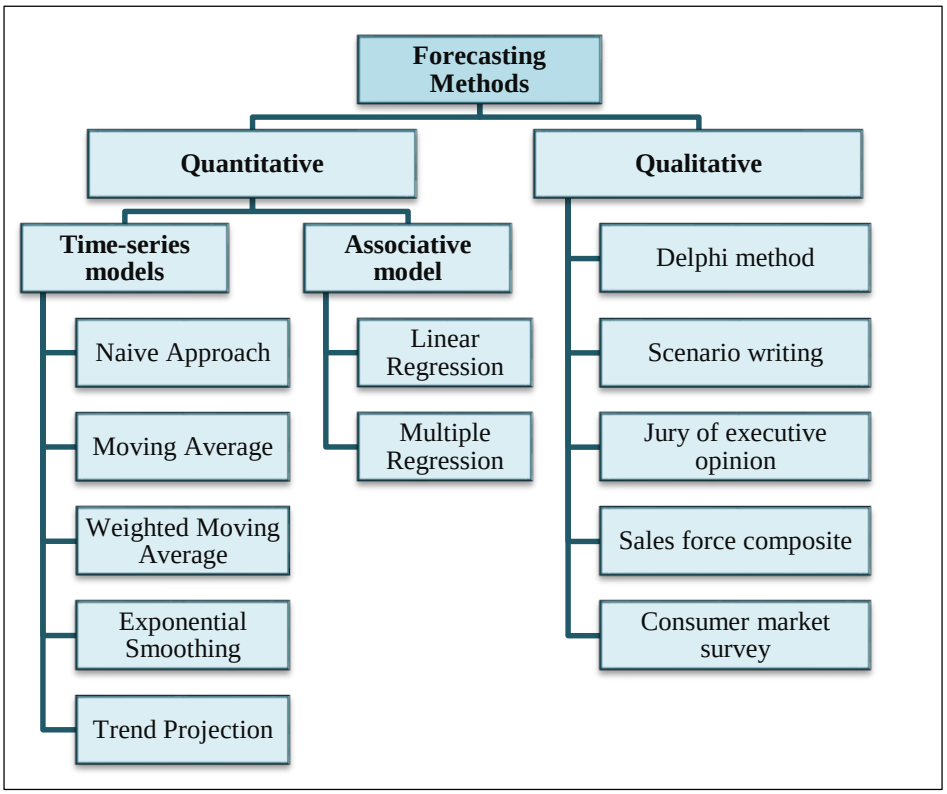
ii. Quantification of information is possible and

iii. Quantitative methods are essentially based on an analysis of historical data of time series.

A time series is a group of data values measured at successive points in time or over successive periods of time. Associative or causal forecasting methods assume that the variable we are forecasting has a cause-effect relationship with one or more other variables.

Figure 16.1 shows different forecasting methods.

Figure 16.1: Forecasting Methods



Source: ICFAI Research Center

Example: Portland General Electric Deploys Regression Analysis and Other Forecasting Tools to Ensure Uninterrupted Power Supply to Clients

Portland General Electric (PGE) is a utility based in Portland, Oregon. It distributes electricity to 44% of the inhabitants of Oregon. The Utility regularly consumes around 6,000 different kinds of parts to support its transmission and distribution.

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To ensure uninterrupted supply to its customers at competitive prices, it should forecast demand for parts to meet its operational needs. The company gets its usage data of parts by part wise and location wise from its Oracle ERP system. The utility uses weighted average forecasting for monthly forecasting and Regression Analysis for long term forecasting. With its limitations, Regression analysis based forecasting will provide fairly accurate forecasts with the reduced risk of any of the monthly forecasts not going off the mark.

Source: https://demand-planning.com/2022/05/05/how-i-forecast-materials-usage-at-portland-general-electric/accessed on 29/06/2022

Activity 16.1

During 2020 the pandemic Covid-19 affected many service industries but its impact on education sector is very highly significant. The pandemic swept the world after admissions were completed for most of the schools, colleges and universities. The governments forced the institutions to resort to online classes right from kindergarten to university level and beyond. One way it has created new opportunities to existing as well as new entrants.

