

BBA 8345
Total Quality Management
Study Module

স্কুল অব বিজনেস
SCHOOL OF BUSINESS



বাংলাদেশ উন্মুক্ত বিশ্ববিদ্যালয়
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Total Quality Management

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Introduction

1

Unit Highlights

- Lesson - 1: Introducing Total Quality Management
- Lesson - 2: Gurus & Historical Development of TQM
- Lesson - 3: Benefits and Obstacles to TQM

Technologies Used for Content Delivery

- ❖ BOUTUBE
- ❖ BOU LMS
- ❖ WebTV
- ❖ Web Radio
- ❖ Mobile Technology with MicroSD Card
- ❖ BTV Program
- ❖ Bangladesh Betar Program

Lesson – 1: Introducing Total Quality Management

After completion of this lesson you will be able to –

- Describe the concept of quality and total quality management (TQM).
- Analyze the dimensions of quality.
- Analyze the principles of TQM.
- Describe the approaches of TQM.
- Compare the previous and TQM system of quality control.

CONCEPT OF QUALITY

When the expression “quality” is used, we usually think in terms of an excellent product or service that fulfills or exceeds our expectations. These expectations are based on the intended use and the selling price. For example, a customer expects a different performance from a plain steel washer than from a chrome-plated steel washer because they are a different grade. When a product surpasses our expectations, we consider that quality. Thus, it is somewhat of an intangible based on perception. Quality can be quantified as follows:

$$Q = P / E$$

Where, Q= quality, P = performance, E = expectations

Quality can be broadly defined as the degree to which a product, service, or process meets or exceeds specified requirements or expectations, including customer needs and preferences. It encompasses various aspects like fitness for purpose, conformance to requirements, and freedom from defects. Ultimately, quality is about consistently delivering value and satisfaction to the user or customer.

THE DIMENSIONS OF QUALITY

The quality dimensions are considered to measure the quality of a product or service. The different dimensions of quality are presented below:

<u>Dimensions</u>	<u>Meaning and Example</u>
Performance	Primary product characteristics, such as the brightness of the picture.
Features	Secondary characteristics, added features, such as remote control.
Conformance	Meeting specifications or industry standards, workmanship.
Reliability	Consistency of performance over time, average time for the unit to fail.
Durability	Useful life, including repair.
Service	Resolution of problems and complaints, ease of repair.
Response	Human-to-human interface, such as the courtesy of the dealer.
Aesthetics	Sensory characteristics, such as exterior finish.
Reputation	Past performance and other intangibles, such as being ranked first.

CONCEPT OF TOTAL QUALITY MANAGEMENT

Total Quality Management (TQM) is an organizational management approach focused on achieving long-term success through customer satisfaction by embedding quality into every aspect of business operations and processes, relying on the involvement of all employees and their commitment to continuous improvement. It is a comprehensive, systematic framework that aims to foster a culture of quality throughout the company, ensuring excellence in products and services while consistently seeking ways to enhance performance and exceed customer expectations.

Total Quality Management (TQM) is an enhancement of the traditional way of doing business. It is a proven technique to guarantee survival in world-class competition. TQM is for the most part common sense. Analyzing the three words, we have:

Total—Made up of the whole.

Quality—Degree of excellence a product or service provides.

Management—Act, art, or manner of handling, controlling, directing, etc.

TQM is defined as both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organization. It is the application of quantitative methods and human resources to improve all the processes within an organization and exceed customer needs now and in the future. TQM integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach. Therefore, TQM is the art of managing the whole to achieve excellence.

KEY PRINCIPLES OF TQM

The TQM has some key principles that are followed everywhere in the organizations, such as –

1. **Customer Focus:** Prioritizing customer satisfaction by understanding and exceeding their needs and expectations.
2. **Total Employee Involvement:** Engaging all employees at every level of the organization in the pursuit of quality and process improvement.
3. **Process-Centered Approach:** Focusing on the interconnected processes within the organization to identify, analyze, and improve them for better efficiency and quality.
4. **Integrated Systems:** Viewing the organization as a unified system where different processes and departments work together towards common quality goals.
5. **Strategic & Systematic Approach:** Implementing a structured and planned approach to quality improvement that is aligned with overall organizational objectives.
6. **Continuous Improvement:** An ongoing effort to constantly enhance processes, products, and services based on data and feedback.
7. **Fact-Based Decision Making:** Using data and facts rather than opinions to guide improvements and decisions within the organization.
8. **Effective Communication:** Fostering open and transparent communication at all levels of the organization to support quality efforts.

TQM APPROACHES

TQM requires six basic concepts:

1. A committed and involved management that provide long-term top-to-bottom organizational support.
2. An unwavering focus on the customer, both internally and externally.
3. Effective involvement and utilization of the entire workforce.
4. Continuous improvement of the business and production processes.
5. Treating suppliers as partners.
6. Establishing performance measures for the processes.

These concepts outline an excellent way to run an organization. A brief paragraph on each of them is given here.

1. ***Management must participate in the quality program.*** A quality council must be established to develop a clear vision, set long-term goals, and direct the program. Quality goals are included in the business plan. An annual quality improvement program is established and involves input from the entire workforce. Managers participate on quality improvement teams and also act as coaches to other teams. TQM is a continual activity that must be entrenched in the culture—it is not just a one-shot program. TQM must be communicated to all people.
2. ***The key to an effective TQM program is its focus on the customer.*** An excellent place to start is by satisfying internal customers. We must listen to the “voice of the customer” and emphasize design quality and defect prevention. Do it right the first time and every time, for customer satisfaction is the most important consideration.
3. ***TQM is an organization-wide challenge that is everyone’s responsibility.*** All personnel must be trained in TQM, statistical process control (SPC), and other appropriate quality improvement skills so they can effectively participate on project teams. Including internal customers and, for that matter, internal suppliers on project teams is an excellent approach. Those affected by the plan must be involved in its development and implementation. They understand the process better than anyone else. People must come to work not only to do their jobs, but also to think about how to improve their jobs. People must be empowered to perform processes in an optimum manner.
4. ***Continual striving to improve all business and production processes.*** Quality improvement projects, such as on-time delivery, order entry efficiency, billing error rate, customer satisfaction, cycle time, scrap reduction, and supplier management, are good places to begin. Technical techniques such as SPC (statistical process control), benchmarking, quality function deployment, ISO 9000, and designed experiments are excellent for problem solving.
5. ***Supplier quality must be outstanding.*** A partnering relationship rather than an adversarial one must be developed. Both parties have as much to gain or lose based on the success or failure of the product or service. The focus should be on quality and life-cycle costs rather than price. Suppliers should be few in number so that true partnering can occur.
6. ***Establish performance.*** Performance measures such as uptime, percent non-conforming, absenteeism, and customer satisfaction should be determined for each

functional area. These measures should be posted for everyone to see. Quantitative data are necessary to measure the continuous quality improvement activity.

The purpose of TQM is to provide a quality product and/or service to customers, which will, in turn, increase productivity and lower costs. With a higher quality product and lower price, the competitive position in the marketplace will be enhanced. This series of events will allow the organization to achieve the objectives of profit and growth with greater ease. In addition, the work force will have job security, which will create a satisfying place to work.

COMPARISON BETWEEN PREVIOUS AND TQM SYSTEM

As previously stated, TQM requires a cultural change. Table below compares the previous state with the TQM state for typical quality elements. This change is substantial and will not be accomplished in a short period of time. Small organizations will be able to make the transformation much faster than large organizations. From the perspective of quality elements the differences between traditional culture and TQM culture are presented below:

Table: Previous/ Traditional and TQM Cultures

Quality Element	Previous/Traditional State	TQM
Definition	Product-oriented	Customer-oriented
Priorities	Second to service and cost	First among equals of service and cost
Decisions	Short-term	Long-term
Emphasis	Detection	Prevention
Errors	Operations	System
Responsibility	Quality control	Everyone
Problem Solving	Managers	Teams
Procurement	Price	Life-cycle costs, partnership
Manager's Role	Plan, assign, control, and enforce	Delegate, coach, facilitate, and mentor

Lesson 2: Gurus & Historical Development of TQM

After completion of this lesson you will be able to –

- *Know about the gurus and their contribution to the TQM*
- *Analyze the historical development of TQM*

GURUS OF TOTAL QUALITY MANAGEMENT

The contributions of some of the gurus of TQM are presented below:

Shewhart

Walter A. Shewhart, PhD, spent his professional career at Western Electric and Bell Telephone Laboratories, both divisions of AT&T. He developed control chart theory with control limits, assignable and chance causes of variation, and rational subgroups. In 1931, he authored Economic Control of Quality of Manufactured Product, which is regarded as a complete and thorough work on the basic principles of quality control. He also developed the PDSA cycle for learning and improvement.

Ronald Fisher

In the conventional sense, Fisher is not known as a quality guru. However, he created a solid foundation of statistical methods, such as design of experiments (DOE) and analysis of variance (ANOVA) in the 1930s. DOE is one of the most powerful tools used by many organizations in problem solving and process improvements. Analysis of variance became widely known after being included in his book Statistical Methods for Research Workers in 1925. Fisher also published The Design of Experiments in 1935 and Statistical Tables in 1947.

Deming

W. Edwards Deming, PhD, was a protégé (apprentice) of Shewhart. In 1950, he taught statistical process control and the importance of quality to the leading CEOs of Japanese industry. He is credited with providing the foundation for the Japanese quality miracle and resurgence as an economic power. Deming is the best-known quality expert in the world. He pointed out 14 issues in a theory for management to improve quality, productivity, and competitive position. He has authored a number of books including Out of the Crisis and Quality, Productivity, and Competitive Position as well as 161 scholarly studies.

Juran

Joseph M. Juran, PhD worked at Western Electric from 1924 to 1941. There he was exposed to the concepts of Shewhart. Juran traveled to Japan in 1954 to teach quality management. He emphasized the necessity for management at all levels to be committed to the quality effort with hands-on involvement. He recommended project improvements based on return on investment to achieve breakthrough results. The Juran Trilogy for managing quality is carried out by the three interrelated processes of planning, control, and improvement. In 1951, the first edition of Juran's Quality Control Handbook was published.

Feigenbaum

Armand V. Feigenbaum, PhD, argues that total quality control is necessary to achieve productivity, market penetration, and competitive advantage. Quality begins by identifying the customer's requirements and ends with a product or service in the hands of a satisfied customer. In addition to customer satisfaction, some of Feigenbaum's quality principles are genuine management involvement, employee involvement, first-line supervision leadership, and company-wide quality control. In 1951, he authored Total Quality Control.

Ishikawa

Kaoru Ishikawa, PhD, studied under Deming, Juran, and Feigenbaum. He borrowed the total quality control concept and adapted it for the Japanese industry. In addition, he authored SPC (statistical process control) texts in both Japanese and English. Ishikawa is best known for the development of the cause and effect diagram, which is sometimes called an Ishikawa diagram. He developed the quality circle concept in Japan, where work groups, including their supervisor, were trained in SPC concepts. The groups then met to identify and solve quality problems in their work environment.

Crosby

Phillip B. Crosby authored his first book, *Quality is Free*, in 1979, which was translated into 15 languages. It sold 1.5 million copies and changed the way management looked at quality. He argued that "doing it right the first time" is less expensive than the costs of detecting and correcting nonconformities. In 1984, he authored *Quality Without Tears*, which contained his four absolutes of quality management. These absolutes are: quality is conformance to requirements; prevention of nonconformance is the objective, not appraisal; the performance standard is zero defects, not "that's close enough"; and the measurement of quality is the cost of nonconformance.

Taguchi Genichi

Taguchi, PhD, developed his loss function concept that combines cost, target, and variation into one metric. Because the loss function is reactive, he developed the signal to noise ratio as a proactive equivalent. The cornerstone of Taguchi's philosophy is the robust design of parameters and tolerances. It is built on the simplification and usage of traditional design of experiments.

HISTORICAL DEVELOPMENT OF TOTAL QUALITY MANAGEMENT

The history of quality control is undoubtedly as old as industry itself. During the Middle Ages, quality was, to a large extent, controlled by the long periods of training required by the organizations. This training instilled pride in workers for quality of a product.

The concept of specialization of labor was introduced during the Industrial Revolution. As a result, a worker no longer made the entire product but only a portion. This change brought about a decline in workmanship. Because most products manufactured during that early period were not complicated, quality was not greatly affected. In fact, because productivity improved, there was a decrease in cost, which resulted in lower customer expectations. As

products became more complicated and jobs more specialized, it became necessary to inspect products after manufacture.

In 1924, W. A. Shewhart of Bell Telephone Laboratories developed a statistical chart for the control of product variables. This chart is considered to be the beginning of statistical quality control. Later in the same decade, H. F. Dodge and H. G. Romig, both of Bell Telephone Laboratories, developed the area of acceptance sampling as a substitute for 100% inspection. Recognition of the value of statistical quality control became apparent by 1942. Unfortunately, U.S. managers failed to recognize its value.

In 1946, the American Society for Quality Control was formed. Recently, the name was changed to American Society for Quality (ASQ). This organization, through its publications, conferences, and training sessions, has promoted the use of quality for all types of production and services.

In 1950, W. Edwards Deming, who learned statistical quality control from Shewhart, gave a series of lectures on statistical methods to Japanese engineers and on quality responsibility to the CEOs of the largest organizations in Japan. Joseph M. Juran made his first trip to Japan in 1954 and further emphasized management's responsibility to achieve quality. Using these concepts, the Japanese set the quality standards for the rest of the world to follow.

In 1960, the first quality control circles were formed for the purpose of quality improvement. Simple statistical techniques were learned and applied by Japanese workers.

By the late 1970s and early 1980s, U.S. managers were making frequent trips to Japan to learn about the Japanese miracle. These trips were really not necessary; — they could have read the writings of Deming and Juran. Nevertheless, a quality renaissance began to occur in U.S. products and services, and by the middle of 1980 the concepts of TQM were being publicized.

In the late 1980s, the automotive industry began to emphasize statistical process control (SPC). Suppliers and their suppliers were required to use these techniques. Other industries and the Department of Defense also implemented SPC. The Malcolm Baldrige National Quality Award was established and became the means to measure TQM. Genechi Taguchi introduced his concepts of parameter and tolerance design and brought about a resurgence in design of experiments (DOE) as a valuable quality improvement tool.

Emphasis on quality continued in the auto industry in the 1990s when the Saturn automobile ranked first in customer satisfaction in 1996. In addition, ISO 9000 became the worldwide model for a quality management system. ISO 14000 was approved as the worldwide model for environmental management systems.

Lesson 3: Benefits and Obstacles to TQM

After completion of this lesson you will be able to –

- *Explain the benefits of TQM*
- *Identify the obstacles to TQM*
- *Apply appropriate measures to overcome the obstacles to TQM*

BENEFITS OF TQM

The primary benefits of Total Quality Management (TQM) include increased profitability, enhanced customer satisfaction and loyalty, improved operational efficiency, and reduced costs due to less waste and fewer defects. Organizations also gain a stronger competitive position, higher productivity, better employee morale, and engagement, and improved relationships with suppliers.

Here's a breakdown of the key benefits:

For Customers

- **Higher Customer Satisfaction and Loyalty:** Products and services consistently meet customer needs, leading to more satisfied and loyal customers.
- **Improved Product Quality:** A focus on continuous improvement leads to higher quality products and services with fewer defects.

For the Organization

- **Increased Profitability:** By reducing waste and improving quality, organizations lower costs and boost profit margins.
- **Stronger Competitive Position:** Higher quality, better customer satisfaction, and efficiency help organizations gain market share and stand out in the market.
- **Reduced Costs:** TQM helps eliminate waste and rework by addressing problems early, leading to significant cost savings.
- **Improved Productivity:** Greater efficiency and reduced inefficiencies lead to increased productivity in all business processes.
- **Greater Adaptability:** TQM promotes a culture of adaptability to changing market conditions, regulations, and emerging technologies.
- **Enhanced Decision-Making:** A focus on data and continuous improvement leads to better-informed and more effective decisions.

For Employees

- **Increased Employee Morale and Engagement:** TQM fosters teamwork, employee involvement, and a shared commitment to quality, leading to higher job satisfaction.
- **Improved Job Security:** A stronger, more stable, and profitable organization provides greater job security for employees.
- **Enhanced Workplace Culture:** TQM cultivates a positive culture centered on quality, teamwork, and continuous improvement.

For Suppliers and Operations

- **Stronger Supplier Relationships:** TQM encourages better partnerships with suppliers, ensuring consistent quality inputs.

- **Optimized Processes:** Continuous assessment and improvement of operational processes lead to greater efficiency and the elimination of redundant activities.

OBSTACLES TO THE IMPLEMENTATION OF TQM

The obstacles associated with the implementation of TQM can be explained from different perspectives. Many organizations, especially small ones with a niche, are comfortable with their current state. They are satisfied with the amount of work being performed, the profits realized, and the perception that the customers are satisfied. Organizations with this culture will see little need for TQM until they begin to lose market share. Once an organization embarks on TQM, there will be obstacles to its successful implementation. The first eight most common obstacles were determined by Robert J. Masters after an extensive literature review, and the last obstacle was added by the authors. They are given below.

1. Lack of Management Commitment

In order for any organizational effort to succeed, there must be a substantial management commitment of management time and organizational resources. The purpose must be clearly and continuously communicated to all personnel. Robert Galvin of Motorola said that only the CEO can ensure, even in times of great pressure, that quality and customer satisfaction are preserved. In a survey of 188 quality professionals, 66% reported that management's compensation is not linked to quality goals such as failure costs, customer complaints, and cycle time reduction.

2. Inability to Change Organizational Culture

Changing an organization's culture is difficult and will require as much as five years. Individuals resist change—they become accustomed to doing a particular process and it becomes the preferred way. Management must understand and utilize the basic concepts of change. They are:

1. People change when they want to and to meet their own needs.
2. Never expect anyone to engage in behavior that serves the organization's values unless adequate reason (why) has been given.
3. For change to be accepted, people must be moved from a state of fear to trust.

It is difficult for individuals to change their way of doing things; it is much more difficult for an organization to make a cultural change.

3. Improper Planning

All constituents of the organization must be involved in the development of the implementation plan and any modifications that occur as the plan evolves. The two-way communication of ideas by all personnel during the development of the plan and its implementation. Customer satisfaction should be the goal rather than financial or sales goals. Peterson Products, a metal stamping firm near Chicago, improved on-time delivery, which resulted in a 25% increase in sales. Focus on quality and the other goals will follow.

4. Lack of Continuous Training and Education

Training and education is an ongoing process for everyone in the organization. Needs must be determined and a plan developed to achieve those needs. Training and education are most effective when senior management conducts the training on the principles of TQM. Informal training occurs by communicating the TQM effort to all personnel on a continual

basis. In the study by Tamimi and Sebastianelli previously cited, lack of training in group discussion and communication techniques, quality improvement skills, problem identification, and the problem-solving method was the second most important obstacle.

5. Incompatible Organizational Structure and Isolated Individuals and Departments

Differences between departments and individuals can create implementation problems. The use of multifunctional teams will help to break down long-standing barriers. Restructuring to make the organization more responsive to customer needs may be needed. Individuals who do not embrace the new philosophy can be required to leave the organization. Adherence to the six basic concepts will minimize the problems over time. At Spartan Light Metal Products, Inc., in Sparta, IL, product support teams composed of three members from design, quality, and production are assigned to each customer segment.

6. Ineffective Measurement Techniques and Lack of Access to Data and Results

Key characteristics of the organization should be measured so that effective decisions can be made. In order to improve a process you need to measure the effect of improvement ideas. Access to data and quick retrieval are necessary for effective processes. Peoples Bank of Bridgeport, CT, found that extra inspection, training, and management encouragement did not reduce a high error rate. Finally the bank investigated the root causes of the problem and corrected them, which virtually eliminated the problem.

7. Paying Inadequate Attention to Internal and External Customers

Organizations need to understand the changing needs and expectations of their customers. Effective feedback mechanisms that provide data for decision making are necessary for this understanding. One way to overcome this obstacle is to give the right people direct access to the customers. Maruti Suzuki, the leading car manufacturing company in India, takes significant steps in training their service technicians and dealers' sales staff in order to ensure that their actions and interactions are aligned with the changes in customer profiles and expectations. When an organization fails to empower individuals and teams, it cannot hold them responsible for producing results.

8. Inadequate Use of Empowerment and Teamwork

Teams need to have the proper training and, at least in the beginning, a facilitator. Whenever possible, the team's recommendations should be followed. Individuals should be empowered to make decisions that affect the efficiency of their process or the satisfaction of their customers. Solar Turbines, Inc., flattened its organization by restructuring into work teams and delegating authority to the point of customer contact or to the work performed.

9. Failure to Continually Improve

It is tempting to sit back and rest on your laurels. However, a lack of continuous improvement of the processes, product, and/or service will leave even the leader of the pack in the dust. Will Rogers said it best, "Even if you're on the right track, you'll get run over if you just sit there." Even though Champion Mortgage's 1998 business volume increased by 59%, it continues to address culture, staff, and service issues.

WAYS OF OVERCOMING OBSTACLES OF TQM IMPLEMENTATION

To overcome obstacles in Total Quality Management (TQM) implementation, organizations should secure strong top management commitment and foster a positive organizational culture. Key measures include providing comprehensive training for all employees, ensuring effective communication across departments, clearly defining quality goals, and focusing on customer satisfaction. Other important steps include employees through empowerment and teamwork, using data-driven decision-making, and promoting a mindset of continuous improvement through tools like the PDCA cycle.

- **Lack of Top Management Commitment:**
 - **Measure:** Secure active and visible leadership support.
 - **Action:** Ensure top management drives the TQM vision and provides the necessary resources and direction.
- **Resistance to Change and Poor Culture:**
 - **Measure:** Foster a culture of quality and trust.
 - **Action:** Communicate the benefits of TQM, address fears, and encourage a mindset shift from old ways of working to new, quality-focused processes.
- **Inadequate Training and Skills:**
 - **Measure:** Provide comprehensive and ongoing training.
 - **Action:** Train employees in TQM concepts, tools, communication techniques, and problem-solving to enable them to contribute effectively to quality improvement.
- **Poor Communication and Coordination:**
 - **Measure:** Break down departmental barriers and promote cross-functional teamwork.
 - **Action:** Establish clear communication channels and encourage collaboration between departments to ensure integrated quality efforts.
- **Lack of Clear Quality Goals:**
 - **Measure:** Define clear quality goals and a vision for the organization.
 - **Action:** Develop a concise vision and mission statement for quality and set measurable quality criteria for all processes.
- **Insufficient Customer Focus:**
 - **Measure:** Emphasize customer satisfaction as a key goal.
 - **Action:** Actively collect and analyze customer feedback to understand needs and expectations, then implement mechanisms to track and improve customer satisfaction.
- **Lack of Employee Involvement:**
 - **Measure:** Empower employees and encourage their participation.
 - **Action:** Motivate staff to take accountability for quality, involve them in planning, and create a team-oriented environment.
- **Inadequate Use of Data and Metrics:**
 - **Measure:** Implement continuous monitoring and data-driven decision-making.

- **Action:** Develop relevant metrics to track the effectiveness of TQM techniques and processes, and use the data to guide continuous improvement efforts.
- **Focus on Short-Term Results:**
 - **Measure:** Promote a long-term perspective on continuous improvement.
 - **Action:** Use the Plan-Do-Check-Act (PDCA) cycle to guide gradual, ongoing improvements rather than seeking immediate, unrealistic results.

Discussion Questions:

1. What do you understand by quality?
2. Explain the dimensions that are used to measure the quality of products or services.
3. What do you understand by total quality management?
4. Describe the principles of total quality management.
5. Discuss the approaches of total quality management.
6. Do you find any differences between traditional culture and TQM culture with regards to quality elements? Illustrate.
7. Who are the gurus of TQM? Explain their contributions to the development of TQM.
8. Describe the historical development of TQM.
9. Discuss the benefits of TQM.
10. Describe the obstacles that hinder TQM in the organization.
11. Analyze the ways of overcoming obstacles to the implementation of TQM.

Leadership

2

Unit Highlights

- Lesson – 1 & 2: Leadership and its Characteristics
- Lesson – 3 & 4: Ethical Management
- Lesson – 5: TQM Leaders and Quality Culture
- Lesson 6 and 7: TQM Framework and Quality Statement

Technologies Used for Content Delivery

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Lesson 1 and 2: Leadership and its Characteristics

After completion of this lesson you will be able to –

- *Understand the concept of leadership.*
- *Explain the characteristics of a quality leader.*
- *Describe the intuitive leadership.*
- *Assess the habits of highly effective people.*

CONCEPT OF LEADERSHIP AND LEADER

Leadership is the ability to influence and guide a group of people toward a shared goal by providing direction, motivating team members, and fostering collaboration. It's not limited to formal positions but is a set of skills and behaviors that anyone can develop and exhibit. Effective leaders set a vision, make decisions, solve problems, and empower others to achieve success and create positive outcomes.

There is no universal definition of leadership and indeed many books have been devoted to the topic of leadership. James MacGregor Burns describes a leader as one who instills purposes, not one who controls by brute force. A leader strengthens and inspires the followers to accomplish shared goals. Leaders shape the organization's values, promote the organization's values, protect the organization's values and exemplify the organization's values.

Burns says, "Leaders and followers raise one another to higher levels of motivation and morality. In this context, leadership becomes moral in the sense that it raises the level of human conduct and ethical aspiration of both the leader and the led, and thus has a transforming effect on both. Similarly, Daimler Chrysler's CEO Bob Eaton defines a leader as "someone who can take a group of people to a place they don't think they can go." "Leadership is we, not me; mission, not my show; vision, not division; and community, not domicile."

According to Narayana Murthy, "A great leader is one who is not only good in creating vision, but also ensuring that he goes into the nitty-gritty, into the details of making sure that his vision is actually translated into reality through excellence of execution. In other words, great leaders have great vision, great imagination, great ideas but they also implement these ideas through hard work, commitment and flawless execution. In doing so, they motivate thousands of people.

CHARACTERISTICS OF QUALITY LEADERS

There are 12 behaviors or characteristics that successful quality leaders demonstrate:

1. They give **attention to external and internal customers** and their needs. Leaders place themselves in the customers' shoes and service their needs from that perspective. They continually evaluate the customers' changing requirements.
2. The quality **leaders empower followers**, rather than control them. Leaders have trust and confidence in the performance of their subordinates. They provide the resources, training, and work environment to help subordinates do their jobs.
3. Leaders **emphasize improvement rather than maintenance**. Leaders use the phrase "If it isn't perfect, improve it" rather than "If it isn't broke, don't fix it." There is always

room for improvement, even if the improvement is small. Major breakthroughs sometimes happen, but it's the little ones that keep the continuous process improvement on a positive track.