You are requested by a business group to forecast demand for online education for intermediate students aspiring for engineering and medical studies.

- How do you proceed for forecasting the demand?
- Identify relevant methods and select the most suitable one to be recommended to the business group.
- Justify selection of the method.

Check Your Progress - 1

1. What is the main purpose of capacity and demand management in an organization?
    a. Manage
    b. Study
    c. Coordinate and control
    d. Analyze
    e. Forecast

2. Under which condition an organization can take an active role to influence demand?
    a. The organization is running full capacity
    b. High expenses of advertisement
    c. Fixed and static market size
    d. The action can increase demand
    e. Demand is beyond its control
3. What is the purpose of operations personnel using forecasts to make periodic decisions?
    a. Sales forecasting
    b. Production planning and scheduling
    c. Cost control
    d. Budgetary planning
    e. Compensation of sales personnel
4. Which of the following is a qualitative forecasting method?
    a. Delphi method
    b. Naive approach
    c. Linear regression
    d. Moving average
    e. Exponential smoothing
5. Which of the following is not a quantitative forecasting method?
    a. Trend projection
    b. Linear regression
    c. Consumer market survey
    d. Moving average
    e. Exponential smoothing

16.5 Regression Models

Often, a manager or decision-maker is interested in the relationship between two or more variables. Once the related variables are found, a statistical model is built and used to forecast the item of interest. This approach is more in practice than the time-series methods that use only the historical values for finding the values of forecasted variable. Many factors can be considered in a regression model. For example, the sales of an airline's ticket may be related to its advertising budget, its prices, competitors' prices and promotional strategies, and even the nation's

economy and unemployment rates. In this case, the ticket sales would be called the dependent variable, and all other variables would be called independent variables. The manager's job is to develop the best statistical relationship between ticket sales and the independent variables. The most common quantitative associative model is Linear-Regression Analysis Model.

16.5.1 Simple Linear Regression Model:

The equation that describes how the dependent variable "Y" is related to independent variable "X" and an error term is called the Regression Model. The simple Linear Regression Model is:

$$Y = b_0 + b_1X + \varepsilon$$

Where:

b_0 and b_1 are called parameters of the model,

ε is a random variable called the error term.

16.5.2 Multiple Regression Model

Multiple regression model is the equation that describes how the dependent variable (Y) is related to the independent variables (X_1, X_2, . . . $X_{p)}$ and an error term.

$$Y = b_0 + b_1X_1 + b_2X_2 + \ldots + b_pX_p + \varepsilon$$

Where:

b_0, b_1, b_2. . . b_p are the parameters, and

ε is a random variable called the error term.

Example: University of Central Florida Developed a Linear Regression Based Forecasting Model to Predict Spread of any Virus

The Virtual Readability Lab at University of Central Florida developed a forecasting model based on Covid 19 data to predict spread of any virus in the future. The model is based on Liner Regression technique and other techniques. This could help the healthcare agencies to prepare themselves well to handle in terms of hospital facilities, testing centres, medicines, vaccinations citizen awareness etc. The facilities can be planned as per the forecasted needs at various geographies The inputs to the model include patients affected, hospitalized and deaths location wise. The data was obtained from Florida state Health system.

Source: https://www.ucf.edu/news/ucfs-virtual-readability-lab-will-present-covid-19-forecasting-research-at-international-conference/#:~:text=A%20UCF%2Ddeveloped%20forecast%20model,healthcare%20agencies%20prepare%20their%20response.

UCF's Virtual Readability Lab Will Present COVID-19 Forecasting Research at International Conference | University of Central Florida News, June 14, 2022, accessed on 29/06/2022

16.6 Time Series Approach

A time series is data values measured at consecutive points in time or over successive periods of time. The purpose of time series analysis is to identify some kind of pattern in the historical data or time series and then extrapolate the pattern into the future times. A time series is an order of measurements which can be taken at every hour, day, week, fortnight, month, quarter, year, or at any other regular time interval. A useful technique for selecting a suitable forecasting method is to construct a time series plot. A time series plot is a graphical representation of the relationship between time and the time series variable. Time is on the x-axis, and the time series values are shown on the y-axis.

16.6.1 Variations in time series

Variations involved in time series analysis:

- **Secular Trend:** Secular trend represents the long-term direction of the series. Study of secular trends allows us to describe the historical pattern. Studying secular trends permits us to project past patterns, or trends, into the future. Trends can be linear or curvilinear.
- **Cyclical Variation:** Cyclical variation is the time series component that represents the oscillations above and below the linear trend line for period more than one year. It does not follow any regular pattern but move in a somewhat unpredictable manner, and for a period of more than one year.
- **Seasonal Variation:** Periodic patterns of change within a year that tends to repeat year after year. In order to find seasonal variation, time intervals may be measured in small units (days, weeks, months or quarters). To measure seasonal variation, the ratio-to-moving average method is used. It provides an index that describes the degree of seasonal variation.
- **Irregular Variation**: Describing the variation which is completely unpredictable, changing in a random manner. The unpredictability of irregular variation, does not allow us to explain it mathematically. However, it is possible to isolate some of its causes.

The overall variation in a single time series can be described in terms of these four different kinds of variation.

Example: Seoul Subway Uses Time-Series Analysis to Forecast Passenger Growth and Plan the Expansion of the Subway

Seoul subway is a major factor for urban transportation in a big city like Seoul. With the massive use of smartcard facility by the passengers, the subway has collected huge data which can be analysed to get better forecast of passenger numbers and patterns.

Contd….

The subway administrators took recourse to analytical forecasting tools like Time-series data analysis for this purpose. The analysis provides forecasts and based on the forecasts, the management can decide where to introduce new stations, frequency in various routes etc.

Source: https://www.nature.com/articles/s41598-022-06767-7, February 17, 2022, accessed on 29/06/2022

16.7 Factors to Choose an Appropriate Model for Each Service Segment

Forecasting in service sector presents some extraordinary challenges. However, it must be done because forecasting is the fundamental to any planning effort. Here three sectors are chosen for explaining the approaches followed for demand forecasting- Retail, Fast-food and Aviation and Tourism sectors.

Retail sector

Amazon earns more than one-fifth of its North America retail revenue because local stores can't forecast accurately. Customers try to purchase the product at a store in these scenarios, but the stores are out-of-stock and so shoppers look to Amazon. Clearly, forecasting essential, but we should note that it's more than just predicting demand for your products. Demand forecasting also helps businesses effectively manage cash flow and maintain lean operations. If you're carrying extra stock or don't have enough to meet demand, you're losing money.

At Conway MacKenzie, the team learned that a 10% increase in forecast accuracy could increase profitability by more than $10 million. And while not all retailers have the same opportunity, neglecting to forecast could be detrimental to your business. One study found that retailers lost $1.75 trillion to overstocks and out-of-stocks in a single year.

Retailers perform demand forecasting in the fashion industry by taking the following steps:

- Research basic facts about past trends and assumptions about future trends.
- Define the reasons for changes in past trends.
- Measure the difference between past predictions and actual consumer behavior.
- Determine possible factors that will affect.

A major technique in the retail sector is tracking demand by maintaining good short-term data. Specialty retail facilities such as florist may get very unusual demand patterns; and the patterns may differ based on functions, festival, and holidays.

Fast-food sector:

The major drivers of the market growth in this sector are:

- Increasing number of restaurants and hotels due to rapid prohibition and globalization
- Increase in health awareness and demand for healthy and delicious food
- Increase in population demanding meal at home.
- App-based companies offering fast food at door step.
- Rise in disposal income

In fast-food restaurants, not only weekly, daily or hourly but even 15 minutes variations in demands can influence the sales. Thus, detailed forecast of demand is needed. Fast food restaurant Teco Bell is using the hourly point-of-sales information to find the six-week moving average for its quarter hour forecasts. This information helps the store managers to schedule staff in 15 minutes increments, not one hour blocks as in other restaurants.