4. The quality **leader emphasizes prevention**. “An ounce of prevention is worth a pound of cure” is certainly true. It is also true that perfection can be the enemy of creativity. We can't always wait until we have created the perfect process or product. There must be a balance between preventing problems and developing better, but not perfect, processes.
5. The **quality leaders encourage collaboration rather than competition**. When functional areas, departments, or work groups are in competition, they may find subtle ways of working against each other or withholding information. Instead, there must be collaboration among and within units.
6. **Leaders train and coach**, rather than direct and supervise. Leaders know that the development of the human resource is a necessity. As coaches, they help their subordinates learn to do a better job.
7. The quality leader **learns from problems**. When a problem exists, it is treated as an opportunity rather than something to be minimized or covered up. “What caused it?” and “How can we prevent it in the future?” are the questions quality leaders ask.
8. Leaders **continually try to improve communications**. Leaders continually disseminate information about the TQM effort. They make it evident that TQM is not just a slogan. Communication is two way—ideas will be generated by people when leaders encourage them and act upon them. Communication is the glue that holds a TQM organization together.
9. Leaders **continually demonstrate their commitment to quality**. Leaders walk their talk—their actions, rather than their words, communicate their level of commitment. They let the quality statements be their decision-making guide.
10. **Leaders choose suppliers on the basis of quality**, not price. Suppliers are encouraged to participate on project teams and become involved. Leaders know that quality begins with quality materials and the true measure is the life-cycle cost.
11. Leaders **establish organizational systems to support the quality effort**. At the senior management level a quality council is provided, and at the first-line supervisor level, work groups and project teams are organized to improve the process.
12. The quality leaders **encourage and recognize team effort**. They encourage, provide recognition, and reward individuals and teams. Leaders know that people like to know that their contributions are appreciated and important. This action is one of the leader's most powerful tools.

LEADERSHIP: AN INTUITIVE UNDERSTANDING

In order to become successful, leadership requires an intuitive understanding of human nature—the basic needs, wants, and abilities of people. To be effective, a leader understands that:

1. People, paradoxically, need security and independence at the same time.

2. People are sensitive to external rewards and punishments and yet are also strongly self-motivated.
3. People like to hear a kind word of praise. Catch people doing something right, so you can put them on the back.
4. People can process only a few facts at a time; thus, a leader needs to keep things simple.
5. People trust their gut reaction more than statistical data.
6. People distrust a leader's rhetoric if the words are inconsistent with the leader's actions.

Leaders need to give their employees independence and yet provide a secure working environment that encourages and rewards successes. A working environment must be provided that fosters employee creativity and risk-taking by not penalizing mistakes.

A leader will focus on a few key values and objectives. Focusing on a few values or objectives give the employees the ability to discern on a daily basis what is important and what is not. Employees, upon understanding the objectives, must be given personal control over the task in order to make the task their own and, thereby, something to which they can commit.

Having a worthwhile cause such as total quality management is not always enough to get employees to participate. Indeed, when people like the leader but not the vision, they will try to change the vision or reconcile their vision to the leader's vision. If the leader is liked, people will not look for another leader. This is especially evident in politics. If the leader is trusted and liked, then the employees will participate in the total quality management cause. Therefore, it is particularly important that a leader's character and competence, which is developed by good habits and ethics, be above reproach (criticism).

HABITS OF HIGHLY EFFECTIVE PEOPLE

The highly effective people possess 7 habits that are in harmony with a natural law. These habits make them effective and assist in achieving success they are:

Habit 1: Be Proactive

Proactive means taking responsibility for life and the ability to choose the response to a situation. Proactive behavior is a product of conscious choice based on values, rather than reactive behavior, which is based on feelings. Proactive people let carefully thought-about, selected, and internalized values tell them how to respond. It's not what happens to us, but our response that differentiates the two behaviors.

The comparisons between reactive and proactive people are given in the table below.

Reactive	Proactive
There's nothing I can do.	Let's look at our alternatives.
She makes me so mad.	I control my own feelings.
I have to do that.	I will choose an appropriate response.
I can't.	I choose.
I must.	I prefer.
Things are getting worse.	What initiative can we use?

Habit 2: Begin with the End in Mind

The most fundamental application of this habit is to begin each day with an image, picture, or paradigm of the end of one’s life as his frame of reference. All things are created twice—there’s a mental or first creation and a physical or second creation of all things. To build a house one first creates, a blueprint and then construct the actual house. People create a speech on paper before they give it. If a person wants to have a successful organization, he begins with a plan that will produce the appropriate end; thus, leadership is the first creation, and management, the second.

In order to begin with the end in mind, we need to develop a personal philosophy or creed that comprises the items below:

- Never compromise with honesty.
- Remember the people involved.
- Maintain a positive attitude.
- Exercise daily.
- Keep a sense of humor.
- Do not fear mistakes.
- Facilitate the success of subordinates.
- Seek divine help.
- Read a leadership book monthly.

By centering our lives on correct principles, we create a solid foundation for the development of the life support factors of security, guidance, wisdom, and power.

Habit 3: Put First Things First

Habit 3 is practicing self-management and requires habits 1 and 2 as prerequisites. It is the day-by-day, moment-by-moment management of a leader’s time.

	Urgent	Not Urgent
Important	<p><u>Quadrant I</u></p> <ul style="list-style-type: none"> • Crisis • Pressing problems • Deadline driven projects 	<p><u>Quadrant II</u></p> <ul style="list-style-type: none"> • Relationship building • Finding new opportunities • Long-term planning • Preventive activities • Personal growth • Recreation
Not Important	<p><u>Quadrant III</u></p> <ul style="list-style-type: none"> • Interruptions • Emails, calls, meetings • Popular activities • Proximate, pressing matters 	<p><u>Quadrant IV</u></p> <ul style="list-style-type: none"> • Trivia, busy work • Time wasters • Some calls and emails • Pleasant activities

The Time Management Matrix is presented in the diagram. Urgent means it requires immediate attention, and important relates to results that contribute to your mission, goals, and values. Effective, proactive people spend most of their time in Quadrant II, thereby reducing the time spent in Quadrant I. Four activities are necessary to be effective. First, write down your key roles for the week (such as research manager, United Way

chairperson, and parent). Second, list your objectives for each role using many Quadrant II activities. These objectives should be tied to your personal goals or philosophy developed in Habit 2. Third, schedule time to complete the objectives. Fourth, adapt the weekly schedule to your daily activities.

Habit 4: Think Win-Win

Win-Win is a frame of mind and heart that constantly seeks mutual benefit in all human interactions. Both sides come out ahead; in fact, the end result is usually a better one. If Win-Win is not possible, then the alternative is no deal. It takes great courage as well as consideration to create mutual benefits, especially if the other party is thinking Win-Lose.

Win-Win embraces five interdependent dimensions of life — character, relationships, agreements, systems, and processes. Character involves the traits of integrity; maturity, which is a balance between being considerate of others and the courage to express feelings; and abundance mentality, which means that there is plenty out there for everyone. Relationships means that the two parties trust each other and are deeply committed to Win-Win. In order to obtain Win-Win, a four-step process is needed: (1) see the problem from the other viewpoint, (2) identify the key issues and concerns, (3) determine acceptable results, and (4) seek possible new options to achieve those results.

Habit 5: Seek First to Understand, Then to Be Understood

Seeking first to understand involves a paradigm shift since we usually try to be understood first. Empathic listening is the key to effective communication. It focuses on learning how the other person sees the world, how they feel. The essence of Empathic Listening is not that you agree with someone; it's that you fully, deeply understand that person, emotionally as well as intellectually.

The second part of the habit is to be understood. Covey uses three sequentially arranged Greek words— ethos, pathos, and logos. Ethos is your personal credibility or character; pathos is the empathy (understanding) you have with the other person's communication; and logos is the logic or reasoning part of one's presentation.

Habit 6: Synergy

Synergy means that the whole is greater than the parts. Together, we can accomplish more than any of us can accomplish alone. Synergy occurs when people abandon their humdrum (routine/unexciting) presentations and Win/Lose mentality and open themselves up to creative cooperation. When there is genuine understanding, people reach solutions that are better than they could have achieved acting alone.

Habit 7: Sharpen the Saw (Renewal)

There is a proverb, "Take time to Sharpen the Saw so it will cut faster." It's renewing the four dimensions of your nature — physical, spiritual, mental, and social/emotional. All four dimensions of nature must be used regularly in wise and balanced ways. Renewing the physical dimension means following good nutrition, rest and relaxation, and regular exercise. The spiritual dimension is your commitment to your value system. Renewal comes from prayer, meditation, and spiritual reading. The mental dimension is continuing to develop your intellect through reading, seminars, and writing. The social and emotional dimensions of our lives are tied together because our emotional life is primarily, but not exclusively, developed out of and manifested in our relationship with others.

Lesson 3 and 4: Ethical Management

After completion of this lesson you will be able to –

- *Understand the concept of ethics.*
- *Identify the root causes of unethical behavior.*
- *Implement the ways of ethics management.*
- *Describe the Deming philosophy for leading the organization.*

DEFINITION OF ETHICS

Ethics is a body of principles or standards of human conduct that govern the behavior of individuals and organizations. It is knowing what is the right thing to do and is learned when one is growing up, or at a later date during an organization's ethics training program. Ethics can mean something different to different people, especially given an organization's international workforce and the varying cultural norms. Because individuals have different concepts of what is right, the organization will need to develop its own standards or code of ethics.

Ethics is the branch of philosophy that studies right and wrong and moral principles, guiding behavior and decision-making. It provides a framework for distinguishing between acceptable and unacceptable conduct in personal life and professional settings by using well-founded standards of right and wrong, often based on concepts like rights, obligations, and fairness.

THE ROOT CAUSES OF UNETHICAL BEHAVIOR

Much of the unethical behavior in organizations occurs when:

1. Organizations favor their own interests above the well-being of their customers, employees, or the public.
2. Organizations reward behavior that violates ethical standards, such as increasing sales through false advertising.
3. Organizations encourage separate standards of behavior at work than at home, such as secrecy and deceit versus honesty.
4. Individuals are willing to abuse their position and power to enhance their interests, such as taking excessive compensation for themselves off the top before other stakeholders receive their fair share.
5. Managerial values exist that undermine integrity, such as the pressure managers exert on employees to cover up mistakes or to do whatever it takes to get the job done, including cutting corners.
6. Organizations and individuals overemphasize the short-term results at the expense of themselves and others in the long run; for example behavior is good based on the degree of utility, pleasure, or good received, regardless of the effect on others.
7. Organizations and managers believe their knowledge is infallible and miscalculate the true risks, such as when financial managers invest organizational funds in high-risk options trading.

Unethical behavior is especially prevalent if employee morale is low. For example, poor working conditions, employee downsizing, unacknowledged good work, and denied promotions can all contribute to an employee's poor attitude.

ETHICS MANAGEMENT PROGRAM

An ethics management program needs to address pressure, opportunity, and attitude. Managing ethical behavior requires commitment, new policies and procedures, continuous improvement, and investments in appraisal, prevention, and promotion.

Step 1: Appraisal: Appraisal is the analysis of the costs associated with unethical behavior. These costs can be divided into the three root causes of pressure, opportunity, and attitude.

- Costs from pressure are those costs from well-intended but unethical decisions made under pressure. They include but are not limited to errors, waste, rework, lost customers, and warranties.
- Costs from opportunity are those costs from intentional wrongdoing. They include but are not limited to theft, overstated expenses, excessive compensation, and nepotism.
- Costs from attitudes are those costs from mistaken beliefs in unethical forms of behavior. They include but are not limited to errors, waste, rework, lost customers, and health care.

Step 2: Prevention: which is the development of a system that will minimize the costs. Because management has a good idea of the appraisal costs, this step can proceed concurrently with Step 1.

- Pressure can be addressed by being involved in the development of goals and values and developing policies that allow for individual diversity, dissent, and decision-making input.
- Opportunity can be addressed by developing policies that encourage and protect whistleblowers and require the existence of ombudsmen who can work confidentially with people to solve ethical problems internally.
- Attitude can be addressed by requiring ethics training for all personnel, recognizing ethical conduct in the workplace, requiring performance appraisals to include ethics, and encouraging open discussion concerning ethical behavior issues.

Step 3: Promotion: which is the continuous advertising of ethical behavior in order to develop an ethical organizational culture that is clear, positive, and effective.

- To be clear the philosophy needs to be written, with input from all personnel, and posted. Standardized ethics training should be given to everyone to: (1) teach them how to clarify ethical issues, (2) encourage them to get the facts before acting, (3) encourage them to consider all the consequences before acting, and (4) show them how to test their actions in advance. This testing can be accomplished by asking (1) Is it legal? (2) Is it right? (3) Is it beneficial for all involved? and (4) How would I feel if it were published on the front page of the newspaper?
- To be positive, the culture should be about doing what is right, encouraging principled organizational dissent, and rewarding ethical behavior.

- To be effective, the philosophy must be set and adopted by senior management, with input from all personnel. Senior management should act as they would want others to act and make no exceptions.

THE DEMING PHILOSOPHY

Deming's philosophy is given in his 14 points. Most of these points were given in a seminar for 21 Presidents of leading Japanese industry in 1950. The rest were developed and the original ones modified over a period of three decades.

1. **Create and Publish the Aims and Purposes of the Organization:** Management must demonstrate constantly its commitment to this statement. It must include investors, customers, suppliers, employees, the community, and a quality philosophy. The statement is an ever changing document that requires input from everyone. Organizations must develop a long-term view of at least ten years and plan to stay in business by setting long-range goals. Resources must be allocated for research, training, and continuing education to achieve the goals. Innovation is promoted to ensure that the product or service does not become obsolete. A family organizational philosophy is developed to send the message that everyone is part of the organization.
2. **Learn the New Philosophy:** Top management and everyone must learn the new philosophy. Organizations must seek never-ending improvement and refuse to accept nonconformance. Customer satisfaction is the number one priority, because dissatisfied customers will not continue to purchase nonconforming products and services. The organization must concentrate on defect prevention rather than defect detection. By improving the process, the quality and productivity will improve.
3. **Understand the Purpose of Inspection:** Management must understand that the purpose of inspection is to improve the process and reduce its cost. For the most part, mass inspection is costly and unreliable. Where appropriate, it should be replaced by never ending improvement using statistical techniques. Mass inspection is managing for failure and defect prevention is managing for success.
4. **Stop Awarding Business Based on Price Alone:** The organization must stop awarding business based on the low bid, because price has no meaning without quality. The goal is to have single suppliers for each item to develop a long-term relationship of loyalty and trust, thereby providing improved products and services. Purchasing agents must be trained in statistical process control and require it from suppliers. They must examine how customer expectations are affected and provide feedback to the supplier regarding the quality.
5. **Improve Constantly and Forever the System:** Management must take more responsibility for problems by actively finding and correcting problems so that quality and productivity are continually and permanently improved and costs are reduced. The focus is on preventing problems before they happen. Variation is expected, but there must be a continual striving for its reduction using control charts. Responsibilities are assigned to teams to remove the causes of problems and continually improve the process.
6. **Institute Training:** Each employee must be oriented to the organization's philosophy of commitment to never-ending improvements. Management must allocate resources to train employees to perform their jobs in the best manner possible. Everyone should

be trained in statistical methods, and these methods should be used to monitor the need for further training.

7. **Teach and Institute Leadership:** Improving supervision is management's responsibility. They must provide supervisors with training in statistical methods and these 14 points so that the new philosophy can be implemented. Instead of focusing on a negative, fault-finding atmosphere, supervisors should create a positive, supportive one where pride in workmanship can flourish. All communication must be clear from top management to supervisors to operators.
8. **Drive out Fear, Create Trust, and Create a Climate for Innovation:** Management must encourage open, effective communication and teamwork. Fear is caused by a general feeling of being powerless to control important aspects of one's life. It is caused by a lack of job security, possible physical harm, performance appraisals, ignorance of organization goals, poor supervision, and not knowing the job. When people are treated with dignity, fear can be eliminated and people will work for the general good of the organization. In this climate, they will provide ideas for improvement.
9. **Optimize the Efforts of Teams, Groups, and Staff Areas:** Management must optimize the efforts of teams, work groups, and staff areas to achieve the aims and purposes of the organization. Barriers exist internally among levels of management, among departments, within departments, and among shifts. Externally, they exist between the organization and its customers and suppliers. These barriers exist because of poor communication, ignorance of the organization's mission, competition, fear, and personal grudges or jealousies. Attitudes need to be changed; communication channels need to be opened; project teams need to be organized; and teamwork training need to be implemented. Multifunctional teams, such as used in concurrent engineering, are an excellent method.
10. **Eliminate Exhortations for the Work Force:** Exhortations that ask for increased productivity without providing specific improvement methods can handicap an organization. Goals should be set that are achievable and are committed to the long-term success of the organization. Improvements in the process cannot be made unless the tools and methods are available.
11. **A) Eliminate Numerical Quotas for the Work Force:** Instead of quotas, management must learn and institute methods for improvement. Quotas and work standards focus on quantity rather than quality. They encourage poor workmanship in order to meet their quotas. Quotas should be replaced with statistical methods of process control.
B) Eliminate Management by Objective: Instead of management by objective, management must learn the capabilities of the processes and how to improve them. Internal goals set by management, without a method, are ineffective. Management by numerical goal is an attempt to manage without knowledge of what to do.
12. **Remove Barriers That Rob People of Pride of Workmanship:** Loss of pride in workmanship exists throughout organizations because (1) workers do not know how to relate to the organization's mission, (2) they are being blamed for system problems, (3) poor designs lead to the production of "junk," (4) inadequate training is provided,

(5) punitive supervision exists, and (6) inadequate or ineffective equipment is provided for performing the required work. Restoring pride will require a long-term commitment by management. When workers are proud of their work, they will grow to the fullest extent of their job. Management must give employees operational job descriptions, provide the proper tools and materials, and stress the workers' understanding of their role in the total process. By restoring pride, everyone in the organization will be working for the common good.

13. **Encourage Education and Self-Improvement for Everyone:** A long-term commitment to continuously train and educate people must be made by management. Deming's 14 points and the organization's mission should be the foundation of the education program. Everyone should be retrained as the organizations requirements change to meet the evolving environment.
14. **Take Action to Accomplish the Transformation:** Management has to accept the primary responsibility for the never-ending improvement of the process. It has to create a corporate structure to implement the philosophy. A cultural change is required from the previous "business as usual" attitude. Management must be committed, involved, and accessible if the organization is to succeed in implementing the new philosophy.

Lesson 5: TQM Leaders and Quality Culture

After completion of this lesson you will be able to –

- *Analyze the role of TQM leaders.*
- *Implement the TQM process in the organization.*
- *Build a quality culture in the organization.*

ROLE OF TQM LEADERS

Everyone is responsible for quality, especially senior management and the CEO. For instance, in the 1980's, General Electric's CEO, Jack Welch, instituted leadership training courses at all levels of the organization. Jack Welch supported the development of a leadership system whereby quality control leaders were developed at all levels in all functions of the organization, including research, marketing, manufacturing, sales, finance, and human resources.

1. Senior managers need to be **provided with the skills to implement quality control techniques and actively participate in the quality council**. Senior management must practice the philosophy of Management by Wandering Around (MBWA). Management should get out of the office and visit customers, suppliers, departments, and plants within the organization. For example, Kinko's executives perform normal operating duties for two or three days at one location. This approach is an excellent technique for gaining firsthand information.
2. Senior management's role is no longer to make the final decision, but to make sure the team's decision is aligned with the quality statements of the organization. **The idea is to let employees think for themselves**. Push problem solving and decision making to the lowest appropriate level by delegating authority and responsibility.
3. Senior managers must **stay informed on the topic of quality improvement by reading books and articles, attending seminars, and talking to other TQM leaders**. The leader sends a strong message to subordinates when that leader asks if they have read a particular book or article.
4. The needed **resources must be provided to train employees in the TQM tools and techniques**, the technical requirements of the job, and safety. Resources in the form of the appropriate equipment to do the job must also be provided.
5. Senior managers **must find time to celebrate the success of their organization's quality efforts** by personally participating in award and recognition ceremonies. This activity is an excellent opportunity to reinforce the importance of the effort and to promote TQM. A phone call or handshake combined with a sincere "thank you for a job well done" is a powerful form of recognition and reward. Also, provisions must be made to reward teams as well as creative individuals.
6. Senior managers **must be visibly and actively engaged in the quality effort** by serving on teams, coaching teams, and teaching seminars. They should lead by demonstrating, communicating, and reinforcing the quality statements. As a rule of thumb, they should spend about one-third of their time on quality.
7. A senior manager's role is to **listen to internal and external customers and suppliers through visits**, focus groups, and surveys. This information is translated into core values and process improvement projects.

8. Another very **important role of a TQM leader is communication**. The TQM message must be “sold” to personnel, because if they don’t buy it, TQM will never happen. In addition to internal efforts, there must be external activities with customers and suppliers, the media, advertising in trade magazines, and interaction with the quality community.

By following the preceding suggestions, senior managers should be able to drive fear out of the organization, break down barriers, remove system roadblocks, anticipate and minimize resistance to change, and, in general, change the culture.

TQM IMPLEMENTATION PROCESS

The TQM implementation process begins with senior management and, most important, the CEO’s commitment. The importance of the senior management role cannot be overstated. Leadership is essential during every phase of the implementation process and particularly at the start. For the implementation of TQM process the following things need to be carried out:

1. Senior management **needs to be educated in the TQM concepts**. In addition to formal education, managers should visit successful TQM organizations, read selected articles and books, and attend seminars and conferences.
2. The next step is for senior management to **develop an implementation plan**. Timing of the implementation process can be very important. There may be some foreseeable problems, such as a reorganization, change in senior management personnel, interpersonal conflicts, a current crisis, or a time-consuming activity.
3. The next step is the **formation of the quality council**. Initiation of these duties is a substantial part of the implementation of TQM. The development of core values, a vision statement, a mission statement, and a quality policy statement, with input from all personnel, should be completed first.
4. The active involvement of middle managers and first-line supervisors is essential to the success of the TQM effort. They are accountable for achieving many of the organization’s performance goals and objectives, and they form enduring links in the communication chain from senior management to the front-line workers.
5. If there is a union, there should be early discussions with the representatives on TQM. Managers should involve union leaders by sharing with them implementation plans for TQM. As the quality effort progresses, managers and union leaders should work together on quality improvement activities. For example, the United Auto Workers have worked closely with the big three automakers in their TQM activities.
6. At this stage, it is important to **communicate TQM to the entire organization**. Communication is important throughout the implementation stage. Communication is necessary to create TQM awareness, interest, desire, and action.
7. Everyone needs to be **trained in quality awareness and problem solving**. This training is conducted when the employee is placed on a project team or the work group is ready for the training. Customer, employee, and supplier surveys must be conducted to benchmark the attitudes of these three stakeholders. Information from these surveys provides ideas for quality improvement projects.

QUALITY COUNCIL: BUILDING QUALITY CULTURE

In order to build quality into the culture, a quality council is established to provide overall direction. It is the driver for the TQM engine.

In a typical organization, the council is composed of the chief executive officer (CEO); the senior managers of the functional areas, such as design, marketing, finance, production, and quality; and either a coordinator or a consultant. If there is a union, consideration should be given to having a representative on the council. A coordinator is necessary to assume some of the added duties that a quality improvement activity requires. The individual selected for the coordinator's position should be a competent individual with executive potential. That person will report to the CEO.

The responsibility of the coordinator is to build two-way trust, propose team needs to the council, share council expectations with the team, and brief the council on team progress. In addition, the coordinator will ensure that the teams are empowered and know their responsibilities. The coordinator's activities are to assist the team leaders, share lessons learned among teams, and have regular leaders' meetings.

In smaller organizations where managers may be responsible for more than one functional area, the number of members will be smaller. Also, a consultant would most likely be employed rather than a coordinator.

In general, the duties of the quality council are to:

- Develop, with input from all personnel, the core values, vision statement, mission statement, and quality policy statement.
- Develop the strategic long-term plan with goals and the annual quality improvement program with objectives.
- Create the total education and training plan.
- Determine and continually monitor the cost of poor quality.
- Determine the performance measures for the organization, approve those for the functional areas, and monitor them.
- Continually determine those projects that improve the processes, particularly those that affect external and internal customer satisfaction.
- Establish multifunctional project and departmental or work group teams and monitor their progress.
- Establish or revise the recognition and reward system to account for the new way of doing business.

In large organizations, quality councils are also established at lower levels of the corporation. Their duties are similar but relate to that particular level in the organization. Initially these activities will require additional work by council members; however, in the long term, their jobs will be easier. These councils are the instruments for perpetuating the idea of never-ending quality improvement.

Once the TQM program is well established, a typical meeting agenda might have the following items:

- Progress report on teams.
- Customer satisfaction report.

- Progress on meeting goals.
- New project teams.
- Recognition dinner.
- Benchmarking report.

Eventually, within three to five years, the quality council activities will become so ingrained in the culture of the organization that they will become a regular part of the executive meetings. When this state is achieved, a separate quality council is no longer needed.

Lesson 6 and 7: TQM Framework and Quality Statement

After completion of this lesson you will be able to –

- *Analyze the values, concept and framework that foster TQM behavior.*
- *Prepare quality statements for your organization.*
- *Prepare a strategic plan with due process.*

CORE VALUES, CONCEPTS, AND FRAMEWORK

Unity of purpose is key to a leadership system. Core values and concepts provide that unity of purpose. The core values and concepts enable a framework for leaders throughout the organization to make right decisions. Each organization will need to develop its own values. There are some issues related to the core values, concepts, and framework that can be used as a starting point for any organization as it develops its own. Such as:

1. Visionary Leadership

An organization's senior leaders need to set directions and create a customer orientation, clear and visible quality values, and high expectations. Values, directions, and expectations need to address all stakeholders. The leaders need to ensure the creation of strategies, systems, and methods for achieving excellence. The senior leaders must commit to the development of the entire workforce and should encourage participation, learning, innovation, and creativity by all employees.

2. Customer-Driven Excellence

Quality is judged by customers. All product and service characteristics that contribute value to the customer and lead to customer satisfaction, preference, and retention must be the focus of an organization's management system.

Customer-driven excellence has both current and future components: understanding today's customer desires and marketplace offerings as well as future innovations. Value and satisfaction may be influenced by many factors throughout the customer's overall purchase, ownership, and service experiences. These factors include the organization's relationship with customers that helps build trust, confidence, and loyalty. This concept of quality includes not only the product and service characteristics that meet basic customer requirements, but also includes those features and characteristics that differentiate them from competing offerings.

Success requires more than defect and error reduction, merely meeting specifications, or reducing complaints. Nevertheless, defect and error reduction and the elimination of causes of dissatisfaction contribute to the customers' view of quality, and they are important parts of customer-driven quality.

3. Organizational and Personal Learning

Achieving the highest levels of performance requires a well-executed approach to organizational and personal learning. Organizational learning refers to both continuous improvement of existing approaches and adaptation to change, leading to new goals and approaches. Learning needs to be embedded in the way the organization functions. Learning must be (1) a required part of the daily work; (2) practiced at personal and organizational levels; (3) directed at solving problems; (4) focused on sharing knowledge throughout the organization; and (5) driven by opportunities to create significant change and to do better.

Organizational learning can result in (1) enhancing value to customers through new and improved products and services; (2) developing new opportunities; (3) reducing errors, defects, waste, and related costs; (4) improving responsiveness and cycle time performance; (5) increasing productivity and effectiveness in the use of all resources; and (6) enhancing your organization's performance in fulfilling its public responsibilities and service as a good citizen.

Personal learning can result in (1) more satisfied and versatile employees who stay with the organization, (2) organizational cross-functional learning, and (3) an improved environment for innovation. Thus, learning is directed not only toward better products and services but also toward being more responsive, adaptive, and efficient—giving the organization greater marketplace sustainability and performance advantages.

4. Valuing Employees and Partners

An organization's success depends increasingly upon the skills, knowledge, creativity, and motivation of its employees and partners. Valuing employees' means committing to their satisfaction, development, and wellbeing. Increasingly, this involves more flexible, high-performance work practices tailored to employees with diverse workplace and home life needs. Major challenges in the area of valuing employees include (1) demonstrating your leaders' commitment to your employees' success, (2) recognition that goes beyond the regular compensation system, (3) development and progression within your organization, (4) sharing your organization's knowledge so your employees can better serve your customers and contribute to achieving your strategic objectives, and (5) creating an environment that encourages risk-taking.