Airlines Industry

Following are the industry forecast highlights:

- Prospects vary for advanced, emerging economies
- Globally, most airfares to rise 1%
- Regional business fares to increase 2%
- Global hotel rates to be 1% to 3% higher
- Oil prices to average US$ 67 per barrel

In the airline industry, it is valuable for management to know ahead of time how many seats will likely be occupied on any given flight. It is because the number of seats booked affects resourcing demands and revenue, knowledge of booking trends can help airlines plan ahead.

Traditionally, data scientists have approached this forecasting problem from two standpoints:

- Backward—looking for trends in historical data for departed flights to inform predictions of future bookings
- Forward—looking at bookings that have already been made for a future departure date to predict future demand.

The results of these two approaches are also sometimes blended together as a combined model to make the final forecast.

Globally, many airline companies such as Singapore Airlines and American Airlines are involved in forecasting of air transport demands in both long-haul and short-haul routes. The major benefits of using different forecasting methods by the airlines companies are route optimization, effective fleet size and scheduling, decisions on aircraft handling equipment and fuel purchases,

improving turnaround time and service efficiency and developing optimal fare policies.

Tourism Sector

Apex sectoral body Federation of Associations in Indian Tourism & Hospitality (FAITH) doubled its loss guidance for India's tourism sector to ₹ 10 lakh crore in 2020 on account of impact of COVID-19 pandemic. The earlier forecast, which was shared with the government in March 2020, had put tourism's economic value at risk at around ₹ 5 lakh crore, FAITH said in a statement. The federation has revised its guidance given the way tourism supply chains are breaking down in India across all its key inbound, domestic and outbound markets, it added.

"We would like to double the earlier guidance of Indian tourism economic value at risk from ₹ 5 lakh crore to ₹ 10 lakh crore," a FAITH spokesperson said.

FAITH said it has shared the revision of loss guidance with an inter-ministerial group of the government. It has already requested help from the government for the survival of the tourism and hospitality sector.

Example: Pizza Hut uses Analytics Models to Forecast Sales Across Various Channels

Pizza Hut engages analytics company Intalytics to generate a sales demand forecasting model to increase sales across multiple channels like "dine in" "door delivery" and "takeaway". The model also supports analysis at unit level. The food retailer also uses the tool from Intalytics (siteIntel) inhouse to explore forecasting future store locations. The forecasting provides inputs for decision making for current and future growth. The solution is customized for the requirements of Pizza Hut.

Source: https://intalytics.com/news/intalytics-and-pizza-hut-partner-to-optimize-real-estate-location-strategy-with-predictive-analytics/, September 29, 2020, accessed on 29/06/2022

Activity 16.2

Demand forecasting for service sector is very challenging in view of the volatility of the sector. We come across super markets opening outlets in an area after a detailed forecast is made for demand. But we often find that footfalls are more at one or two places while others look for customers. This is a situation even when such outlets are opposite to each other.

- Analyse the situation with regard to demand forecasting practices in such retail stores like supermarkets.
- Identify more accurate methods for demand forecasting in retail industry?

Check Your Progress - 2

6. In case of sale of an airline's ticket, which of the following may not be considered as an independent variable?
   a. Advertising budget
   b. Competitors' price
   c. Promotional strategies
   d. Airline's ticket sales volume
   e. Airlines ticket price
7. What b_0 and b_1 are called in simple regression?
   a. Random variables
   b. Error terms
   c. Parameters
   d. Dependent variables
   e. Independent variables
8. Which variation is completely unpredictable and changes in a random manner?
   a. Secular trend
   b. Cyclical
   c. Seasonal
   d. Curvilinear trend
   e. Irregular
9. Which of the following is an important technique in the retail industry for tracking demand?
   a. Maintaining long term information
   b. Maintaining good short term data
   c. Studying all unusual demand patterns
   d. Doing qualitative study
   e. Using regression models
10. Which of the following is not a major benefit for airline companies from using different forecasting methods?
    a. Improved turnaround time
    b. Service efficiency
    c. Tax savings
    d. Optimal fare policies
    e. Managing fleet size