Successful internal and external partnerships develop longer-term objectives, thereby creating a basis for mutual investments and respect. Partners should address the key requirements for success, means for regular communication, approaches to evaluating progress, and means for adapting to changing conditions. In some cases, joint education and training could offer a cost-effective method for employee development.

5. Agility

Success in global markets demands agility. All aspects of e-commerce require and enable more rapid, flexible, and customized responses. Major improvements in response time often require simplification of work units and processes and the ability for rapid change over from one process to another. Cross-trained and empowered employees are vital assets in such a demanding environment.

A major success factor in meeting competitive challenges is the design-to-introduction cycle time. To meet the demands of rapidly changing markets, organizations need to carry out stage-to-stage integration, such as concurrent engineering of activities, from the research concept to commercialization.

6. Focus on the Future

Focus on the future requires understanding the short-term and long-term factors that affect an organization and the marketplace. Pursuit of sustainable growth and market leadership requires a strong future orientation and a willingness to make long-term commitments to key stakeholders. An organization's planning should anticipate many factors, such as customers' expectations, new business and partnering opportunities, the increasingly global marketplace, technological developments, the evolving e-commerce environment,

new customer and market segments, evolving regulatory requirements, societal expectations, and strategic moves by competitors.

7. Managing for Innovation

Innovation means making meaningful change to improve an organization's products, services, and processes and to create new value for the organization's stakeholders. Innovation should lead an organization to new dimensions of performance. Innovation is no longer strictly the purview of research and development departments; innovation is important for all aspects of business and all processes. Organizations should be led and managed so that innovation becomes part of the culture and is integrated into daily work.

8. Management by Fact

Organizations depend on the measurement and analysis of performance. Such measurements should derive from business needs and strategy, and they should provide critical data and information about key processes, outputs, and results. Many types of data and information are needed for performance management. Performance measurement should include customer, product, and service performance; comparisons of operational, market, and competitive performance; and supplier, employee, and cost, and financial performance.

9. Public Responsibility and Citizenship

An organization's leaders should stress the need to practice good citizenship. Basic expectations to adhere to business ethics and, to protect public health, safety, and the environment should be maintained. Protection of health, safety, and the environment includes an organization's operations, as well as the life cycles of products and services. For many organizations, the product design stage is critical. Effective design strategies should anticipate growing environmental concerns and responsibilities.

Practicing good citizenship refers to leadership and support within the limits of an organization's resources of publicly important purposes. Leadership as a corporate citizen also entails influencing other organizations. For example, an organization might lead or participate in efforts to help define the obligations of its industry to its communities.

10. Focus on Results and Creating Value

An organization's performance measurements need to focus on key results. Results should be used to create and balance value for the organization's key stakeholders such as customers, employees, stockholders, suppliers and partners, the public, and the community. By creating value for key stakeholders, an organization builds loyalty and contributes to growing the economy. To meet the sometimes conflicting and changing aims that balancing value implies, organizational strategy should explicitly include key stakeholder requirements. This will help ensure that actions and plans meet differing stakeholder needs and avoid adverse impacts on any stakeholders.

11. Systems Perspective

The Core Values form the building blocks and the integrating mechanism for the system. However, successful management of overall performance requires organization-specific synthesis and alignment. Synthesis means looking at an organization as a whole and building upon key business requirements, including strategic objectives and action plans.

Alignment means using the key linkages among requirements given, including the key measures/indicators.

QUALITY STATEMENTS

The quality statements include the vision statement, mission statement, and quality policy statement. Once developed, they are only occasionally reviewed and updated. They are part of the strategic planning process. The utilization of the three statements varies considerably from organization to organization. In fact, small organizations may use only the quality policy statement. The quality statements are as follow:

Vision Statement

The vision statement is a short declaration of what an organization aspires to be tomorrow. It is the ideal state that might never be reached but which the organization continually strive to achieve. Successful visions are timeless, inspirational, and become deeply shared within the organization, such as IBM's service, Apple's computing for the masses, Disney theme park's 'happiest place on earth', and Polaroid's instant photography. These shared visions usually emerge over time.

Successful visions provide a succinct guideline for decision-making. Having a concise statement of the desired end provides criteria for sound decision making. It is important that the leader articulate and act upon the vision and that employees understand the vision and can connect their work with the well-being of the organization.

An example of a simple, one-sentence vision statement is –

“To be a world-class enterprise in professional electronics”

- BHARAT ELECTRONICS

An example of a more elaborate vision statement is –

L&T shall be a professionally-managed Indian multinational, committed to total customer satisfaction and enhancing shareholder value.

L&T shall be an innovative, entrepreneurial and empowered team constantly creating value and attaining global benchmarks.

L&T shall foster culture of caring, trust and continuous learning while meeting expectations of employees, stakeholders and society.

- LARSEN & TOUBRO

Mission Statement

The mission statement answers the following questions: who we are, who are the customers, what we do, and how we do it. This statement is usually one paragraph or less in length, is easy to understand, and describes the function of the organization. It provides a clear statement of purpose for employees, customers, and suppliers.

An example of a mission statement is –

Ford Motor Company is a worldwide leader in automatic and automotive-related products and services as well as the newer industries such as aerospace, communications, and financial services. Our mission is to improve continually our products and services to meet our customers' needs, allowing us to prosper as a business and to provide a reasonable return to our shareholders, the owners of our business.

- FORD MOTOR COMPANY

A simpler mission statement is –

Our mission is to help our customers achieve their business goals through excellence in global product realization. We will enable this through solutions based on innovative technologies, efficient processes and world-class competencies in our people.

- GEOMETRIC SOFTWARE

Quality Policy Statement

The quality policy is a guide for everyone in the organization as to how they should provide products and service to the customers. It should be written by the CEO with feedback from the workforce and be approved by the quality council. A quality policy is a requirement of ISO/QS 9000. Common characteristics of quality policy are:

- Quality is first among equals.
- Meet the needs of the internal and external customers.
- Equal or exceed the competition.
- Continually improve the quality.
- Include business and production practices.
- Utilize the entire work force.

A simple quality policy is –

Xerox is a quality company. Quality is the basic business principle for Xerox. Quality means providing our external and internal customers with innovative products and services that fully satisfy their requirements. Quality is the job of every employee.

- XEROX CORPORATION

A more elaborate quality policy statement is –

Tata Motors is committed to maximizing customer satisfaction and strives to achieve the goal of excellence, by continual improvement, through ongoing design and development, manufacture and sale of reliable, safe, cost-effective, quality products and services of international standards, using environmentally sustainable technologies, for improving levels of efficiency and productivity within its plants and ancillaries.

SEVEN STEPS TO STRATEGIC PLANNING

There are seven basic steps to strategic quality planning. The process starts with the principle that quality and customer satisfaction are the center of an organization's future. It brings together all the key stakeholders.

- 1. Customer Needs.** The first step is to discover the future needs of the customers. Who will they be? Will your customer base change? What will they want? How will the organization meet and exceed expectations?
- 2. Customer Positioning.** Next, the planners determine where the organization wants to be in relation to the customers. Do they want to retain, reduce, or expand the customer base? Products or services with poor quality performance should be targeted for breakthrough or eliminated. The organization needs to concentrate its efforts on areas of excellence.

3. **Predict the Future.** Next, the planners must look into their crystal balls to predict future conditions that will affect their product or service. Demographics, economic forecasts, and technical assessments or projections are tools that help predict the future. More than one organization's product or service has become obsolete because it failed to foresee the changes in technology. Note that the rate of change is continually increasing.
4. **Gap Analysis.** This step requires the planners to identify the gaps between the current state and the future state of the organization. An analysis of the core values and concepts, given earlier in the chapter, is an excellent technique for pinpointing gaps.
5. **Closing the Gap.** The plan can now be developed to close the gap by establishing goals and responsibilities. All stakeholders should be included in the development of the plan.
6. **Alignment.** As the plan is developed, it must be aligned with the mission, vision, and core values and concepts of the organization. Without this alignment, the plan will have little chance of success.
7. **Implementation.** This last step is frequently the most difficult. Resources must be allocated to collecting data, designing changes, and overcoming resistance to change. Also part of this step is monitoring activities to ensure that progress is being made. The planning group should meet at least once a year to assess progress and take any corrective action.

Strategic planning can be performed by any organization. It can be highly effective, allowing organizations to do the right thing at the right time, every time.

Discussion Questions:

1. What do you understand by the concept of leadership?
2. Explain the characteristics of a quality leader.
3. Describe intuitive leadership.
4. What are the habits found in the highly effective people?
5. What do you understand by ethics?
6. Identify and explain the root causes of unethical behavior.
7. How can you implement the ethics management in your organization? Explain.
8. Describe the components of Deming's philosophy in leading the organization.
9. Describe the role of TQM leaders.
10. Describe the steps of the TQM process in the organization.
11. How can you build a quality culture in the organization? Explain.
12. Analyze the values, concepts and framework that foster TQM behavior.
13. Describe the different types of quality statements. Prepare quality statements for your organization.
14. Prepare a strategic plan with due process. / Describe the steps of strategic planning process.

Customer Satisfaction

3

Unit Highlights

- Lesson 1 and 2: Customers and their Perceptions and Satisfaction
- Lesson 3: Customer Feedback
- Lesson 4: Handling Customer Complaints & Customer Retention

Technologies Used for Content Delivery

- ❖ BOUTUBE
- ❖ BOU LMS
- ❖ WebTV
- ❖ Web Radio
- ❖ Mobile Technology with MicroSD Card
- ❖ BTV Program
- ❖ Bangladesh Betar Program

Lesson 1 and 2: Customers and their Perceptions and Satisfaction

After completion of this lesson you will be able to –

- *Define customer and types of customers*
- *Understand the perceptions of customers regarding quality.*
- *Analyze how customer satisfaction is related to TQM.*
- *Describe the customer satisfaction model.*

CONCEPT OF CUSTOMER AND ITS TYPES

A customer is an individual or business that purchases goods or services from another party, usually a business. They are the driving force behind revenue for a business, and their satisfaction is crucial for business success. Customers can be individuals buying for personal use or businesses buying for their operations.

There are two distinct types of customers—external and internal.

1. **External customer:** An external customer can be defined in many ways, such as the one who uses the product or service, the one who purchases the product or service, or the one who influences the sale of the product or service. For instance, McDonald's targeted the child as their primary customer when they introduced their Happy Meals. The child never paid for the meals but the child influenced the sale. Oftentimes, parents purchase mobile phones and yet the teenage children use the mobile phones. The identity of the external customer is not always easy to determine.

An external customer exists outside the organization and generally falls into three categories: **current, prospective, and lost customers**. Each category provides valuable customer satisfaction information for the organization. Every employee in the organization must know how their job enhances the total satisfaction of the external customer. Performance must be continually improved in order to retain existing customers and to gain new ones.

2. **Internal customer:** An internal customer is anyone within an organization who relies on another part of the same organization for goods, services, or information to perform their job. Essentially, it's an employee or department that acts as a customer to another employee or department within the company. Every function, whether it be engineering, order processing, or production, has an internal customer—each receives a product or service and, in exchange, provides a product or service. Every person in a process is considered a customer of the preceding operation. Each worker's goal is to make sure that the quality meets the expectations of the next person. When that happens throughout the manufacturing, sales, and distribution chain, the satisfaction of the external customer should be assured.

One basic concept of TQM is an unwavering focus on customers, both internal and external. Most employees know about the external customer or end user but may not think of other employees as internal customers of their output.

CUSTOMER PERCEPTION OF QUALITY

An American Society for Quality (ASQ) survey on end user perceptions of important factors that influenced purchases showed the following ranking:

1. **Performance:** Performance involves “fitness for use”—a phrase that indicates that the product and service are ready for the customer’s use at the time of sale. Other considerations are (1) availability, which is the probability that a product will operate when needed; (2) reliability, which is freedom from failure over time; and (3) maintainability, which is the ease of keeping the product operable.
2. **Features:** Identifiable features or attributes of a product or service are psychological, time-oriented, contractual, ethical, and technological. Features are secondary characteristics of the product or service. For example, the primary function of an automobile is transportation, whereas a car stereo system is a feature of an automobile.
3. **Service:** An emphasis on customer service is emerging as a method for organizations to give the customer-added value. However, customer service is an intangible—it is made up of many small things, all geared to changing the customer’s perception. Intangible characteristics are those traits that are not quantifiable, yet contribute greatly to customer satisfaction. Providing excellent customer service is different from and more difficult to achieve than excellent product quality. For instance, at Baptist Hospital in Pensacola, FL, janitors, after cleaning a room, ask if there is anything they can do for the patient. Often patients will have a request for a window shade to be drawn or a door closed.
4. **Warranty:** The product warranty represents an organization’s public promise of a quality product backed up by a guarantee of customer satisfaction. Ideally, it also represents a public commitment to guarantee a level of service sufficient to satisfy the customer.

A warranty forces the organization to focus on the customer’s definition of product and service quality. A warranty generates feedback by providing information on the product and service quality. It also forces the organization to develop a corrective action system. Finally, a warranty builds marketing muscle. The warranty encourages customers to buy a service by reducing the risk of the purchase decision, and it generates more sales from existing customers by enhancing loyalty.

5. **Price:** Today’s customer is willing to pay a higher price to obtain value. Customers are constantly evaluating one organization’s products and services against those of its competitors to determine who provides the greatest value. However, in our highly-competitive environment, each customer’s concept of value is continually changing. Ongoing efforts must be made by everyone having contact with customers to identify, verify, and update each customer’s perception of value in relation to each product and service.

6. **Reputation:** Most of us find ourselves rating organizations by our overall experience with them. Total customer satisfaction is based on the entire experience with the organization, not just the product. Good experiences are repeated to six people and bad experiences are repeated to 15 people; therefore, it is more difficult to create a favorable reputation.

Customers are willing to pay a premium for a known or trusted brand name and often become customers for life. Although it is difficult for an organization to quantify improved customer satisfaction, it is very easy to quantify an increase in customer retention.

CUSTOMER SATISFACTION AND TQM

The most important asset of any organization is its customers. An organization's success depends on how many customers it has, how much they buy, and how often they buy. Customers who are satisfied will increase in number, buy more, and buy more frequently. Satisfied customers also pay their bills promptly, which greatly improves cash flow—the lifeblood of any organization. The organizational diagram below exemplifies how important the customer is to any organization.

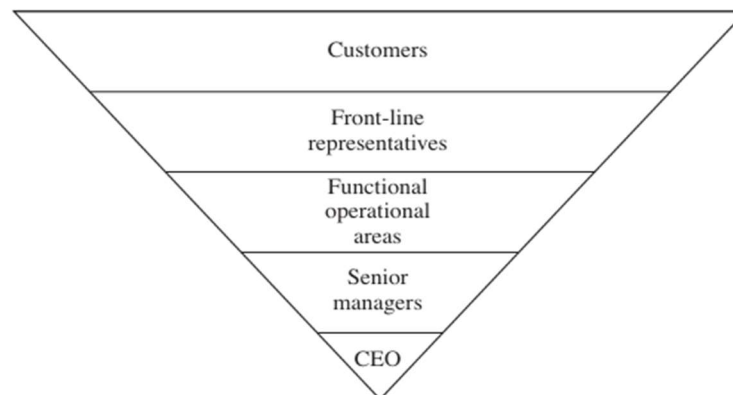


Figure: Customer Satisfaction Organizational Diagram

Increasingly, manufacturing and service organizations are using customer satisfaction as the measure of quality. The importance of customer satisfaction is not only due to national competition but also to worldwide competition.

Total Quality Management (TQM) implies an organizational obsession with meeting or exceeding customer expectations, so that customers are delighted. Understanding the customer's needs and expectations is essential to winning new business and keeping existing business. An organization must give its customers a quality product or service that meets their needs at a reasonable price, which includes on-time delivery and outstanding service. To attain this level, the organization needs to continually examine its quality system to see if it is responsive to ever-changing customer requirements and expectations.

The most successful TQM programs begin by defining quality from the customer's perspective. Quality means meeting or exceeding the customer's expectations. Dr. Deming added that quality also means anticipating the future needs of the customer. Customer satisfaction, not increasing profits, must be the primary goal of the organization. It is the most important consideration, because satisfied customers will lead to increased profits.

CUSTOMER SATISFACTION MODEL

Customer satisfaction is achieved when the offer matches the need. The customer satisfaction goal is to cover the expected performance level better than the competitors. The customer's needs are represented by the circle, and the square depicts the product or service offered by the organization. Customer satisfaction is illustrated by the Teboul model, which is shown in the following figure.

In the figure the square part that lies within the circle is perceived by the customer as satisfying, and the part of the square outside the circle is perceived as unnecessary. It is important that the organization listens to the "voice of the customer" and ensure that its marketing, design, production, and distribution processes truly meet the expectations of the customer. Customer satisfaction seems simple enough, and yet it is far from simple.

Customer satisfaction is not an objective statistic but more of a feeling or attitude. Because customer satisfaction is subjective, it is hard to measure. There are so many facets to a customer's experience with a product or service that need to be measured individually to get an accurate total picture of customer satisfaction. Whether or not a customer is satisfied cannot be classified as a yes or no answer. Errors can occur when customer satisfaction is simplified too much. The Teboul model, for instance, describes customer satisfaction as the degree to which the customer's experience of a service or product matches her expectations. Using this model, a customer's satisfaction level would be the same if the experience were ordinary in the context of low expectations, or if the experience were superior in the context of high expectations. Customer satisfaction's focus is creating superior experiences, not mediocre (ordinary) experiences.

Since customer satisfaction is hard to measure, the measurement often is not precise. As with most attitudes, there is variability among people, and often within the same person at different times. Often, due to the difficulty of measuring feelings, customer satisfaction strategies are developed around clearly stated, logical customer feedback, and the emotional issues of a purchase are disregarded. This can be a costly mistake.

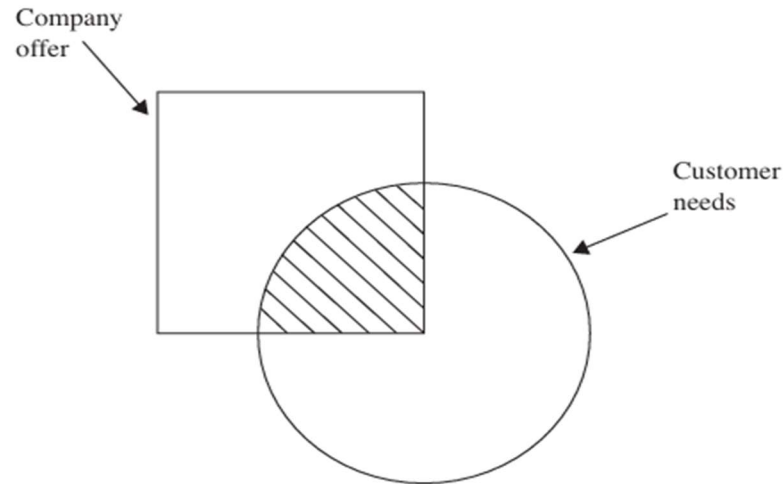


Figure: Customer Satisfaction Model

Customer satisfaction should not be viewed in a vacuum. For example, a customer may be satisfied with a product or service and therefore rate the product or service highly in a survey, and yet that same customer may buy another product or service. It is of little benefit to understand a customer's views about a product or service if the customer's views about competitors' products or services are not understood. The value customers place on one product compared to another may be a better indicator of customer loyalty. Customer loyalty can be sustained only by maintaining a favorable position when compared with competitors. As mentioned before customer satisfaction is not a simple concept to understand or to measure.

Lesson 3: Customer Feedback

After completion of this lesson you will be able to –

- *Recognize the necessity of customer feedback.*
- *Analyze the methods of obtaining customer feedback.*

NECESSITY OF CUSTOMER FEEDBACK

Customer feedback must be continually solicited and monitored. Customers continually change. They change their minds, their expectations, and their suppliers. Customer feedback is not a one-time effort; it is an ongoing and active probing of the customers' minds. Feedback enables the organization to:

- Discover customer dissatisfaction.
- Discover relative priorities of quality.
- Compare performance with the competition.
- Identify customers' needs.
- Determine opportunities for improvement.

METHODS OF OBTAINING CUSTOMER FEEDBACK / WAYS OF LISTENING VOICE OF CUSTOMERS

Listening to the voice of the customer can be accomplished by numerous information-collecting tools. The principal ones are comment cards, questionnaires, focus groups, toll-free telephone lines, customer visits, report cards, the Internet, employee feedback, mass customization and the American Customer Satisfaction Index.

A) Comment Card

A low-cost method of obtaining feedback from customers involves a comment card, which can be attached to the warranty card and included with the product at the time of purchase. The intent of the card is to get simple information, such as name, address, age, occupation, and what influenced the customer's decision to buy the product. Generally, people respond only if something very good or very bad has happened. Comment cards are also used in the hospitality industry. Restaurants and hotels provide them at the ends of tables and in hotel rooms. They can even be found on the bottom of restaurant sales receipts. Often, free meals or hotel stays are provided to rectify a poor experience noted on a comment card. Free meals and hotel stays can generate significant customer loyalty, provided the organization also fixes the problem.

B) Customer Questionnaire

A customer questionnaire is a popular tool for obtaining opinions and perceptions about an organization and its products and services. However, questionnaires can be costly and time-consuming. Surveys may be administered by mail or telephone. In the form of questionnaires, the customer is asked to furnish answers relating to the quality of products

and services. Most surveys ask the customer to grade the question on a one-to-five scale or a one-to-ten scale, where the highest number typically has a description like “highly satisfied.” One of the reasons the one-to-five or one-to-ten scale is used, because it easily produces a metric. The sample of customer survey format is given below:

Customer Satisfaction Survey

Patient Information				
Name			Date of Visit	
Service or Treatment Received				
Survey Questions				
1. How satisfied were you with your overall experience at our healthcare practice?				
<input type="checkbox"/> Very Satisfied	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Neutral	<input type="checkbox"/> Dissatisfied	<input type="checkbox"/> Very Dissatisfied
2. How would you rate the quality of care you received?				
<input type="checkbox"/> Very Satisfied	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Neutral	<input type="checkbox"/> Dissatisfied	<input type="checkbox"/> Very Dissatisfied
3. How satisfied were you with the interactions you had with our staff (including doctors, nurses, and administrative staff)?				
<input type="checkbox"/> Very Satisfied	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Neutral	<input type="checkbox"/> Dissatisfied	<input type="checkbox"/> Very Dissatisfied
4. How do you feel about the wait time for your appointment?				
<input type="checkbox"/> Very Satisfied	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Neutral	<input type="checkbox"/> Dissatisfied	<input type="checkbox"/> Very Dissatisfied
5. How well did our staff explain your treatment and answer your questions?				
<input type="checkbox"/> Very Satisfied	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Neutral	<input type="checkbox"/> Dissatisfied	<input type="checkbox"/> Very Dissatisfied
6. How would you rate the cleanliness and comfort of our facility?				
<input type="checkbox"/> Very Satisfied	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Neutral	<input type="checkbox"/> Dissatisfied	<input type="checkbox"/> Very Dissatisfied

Figure: Sample of Customer Satisfaction Survey

But it does not tell the surveyor how important trash removal is relative to other qualities, nor does it tell the surveyor what the spouse wants or expects. Although the most detailed and most useful information may come from a mail survey, the results are usually not

representative of a normal population. This result occurs because the only people who will take the time to fill out a survey are those who feel very strongly about a subject and, therefore, tend to be biased. To further enhance a mail survey, the survey may be followed up with a phone call to non-responders.

To make surveys more useful, it is best to remember eight points.

1. Clients and customers are not the same.
2. Surveys raise customers' expectations.
3. How you ask a question will determine how the question is answered.
4. The more specific the question, the better the answer.
5. You have only one chance and only 15 minutes.
6. The more time you spend in survey development, the less time you will spend in data analysis and interpretation.
7. Who you ask is as important as what you ask.
8. Before the data are collected, you should know how you want to analyze and use the data.

Clients are the people for whom you are doing the survey, and customers are the ones who use the product or service. The customers must be surveyed to provide information for the clients to take action. It is important to note that customer satisfaction surveys are different from traditional public-opinion polls. For instance, public-opinion polls are based on respondent anonymity, whereas customers don't necessarily want to remain anonymous. Customer satisfaction surveys need to be sensitive to the management of customer relationships, which is not necessary when doing traditional public-opinion polls. "Customer satisfaction survey respondents are more than survey participants, they are cherished customers of an organization. Their relationship with the organization should be strengthened as a result of the survey.

C) Focus Groups

Customer focus groups are a popular way to obtain feedback, but they too can be very expensive. These groups are very effective for gathering information on customer expectations and requirements.

Surveying a focus group is a research method used to find out what customers are really thinking. A group of customers is assembled in a meeting room to answer a series of questions. These carefully structured questions are asked by a skilled moderator, who probes into the participants' thoughts, ideas, perceptions, or comments. The moderator has a clear understanding of the type of information wanted and a plan for obtaining it.

Meetings are designed to focus on current, proposed, and future products and services. The people selected to participate have the same profile as the customers that the organization is trying to attract. As an incentive to participate, these people are reimbursed for their time. Focus groups are sometimes used with an organization's employees to examine internal issues. Imprint analysis is an emerging technique used in focus groups. This is a good way

to obtain the intrinsic feelings associated with a product or service. Feelings are not as easily obtained from customer questionnaires, because customers often hold back information on surveys. Word association, discussions, and relaxation techniques can identify a customer's emerging needs, even if the participants are unable to directly articulate those needs.

D) Toll-Free Telephone Numbers

Toll-free telephone numbers are an effective technique for receiving complaint feedback. Organizations can respond faster and more cheaply to the complaint. Such a number does not, however, reach those who decided not to buy the product or those who discovered some likable feature on a competitor's product.

Implementation of toll-free numbers has increased tremendously in India and many other developing countries. Nowadays, mobile networks are extensively used for marketing purposes and mass communication.

E) Visits to Customer

Visits to a customer's place of business provide another way to gather information. An organization can proactively monitor its product's performance while it is in use and thereby identify any specific or recurring problems. Senior managers should be involved in these visits and not delegate them to someone else. However, it is a good idea to take along operating personnel so they can see firsthand how the product is performing.

The organization should also continually keep informed about new developments in the customer's industry by reading their journals and attending their conferences. Brainstorming sessions with the customers about future products and services should be held at least annually.

F) Report Card

Another very effective information-gathering tool is the report card. Figure 3-6 shows a typical one. It is usually sent to each customer on a quarterly basis. The data are analyzed to determine areas for improvement. For instance, the University of California in San Diego uses a report card to grade the quality of campus business services, such as the payroll department and the bookstore.

QUARTERLY REPORT CARD

To our Customers:

We are continually striving to improve. To assist us in this endeavor, we need your feedback. Would you please grade our performance in each category? The grading scale is

A = Excellent
 B = Very Good
 C = Average
 D = Poor
 F = Failing

I. PRODUCT QUALITY Grade _____
 Comments: _____

II. ON-TIME DELIVERY Grade _____
 Comments: _____

III. SERVICE Grade _____
 Comments: _____

IV. OVERALL Grade _____
 Comments: _____

Signed _____ Date _____
 Title _____ Organization _____

Figure: Sample Report Card

G) The Internet and Computers

Some managers are beginning to monitor discussions that take place on the Internet to find out what customers are saying about their products. Internet users frequently seek advice regarding their everyday activities or activities related to specific interests, hobbies, or sports. Newsgroups, electronic bulletin boards, and mailing lists can be scanned using keyword searches if one knows that a company’s product is of interest to participants in certain activities, hobbies, or professions. Ideally, messages that compare a company’s products with those of its competitors can be uncovered. In the newsgroups it is best to read the views and discussions of others and not intervene in the discussion with the organization’s perspective on the product or service. Monitoring Internet conversations is timely, the cost is minimal, and it can be a source of creative ideas. One of the drawbacks of monitoring Internet conversations, however, is that the conversations can be unfocused.

There are even internet sites that take consumer complaints and compliments about businesses and gives organizations grades based on their ratio of complaints to compliments. Planetfeedback.com also sends letters to companies on behalf of consumers. The organization's web page also provides an easy way for customers to e-mail the company with their thoughts on the organization's products and services.

H) Employee Feedback

Employees are often an untapped source of information. Companies are listening more to the external customer but still are not listening to employees. Employees can offer insight into conditions that inhibit service quality in the organization. Employee groups can brainstorm ideas to come up with solutions to problems that customers have identified.

Although customer research reveals what is happening, employee research reveals why it is happening. Employee feedback should be proactively solicited, instead of checking the wooden suggestion box once a year. When staff members cannot get what they need or have low morale, then they cannot provide good service. Management should share the survey results with employees and uses the findings to make substantial changes.

D) Mass Customization

The ultimate in customer satisfaction is giving customers exactly what they want. Mass customization is a direct result of advances made in manufacturing, such as flexible manufacturing technologies, just-in-time systems, and cycle time reduction. It has been done in the car industry for years. Customers determine what type of seat coverings, color, and stereo system they want. Mass customization is now being used in many other industries. For instance, Levi Strauss customers are measured for jeans, choose the fabric, and choose the pattern at a local store. The custom fit jeans are then manufactured to order at a central factory and sent to the local store. Modular (segmental / integrated) furniture is a customized product at the delivery stage. Different customers can adapt modular furniture to meet their changing needs long after the initial purchase.

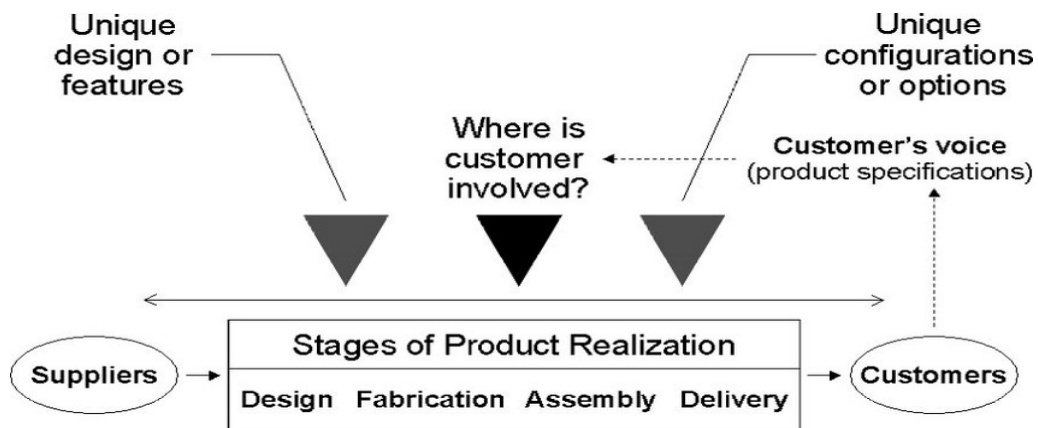


Figure: Point of Customer Involvement

The figure above reveals the voice of the customer or involvement of the customer in the production process. The voice of the customer can be captured in mass-customized products by using the hard data on what the customer bought instead of what the customer was thinking about buying. The customer satisfaction information obtained from mass customization can be used to provide more standardized products. The voice of the purchasing customer, however, provides no information about the non-purchasing customer.

Lesson 4: Handling Customer Complaints & Customer Retention

After completion of this lesson you will be able to –

- *Identify and solve the customer complaints.*
- *Analyze the customer service quality.*
- *Develop the ways to fulfill customer requirements / analyse the Kano model.*
- *Create a mechanism of customer retention.*

HANDLING / USING CUSTOMER COMPLAINTS

By taking a positive approach, complaints can be seen as an opportunity to obtain information and provide a positive service to the customer. In reality, the customer is giving the organization a second chance. Some actions organizations can take to handle complaints are as follows:

- Investigate customers' experiences by actively soliciting feedback, both positive and negative, and then acting on it promptly.
- Develop procedures for complaint resolution that include empowering front-line personnel.
- Analyze complaints, but understand that complaints do not always fit into neat categories.
- Work to identify process and material variations and then eliminate the root cause. "More inspection" is not a corrective action.
- When a survey response is received, a senior manager should contact the customer and strive to resolve the concern.
- Establish customer satisfaction measures and constantly monitor them.
- Communicate complaint information, as well as the results of all investigations and solutions, to all people in the organization.
- Provide a monthly complaint report to the quality council for their evaluation and, if needed, the assignment of process improvement teams.
- Identify customers' expectations beforehand rather than afterward through complaint analysis.

Ninety percent of all customer contact comes through an organization's front-line employees. A petty complaint voiced to a front-line employee often becomes a major complaint when it gets to the management level.

An organization can save both customer satisfaction, and money by training front-line employees to solve problems directly with customers. Customers want problems solved quickly and efficiently; therefore, employees should know how to handle a wide range of situations that arise in the customer relationship. Customer focus and listening skills are not easily learned. Training becomes a top management priority, because front-line employees must have the skills to encourage customers to discuss their complaints and deal with them. Recognition and reward should be linked to service quality performance and

the ability to satisfy customers. Front-line employees should have the responsibility and authority to provide the services necessary to satisfy the customer.

Studies have shown that the better the service at the point of sale, the fewer the complaints and the greater the sales volume. Employees who are dissatisfied with their organization are as noticeable as dissatisfied customers. It's just as important to focus on employee satisfaction as on customer satisfaction. A measurement system is necessary to evaluate the improvement in customer satisfaction.

ELEMENTS OF CUSTOMER SERVICE QUALITY

Strategies that have produced significant results in production are often harder to implement in a service environment. Thanks to the teachings of Deming, Juran, and others, significant strides have been made in manufacturing. The same results have been slower in service organizations or service activities in manufacturing. Customer service is the set of activities an organization uses to win and retain customer satisfaction. It can be provided before, during, or after the sale of the product or may exist on its own. **Elements of customer service from different perspectives are:**

Organization

1. Identify each market segment.
2. Write down the requirements.
3. Communicate the requirements.
4. Organize processes.
5. Organize physical spaces.

Customer Care

6. Meet the customer's expectations.
7. Get the customer's point of view.
8. Deliver what is promised.
9. Make the customer feel valued.
10. Respond to all complaints.
11. Over-respond to the customer.
12. Provide a clean and comfortable customer reception area.

Communication

13. Optimize the trade-off between time and personal attention.
14. Minimize the number of contact points.
15. Provide pleasant, knowledgeable, and enthusiastic employees.
16. Write documents in customer-friendly language.

Front-line people

17. Hire people who like people.
18. Challenge them to develop better methods.
19. Give them the authority to solve problems.
20. Serve them as internal customers.
21. Be sure they are adequately trained.
22. Recognize and reward performance.

Leadership

23. Lead by example.
24. Listen to the front-line people.
25. Strive for continuous process improvement.

Some of the industries that have been growing rapidly include mobile communication, software, hotels, insurance, call centers, healthcare and retail. The importance of service sector has therefore, increased significantly in the Bangladesh.

KANO MODEL OF CUSTOMER REQUIREMENTS / TRANSLATING NEEDS INTO REQUIREMENTS

The Kano Model is a framework by Noriaki Kano that classifies product/service features based on how they affect customer satisfaction, moving beyond a simple "more is better" approach. It categorizes features into five types: Must-be, Performance, Attractive (delighters), Indifferent, and Reverse; helping companies prioritize development by identifying essential, performance-driven, and innovative features that create satisfaction and loyalty. The Kano model conceptualizes customer requirements. The model represents three major areas of customer satisfaction.

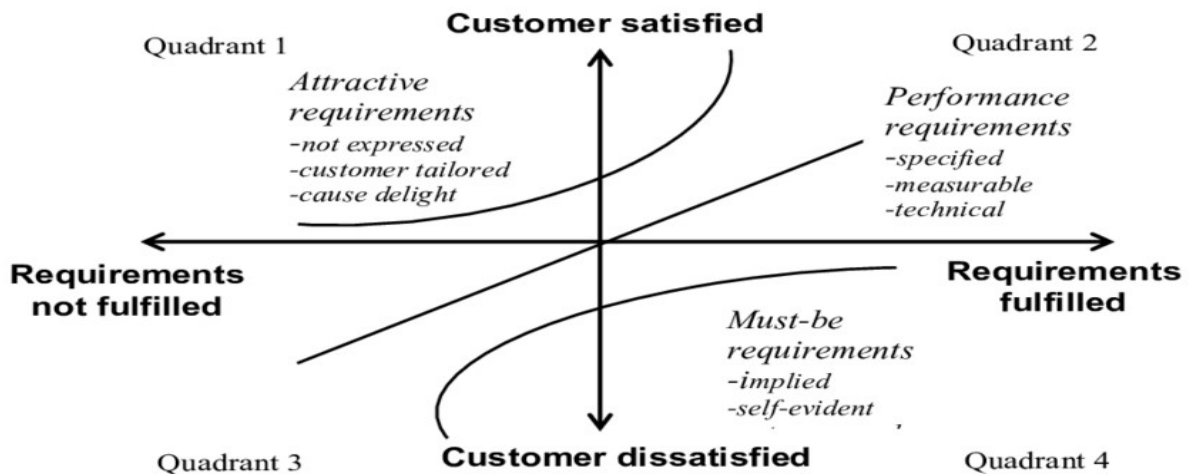


Figure: Kano Model

The first area of customer satisfaction, represented by the diagonal line, represents explicit requirements. These include written or verbal requirements and are easily identified, expected to be met, and typically performance related. Satisfying the customer would be relatively simple if these were the only requirements.

The second area of customer satisfaction represents innovations, as shown by the curved line in the upper left corner of the figure. A customer's written instructions are often purposefully vague to avoid stifling new ideas during conceptualization and product definition. Because they are unexpected, these creative ideas often excite and delight the customer. These ideas quickly become expected.

The third and most significant area of customer satisfaction represents unstated or unspoken requirements, as shown by the curve in the lower right corner of the figure. The customer may indeed be unaware of these requirements, or they may assume that such requirements will be automatically supplied. Basic specifications often fail to take real-world manufacturing requirements into account; many merely are based on industry standards or past practice. These implied requirements are the hardest to define but prove very costly if ignored. They may be rediscovered during an after-the-fact analysis of lessons learned.

Realistically, the customer doesn't buy a specification; the customer buys the product or service to fulfill a need. Peter Drucker once said, "Customers don't buy products, they buy results." People don't buy products; they buy transportation or status. Customers are loyal to whatever best helps them achieve their desired outcome. Just meeting a customer's needs is not enough; the organization must exceed the customer's needs.

CUSTOMER RETENTION

Customer retention is more powerful and effective than customer satisfaction. Customer retention represents the activities that produce the necessary customer satisfaction that creates customer loyalty, which actually improves the bottom line. Customer satisfaction surveys, focus groups, interviews, and observations can help determine what customers think of a service or a product. However, what people say and think is often different from what they do.

Customers may be delighted with the tropical oils and aromas in a high-priced, well-advertised hair-care product but still end up buying the generic equivalent. Therefore, customer satisfaction should also be measured by using the hard measures such as, cash register receipts, market share, the level of customer retention, and the number of referrals from customers. The better companies have established a link between customer satisfaction and the bottom line. The analysis identifies the number of customers and the revenue at risk.

Customer retention moves customer satisfaction to the next level by determining what is truly important to the customers and making sure that the customer satisfaction system

focuses valuable resources on things that really matter to the customer. Customer retention is the connection between customer satisfaction and the bottom line.

Likewise, high employee retention has a significant impact on high customer retention. One way companies can manage customer retention is to pay attention to their present employees and to whom they are hiring.

Discussion Questions:

1. Define customer and describe the different types of customers.
2. Describe the perceptions of customers regarding quality of a product.
3. How is customer satisfaction related with TQM? Explain.
4. Describe the customer satisfaction model.
5. Discuss the necessity of customer feedback.
6. Analyze the methods of obtaining customer feedback.
7. How will you solve the customer complaints?
8. How you can assess the customer service quality?
9. Develop the ways to fulfill customer requirements with a diagram. / Analyze the Kano model of customer requirement.
10. Develop a mechanism of customer retention.

Employee Involvement

4

Unit Highlights

- Lesson – 1: Motivation and Employee Involvement
- Lesson – 2: Empowerment
- Lesson – 3: Team and its Types and Development
- Lesson – 4 & 5: Roles of Team Members, their Problems and Solutions

Technologies Used for Content Delivery

- ❖ BOUTUBE
- ❖ BOU LMS
- ❖ WebTV
- ❖ Web Radio
- ❖ Mobile Technology with MicroSD Card
- ❖ BTV Program
- ❖ Bangladesh Betar Program

Lesson 1: Motivation and Employee Involvement

After completion of this lesson you will be able to –

- *Understand motivation as a way of involving people.*
- *Analyze how Maslow's need theory leads to employee involvement.*
- *Analyze how the Two-Factor theory leads to employee involvement.*
- *Conceptualize the ways of achieving a motivated workforce.*

MOTIVATION AND EMPLOYEE INVOLVEMENT

Employee motivation is a key driver for involving them in the organization. By understanding what motivates employees, organizations can foster a more engaged and productive workforce. This involves both intrinsic motivators like a sense of purpose and enjoyment in the work, and extrinsic motivators like rewards and recognition. When employees feel motivated, they are more likely to be involved, committed, and invest efforts in their work and contribute to the organization's success. How motivation leads to employee involvement are discussed below:

1. **Increased Engagement:** Motivated employees are more likely to be engaged, which means they are emotionally connected to their work and the organization. This connection translates into a willingness to go the extra mile, contribute ideas, and actively participate in workplace activities.
2. **Enhanced Performance:** When employees are motivated, they tend to be more productive and perform at a higher level. They are more likely to set and achieve goals, take initiative, and strive for continuous improvement.
3. **Stronger Commitment:** Motivated employees develop a stronger sense of commitment to the organization's goals and values. They feel more connected to the company's mission and are more likely to stay with the organization for long-term.
4. **Higher Morale:** A motivated workforce experiences higher morale and job satisfaction. This positive work environment can reduce stress, improve teamwork, and create a more enjoyable workplace.
5. **Increased Creativity and Innovation:** When employees feel motivated and valued, they are more likely to share their ideas and contribute to innovation. This can lead to new solutions, improved processes, and a more dynamic organization.
6. **Reduced Turnover:** By fostering motivation and engagement, organizations can reduce employee turnover. When employees feel valued, respected, and motivated, they are less likely to seek employment elsewhere.
7. **Improved Communication:** Motivation can also improve communication within the organization. Motivated employees are more likely to participate in discussions, share their feedback, and communicate openly with their colleagues.

In summary, by creating a work environment that fosters motivation, organizations can effectively involve employees, leading to increased productivity, engagement, and overall success.

MASLOW'S HIERARCHY OF NEEDS

One of the first and most popular motivational theories was developed by Abraham Maslow. He stated that motivation could best be explained in terms of a hierarchy of needs and that there were five levels. These levels are survival, security, social, esteem, and self-actualization. They are shown in the figure below. Once a given level is satisfied, it can no longer motivate a person. The needs are given below:

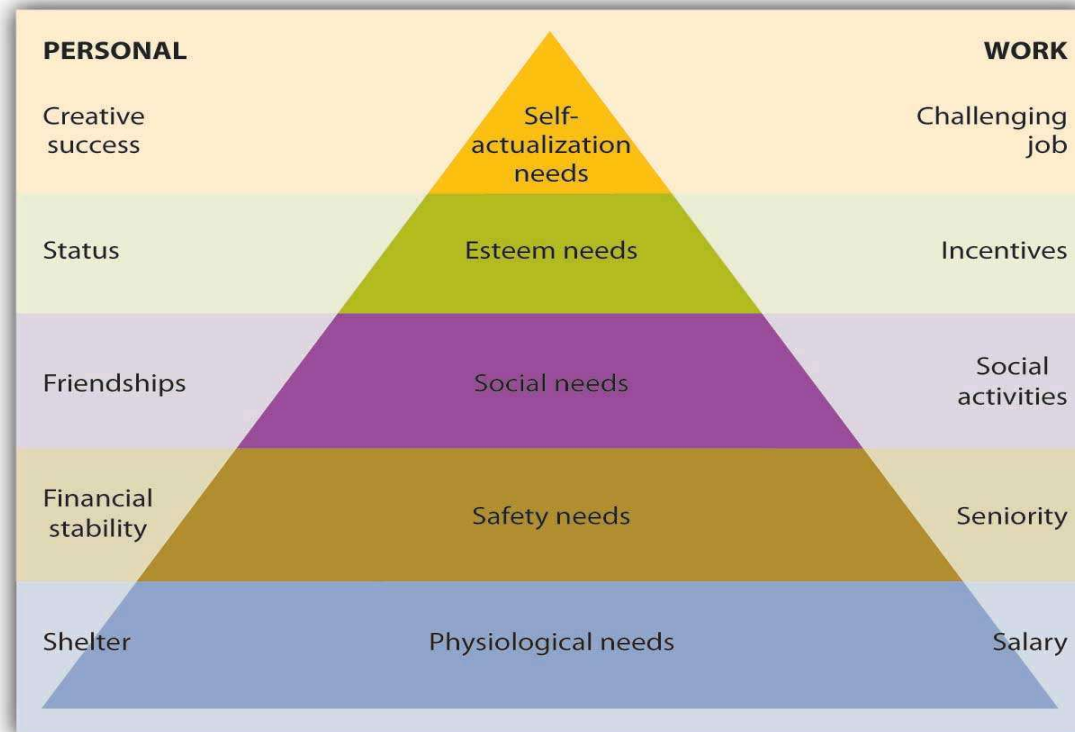


Figure: Hierarchy of Needs

1. **Survival Need (Level 1):** Survival needs includes food, clothing, and shelter, which are usually provided by a job. In the workplace, Level 1 needs include proper lighting, heating/air conditioning, ventilation, phone systems, data/voice access, and computer information systems.
2. **Security Need (Level 2):** Security means a safe place to work and job security, which are very important to employees. When the organization demonstrates an interest in the personal well-being of employees, it is a motivating factor. A threat of losing one's job certainly does not enhance motivation. It is not limited to job security but also includes having privacy on the job, such as being able to lock one's office door or having lockable storage for personal items, as well as having a safe work environment.
3. **Social Need (Level 3):** Since we are social beings, it relates to our need to belong. It has been said that cutting someone out of the group is devastating to that individual.

Isolation is an effective punishment. Conversely, giving an individual the opportunity to be part of the group by feeling important and needed will motivate that person. If possible, employees should be provided with both formal social areas, such as a cafeteria and conference rooms. Being a member of a team is a good way to bring employees into the group.

4. **Esteem Needs (Level 4):** Esteem needs relate to pride and self-worth. Everyone, regardless of position or job assignment, wants to be recognized as a person of value to the organization. Where possible, employees should be given offices or personal spaces with aesthetics. Business cards, workspace size, and office protocols also provide employees with a certain level of self-esteem within an organization. Seeking advice or input into business or production processes is a good way of telling employees that they are valued by the organization. This activity requires giving employees control and freedom of their jobs by providing trust.
5. **Self-actualization Need (Level 5):** Self-actualization says that individuals must be given the opportunity to go as far as their abilities will take them. Many organizations have a policy of promoting from within. It is true that some employees do not want to move up the corporate ladder, which is understandable. However, those who do want to move up must know that it is possible.

HERZBERG'S TWO-FACTOR THEORY

Frederick Herzberg extended the general work of Maslow by using empirical research to develop his theory on employee motivation. This theory identified some factors that are related to the increase and decrease in motivation. On the other hand, some factors are labelled as the dissatisfier or hygiene factors that increase or decrease the level of dissatisfaction.

Herzberg found that people were motivated by recognition, responsibility, achievement, advancement, and the work itself. These factors were labeled motivators. In addition, his research showed that bad feelings were associated with low salary, minimal fringe benefits, poor working conditions, ill-defined organizational policies, and mediocre technical supervision. These job-related factors were labeled dissatisfiers or hygiene factors, which imply they are preventable.

It is important to realize that dissatisfiers are often extrinsic in nature and motivators are intrinsic. The presence of the extrinsic conditions does not necessarily motivate employees; however, their absence results in dissatisfaction among employees. Absence of motivating factors does not make employees dissatisfied, but when the motivating factors are present, they do provide strong levels of motivation that result in good job performance for the individual and the organization. In general, dissatisfiers must be taken care of before motivators can be actuated. Herzberg's dissatisfiers are roughly equivalent to Maslow's lower levels, and the motivators are similar to the upper levels.

ACHIEVING A MOTIVATED WORK FORCE

The building of a motivated workforce is for the most part an indirect process. Managers at all levels cannot cause an employee to become motivated; they must create the environment for individuals to motivate themselves. Concepts to achieve a motivated work force are as follows:

1. ***Know thyself.*** Managers must understand their own motivations, strengths, and weaknesses. This understanding can best be obtained by having peers and employees anonymously appraise the manager's performance. Motivating managers know that the most valuable resource is people and that their success largely depends on employees achieving their goals.
2. ***Know your employees.*** Most people like to talk about themselves; therefore, the motivating manager will ask questions and listen to answers. With knowledge of the employees' interests, the manager can help achieve their goals within the business context. As the manager learns more about the employee, he/she can assist the employee in directing their efforts toward satisfying their goals and well-being. This knowledge will also enable the manager to utilize their strengths.
3. ***Establish a positive attitude.*** A positive action-oriented attitude permeates the work unit. Managers are responsible for generating attitudes that lead to positive actions. Respect and sensitivity toward others are essential to the development of positive attitudes. Asking employees for their opinions concerning job-related problems is an effective way to build a cooperative atmosphere. Managers should treat ideas and suggestions as priceless treasures and implement them whenever possible.
4. ***Share the goals.*** A motivated workforce needs well-defined goals that address both individual and organizational needs.
5. ***Monitor progress.*** The process of goal-setting should include a road map detailing the journey with periodic milestones and individual assignments. Managers should periodically review performance.
6. ***Develop interesting work.*** Managers should consider altering the employees' assignments by means of job rotation, job enlargement, and job enrichment. Job rotation permits employees to switch jobs within a work unit for a prescribed period of time. This activity reduces boredom and provides knowledge of the entire process and the effect of the sub-process. Job enlargement combines tasks horizontally so that the employee performs a number of jobs sequentially. Thus, the employee is responsible for a greater portion of the product or service, which may also lead to process improvement. Job enrichment combines tasks vertically by adding managerial elements such as planning, scheduling, and inspection. This contributes to the

employees' sense of autonomy and control over their work, which may lead to process improvement.

7. ***Communicate effectively.*** Effective communication provides employees with knowledge about their work unit and the organization rather than “grapevine” information.
8. ***Celebrate success.*** Recognizing employee achievements is the most powerful tool in the manager's toolbox.

These eight concepts can be used at all managerial levels of the organization in developing a motivated workforce.

Lesson 2: Empowerment

After completion of this lesson you will be able to –

- *Define empowerment.*
- *Analyze the conditions that create an empowered environment.*
- *Analyze the components of empowerment.*
- *Describe the types or levels of empowerment.*

CONCEPT OF EMPOWERMENT

The dictionary definition of empowerment is to invest people with authority. Its purpose is to tap the enormous reservoir of potential contribution that lies within every worker. An operational definition follows: Empowerment is an environment in which people have the ability, the confidence, and the commitment to take responsibility and ownership to improve the process and initiate the necessary steps to satisfy customer requirements within well-defined boundaries in order to achieve organizational values and goals.

The Manufacturers' Alliance for Productivity and Innovation stated that "organizations that empower employees as part of their total management effort are twice as likely as other firms to report significant product or service improvement."

Employee empowerment requires that the individual is held responsible for accomplishing a whole task. The employee becomes the process owner—thus, the individual is not only responsible but also accountable. Job enrichment is aimed at expanding the content of an individual's job, whereas empowerment focuses on expanding the context of the job such as its interactions and interdependencies with other functions of the organization.

Empowerment is the process of gaining confidence, strength, and control over one's own life and decisions, leading to greater self-determination and the capacity to achieve desired outcomes. It involves having the necessary resources, authority, skills, and information to act effectively and make meaningful choices, fostering a sense of competence and impact. Empowerment can happen at individual, community, and organizational levels, and it is a fundamental aspect of personal growth and effective support.

CONDITIONS FOR CREATING AN EMPOWERED ENVIRONMENT

There are three conditions for creating an empowered environment. These are:

1. Everyone must understand the need for change although people are frightened about change. The effective communication of why the organization needs to change is critical to success. In addition, people need to understand the role they will play in the change process. Senior management must understand that people change for their own reasons, not for reasons of the organization. People who are older, well educated, highly skilled, and experienced are more likely to accept increased demands and expectations associated with empowerment. In addition, one's perceived internal control (locus of

- control) contributes to whether an employee is receptive to an empowered environment, or not.
2. The system needs to change to the new paradigm. The system needs to change to reinforce and motivate individual and group accomplishments. Individuals and groups must understand that freedom to act and (sometimes to fail) is not only OK but is encouraged. Other contextual factors need to be considered if empowerment is to be successful, such as the role of unions and the type of industry (service or manufacturing). If the union environment is not willing to engage employees in an empowerment culture, success will be difficult.
 3. The organization must enable its employees. Enablement means providing information, education, and skill. To ask people to change work habits without providing them with the tools for change only increases resistance to the change process. Additional factors that should be considered before determining if the organization can enable its employees are strategy and technology. Companies that have a business strategy and technology focus on customization are more likely to embrace empowerment compared to companies whose strategy is that of low-cost and high volume.

KEY COMPONENTS OF EMPOWERMENT

The concept of empowerment comprises several interacting components, which can be observed across different contexts:

1. **Self-efficacy:** A person's belief in their own capability to perform tasks and influence their circumstances. When individuals feel they can change their lives, they are more likely to take action.
2. **Critical consciousness:** An understanding of the social, economic, and political realities that affect one's life. This awareness helps individuals see that their struggles are not merely personal but are connected to broader systemic issues.
3. **Skill and competence:** The acquisition of knowledge, abilities, and resources necessary to make informed decisions and solve problems effectively.
4. **Agency and autonomy:** A sense of choice in initiating and regulating one's own actions, giving individuals freedom to make decisions and take responsibility for their work.
5. **Impact:** The degree to which a person can influence strategic, administrative, or operational outcomes within their environment, whether it's at work or in the community.