16.8 Summary

- Forecasts are critical part of the operations manager's function.
- Demand forecast drives an organization's production, capacity, scheduling systems.
- Forecasting affects the marketing, financial and the personnel planning activities.
- There are varieties of quantitative and qualitative techniques of forecasting.
- Quantitative forecasting uses past data and causal/associative relatives to project future demands. Qualitative forecasting approaches use judgements, experience, intuition, and many more factors that are difficult to quantify.
- No forecasting method is perfect under all conditions.
- Even though management has found a satisfactory approach once, it must still monitor and control forecasts to make sure errors do not get out of control.
- Forecasting can often be a very challenging, but rewarding part of operations.

16.9 Glossary

Causal Forecasting: A situation in which one event causes another development. If the event is far enough in future, it can be used as a basis for forecasting.

Delphi Method: A qualitative forecasting method that obtains forecasts through group consensus.

Exponential Smoothing: A forecast technique that uses a value of weighted average of past time series as the forecast.

Forecast: A prediction of future value of a time series.

Linear Regression: A forecasting technique that assumes that past data and future projections falling around a straight-line.

Moving Average: A method of forecasting or smoothing a time series that uses the average of most recent data values in the time series for forecasting for the next period.

Multiple Regression: Regression analysis involving two or more independent variables.

Scenario Writing: A qualitative forecasting method that consists of developing a conceptual scenario of the future based on a well-defined set of assumptions.

Time Series: A set of observations of a variable, measured at successive points in time or over successive periods of time.

Weighted Moving Average: A method of forecasting a time series by computing a weighted average of past data values. The sum of weights must be equal to one.

16.10 Self-Assessment Test

1. What is qualitative forecasting model and when is its use appropriate?
2. Identify and describe the two general forecasting approaches.
3. What is the primary difference between a time-series model and an associative model?
4. How are seasonal patterns differing from cyclic patterns?
5. What are the differences between a dependent and an independent variable?

16.11 Suggested Readings / Reference Materials

1. Chase R. B., Ravi Shankar, Jacobs F. R. (2018), Operations and supply chain management, McGraw Hill, 15th edition.
2. Haskett J. L. (1986), Managing in the service economy, Harvard Business School Press.
3. Nitin Joshi, S. Rajagopalan (2019), Service Operations Management: Towards Excellence, Himalaya Publishing House, 1st edition.
4. Mathur S. S., S Mathur and Kenyon A. (2017), Creating Value: Successful Business Strategies, Routledge, 2nd edition.
5. Robert Johnston, Michael Shulver, Nigel Slack and Graham Clark (2020), Service Operations Management: Improving Service Delivery, Pearson, 5th edition.

16.12 Answers to Check Your Progress Questions

1. (c) Coordinate and control

It is the main purpose of capacity and demand management in an organization.

2. (d) The action can increase demand

It is the condition in which an organization can take an active role to influence demand.

3. (b) Production planning and scheduling

It is the purpose of operations personnel using forecasts to make periodic decisions.

4. (a) Delphi method

It is a qualitative forecasting method.

5. (c) Consumer market survey

It is not a quantitative method for forecasting demand.

6. (d) Airline's ticket sales volume

This may not be considered as an independent variable in case of sale of an airline's ticket.

7. (c) Parameters

They are called in simple regression.

8. (e) Irregular

Irregular variation is completely unpredictable and changes in a random manner.

9. (b) Maintaining good short-term data

It is an important technique in the retail industry for tracking demand.

10. (c) Tax saving

It is not a major benefit for airline companies using different forecasting methods.

Services Operations Management

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