TYPES AND LEVELS OF EMPOWERMENT

Empowerment can be discussed and implemented across various domains and levels of society:

1. **Personal empowerment:** Focuses on strengthening an individual's self-confidence, self-esteem, and sense of personal agency to shape their own life.
2. **Organizational empowerment:** A management approach that delegates greater discretion and resources to employees, enabling them to take initiative and make decisions. This relies on fostering a culture of trust and providing opportunities for professional growth.
3. **Social empowerment:** The process of building the capacity and confidence of individuals and marginalized groups to influence social structures and create positive change in their communities. This often involves collective action to address systemic barriers like discrimination and prejudice.
4. **Political empowerment:** Aims to increase the participation and influence of individuals or groups in political processes and decision-making. This includes promoting civic engagement and advocating for policy changes that benefit their communities.
5. **Economic empowerment:** Involves providing individuals and communities with access to resources, skills, and opportunities to achieve financial independence and improve their economic well-being.
6. **Legal empowerment:** Uses legal tools, systems, and justice mechanisms to enable marginalized people to understand and exercise their rights and transform their social or economic situations.

Lesson 3: Team and its Types and Development

After completion of this lesson you will be able to –

- *Define team*
- *Explain the types of teams.*
- *Analyze the characteristics of team members who will ensure quality.*
- *Form a team by following the necessary stages.*

DEFINITION OF TEAM

A team is defined as a group of people working together to achieve common objectives or goals. Teamwork is the cumulative actions of the team during which each member of the team subordinates his individual interests and opinions to fulfill the objectives or goals of the organization. The objective or goal is a need to accomplish something such as to solve a problem, to improve a process, to design a refrigerator, to plan a conference, to audit a process, or to please a customer.

A team is a group of interdependent individuals who combine their complementary skills and efforts to achieve a common goal, sharing responsibility and creating synergy that surpasses individual capabilities. Key aspects include a shared purpose, collective goals, trust, open communication, and collective accountability for outcomes. Unlike a mere workgroup, a team fosters interdependence and coordinated effort to achieve more through cooperation.

Members of the team will need to focus on how they relate to each other, listen to the suggestions of others, build on previous information, and use conflict creatively. They will need to set standards, maintain discipline, build team spirit, and motivate each other. Each member of the team has their own history of experience to help achieve the objective. They should have a need to see the task completed, but also the need of companionship, fulfillment of personal growth, and self-respect.

TYPES OF TEAMS

The early history suggests that work simplification efforts by management and labor were most likely the first production-oriented teams. However, the development of quality control circles by the Japanese in 1961 is considered to be the beginning of the use of teams to improve quality. Quality control circles are groups of people from one work unit who voluntarily meet together on a regular basis to identify, analyze, and solve quality related and other problems within their area. The current types of teams can be divided into four main groups. They may be called by different names and have slightly different characteristics to accommodate a particular organization.

1. **Process improvement team:** The members of a process improvement team represent each operation of the process or sub-process. Usually the scope of the team's activity is limited to the work unit. A team of about six to ten members will come from the

- work unit and, depending on the location of the sub-process, an external or internal supplier and external or internal customer would be included on the team. During the course of the team's life, additional expertise from other work areas may be added on a permanent or temporary as-needed basis. The life cycle of this type of team is usually temporary—it is disbanded when the objective has been obtained.
2. **Cross-functional team:** A team of about six to ten members will represent a number of different functional areas such as engineering, marketing, accounting, production, quality, and human resources. It may also include the customer and supplier. A design review team is a good example of a cross-functional team. This type of team is usually temporary. An exception would be a product support team, which would be permanent and have as an objective to serve a particular product line, service activity, or a particular customer.
 3. **Natural work teams:** This type of team is not voluntary—it is composed of all the members of the work unit. It differs from quality control circles because a manager is part of the team and the projects to be improved are selected by management. Some employees may opt not to work in teams for a variety of reasons, and managers should anticipate this action and be prepared to help employees become comfortable in the team environment or, alternatively, find work in another unit that still performs work as individuals.
 4. **Self-directed/self-managed work teams:** They are an extension of natural work teams without the supervisor. Thus, they are the epitome of the empowered organization—they not only do the work but also manage it. There is wide discretion to organize their work subject to organizational work flow requirements. There is a team coordinator to liaise with senior management that may rotate among members. The team meets daily to plan their activities, and decisions are usually made by consensus. Additional responsibilities may include: hiring/dismissal, performance evaluation, customer relations, supplier relations, recognition/reward, and training. The team must have access to business information in order to plan, control, and improve their processes.

CHARACTERISTICS OF SUCCESSFUL TEAMS

In order for a team to be effective, it should have certain characteristics, listed below.

1. **Sponsor:** In order to have effective liaison with the quality council, there should be a sponsor. Preferably the sponsor is a member of the quality council, thereby providing organizational support.
2. **Team charter:** A team charter is a document that defines the team's mission, boundaries, the background of the problem, the team's authority and duties, and resources. It also identifies the members and their assigned roles—leader, recorder, timekeeper, and facilitator (optional).

3. **Team composition:** The size of the team should rarely exceed ten people except in the case of natural work teams or self-directed teams. Larger teams have difficulty maintaining commitment, and interpersonal aspects become difficult to control. Teams should be diverse by having members with different skills, perspectives, and potential. Where appropriate, internal and external customers and suppliers should be included.
4. **Training:** As the need arises, members should be trained in problem-solving techniques, team dynamics, and communication skills.
5. **Ground rules:** The team must develop its rules of operations and conduct. There should be open discussion on what will and will not be tolerated. Periodically, the ground rules should be reviewed and revised when appropriate.
6. **Clear objectives:** Without clear objectives and goals, the team will have difficulty. In addition, the criteria for success should be agreed on with management.
7. **Accountability:** The team is accountable to perform specific goals. Periodic status reports should be given to the quality council. In addition, the team should review its performance to determine possible team process weaknesses and make improvements.
8. **Well-defined decision procedures:** Effective, acceptable, and timely decisions have to be made by the team.
9. **Resources:** Resources include not only funding and employee release time for the project important, but also access to information. The team cannot be expected to perform successfully without the necessary tools and logistic supports.
10. **Trust:** Management must trust the team to perform the task effectively. There must also be trust among the members and a belief in each other.
11. **Effective problem solving:** The Team can make effective decisions in solving the problems that arises in the organization.
12. **Open communication:** Members actively listen, without interruption, to other members, speak with clarity and directness, ask questions, and say what they mean.
13. **Appropriate leadership:** All teams need leadership—whether imposed by the quality council, or whether someone emerges as a leader figure as the life of the team progresses, or whether the leadership changes as the team matures.
14. **Balanced participation:** All members must become involved in the team's activities by voicing their opinions, lending their knowledge, and encouraging other members to take part.
15. **Cohesiveness:** Members should be comfortable working with each other and act as a single unit, not as individuals or sub-groups.

STAGES OF TEAM DEVELOPMENT

Organizations can dramatically improve team performance by understanding and recognizing the stages in the life cycle of teams. Knowing a team's location in the life cycle helps management understand team performance and avoid setting unrealistic objectives that limit a team's success. Bruce Tuckerman identified four stages to a team's development. These stages are forming, storming, norming, and performing.

1. **Forming stage:** Forming is the beginning stage where members become aware of the boundaries of acceptable behavior. Members are often not familiar with each other's skills, and each prefers to do the work on their own as there is a lack of trust. Members are cautious with their communication and tend to be formal. In general, the mission and goals of the team are still questionable, and the problems seem too large to solve. It is a stage of transition from individual to member status and of testing the leader's guidance. In chartering a team, a facilitator commonly meets with the upper management to discuss the specific problem; he/she then develops a macro flowchart of the major processes associated with the product, service or process. From this information, the facilitator can better determine the team members that should be selected based on their skills and knowledge. The facilitator can then have the team meet to evaluate the problem posed by management, determine the type of training team members may need, and identify the appropriate team leader.
2. **Storming stage:** Storming is the most difficult stage as members start to realize the amount of work that lies ahead. There is a tendency to panic. Members rely almost solely on their personal and professional experience and resist working with other team members. There is a great deal of conflict, and the leader needs to be patient and flexible in working with the team. However, not all conflict is bad. If a team does not have any conflict, chances of the level of organizational performance is low. Such teams adapt slowly to change, show apathy, or are stagnant. On the other hand, when conflict becomes disruptive, interferes with activities and makes coordination difficult, the team is dysfunctional. Team leaders and facilitators need to know how to manage team conflict so that it is productive and not destructive.

Below are tips to help team members handle conflict.

- Ask those who disagree to paraphrase one another's comments. This may help them learn if they really understand one another.
- Work out a compromise. Agree on the underlying source of conflict, engage in a give and take, and finally agree on a solution.
- Ask each member to list what the other side should do. Exchange lists, select compromises all are willing to accept, and test the compromise to see if it meshes with team goals.

- Have the sides each write ten questions for their “opponents.” This will allow them to signal their major concerns about the other side’s position. The answers often lead to compromise.
- Convince team members they sometimes may have to admit they are wrong. Help them save face by convincing them that changing a position shows strength.
- Respect the experts on the team. Give their opinions more weight when the conflict involves their expertise, but don’t rule out conflicting opinions.

If managed properly, functional conflict leads to positive movement toward goals, innovation and creativity, and solutions to problems.

3. **Norming stage:** Norming is the stage where members begin to work together. Emotional conflict is reduced as cooperation, cohesion, and constructive criticism start to become the normal behavior. Because there is more time and energy to focus on the objectives, significant progress begins to occur.
4. **Performing stage:** Performing is the stage where the team members have settled their relationships and expectations. They better understand the project and begin performing by diagnosing and solving problems and choosing and implementing changes. Members understand their roles and work in concert to achieve their objective(s) effectively and efficiently.
5. **Adjourning stage:** Adjourning is a stage that is reserved for temporary teams. The team needs to evaluate its performance and determine lessons learned. This information can be transferred by members when they participate on future teams. There also needs to be a celebration to recognize the team’s contribution to the organization. As a result of proper training and effective leadership, some teams arrive at the performing stage so quickly that it may be difficult for an organization to observe the first three stages.

Lesson 4 & 5: Roles of Team Members, their Problems and Solutions

After completion of this lesson you will be able to –

- *Analyze the roles of a team member.*
- *Identify the group problems and to formulate the solutions.*
- *Find out the barriers to team progress.*
- *Stimulate and encourage the ways of team progress.*

TEAM MEMBER ROLES

Teams are usually selected or authorized by the quality council. A team will consist of a team leader, facilitator, recorder, timekeeper, and members. All team members have clearly defined roles and responsibilities.

The team leader, who is selected by the quality council, sponsor, or by the team itself, has the following roles:

- Ensures the smooth and effective operation of the team, handling and assigning record keeping, orchestrating activities, and overseeing the preparation of reports and presentations.
- Facilitates the team process, ensures that all members participate during the meetings, prevents other members from dominating, actively participating when appropriate, guides without domineering, and uses positive interpersonal behavior.
- Serves as a contact point between the team and the sponsor or the quality council.
- Orchestrates the implementation of the changes recommended by the team within organizational constraints and team boundaries.
- Monitors the status and accomplishments of members, assuring timely completion of assignments.
- Prepares the meeting agenda, including time, date, and location; sticks to the agenda or modifies it where appropriate; and ensures the necessary resources are available for the meeting.
- Ensures that team decisions are made by consensus where appropriate, rather than by unilateral, handclasp, majority-rule, or minority-rule decision.

The facilitator is not a member of the team; he/she is a neutral assistant and may not be needed with a mature team. This person does not get involved in the meeting content or evaluation of the team's ideas. The facilitator's roles are as follows:

- Supports the leader in facilitating the team during the initial stages of the team.
- Focuses on the team process; is concerned more with how decisions are made rather than the decision itself.
- Acts as a resource to the team by intervening when necessary to keep the team on track.
- Does not perform activities that the team can do.
- Provides feedback to the team concerning the effectiveness of the team process.

The team recorder, who is selected by the leader or by the team and may be rotated on a periodic basis, has the following roles:

- Documents the main ideas of the team's discussion, the issues raised, decisions made, action items, and future agenda items.
- Presents the documents for the team to review during the meeting and distributes them as minutes after the meeting in a timely manner.
- Participates as a team member.

The timekeeper, who is selected by the leader or by the team and may be rotated on a periodic basis, has the following roles:

- Monitors the time to ensure that the team maintains the schedule as determined by the agenda.
- Participates as a team member.

The team member, who is selected by the leader, sponsor, or quality council or is a member of a natural work team, has the following responsibilities:

- Contributes best, without reservation, by actively participating in meetings and sharing knowledge, expertise, ideas, and information.
- Respects other people's contributions—doesn't criticize, complain, or condemn.
- Listens carefully and asks questions.
- Is enthusiastic—it's contagious and helps galvanize the entire team.
- Works for consensus on decisions and is prepared to negotiate important points.
- Supports the decisions of the team—badmouthing a decision or a member reduces the effectiveness of the team.
- Trusts, supports, and has genuine concern for other team members.
- Understands and is committed to team objectives.
- Respects and is tolerant of individual differences.
- Encourages feedback on own behavior.
- Acknowledges and works through conflict openly.
- Carries out assignments between meetings such as collecting data, observing processes, charting data, and writing reports.
- Gives honest, sincere appreciation.

TEN COMMON GROUP/GROUP MEMBER'S PROBLEMS AND THEIR SOLUTION

One way to deal with group problems is to talk about them as soon as they occur. Most problems require a more structured approach. Common team problems and their solutions are given below.

1. Floundering occurs when the team has trouble starting or ending a project or different stages of the project. Solutions to this state are to look critically at the improvement

plan, review the mission statement, determine the cause of the holdup, and having each member write down reasons and discuss them at the next meeting.

2. Overbearing participants have an unusual amount of influence in the team. They usually have a position of authority or a particular expertise. Teams need these abilities; however, it becomes detrimental when they discourage discussion on their expertise and discount other members' ideas. Solutions are to reinforce the ground rules, talk to the person off-line and ask for cooperation, and enforce the importance of data and the problem-solving method.
3. Dominating participants like to hear themselves talk, use overlong anecdotes, and dominate the meeting. Members get discouraged and find excuses for missing meetings. Solutions are to structure discussion on key issues for equal participation, talk to the offending person off-line, and have the team agree on the need for limits and a balanced participation. In addition, the leader may act as a gatekeeper by asking questions such as "Gupta, we heard from you; what do the others think?"
4. Reluctant participants feel shy or unsure of themselves and must be encouraged to contribute. Problems develop when there are no built-in activities that encourage introverts to participate and extroverts to listen. In addition to structured activities, solutions include dividing the task into individual assignments and acting as a gatekeeper by asking questions such as, "Sanjeev, what is your experience in this area?"
5. Unquestioned acceptance of opinions as facts occurs when members assert personal beliefs with such confidence that other members think they are facts. Solutions are to request data and to follow the problem solving method.
6. Rush to accomplish is common to teams being pushed by one or more members who are impatient for results. Teams must realize that improvements do not come easily and rarely overnight. Solutions are to remind members that the ground rules call for the problem-solving method or to confront the rusher off-line and explain the effects of impatience.
7. Attribution is the activity of guessing at a person's motives when we disagree or don't understand his or her opinion or behavior. Solutions are to reaffirm the importance of the problem-solving method, question whether this opinion is based on data, and find out the real meaning of the problem.
8. Discounts and "plops" arise when members fail to give credit to another's opinions or no one responds to a statement that "plops." Every member deserves the respect and attention from the team. Solutions are to reinforce active listening as a team behavior, support the discounted member, or talk off-line with members who frequently discount, put down, or ignore.

9. **Wanderlust:** digression and tangents happen when members lose track of the meeting's purpose or want to avoid a sensitive topic. Discussions then wander off in many directions at once. Solutions are to use a written agenda with time estimates, write meeting topics on flip charts, or redirect the conversation back to the agenda.
10. **Feuding team members** can disrupt an entire team with their disagreements. Usually these feuds predate the team and are best dealt with outside the team meetings. Solutions are to get the adversaries to discuss the issues off-line, offer to facilitate the discussion, and encourage them to form some contract about their behavior.

When people work together on a team, some of their energies are expended on “people issues.” Mastery of these “people issues” leads to team success.

COMMON BARRIERS TO TEAM PROGRESS

Evidence shows that the barriers given below are due primarily to the system rather than to the team.

1. **Insufficient training:** Teams cannot be expected to perform unless they are trained in problem-solving techniques, group dynamics, and communication skills.
2. **Incompatible rewards and compensation:** In general, organizations make little effort to reward team performance. Because of a strong focus on individual rewards it is difficult for individuals to buy into the team concept. Similarly, performance appraisals do not accept input from peers or team members.
3. **First-line supervisor resistance:** Supervisors are reluctant to give up power, confident that they can do the work better and faster, are concerned about job security, and are ultimately held responsible.
4. **Lack of planning:** A lack of common direction or alignment on the use of collaborative efforts, internal competition, redundancy, and fragmented work processes all prevent team progress.
5. **Lack of management support:** Management must provide the resources and “buy into” the quality council/sponsor system.
6. **Access to information systems:** Teams need access to organizational information such as business performance, competitive performance, financial data, and so forth.
7. **Lack of union support:** Organizations need union support for the team to be successful.
8. **Project scope too large:** The team and organization are not clear on what is reasonable, or management is abdicating its responsibility to guide the team.
9. **Project objectives are not significant:** Management has not clearly defined what role the team will play in the organization.
10. **No clear measures of success:** The team is not clear about its charter and goals.

11. **No time to do improvement work:** Values and beliefs of the organization are not compatible with the team's work. Individual departmental politics interfere with the team's progress. Management has not given the team proper resources.
12. **Team is too large:** The organization lacks methods for involving people in ways other than team membership.
13. **Trapped in groupthink:** Team members all have a mind-set that no actions are taken until everyone agrees with every decision.

With a knowledge of these barriers, management can evaluate their own performance and take the necessary corrective action to support team progress.

STIMULATING AND ENCOURAGING EMPLOYEE PARTICIPATION

Stimulating and encouraging employee participation starts the creative process. There are five ground rules:

1. Be progressive by regularly asking your employees for suggestions. Merely putting up a suggestion box will not create the necessary motivation.
2. Remove fear by focusing on the process and not on the person. When employees know that punitive actions will not occur, they are more likely to respond.
3. Simplify the process, so it is easy to participate. Stamp out superfluous paperwork, review, and procedures.
4. Respond quickly to suggestions and within a specific period of time. The evaluation process must be simple and effective. The response, in writing, has three possible responses—acceptance, rejection, or referral to a committee for further evaluation. If accepted, a time frame for implementation should be given; if rejected, the reason for the rejection should be stated; and if referred to a committee, the evaluation time should be stated.
5. Reward the idea with published recognition so that everyone knows the value of the contribution. Individual ideas are a vast untapped resource. The five-step approach helps to create an environment that opens communication between employees and managers. Idea generation is a skill that requires practice. It supplements the team process.

Discussion Questions:

1. Define motivation as a way of involving people.
2. Analyze how Maslow's need theory leads to employee involvement.
3. Analyze how the Two-Factor Theory leads to employee involvement.
4. Describe the ways of achieving a motivated workforce.
5. Define empowerment.
6. Which conditions create an empowered environment? Explain.
7. Discuss the components of empowerment.
8. Describe the types or levels of empowerment.
9. Define team.
10. Explain the types of teams.
11. Analyze the characteristics of team members who can ensure quality.
12. Form a team by following the necessary stages.
13. Explain the roles of a team member.
14. Identify the group problems and the ways of solving those problems.
15. Discuss the barriers to team progress.
16. How can you stimulate and encourage the ways of team progress.

Continuous Process Improvement

5

Unit Highlights

- Lesson – 1: Introducing Continuous Process Improvement
- Lesson – 2: Process Improvement Strategies
- Lesson – 3: Improvement Technique
- Lesson – 4: Model of Continuous Improvement

Technologies Used for Content Delivery

- ❖ BOUTUBE
- ❖ BOU LMS
- ❖ WebTV
- ❖ Web Radio
- ❖ Mobile Technology with MicroSD Card
- ❖ BTV Program
- ❖ Bangladesh Betar Program

Lesson 1: Introducing Continuous Process Improvement

After completion of this lesson you will be able to –

- *Understand the concept and issues related to continuous process improvement.*
- *Identify and describe the key aspect of continuous process improvement.*
- *Describe the benefits of continuous process improvement.*
- *Conceptualize the process model of continuous process improvement.*

CONCEPT AND ISSUES OF CONTINUOUS PROCESS IMPROVEMENT

Continuous Process Improvement (CPI) is a systematic and ongoing effort to enhance products, services, or processes through incremental or breakthrough changes. It's a philosophy that emphasizes the importance of continuous evaluation and improvement rather than one-time fixes. This approach aims to increase efficiency, quality, and overall organizational performance over time.

Continuous process improvement (CPI) is an ongoing, organized effort to improve products, services, and processes through small, incremental changes or larger, breakthrough improvements. It's a long-term business philosophy focused on increasing efficiency, quality, and customer satisfaction by constantly evaluating and refining workflows.

Quality-based organizations should strive to achieve perfection by continuously improving the business and production processes. Of course, perfection is impossible because the race is never over; however, we must continually strive for its attainment.

Improvement is expected in the organization by –

- Viewing all work as a process, whether it is associated with production or business activities.
- Making all processes effective, efficient, and adaptable.
- Anticipating changing customer needs.
- Controlling in-process performance using measures such as scrap reduction, cycle time, control charts, and so forth.
- Maintaining constructive dissatisfaction with the present level of performance.
- Eliminating waste and rework wherever it occurs.
- Investigating activities that do not add value to the product or service, with the aim of eliminating those activities.
- Eliminating nonconformities in all phases of everyone's work, even if the increment of improvement is small.
- Using benchmarking to improve competitive advantage.
- Innovating to achieve breakthroughs.
- Incorporating lessons learned into future activities.

- Using technical tools such as statistical process control (SPC), experimental design, benchmarking, quality function deployment (QFD), and so forth.

Continuous process improvement is designed to utilize the resources of the organization to achieve a quality-driven culture. Individuals must think, act, and speak quality.

KEY ASPECTS OF CONTINUOUS PROCESS IMPROVEMENT

The following are the key aspects of continuous process improvement:

- **Never-ending journey:** CPI is not a one-time project but a perpetual cycle of evaluation and optimization. Even after a process is improved, the effort continues to find further enhancements.
- **Incremental and breakthrough changes:** Improvements can be minor and gradual over time, or they can be more significant, all-at-once changes.
- **Data-driven and methodical:** CPI often relies on data to identify areas for improvement and then systematically implements and measures changes.
- **Employee involvement:** It encourages a culture where all employees, from the front lines to leadership, are involved in identifying and implementing improvements.
- **Focus on efficiency and quality:** The primary goals are to increase efficiency, reduce waste, improve product/service quality, and ultimately enhance customer satisfaction.

BENEFITS OF CONTINUOUS PROCESS IMPROVEMENT

- **Increased Efficiency:** Streamlining processes and eliminating waste can lead to significant efficiency gains.
- **Improved Quality:** Continuous improvement efforts can lead to higher quality products, services, and processes.
- **Reduced Costs:** By optimizing processes and reducing waste, organizations can lower costs.
- **Enhanced Customer Satisfaction:** Improved efficiency and quality can lead to greater customer satisfaction.
- **Increased Employee Morale:** Employee involvement in the improvement process can boost morale and engagement.
- **Adaptability to Change:** CPI helps organizations adapt to changing market conditions, customer needs, and technological advancements.

PROCESS MODEL

Process refers to business and production activities of an organization. Business processes such as purchasing, engineering, accounting, and marketing are areas where nonconformance can represent an opportunity for substantial improvement.

Inputs may be materials, money, information, data, etc. Outputs may be information, data, products, service, etc. The output of one process also can be the input to another process. Outputs usually require performance measures. They are designed to achieve certain desirable outcomes such as customer satisfaction. Feedback is provided in order to improve the process.

The process is the interaction of some combination of people, materials, equipment, method, measurement, and the environment to produce an outcome such as a product, a service, or an input to another process. In addition to having measurable input and output, a process must have value-added activities and repeatability. It must be effective, efficient, under control, and adaptable.

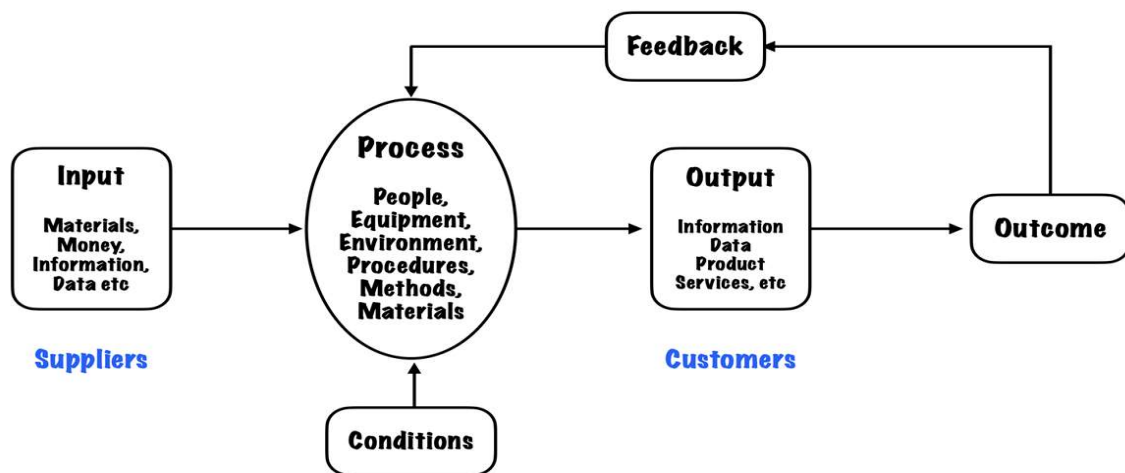


Figure: Input-Output Process Model

Process definition begins with defining the internal and/or external customers. The customer defines the purpose of the organization and every process within it. Because the organization exists to serve the customer, process improvements must be defined in terms of increased customer satisfaction as a result of higher quality products and services.

At this point it is important to define an improvement. There are five basic ways to improve:

- (1) **Reduce resources:** A process that uses more resources than necessary is wasteful. Reports that are distributed to more people than necessary wastes copying and distribution time, material, user reading time, and, eventually, file space.
- (2) **Reduce errors:** Errors are a sign of poor workmanship and require rework. Typing errors that are detected after the computer printout require opening the file, making the correction, and printing the revised document.
- (3) **Meet or exceed expectations of downstream customers:** By meeting or exceeding expectations of downstream customers, the process is improved. For example, the

better the weld, the less grinding required, making the appearance of a finish paint more pleasing.

- (4) **Make the process safer:** A process can be improved is by making it safer. A safer workplace is a more productive one with fewer lost-time accidents and less workers' compensation claims.
- (5) **Make the process more satisfying to the person doing it:** To improve a process is to increase the satisfaction of the individual performing the process. Sometimes a little change, such as an ergonomically correct chair, can make a substantial change in a per son's attitude toward their work.

Lesson 2: Process Improvement Strategies

After completion of this lesson you will be able to –

- *Describe and implement the Juran Trilogy in your organization.*
- *Apply improvement strategies in your organization.*
- *Classify the improvement problems.*

THE JURAN TRILOGY

Process improvement involves planning. One of the best approaches developed by Dr. Joseph Juran. According to him, it has three components: planning, control, and improvement, and is referred to as the Juran Trilogy. The components are discussed below:

1. **Planning:** The planning component begins with external customers. Once quality goals are established, marketing determines the external customers, and all organizational personnel (managers, members of multifunctional teams, or work groups) determine the internal customers. Once the customers are determined, their needs are discovered. This activity requires the customers to state needs in their own words and from their own viewpoint; however, real needs may differ from stated needs. For example, a stated need may be an automobile, whereas the real need is transportation or a status symbol. In addition, internal customers may not wish to voice real needs out of fear of the consequences.

The next step in the planning process is to develop product and/or service features that respond to customer needs, meet the needs of the organization and its suppliers, are competitive, and optimize the costs of all stakeholders. The subsequent step is to develop the processes able to produce the product and/or service features. Some of this planning would have occurred during the previous step. This step is also performed by a multifunctional team with a liaison to the design team. Activities include determining the necessary facilities, training, and operation, control, and maintenance of the facilities. Additional activities include process capability evaluation and process control type and location.

Transferring plans to operations is the final step of the planning process. Once again, a multifunctional team with a liaison to the other teams is used. When training is necessary, it should be performed by members of the process planning team. Process validation is necessary to ensure, with a high degree of assurance, that a process will consistently produce a product or service meeting requirements.

2. **Control:** Control is used by operating forces to help meet the product, process, and service requirements. It uses the feedback loop and consists of the following steps:

- (a) Determine items/subjects to be controlled and their units of measure.
- (b) Set goals for the controls and determine what sensors need to be put in place to measure the product, process, or service.
- (c) Measure actual performance.
- (d) Compare actual performance to goals.
- (e) Act on the difference. Statistical process control (see Chapter 15) is the primary technique for achieving control. The basic statistical process control (SPC) tools are Pareto diagrams, flow diagrams, cause-and-effect diagrams, check sheets, histograms, control charts, and scatter diagrams.

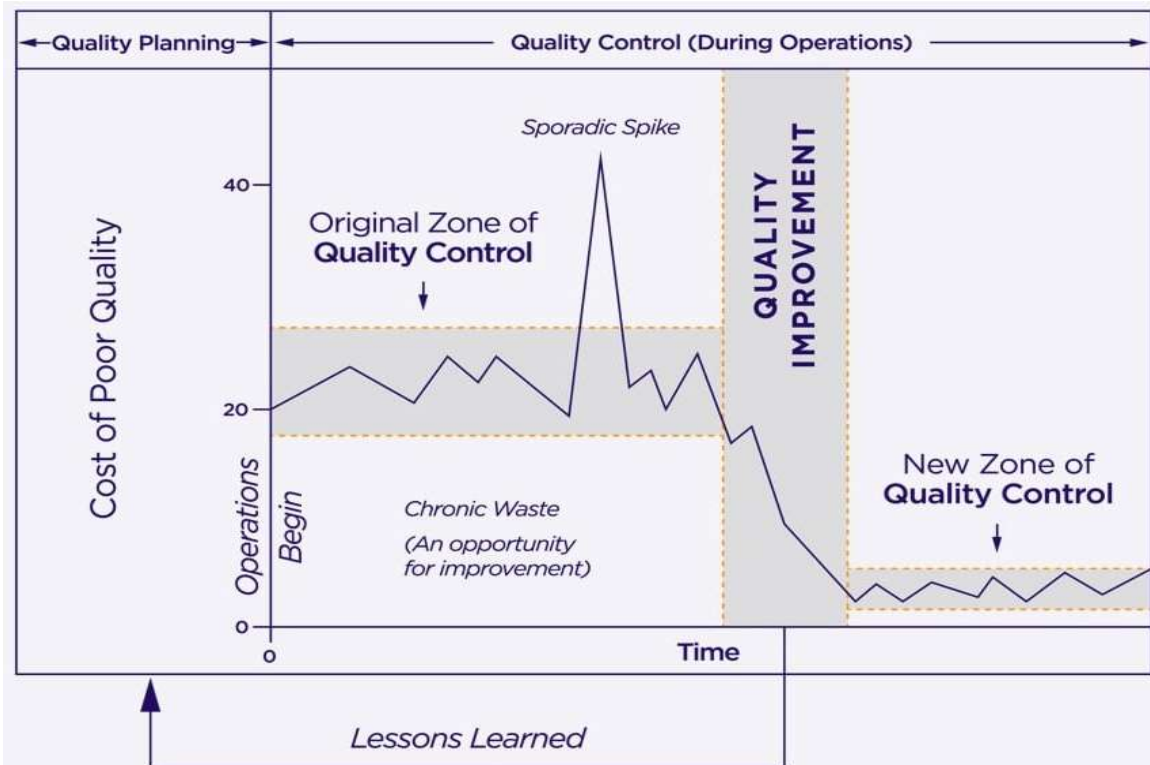


Figure: The Juran Trilogy

3. **Improvement:** The third part of the trilogy aims to attain levels of performance that are significantly higher than current levels. Process improvements begin with the establishment of an effective infrastructure such as the quality council. Two of the duties of the council are to identify the improvement projects and establish the project teams with a project owner. In addition, the quality council needs to provide the teams with the resources to determine the causes, create solutions, and establish controls to hold the gains. Process improvement can be incremental or breakthrough.

IMPROVEMENT STRATEGIES

There are four primary improvement strategies—repair, refinement, renovation, and reinvention. Choosing the right strategy for the right situation is critical. It is also true that proper integration of the strategies will produce never-ending improvement. The strategies are given below:

1. **Repair:** This strategy is simple—anything broken must be fixed so that it functions as designed. There are two levels to this strategy. If a customer receives a damaged product, a quick fix is required. This level is a temporary or short-term measure. Although short-term measures shore up the problem, they should not become permanent. The second level occurs when an individual or team identifies and eliminates the root cause(s) of the problem and effects a permanent solution. It is important to note that the repair strategy does not make the process better than the original design.
2. **Refinement:** This strategy involves activities that continually improve a process that is not broken. Improvements to processes, products, and services are accomplished on an incremental basis. Refinement improves efficiency and effectiveness. It should become an integral part of every employee's job. Both individuals and teams can use this strategy. Typically it relies on doing things just a bit quicker, better, easier, or with less waste. The change may be so gradual that there is no appearance of change. The primary benefit of gradual change is that it produces little resistance from employees. However, because the change is so gradual, minor changes may not be documented or properly communicated.
3. **Renovation:** This strategy results in major or breakthrough improvements. Although the resulting product, service, process, or activity might often appear to be different from the original. Innovation and technological advancements are key factors in this approach. For example, the process of drilling a hole was originally done by hand with a cranking mechanism; however, with the advent of the electric motor, the electric drill was born. The electric drill has been continually refined by improved bits, chucks, and materials.
4. **Reinvention:** Reinvention is the most demanding improvement strategy. It is preceded by the feeling that the current approach will never satisfy customer requirements. A new product, service, process, or activity is developed using teams based on a complete understanding of the customer's requirements and expectations. Reinvention or reengineering begins by imagining that the previous condition does not exist. For example, the process of drilling holes using lasers or water jets was a reinvention.

Reinvention might also be desirable to maintain organization vitality or competitive advantage. An organization should use this strategy sparingly (carefully) because of

resistance to change and the fact that any new product, service, process, or activity will probably need to have the “bugs” removed by repair, refinement, and renovation.

TYPES OF PROBLEMS

There are five types of problems: compliance, unstructured, efficiency, process design, and product design. The first three are performance problems where an existing system is not performing satisfactorily, and the last two are design problems that require a new or improved design.

1. **Compliance:** Compliance problems occur when a structured system having standardized inputs, processes, and outputs is performing unacceptably from the user’s viewpoint. These problems are identified by comparing with standards or by feedback from the internal or external customer. The major challenge is to determine the root cause of the nonconformity and then take corrective action. Diagnosis can be difficult, because products and processes are quite complex. Standards cannot address all of the potential problems due to the interaction of individually acceptable characteristics.
2. **Unstructured:** Unstructured problems resemble compliance problems except that they are not specified by standards. The absence of standards may be due to system immaturity or to the need for flexibility in system performance. For example, an expert woodworker adjusts his activities to the grain and moisture content of the wood, and customer service workers adapt their behavior to individual customers. Identification of unstructured problems is usually brought about by negative customer feedback. The major challenges are to determine customer needs and to diagnose the causes of poor performance. Organizations need to treat each customer as an individual and maintain a database on acceptable and unacceptable behavior.
3. **Efficiency:** Efficiency problems occur when the system is performing unacceptably from the viewpoint of its owners or operators. In other words, the end user is satisfied; however, the process is more costly than desired, or working conditions are not acceptable. Problem solving is directed towards reducing cost and providing safe working conditions. Identification of such problems occurs from benchmarking and operator suggestions.
4. **Process Design:** Process-design problems involve the development of new processes and revision of existing processes. Many business and production processes have not been well designed or have become obsolete with advances in technology. Identification of problems is prompted by poor performance, the knowledge that we can do better (benchmarking), or the introduction of new products. It requires that user needs and relevant constraints be identified.
5. **Product Design:** Product-design problems involve the development of new products and the improvement of existing products. A major focus is to prevent process and

end user problems by relying on customer needs. Although design work can be initiated as a result of poor product performance, problem solving usually occurs as a natural part of a competitive environment. A major challenge is translating, in a timely manner, user needs and constraints into product attributes and specifications, usually using quality function deployment (QFD).

Lesson 3: Improvement Technique

After completion of this lesson you will be able to –

- Describe the P-D-S-A cycle as an improvement technique.
- Solve the organization's problems with due process.

THE P-D-S-A CYCLE

The basic Plan-Do-Study-Act (PDSA) cycle was first developed by Shewhart and then modified by Deming. It is an effective improvement technique.

The Plan-Do-Study-Act (PDSA) cycle is an iterative four-stage method for testing a change to improve a process. First, Plan by defining the change, setting a goal, and creating a small-scale test plan. Next, Do by carrying out the test. Then, Study the results by analyzing the data to see if the change was successful. Finally, Act by either adopting the change, modifying the plan, or starting a new cycle with further improvements.

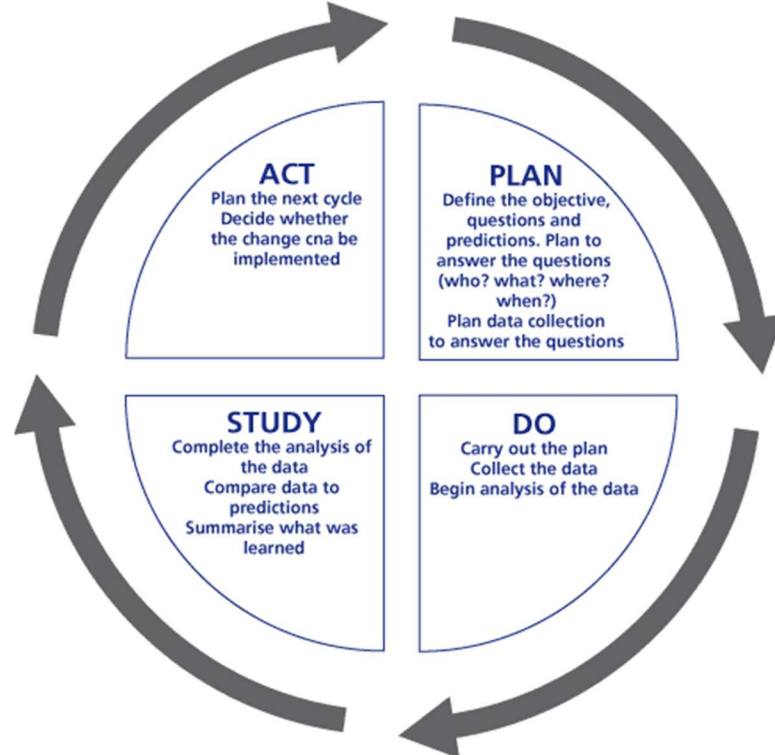


Figure: Plan-Do-Study-Act (PDSA) cycle

The steps are elaborated below:

1. **Plan:** At this stage the following activities are done:
 - **Define the change:** Develop a plan to test the change you want to implement.
 - **Set goals:** Clearly define what you are trying to accomplish and how you will measure success.

- **Gather a team:** Involve those who will be affected by the change.
 - **Collect data:** Determine what data you need to collect to track the results of your test.
 - **Keep it small:** Make the test manageable by keeping it on a small scale (e.g., a single patient or one department).
2. **Do:** this stage is accompanied by:
 - **Implement the test:** Carry out the plan on the small scale you defined.
 - **Document the process:** Record what happens and any obstacles encountered.
 3. **Study:** at this stage the following things are to be carried out:
 - **Analyze the results:** Review the data collected during the "Do" phase.
 - **Evaluate the change:** Determine if the change led to the desired improvement and if your predictions were correct.
 - **Look for patterns:** Identify any trends or shifts in the data that show a consistent effect.
 4. **Act:** Finally the following are to be conducted:
 - **Adapt and modify:** Based on your study, decide what to do next. You can modify the plan and start another PDSA cycle, or if the change was successful, you can begin to implement it more broadly.
 - **Standardize the change:** If the change is successful, document the new standards or process.
 - **Start a new cycle:** If the change was not successful, use what you learned to plan a new and improved test.

The four steps in the cycle are exactly as stated. First, plan carefully what is to be done. Next, carry out the plan (do it). Third, study the results whether the plan worked as intended, or were the results different? Finally, act on the results by identifying what worked as planned and what didn't. Using the knowledge learned, develop an improved plan and repeat the cycle.

PROBLEM-SOLVING METHOD

Process improvement achieves the greatest results when it operates within the framework of the problem solving method. In the initial stages of a program, quick results are frequently obtained because the solutions are obvious or an individual has a brilliant idea. The problem-solving method (also called the scientific method) has seven phases and are integrated because each phase is dependent upon the previous phase. They are:

Phase 1: Identify the Opportunity

The objective of this phase is to identify and prioritize opportunities for improvement. It consists of three parts: identify the problem and define the scope. Problem identification

answers the question, “What are the problems?” The answer leads to those problems that have the greatest potential for improvement and have the greatest need for solution. Problems can be identified from a variety of inputs, such as the following:

- Analysis of repetitive external alarm signals, such as field failures, complaints, returns, and others.
- Analysis of repetitive internal alarm signals (for example, scrap, rework, sorting, and the 100% test).
- Proposals from key insiders (managers, supervisors, professionals, and union stewards).
- Proposals from suggestion schemes.
- Field study of users’ needs.
- Data on performance of competitors (from users and from laboratory tests).
- Comments of key people outside the organization (customers, suppliers, journalists, and critics).
- Findings and comments of government regulators and independent laboratories.
- Customer surveys.
- Employee surveys.
- Brainstorming by work groups.

Phase 2: Analyze the Current Process

The objective of this phase is to understand the process and how it is currently performed. Key activities are to define process boundaries, outputs and customers, inputs and suppliers, and process flow; determine levels of customer satisfaction and measurements needed; gather data; and identify root causes.

The first step is for the team to ***develop a process flow diagram***. A flow diagram translates complex work into an easily-understood graphic description. ***Next, determine the target performance measures***. Measurement is fundamental to meaningful process improvements. If something cannot be measured, it cannot be improved. There is an old saying that what gets measured gets done. Once the target performance measures are established, the team can ***collect all available data and information***. If these data are not enough, then additional new information is obtained. It is important to collect only needed data and to get the right data for the problem. The team will ***identify the customers and their requirements and expectations*** as well as their inputs, out puts, and interfaces of the process. Also, they will systematically review the procedures currently being used.

The cause-and-effect diagram is particularly effective in this phase. Determining all of the causes requires experience, brainstorming, and a thorough knowledge of the process. Once the root cause is determined, the next phase can begin.

Phase 3: Develop the Optimal Solution(s)

This phase has the objective of establishing potential and feasible solutions and recommending the best solution to improve the process. Once all the information is available, the project team begins its search for possible solutions. In this phase, creativity plays the major role, and brainstorming is the principal technique. Brainstorming on possible solutions requires not only a knowledge of the problem but also innovation and creativity.

There are three types of creativity: (1) create new processes, (2) combine different processes, or (3) modify the existing process. The first type is innovation in its highest form, such as the invention of the transistor. Combining two or more processes is a synthesis activity to create a better process. It is a unique combination of what already exists. Modification involves altering a process that already exists so that it does a better job.

Phase 4: Implement Changes

Once the best solution is selected, it can be implemented. This phase has the objective of preparing the implementation plan, obtaining approval, and implementing the process improvements.

Although the project team usually has some authority to institute remedial action, more often than not the approval of the quality council or other appropriate authority is required. If such approval is needed, a written and/or oral report is given.

The contents of the implementation plan report must fully describe

- Why will it be done?
- How will it be done?
- When will it be done?
- Who will do it?
- Where will it be done?

Answers to these questions will designate required actions, assign responsibility, and establish implementation milestones. The length of the report is determined by the complexity of the change. Simple changes may require only an oral report, whereas other changes require a detailed, written report.

Phase 5: Study the Results

This phase has the objective of monitoring and evaluating the change by tracking and studying the effectiveness of the improvement efforts through data collection and the review of progress. It is vital to institutionalize meaningful change and ensure ongoing measurement and evaluation efforts to achieve continuous improvement.

The team should meet periodically during this phase to evaluate the results to see whether the problem has been solved or if fine-tuning is required. In addition, the team will want to see if any unforeseen problems have developed as a result of the changes. If the team is not satisfied, then some of the phases will need to be repeated.

Phase 6: Standardize the Solution

Once the team is satisfied with the change, it must be institutionalized by positive control of the process, process certification, and operator certification. Positive control assures that important variables are kept under control. It specifies the what, who, how, where, and when of the process and is an updating of the monitoring activity. Standardizing the solution prevents “backsliding.”

Finally, operators must be certified to know what to do and how to do it for a particular process. Also needed is cross-training in other jobs within the process to ensure next-customer knowledge and job rotation. Total product knowledge is also desirable. Operator certification is an ongoing process that must occur periodically.

Phase 7: Plan for the Future

This phase has the objective of achieving improved levels of process performance. Regardless of how successful the initial improvement efforts are, the improvement process continues. It is important to remember that TQM addresses the quality of management as well as the management of quality. Everyone in the organization is involved in a systematic, long-term endeavor to constantly improve quality by developing processes that are customer oriented, flexible, and responsive.

A key activity is to conduct regularly scheduled reviews of progress by the quality council and/or work group. Management must establish the systems to identify areas for future improvement and to track performance with respect to internal and external customers. They must also track changing customer requirements.

Lesson 4: Model of Continuous Improvement

After completion of this lesson you will be able to –

- *Implement Kaizen philosophy for continuous improvement of organization.*
- *Analyze reengineering.*
- *Implement Six-sigma for organizational process improvement.*
- *Find the problems or challenges associated with Six-sigma.*

KAIZEN PHILOSOPHY OF CONTINUOUS IMPROVEMENT

Kaizen is a Japanese word for the philosophy that defines management's role in continuously encouraging and implementing small improvements that involve everyone. It is the process of continuous improvement in small increments that make the process more efficient, effective, under control, and adaptable. Improvements are usually accomplished at little or no expense, without sophisticated techniques or expensive equipment. It focuses on simplification by breaking down complex processes into sub-processes and then improving them.

The Kaizen improvement focuses on the use of:

1. Value-added and non-value-added work activities.
2. Muda, which refers to the seven classes of waste—over-production, delay, transportation, processing, inventory, wasted motion, and defective parts.
3. Principles of motion study and the use of cellular technology.
4. Principles of materials handling and use of one-piece flow.
5. Documentation of standard operating procedures.
6. The five S's for workplace organization, which are five Japanese words that mean proper arrangement (seiko), orderliness (seiton), personal cleanliness (seiketso), cleanup (seiso), and discipline (shitsuke).
7. Visual management by means of visual displays that everyone in the plant can use for better communications.
8. Just-in-time principles to produce only the units in the right quantities, at the right time, and with the right resources.
9. Poka-yoke to prevent or detect errors.
10. Team dynamics, which include problem solving, communication skills, and conflict resolution.

Kaizen relies heavily on a culture that encourages suggestions from operators who continually try to incrementally improve their job or process. An example of a Kaizen-type improvement would be the change in color of a welding booth from black to white to improve operator visibility. This change results in a small improvement in weld quality and a substantial improvement in operator satisfaction.

CONCEPT OF REENGINEERING

According to Hammer and Champy, reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in key measures of performance. Many practitioners believe that TQM is associated with only incremental improvements. The Malcolm Baldrige National Quality Award has defined continuous improvement as referring to both incremental and “breakthrough” improvements. The Japanese have not only relied on kaizen but have developed policy management (hoshin kanri) and policy deployment (hoshin tenkai) in large part to produce the kind of large-scale breakthroughs that Hammer and Champy promote. Nor is this concept uniquely Japanese. Joseph Juran has had a long-standing emphasis on breakthrough efforts aimed at achieving unprecedented levels of performance. In 1997, EM Jorgensen Company applied reengineering using a five-phased problem solving approach that ultimately reduced operating costs by 12%. The focus of the project was to identify and eliminate non-value added work and reduce corresponding costs while maintaining quality.

SIX-SIGMA

In 1999, M. Harry and R. Schroeder published Six Sigma: The Breakthrough Management Strategy Revolutionizing the World’s Top Corporations. Since that time, there has been considerable interest in the subject; therefore, the authors have devoted much space to a review of the concept.

Statistical Aspect:

The overarching goal of the improvement approach known as **Six Sigma** is to reduce variance in outcomes by using data and statistical methods to improve system performance. An engineer at Motorola first developed (and later trademarked) Six Sigma in 1986 as a quality control measure. The company wanted to improve its manufacturing and inspection processes, which, at the time, did not adequately detect and correct defects. Sigma (σ), is the Greek symbol for the statistical measurement of dispersion called standard deviation. In statistics, sigma refers to a standard deviation, so Six Sigma is six standard deviations, signaling an event that has a 0.000035% chance of occurring (or 1 out of 285,715 events) an admirable goal for maintaining a defect free process.

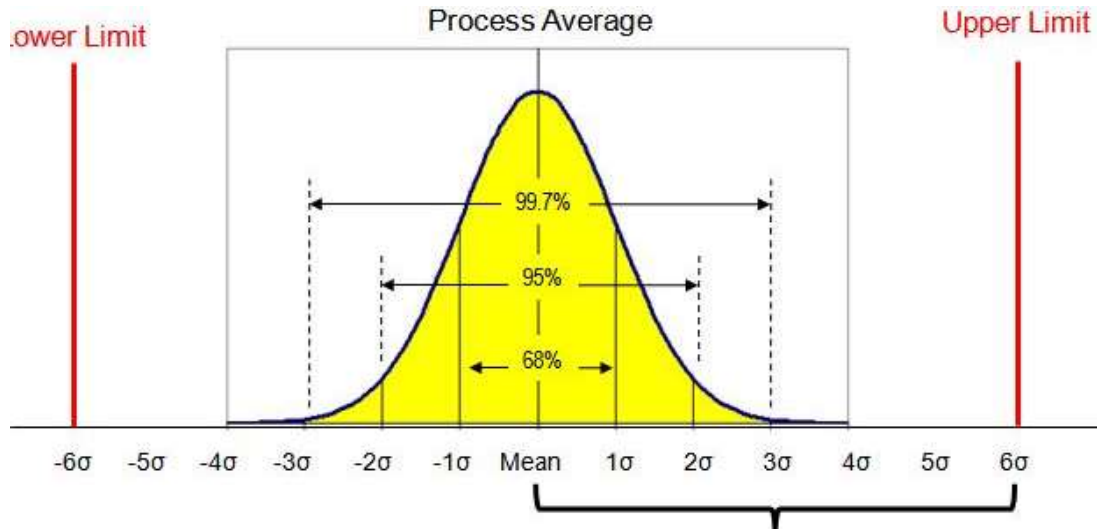
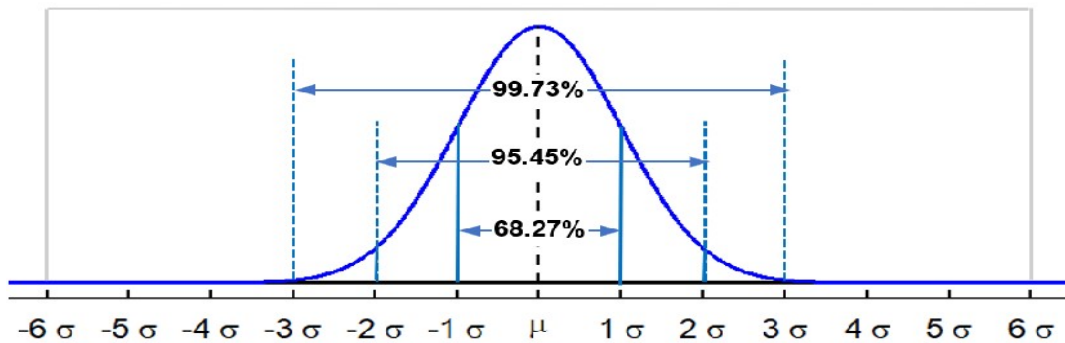


Figure: Six-Sigma (Statistical Review)

According to James Harrington, “Six sigma was simply a TQM process that uses process capability analysis as a way of measuring progress.” It is the best measurement of process variability, because the smaller the deviation value, the less variability in the process. Figure below shows a process that is normally distributed and centered with the upper and lower specification limits (USL and LSL) established at 6σ level. For this situation, 99.999998% of the product or service will be between specifications, and the nonconformance rate will be 0.002 parts per million, or 2.0 per billion.



Specification limit	% inside specs	PPM defective
$\mu \pm 1\sigma$	68.27	317,300
$\mu \pm 2\sigma$	95.45	45,500
$\mu \pm 3\sigma$	99.73	2,700
$\mu \pm 4\sigma$	99.9937	63
$\mu \pm 5\sigma$	99.999943	0.57
$\mu \pm 6\sigma$	99.999998	0.002

Figure: Six-Sigma (Variability in the Process)

According to the six-sigma philosophy, processes rarely stay centered—the center tends to “shift” above and below the target, μ . A process usually is normally distributed, but has shifted within a range of 1.5 above and 1.5 below the target. For the diagrammed situation, 99.9996600% of the product or service will be between specifications and the nonconformance rate will be 3.4 ppm. This off-center situation gives a process capability index (C_{pk}) of 1.5 with 1.0 being the defacto standard. Note that the index is calculated differently and, therefore, has a different symbol (C_{pvs} . C_{pk}). The magnitude and type of shift is a matter of discovery and should not be assumed ahead of time. In fact, the original work of six sigma was based on only a few empirical studies of a single process.

The statistical aspects of six-sigma tell us that we should reduce the process variability, and try to keep the process centered on the target, μ . These concepts are not new. They have been long advocated by Shewhart, Deming, and Taguchi.

Other Aspects:

Six Sigma provides many tools and techniques that rely heavily on the formal training of individuals who use it, which can be a drawback. Many companies have created teams of Six Sigma experts whose full-time job is to lead Six Sigma projects. The central tool is the five-step DMAIC (define, measure, analyze, improve, control) roadmap, pictured here and discussed in greater detail below.

- **Define:** Define the problem, the project goals, and customer requirements.
- **Measure:** Collect data to measure the current process performance and identify variations.
- **Analyze:** Analyze the data to identify the root causes of the problem, often using statistical tools.
- **Improve:** Develop, test, and implement solutions to eliminate the root causes and improve the process.
- **Control:** Establish systems to monitor the new process and ensure improvements are sustained over time.

PROBLEMS / CHALLENGES OF SIX-SIGMA

The problems of six-sigma may be categorized into 3 categories. Such as

A) Implementation challenges:

- **Lack of leadership support:** Without active commitment from senior management, Six Sigma initiatives often fail because they are not treated as a core business strategy.
- **Resistance to change:** Employees may resist new processes, especially if they lack proper training or a clear understanding of the benefits.
- **Inadequate training:** A lack of thorough understanding or training in the Six Sigma methodology can lead to improperly applied practices and failed projects.

- **Difficulty with data:** Challenges can arise from collecting, analyzing, and using high-quality, relevant data. Inaccurate or insufficient data collection can severely hinder a project's success.
- **High implementation costs:** The investment in technology, testing, and skilled labor can be significant, potentially leading to increased production costs.

B) Structural and operational issues:

- **Overemphasis on process over people:** The model can sometimes be implemented with too much faith in the data and process, while underestimating the importance of the people implementing it.
- **"Analysis paralysis":** The heavy reliance on data and statistical analysis can cause projects to stall as teams get stuck in the measurement and analysis phases.
- **Scope creep:** Projects can expand beyond their original goals, making them more difficult to complete on time and within budget.
- **Unsustainable improvements:** Without a focus on creating a continuous improvement culture, the initial gains from a Six Sigma project may not be sustained long-term.

C) Misconceptions and limitations:

- **"One size fits all" thinking:** The Six Sigma model is not a universal solution and may not be suitable for all industries or problems, particularly those requiring a high degree of personalized or creative output.
- **Focus on defects:** While reducing defects is a primary goal, the focus on this can sometimes overshadow other critical aspects of the business, like innovation or customer satisfaction, and can be a costly process.
- **"Paper belt" problem:** Chasing certifications without applying them to real projects can lead to a superficial understanding and lack of tangible results.

Discussion Questions:

1. Describe the concept and issues of continuous process improvement.
2. Identify and describe the key aspect of continuous process improvement.
3. Describe the benefits of continuous process improvement.
4. Discuss the process model of continuous process improvement.
5. Describe the Juran Trilogy in your organization. How this model can be implemented in the organization for process improvement?
6. Discuss the improvement strategies.
7. Classify and discuss the improvement problems.
8. Describe the P-D-S-A cycle as an improvement technique.
9. How will you solve the organization's problems with due process?
10. How Kaizen philosophy is implemented in the organization for continuous improvement.
11. What is reengineering.
12. How Six-sigma is applied for organizational process improvement? / Describe the six-sigma model.
13. Find and explain the problems or challenges associated with Six-sigma.

Performance Measure

6

Unit Highlights

- Lesson – 1: Conceptualization of Performance Measure
- Lesson – 2: Strategy and Presentation of Performance Measure
- Lesson – 3 and 4: Presentation of Performance Measure and Performance Framework
- Lesson – 5: Performance Criteria Development and Balanced Score Card

Technologies Used for Content Delivery

- ❖ BOUTUBE
- ❖ BOU LMS
- ❖ WebTV
- ❖ Web Radio
- ❖ Mobile Technology with MicroSD Card
- ❖ BTV Program
- ❖ Bangladesh Betar Program

Lesson 1: Conceptualization of Performance Measure

After completion of this lesson you will be able to –

- *Describe the concept of performance measure.*
- *Understand the reasons or objectives of performance measure.*
- *Identify the characteristics and types of performance measures.*
- *Identify and make decision on performance areas.*
- *Analyze the criteria of performance measures.*

CONCEPT OF PERFORMANCE MEASURES

Performance measures are metrics used to quantify how well an organization is meeting its goals, particularly those related to customer satisfaction and process improvement. Performance measurement is the process used to assess the efficiency and effectiveness of projects, programs and initiatives. It is a systematic approach to collecting, analyzing and evaluating how “on track” a project/program is to achieve its desired outcomes, goals and objectives.

In Total Quality Management (TQM), performance measures are quantifiable data points used to gauge organizational effectiveness, efficiency, and productivity, enabling informed decision-making and continuous improvement. These measures should align with strategic goals, provide timely and accurate feedback on processes and outcomes, and cover diverse areas like customer satisfaction, employee relations, and financial performance. Common metrics include Key Performance Indicators (KPIs), Cost of Quality, and measures of customer satisfaction, reflecting both internal processes and external perceptions to drive progress.

OBJECTIVES OF PERFORMANCE MEASURES

Here are the seven objectives in more detail:

1. **Establish Baseline Measures and Reveal Trends:** Performance measures provide an initial understanding of current performance levels, allowing for the identification of patterns and trends over time.
2. **Determine Which Processes Need to Be Improved:** By measuring processes, organizations can pinpoint specific areas that are underperforming or not meeting expectations, directing improvement efforts effectively.
3. **Indicate Process Gains and Losses:** Performance measures help to quantify the impact of improvements, showing whether changes are leading to better outcomes (gains) or if they are having negative effects (losses).
4. **Compare Goals with Actual Performance:** Measures serve as a critical tool to check if an organization is meeting its quality objectives and targets by contrasting actual results against established goals.

5. **Provide Information for Individual and Team Evaluation:** Performance data can be used to assess the contributions of individuals and teams, supporting feedback and the development of employees.
6. **Manage by Fact Rather Than Gut Feeling:** By using objective, quantifiable data, organizations can move away from subjective opinions and make strategic, informed decisions based on facts rather than intuition.
7. **Provide Visibility and a Scoreboard:** Performance measures offer a clear "scoreboard" for everyone in the organization to see how performance levels are changing, which helps to monitor progress and maintain focus.

KEY CHARACTERISTICS OF EFFECTIVE TQM PERFORMANCE MEASURES

- **Simplicity:** Easy to understand and apply.
- **Relevance:** Directly tied to organizational goals and objectives.
- **Timeliness:** Provide current and timely feedback for swift action.
- **Focus on Improvement:** Guide actions toward enhancement and learning, rather than just control.
- **Quantifiable:** Offer measurable data rather than subjective assessments.
- **Alignment:** Connect corporate strategies to the operational level for integrated execution.

TYPES OF PERFORMANCE MEASURES

- **Customer Satisfaction:** Measures how well customer requirements are met.
- **Product/Process Performance:** Evaluates quality, defects, and efficiency in processes.
- **Productivity:** Assesses the output generated by the workforce or processes.
- **Employee Performance:** Metrics related to employee satisfaction, training, and relations.
- **Financial Performance:** Measures like cost of quality, which track the financial impact of quality issues.
- **Supplier Performance:** Evaluates the quality and reliability of suppliers.

TYPICAL MEASUREMENTS AREAS

What should be measured is frequently asked by managers and teams. The information below suggests some items that can be measured.

1. **Human Resources:** Lost time due to accidents, absenteeism, turnover, employee satisfaction index, number of suggestions for improvement, number of suggestions implemented, number of training hours per employee, training cost per employee, number of active teams, and number of grievances.

2. **Customers:** Number of complaints, number of on-time deliveries, warranty data such as parts replacement, customer satisfaction index, time to resolve complaints, telephone data such as response time, mean time to repair, dealer satisfaction, report cards.
3. **Production:** Inventory turns, SPC charts, C_p/C_{pk} , amount of scrap/rework, nonconformities per million units, software errors per 1000 lines of code, percent of flights that arrive on time, process yield, and machine downtime, actual performance to goal, number of products returned, and cost per unit.
4. **Research and Development:** New product time to market, design change orders, R & D spending to sales, average time to process proposal, recall data, cost estimating errors.
5. **Suppliers:** SPC charts, C_p/C_{pk} , on-time delivery, service rating, quality performance, billing accuracy, average lead time, percent of suppliers that are error free, just-in-time delivery target.
6. **Marketing/Sales:** Sales expense to revenue, order accuracy, introduction cost to development cost, new product sales to total sales, new customers, gained or lost accounts, sales income to number of salespeople, number of successful calls per week.
7. **Administration:** Revenue per employee, expense to revenue, cost of poor quality, percent of payroll distributed on time, number of days accounts receivable past due, number of accounts payable past due, office equipment up-time, purchase order errors, vehicle fleet data, and order entry/billing accuracy.

A good metric compares the measurement of interest to the total possible outcomes, such as rework hours to total hours.

CRITERIA OF PERFORMANCE MEASURES

All organizations have some measurements in place that can be adapted for TQM. However, some measurements may need to be added. In order to evaluate the existing measures or add new ones, the following ten criteria are recommended:

1. **Simple:** Measures should be understandable by those who will use them.
2. **Few in number:** The important measures must be distinguished from the unimportant ones so that users can concentrate on just a few. Two or three measures should be sufficient for any work group of departments, functional areas, plants, and corporations. Quality councils may wish to use composite measures such as a customer satisfaction index. It is composed of several weighted metrics such as on-time delivery, cost, product or service quality, and complaints.
3. **Developed by users:** In order to ensure ownership of the measures, they must be developed by the user. Measures dictated by a higher authority will usually not receive

support from downstream units. However, in some cases, measures are mandated by the customer.

4. **Relevance to customer:** Measures must be relevant to the needs of internal or external customers. Control over important changes should be vested in the people who are held responsible for the performance measure. They also decide what measures to use and set target goals.
5. **Improvement:** Although correcting non-conformances and making current decisions are important, the focus should be on improvement, prevention, and strategic long-term planning and goal setting. Measures are used to promote improvement, not to identify poor performance and penalize the low performers.
6. **Cost:** Of course, the bottom line is that cost and profit must reflect an improved financial picture, as shown by the cost of poor quality system and other financial data. In addition, the cost of measurement should be considered.
7. **Visible:** Facility-wide measures should be posted in a central location, such as the lunch or break room, where everyone can see them. Likewise, unit measures should be posted at the machine or work center.
8. **Timely:** Financial and accounting data are often presented too late to be actionable. This may require that measurements are taken hourly, daily, or weekly rather than monthly or quarterly as in traditional accounting systems. A significant portion of measurements need to be operational rather than financial. Data needs to be measured, analyzed, and evaluated with respect to the desired goals so that the information can be used effectively in decision making.
9. **Aligned:** A comprehensive set of measures and indicators tied to customer and organizational performance requirements provides a way to align all activities with organizational goals.
10. **Results:** Key result measures need to be guided and balanced by the interests of all stakeholders such as customers, employees, stockholders, suppliers, the public, and the community.

Use of these criteria will improve the suitability of the selected measures.

Lesson 2: Strategy and Presentation of Performance Measure

After completion of this lesson you will be able to –

- *Describe the strategy of performance measure.*
- *Present the options of performance measures.*

STRATEGY OF PERFORMANCE MEASURES

The quality council has the overall responsibility for the performance measures. It ensures that all the measures are integrated into a total system of measures. To develop the system, the quality council will obtain appropriate information from all of the stakeholders. They will utilize the core values, goals, mission, and vision statements as well as the objectives and criteria of performance measures. With this information, the strategic measurement system is created. The strategy of performance measures contain the functions and metrics as given below:

1. Quality

- Percent reduction in cost of poor quality
- Percent reduction in nonconformities
- Percent of certified suppliers
- Percent reduction in supplier base
- Percent reduction in corrective action cycle time.

2. Cost

- Percent increase in inventory turnover
- Percent reduction in data transactions
- Percent increase in materials shipped direct to work-in-process by the supplier
- Percent increase in output dollars per employee
- Percent reduction in floor space utilization.

3. Flexibility

- Percent reduction in cycle time
- Percent reduction in setup time
- Percent reduction in lot/batch size
- Percent increase in number of jobs mastered per employee
- Percent increase in common materials used per product.

4. Reliability

- Percent of processes capable of $C_p = 2.0$
- Percent reduction in down time
- Percent reduction in warranty costs
- Percent reduction in design changes
- Percent increase in on-time delivery.

5. Innovation

- Percent reduction in new product introduction time
- Percent increase in new product sales revenue as a percent of total sales revenue
- Percent increase in new patents granted
- Customer perception as a leader in innovation
- Percent of management time spent on or leading innovation.

The above metrics are tracked monthly to show trends, identify problem areas, and allocate resources.

Once the strategic measurement system is developed, the functional areas can develop their systems by involving their departments and work groups. The first step is to determine which processes or sub-processes are critical to providing input for the strategic system. Next, the critical metric(s) are determined using the information given above under Basic Concepts. This activity is followed by assigning responsibility for the collection, analysis, and dissemination of the data. The last step is the development of improvement procedures.

PERFORMANCE MEASURE PRESENTATION

There are six basic techniques for presenting performance measures. The first three are related to the nonconformance of performance and the other three are related to cost of poor quality (to be discussed in the next topic).

1. **Time Series Graph:** The simplest and most common is the time series graph shown in the following figure. Time as measured by days, weeks, months, and so forth, is shown on the horizontal axis, and the performance measure is shown on the vertical axis. This type of graph benchmarks the process and shows favorable and unfavorable trends in the measure.

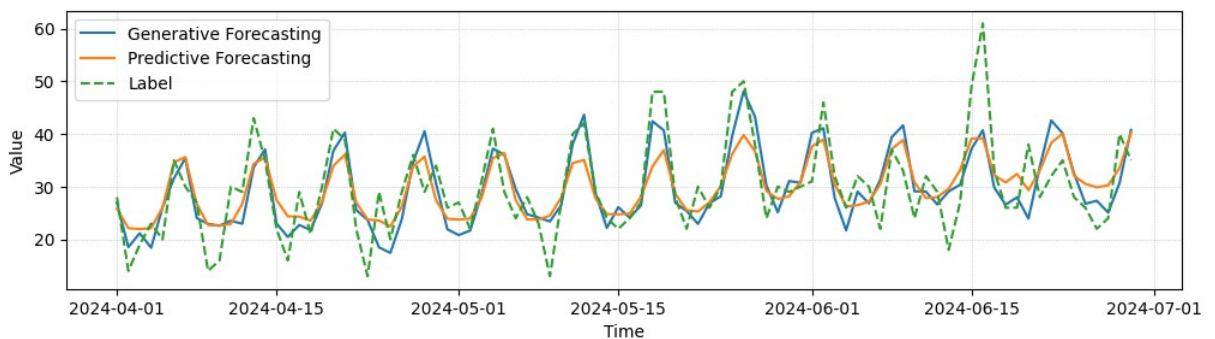


Figure 1: Time Series Graph for Percent Nonconforming

2. **Control Chart:** A control chart for percent nonconforming is shown in the figure below. Another presentation technique is the capability index, which is the ratio of the tolerance to the capability. There are two measures: one indicates the ability of the

process to meet specifications, and the other indicates the centering of the process on the target.

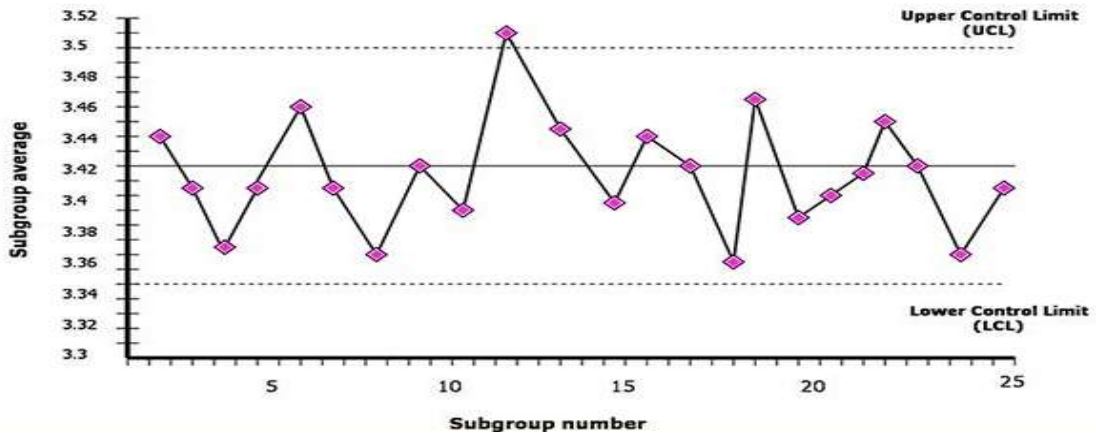


Figure 2: Control Chart for Percent Nonconforming

- Taguchi's Loss Function:** Another way of measuring quality is Taguchi's loss function. This technique combines target, cost, and specifications (Lower Specification Limit and Upper Specification Limit) into one measurement. The Taguchi Loss Function is a statistical tool used to quantify the economic loss incurred by a product or process as it deviates from its target or optimal performance. It is based on the premise that even small variations in quality can lead to increased costs and reduced customer satisfaction.

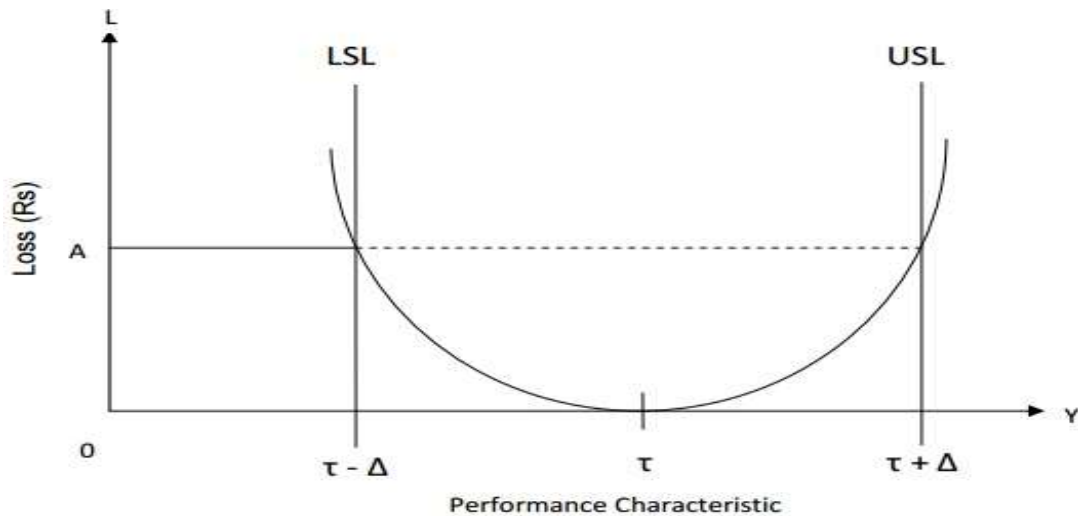


Figure 3: Taguchi's Quadratic Loss Function for Nominal-the-Best Cost of Quality

Lesson 3 and 4: Presentation of Performance Measure and Performance Framework

After completion of this lesson you will be able to –

- Interpret the cost of quality.
- Categorize the quality costs.
- Relate the quality cost with business measures.
- Develop performance excellence framework in accordance of Baldrige criteria.

COST OF QUALITY

“Cost of quality” is an approach to measure and track the financial impact of various quality activities. Until the 1950s, the concept did not explicitly extend to the quality function and the activities related to inspection, testing and audits were merely categorized as “overheads”. In the 1950s, Dr. Armand Feigenbaum suggested to consider reporting systems focusing on quality costs. Dr. Joseph Juran also started emphasizing the need to speak the language of upper management which is money.

With the increasing efforts towards quality control, more and more resources were allocated to the quality function and it became necessary to account for them separately. The heads of quality departments also had to sell their activities to the top management. Since the management understands only one language, money, there was the emergence of the concept of studying quality related costs.

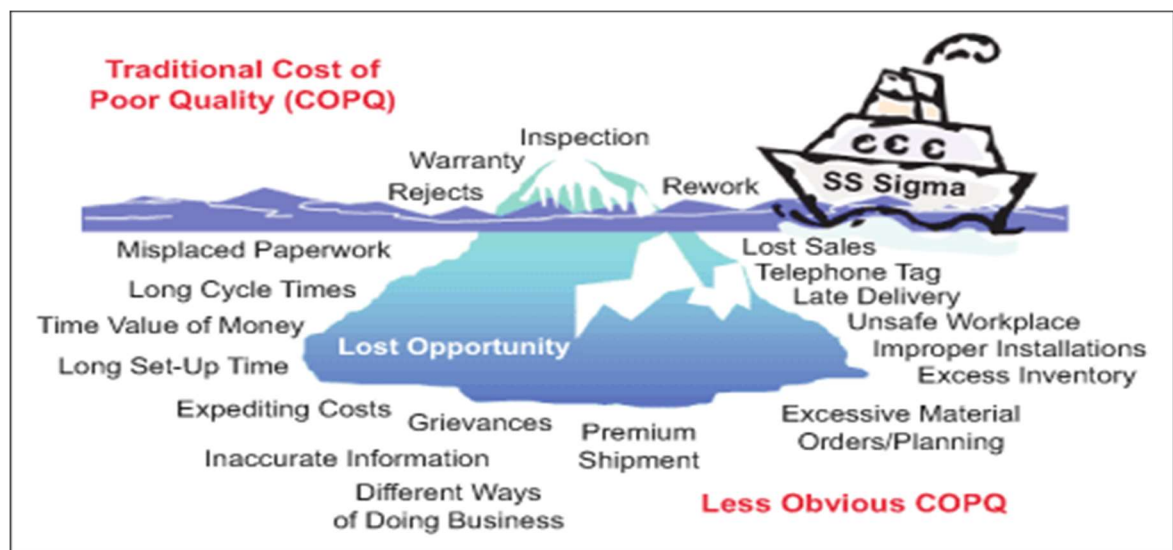


Figure 4: Iceberg of Cost of Poor Quality

Such studies were undertaken and they led to many surprising results. The quality related costs were much more than those shown in accounting statements. These costs were not only limited to factory operations but also extended to support functions. A Big chunk of

the cost was on account of poor quality. The Cost of poor quality is often compared to the tip of an iceberg. The Figure above shows that the warranty costs and scrap costs are clearly visible but a significant portion of the financial impact of poor quality is hidden, like an iceberg.

The term “Quality Cost” means different to different people. Some perceive it as the cost involved in attaining quality, whereas some equate it with the cost of running the Quality Department. The interpretation of quality specialists has been to equate the “quality cost” with the cost of poor quality.

CATEGORIES OF QUALITY COSTS

The cost of quality can be categorized in several ways. Such as:

1. Internal Failure Costs

These are costs which are associated with the defects or non-conforming situations that are found prior to shipment of the product to customer. These costs can be reduced to zero if no defect exists prior to shipment. Whenever quality appraisals are carried out, there exists a possibility of discovering nonconforming situations. Such situations are salvaged by either rework, complete replacement or scrapping. The total cost of carrying out re-inspection/re-tests, failure analysis, evaluation, disposition and subsequent actions are included in the internal failure costs.

In summary, this includes all material, labor, energy and overhead expenses that are wasted on account of non-conforming or defective product or service. Examples of internal failure costs are:

- Rework, fixing of bugs detected in internal testing of software
- Premium freight charges due to late delivery
- Internal scrap
- Engineering and drawing changes to correct errors
- Energy cost for re-melting rejected castings

2. External Failure Costs

Often the defects are found only after the product reaches the dealer or customer. Such costs are included in the external failure costs. This component of quality cost also disappears if there are no defects. Some examples of external failure cost are:

- **Complaints:** Complaints from customer are analyzed, resolved and communicated is sent back to customer. Sometimes it may also involve field service or adjustments.
- **Warranty claims:** Recall of vehicles for defects, costs involved in repairs or replacement of product during warranty period, the cost associated with receipt, evaluation and replacement of defective product from field.

- **Retrofit and recall costs:** It is often required to modify or update the product in order to incorporate new design changes in order to overcome design deficiencies. There have been several cases in the recent past, where automobiles were recalled due to failure investigation reports on the steel used in the manufacturing.
- **Liabilities and penalties:** Insurance claims and contractual obligatory claims are included in such types of costs.
- **Allowances and customer goodwill:** The cost of concessions offered to the customer due to substandard product, poor quality or costs incurred because the customer is not completely satisfied with the quality because his expectations were higher than those delivered to him by the product.

External failure costs will also include lost sales and loss of goodwill, although these are difficult to measure.

3. Appraisal Costs

These are the costs incurred while conducting inspection, tests, and several other planned evaluations with the purpose of determining whether the product (or service) confirms to its stated requirements. Appraisal cost also includes various activities related to quality system audit, cost of legal compliance, supplier surveillance, product quality audits, costs for calibration of testing equipment, etc. Thus, the cost of maintaining the inspection and test equipment is a part of appraisal cost. Examples include:

- Design reviews
- Software testing
- Set-up inspection
- Performance testing by customer
- Calibration of gauges
- Calibration of testing facility
- Receiving inspection of purchased parts

4. **Prevention Costs**

These are the costs of all such activities undertaken to prevent defects in design, development, purchase, labor and other aspects of creation of the product/service. Prevention costs lower the other costs (failure cost and appraisal cost). Prevention is achieved by examining previous failure data and developing action plans for incorporating into the basic system so that the same failures/ defects do not occur again.

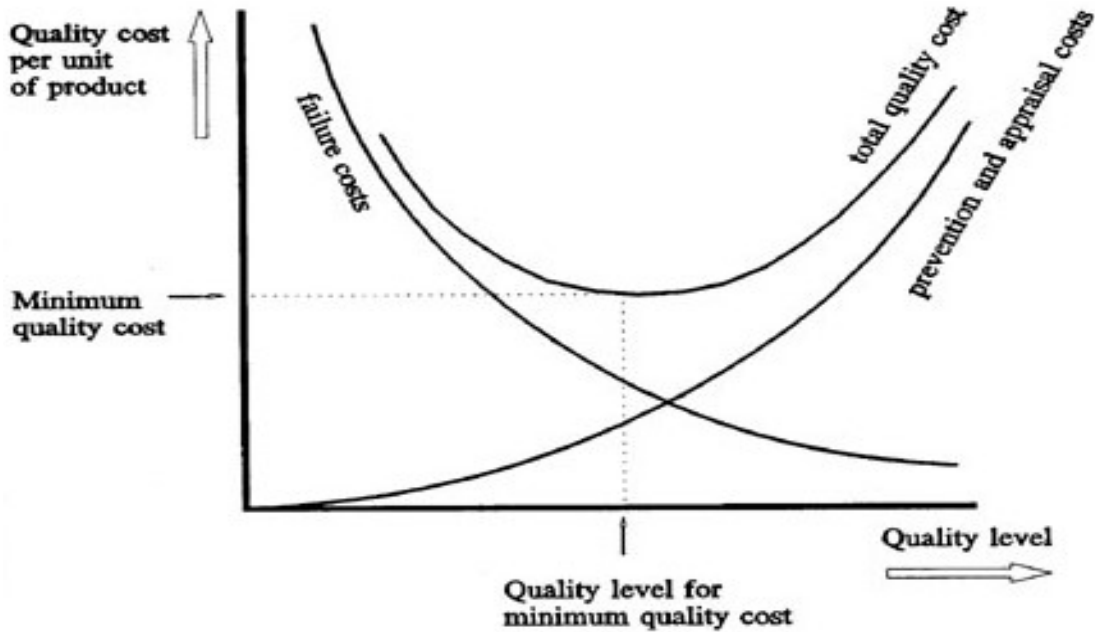


Figure 5: Relation between Prevention Appraisal and Failure Costs

The figure above shows a broad-level relationship between cost of prevention and appraisal with failure costs. There is a quality level at which the total cost of quality is minimum.

Examples of prevention costs include:

- Staff training
- Product Quality Planning
- Design and Process FMEA
- Tolerance analysis before design release
- Computer aided design and analysis
- Process capability study for process qualification
- Part selection for better reliability
- Designed experiment for optimum settings of the product

Cost of quality is the addition of all the four categories and is often expressed as percent sales.

RELATING QUALITY COST TO BUSINESS MEASURES

While sharing the results of quality cost with the management, the quality manager should relate it to the overall business measures. It will have a great impact on the management if the cost of quality relates to the other figures, such as total sales, total profit, etc., with which managers are familiar. For this purpose, some base line is required and the examples are:

1. **As a percentage of sales:** Most of the financial reports extensively use total sales or business value as a key performance index. When quality costs are related to total sales, its impact on top management is inevitable. It gives valuable input for decision making and arriving at annual planning.
2. **As compared to profit:** In the initial studies of quality cost, it comes as a surprise that quality costs are even higher than the company profit.
3. **As related to production:** Quality cost per unit of production cost is also a commonly used index. Production cost consists of material, labor and overheads and is often used in several other indices. It can be similarly indexed with design cost or purchase cost.
4. **As related to unit of production:** Quality cost per unit, such as an engine, one meter of cloth, etc. is a very simple index and effective for comparison when production lines are similar. In case of dissimilar production lines, the comparison is rather difficult.

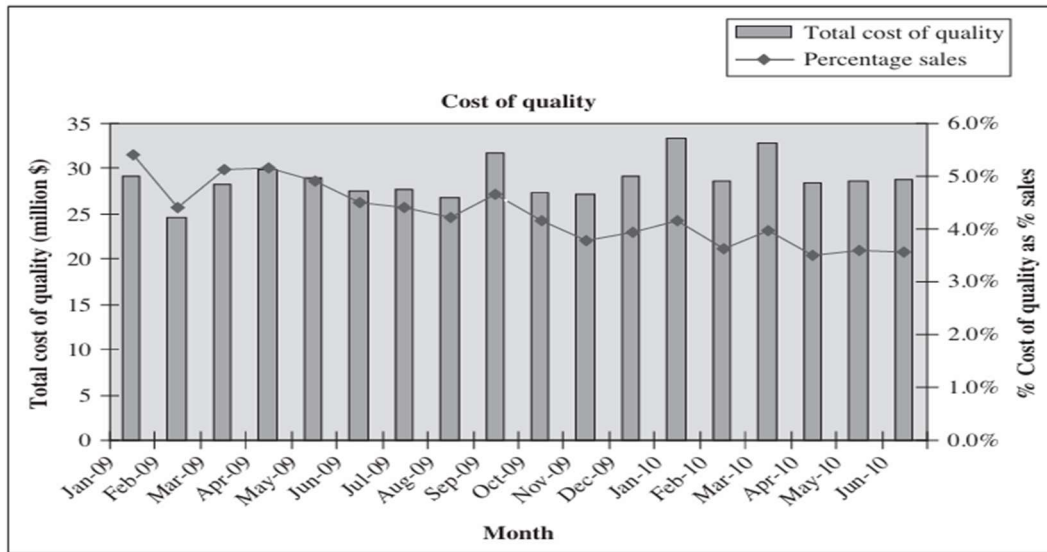


Figure 6: Cost of Poor Quality Tracked as Percentage of Sales (Sample Report)

The Figure shows cost of quality as a percentage at sales. While the absolute value of cost does not show specific trend, the percentage shows some reduction due to increase in sales.

Accounting departments normally issue quality cost reports. The report contains quality costs per month (or any suitable period) for each element and also data from the previous year. Comparison of current costs and historical data enables the management to arrive at budgets for the next period and strategies for control.

BALDRIGE CRITERIA FOR PERFORMANCE EXCELLENCE FRAMEWORK: A SYSTEMS PERSPECTIVE

The Malcolm Baldrige National Quality Award (MBNQA) is an annual award that recognizes U.S. organizations for performance excellence. It was created by Public Law on August 20, 1987. The award promotes: an understanding of the requirements for performance excellence and competitiveness improvement, sharing of information on successful performance strategies, and the benefits derived from using these strategies. There are five categories: manufacturing, service, small business, health care, and education. Three awards may be given each year in each category.

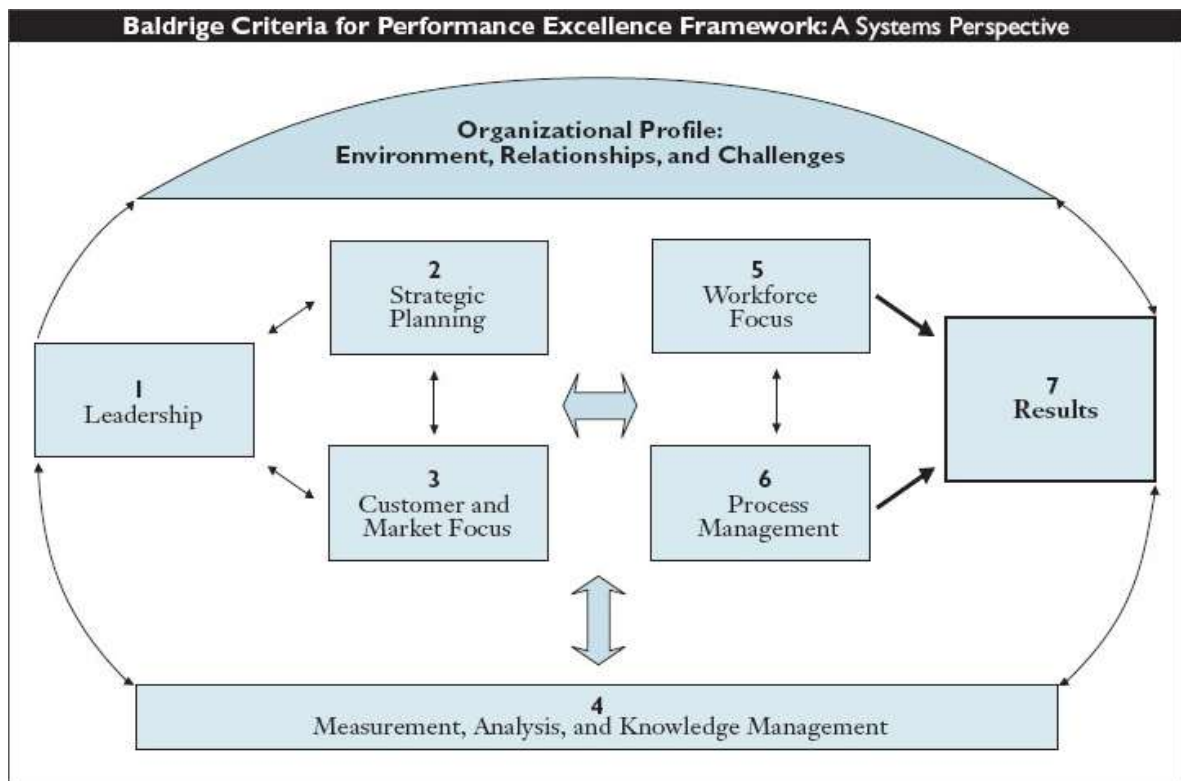


Figure: The Award Criteria Framework

Criteria for Performance Excellence

The criteria for performance excellence are the basis for making awards and for giving feedback to applicants. In addition, they (1) help improve performance practices and capabilities, (2) facilitate communication and sharing of the best practices information among U.S. organizations of all types, and (3) serve as a working tool for understanding and managing performance, planning, training, and assessment. The results-oriented goals are designed to deliver ever-improving value to customers, resulting in marketplace success, and to improve overall organizational performance and capability.

The core values and concepts are embodied in seven categories, as shown in the above figure. The seven categories shown in the figure are subdivided into 18 examination items and one or more sets of areas to address. Information is submitted by applicants in response to specific requirements of these areas.

Key Characteristics of the Criteria

1. **The criteria are directed toward results.** They focus principally on seven key areas of business performance. Results are a composite of

- Product
- Customer
- Market and financial
- Internal operational performance results
- Workforce
- Leadership
- Governance
- Societal responsibility

Improvements in these seven areas contribute significantly to organization performance, including financial performance. The results also recognize the importance of suppliers, the needs of communities, and the needs of the nation.

2. **The criteria are nonprescriptive and adaptable.** The reasons behind it are –

- The focus is on results, not on procedures or tools. Organizations are encouraged to develop and demonstrate creative, adaptive, and flexible approaches for meeting basic requirements.
- Selection of tools, techniques, and systems usually depends upon factors such as business type and size, the organization's stage of development, and employee capabilities and responsibilities.
- The focus is on common requirements within an organization rather than on specific procedures, which fosters better understanding, communication, sharing, and alignment while supporting diversity and creativity in approaches.

3. **The criteria support a systems approach to maintaining organization-wide goal alignment.** A systems approach to goal alignment, particularly when strategy and goals change over time, requires dynamic link ages among criteria items. In the criteria, action-oriented learning takes place using feedback between processes and results through cycles of learning.

The learning cycles have four clearly defined stages, similar to Shewhart's P-D-S-A.

- Planning, including design of processes, selection of measures, and deployment of requirements.
- Execution of plans.
- Assessment of progress, taking into account internal and external results.

- Revision of plans based upon assessment findings, learning, new inputs, and new requirements.
4. **The criteria support goal-based diagnosis.** The criteria and the scoring guidelines make up a two-part diagnostic (assessment) system. The criteria are a set of 18 performance-oriented requirements. The scoring guide lines indicate the assessment dimensions—approach, deployment, and results—and the key factors used to assess against each dimension. An assessment thus provides a profile of strengths and opportunities for improvement relative to the 18 basic requirements. In this way, assessment leads to actions, which contribute to the expected results.

Lesson 5: Performance Criteria Development and Balanced Score Card

After completion of this lesson you will be able to –

- Describe and develop a performance excellence criteria.
- Measure the scoring of applicants' responses.
- Prepare a balanced score card.

CRITERIA FOR PERFORMANCE EXCELLENCE

The Malcolm Baldrige National Quality Award (MBNQA) categories 18 items with their point values. The Leadership category examines how personal actions of the senior leaders of an organization guide and sustain the organization. Also examined, are organization's governance system and how an organization fulfills its legal, ethical and societal responsibilities and supports its key communities.

Criteria for Performance Excellence—Item Listing		
Preface: Organizational Profile		
P.1 Organizational Description		
P.2 Organizational Situation		
Categories and Items	Point	Values
1 Leadership		120
1.1 Senior Leadership . . . . .	.70	
1.2 Governance and Societal Responsibilities . . . . .	.50	
2 Strategic Planning		85
2.1 Strategy Development . . . . .	.40	
2.2 Strategy Development . . . . .	.45	
3 Customer Focus		85
3.1 Customer Engagement . . . . .	.40	
3.2 Voice of the Customer . . . . .	.45	
4 Measurement, Analysis and Knowledge Management		90
4.1 Measurement, Analysis and Improvement of Organizational Performance . . . . .	.45	
4.2 Management of Information, Knowledge and Information Technology . . . . .	.45	
5 Workforce Focus		85
5.1 Workforce Engagement . . . . .	.45	
5.2 Workforce Environment . . . . .	.40	
6 Process Management		85
6.1 Work Systems . . . . .	.35	
6.2 Work Processes . . . . .	.50	
7 Results		450
7.1 Product Outcomes . . . . .	.100	
7.2 Customer-focused Outcomes . . . . .	.70	
7.3 Financial and Market Outcomes . . . . .	.70	
7.4 Workforce-focused Outcomes . . . . .	.70	
7.5 Process Effectiveness Outcomes . . . . .	.70	
7.6 Leadership Outcomes . . . . .	.70	
TOTAL POINTS		1000

Figure: Criteria for Performance Excellence—Item Listing

The strategic planning category examines how an organization develops strategic objectives and action plans. Also examined, are how the chosen strategic objectives and action plans are deployed and changed if circumstances require, and how progress is measured.

The customer focus category examines how an organization engages its customers for long-term market place success. It also examines, how an organization listens to the voice of its customers and uses this information to improve and identify opportunities for innovation.

The measurement, analysis, and knowledge management category examines how an organization selects, gathers, analyzes, manages, and improves its data, information, and knowledge assets and how it manages its information technology. The category also examines how an organization reviews and uses those reviews to improve its performance.

The workforce focus category examines how an organization engages, manages and develops the work force to utilize its full potential in alignment with its overall mission, strategy and action plans. The category examines the ability to assess workforce capability, capacity needs and, the ability to build a workforce environment conducive to high performance.

The process management category examines how an organization designs its work systems and how it designs, manages, and improves its key processes for implementing those work systems that deliver customer value and achieve organizational success and sustainability.

The results category examines an organization's performance and improvement in all key areas, namely, product, customer-focused, financial and market, workforce-focused, process effectiveness and leadership outcomes. Performance levels are examined relative to those of the competitors and other organizations with similar product offerings.

SCORING SYSTEM

The system for scoring applicant responses is based on three evaluation dimensions: (1) approach, (2) deployment, and (3) results.

Approach refers to how the applicant addresses the item requirements. The factors used to evaluate approaches include:

- Appropriateness of the methods to the requirements.
- Effective use of the methods.
- Degree to which the approach is systematic, integrated, and consistently applied; embodies effective evaluation/improvement/learning cycles; and is based on reliable information and data.
- Evidence of innovative and/or significant and effective adaptations of approaches used in other applications or types of businesses.

Deployment refers to the extent to which the applicant’s approach is applied to all requirements of the item. The factors used to evaluate deployment include:

- Use of the approach in addressing business and item requirements.
- Use of the approach by all appropriate work units.

Results refer to outcomes in achieving the purposes given in the item. The factors used to evaluate results include:

- Current performance.
- Performance relative to appropriate comparisons and/or benchmarks.
- Rate, breadth, and importance of performance improvements.
- Demonstration of sustained improvement and/or sustained high-level performance.
- Linkage of results measures to key performance measures identified in the business overview and in approach/deployment items.

Use of the scoring system requires considerable training. Examiners receive more than three days of training, with most of the time devoted to the scoring system. This approach would be more appropriate for small and medium-sized organizations.

BALANCED SCORE CARD

A new approach to strategic management was developed in the early 1990s by Robert Kaplan and David Norton. They named this system as Balanced Score Card (BSC). Recognizing some of the weaknesses and vagueness of previous management approaches, this approach provides a prescription as to what companies should measure in order to “balance” the financial perspective.

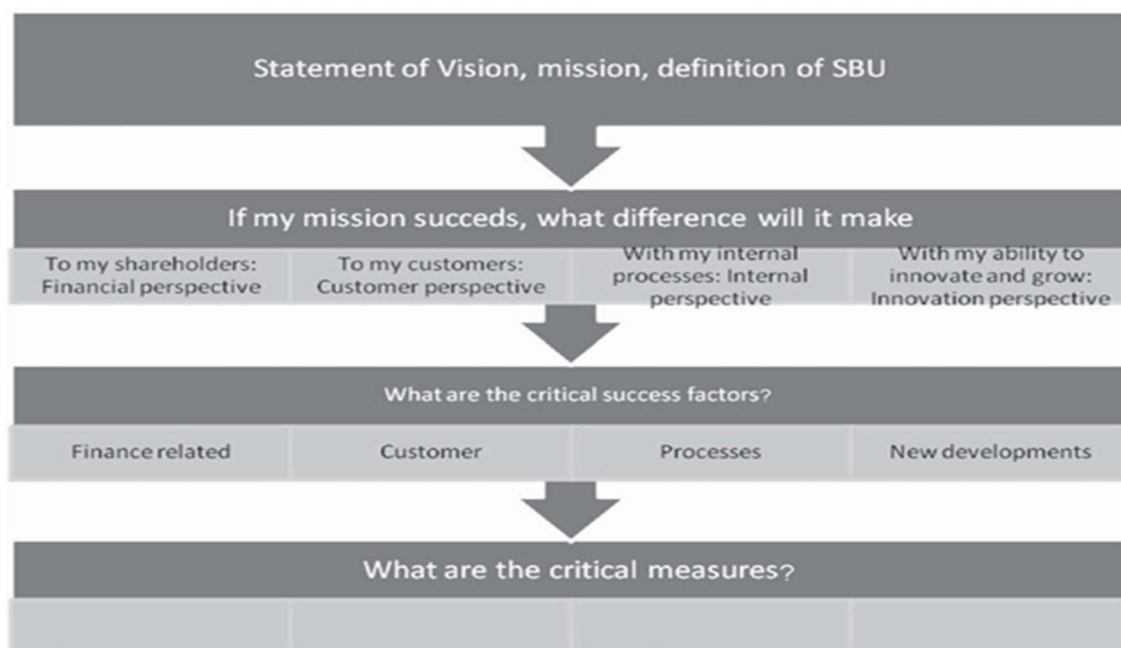


Figure: Deriving Performance Measures from Organizational Strategy

The most critical aspect is often to link measurements to the organizational strategy. One such approach is described in the Figure.

The BSC is not merely a measurement system but a management system that enables the organizations to clarify their vision and strategy and translate them into action. Financial measures tell the story of past, but the stakeholders are more concerned about the future and long-term capabilities and more and also on how to achieve the goals. The BSC approach provides a mechanism to achieve feedback on internal business processes and external outputs such as customer satisfaction.

The BSC is a medium to convert vision and objectives into a strategy and measurable objectives to provide direction to the organization. In today's world, a mere balance sheet is not adequate to assess the performance. The BSC suggests that we review the organization from four perspectives to develop metrics, collect data and analyze it relative to each of these perspectives:

- The learning and growth perspective
- The business process perspective
- The customer perspective
- The financial perspective

Discussion Questions:

1. Describe the concept of performance measure.
2. Explain the reasons or objectives of performance measure.
3. Identify and discuss the characteristics and types of performance measures.
4. How will you make decision on performance areas?
5. Discuss the criteria of performance measures.
6. Define the cost of quality.
7. Categorize and describe the quality costs.
8. How is the quality cost related to business measures? Discuss.
9. Develop a performance excellence framework in accordance with the Baldrige criteria.
10. Describe and develop a performance excellence criteria.
11. How will you score on applicants' responses?
12. How can you prepare a balanced score card?

Critical Questions:

1. Working in a team of three or more people, what performance measures would you recommend for the following organizations?
 - (a) Large bank
 - (b) Health-care facility
 - (c) University academic department
 - (d) University nonacademic department
 - (e) Large department store
 - (f) Grade school
 - (g) Manufacturing facility
 - (h) Large grocery store

Benchmarking



Unit Highlights

- Lesson – 1: Benchmarking Concept, Reasons and Process
- Lesson – 2: Benchmarking Decision, Types and Pitfalls

Technologies Used for Content Delivery

- ❖ BOUTUBE
- ❖ BOU LMS
- ❖ WebTV
- ❖ Web Radio
- ❖ Mobile Technology with MicroSD Card
- ❖ BTV Program
- ❖ Bangladesh Betar Program

Lesson 1: Benchmarking Concept, Reasons and Process

After completion of this lesson you will be able to –

- Understand the benchmarking concept.
- Analyze the reasons behind benchmarking.
- Conduct the benchmarking process in the organization.

CONCEPT OF BENCHMARKING

Benchmarking is a systematic method by which organizations can measure themselves against the best industry practices. It promotes superior performance by providing an organized framework through which organizations learn how the “best in class” do things, understand how these best practices differ from their own, and implement change to close the gap. The essence of benchmarking is the process of borrowing ideas and adapting them to gain competitive advantage. It is a tool for continuous improvement. It is used extensively by both manufacturing and service organizations, including Xerox, Ford, and Toyota.

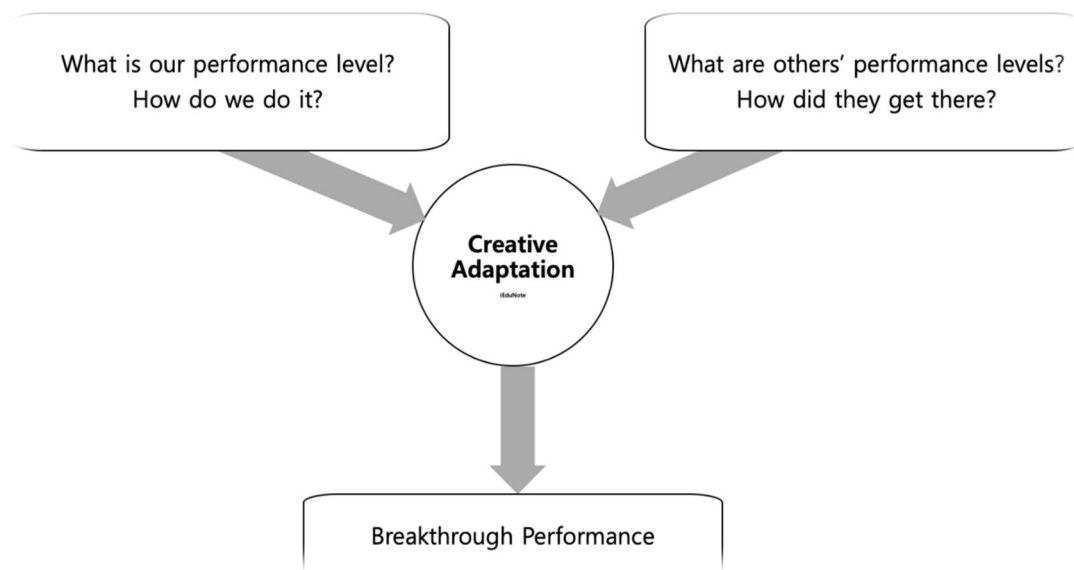


Figure: Conceptual interpretation of benchmarking

Benchmarking is the systematic search for best practices, innovative ideas, and highly effective operating procedures. Benchmarking is not new and indeed has been around for a long time. In fact, in the 1800s, Francis Lowell, a New England colonist, studied British textile mills and imported many ideas along with improvements he made for the burgeoning (flourishing) American textile mills.

As shown in the above figure, benchmarking measures performance against that of best-in-class organizations, determines how the best in class achieve those performance levels, and uses the information as the basis for adaptive creativity and breakthrough performance.

Implicit in the definition of benchmarking have two key elements. *First*, measuring performance requires some sort of unit of measure. These are called metrics and are usually expressed numerically. The numbers achieved by the best-in-class benchmark are the target. An organization seeking improvement then plots its own performance against the target. *Second*, benchmarking requires that managers understand why their performance differs. Benchmarkers must develop a thorough and in-depth knowledge of both their own processes and the processes of the best-in-class organization.

Benchmarking is all about setting goals and objectives and about meeting them by improving processes. It allows companies to compare their performance against competitors or industry standards, identify areas for improvement, and adopt successful strategies from others.

REASONS FOR BENCHMARKING

Benchmarking is used to improve business performance by identifying best practices and setting performance targets. This process helps in enhancing efficiency, reducing costs, increasing profitability, and ultimately gaining a competitive edge. Here's a more detailed look at the reasons for benchmarking:

1. Performance Improvement:

- **Identifying areas for improvement:** Benchmarking reveals performance gaps by comparing a company's operations, processes, and results against those of industry leaders or best-in-class companies.
- **Setting realistic goals:** It helps establish achievable performance targets based on the performance of successful organizations, motivating employees to strive for improvement.
- **Boosting productivity and efficiency:** By learning from the best practices of others, companies can optimize their processes, eliminate bottlenecks, and improve overall efficiency.

2. Competitive Advantage:

- **Understanding the competitive landscape:** Benchmarking provides insights into competitor strategies, strengths, and weaknesses, enabling companies to identify opportunities and threats.
- **Gaining a competitive edge:** By identifying areas where competitors excel, companies can develop strategies to outperform them and differentiate themselves in the market.
- **Staying ahead of the curve:** Continuous benchmarking helps companies adapt to changing market dynamics, technological advancements, and evolving customer expectations.

3. Cost Reduction and Profitability:

- **Identifying cost-saving opportunities:** Benchmarking can reveal inefficiencies in processes and identify areas where costs can be reduced without compromising quality or performance.
- **Optimizing resource allocation:** By understanding how others manage their resources, companies can optimize their own resource allocation to maximize efficiency and minimize waste.
- **Increasing profitability:** By improving efficiency, reducing costs, and gaining a competitive edge, benchmarking can contribute to increased profitability.

4. Innovation and Growth:

- **Identifying new ideas and best practices:** Benchmarking can expose companies to innovative ideas and best practices from other industries or sectors, fostering creativity and innovation within their own organization.
- **Driving strategic planning:** Benchmarking provides valuable data for strategic planning by identifying growth opportunities, potential market expansion areas, and areas for product or service development.
- **Expanding business horizons:** By learning from the experiences of others, companies can broaden their perspectives and explore new business opportunities.

5. Employee Motivation and Engagement:

- **Setting challenging but achievable goals:** Benchmarking can help set challenging yet attainable goals for employees, fostering a culture of continuous improvement and motivating them to perform at their best.
- **Creating a sense of purpose and direction:** By understanding how their work contributes to the overall success of the company and by seeing how they can improve, employees can feel more engaged and motivated.
- **Promoting teamwork and collaboration:** Benchmarking can foster a collaborative environment where employees work together to identify areas for improvement and implement best practices.

PROCESS OF BENCHMARKING

The benchmarking process typically involves six key steps. Here's a more detailed breakdown of each step:

1. Planning: Defining the scope and objectives of the benchmarking study.

- Define the specific area or process you want to benchmark.

- Identify what you want to achieve through benchmarking (e.g., improve efficiency, reduce costs, increase customer satisfaction).
 - Determine which companies or organizations you will benchmark against.
 - Form a cross-functional team to manage the benchmarking process.
- 2. Analysis:** Identifying key performance indicators (KPIs) and gathering data.
- Collect data related to the chosen area from your own organization and the benchmarking partners.
 - Analyze the data to understand your current performance and identify areas for improvement.
 - Identify key performance indicators (KPIs) that will be used to measure performance.
- 3. Comparison:** Measuring your performance against the benchmarks.
- Compare your organization's performance against the benchmarks you have identified.
 - Identify the performance gap between your organization and the best performers.
- 4. Action Planning:** Developing strategies to close the performance gap.
- Develop an action plan to address the performance gap and improve your organization's performance.
 - Prioritize areas for improvement based on their potential impact and feasibility.
 - Set specific, measurable, achievable, relevant, and time-bound (SMART) goals.
- 5. Implementation:** Putting the action plan into practice.
- Put the action plan into practice.
 - Allocate resources and responsibilities for implementing the changes.
- 6. Review:** Regularly monitoring progress and making adjustments as needed.
- Regularly monitor your organization's performance against the benchmarks.
 - Evaluate the effectiveness of the implemented changes.
 - Make adjustments to the action plan as needed to ensure continuous improvement.

Lesson 2: Benchmarking Decision, Types and Pitfalls

After completion of this lesson you will be able to –

- *Make decision about benchmarking in the organization.*
- *Make decision about the areas of benchmarking.*
- *Classify the various types of benchmarking.*
- *Describe the pitfalls of benchmarking.*

DECIDING BENCHMARKING

To decide what to benchmark, prioritize critical processes that align with your business strategy, then select relevant metrics and identify appropriate comparison groups (competitors, internal units, or industry leaders) that provide meaningful data to reveal performance gaps and opportunities for improvement.

1. Understand organization's Purpose & Goals

- **Define your objectives:** What do you want to achieve? Are you looking to improve a specific process, gain a competitive edge, or meet a strategic goal?
- **Identify key stakeholders:** Understand what metrics and areas matter most to key stakeholders and align these with your overall business strategy.

2. Identification of Critical Processes

- **Focus on what matters most:** Look for processes and systems that are crucial to your business's success and directly impact customer satisfaction or other key objectives.

3. Selection of Relevant Metrics

- **Choose clear and consistent metrics:** Define specific performance indicators (KPIs) like response time, throughput, or resource utilization that are measurable and relevant to your goals.
- **Be explicit:** State clearly what you are measuring to ensure clarity and facilitate tangible improvements.

4. Choose the Comparison Group

- **Competitors:** Compare with direct competitors to understand industry norms and customer expectations.
- **Internal comparison:** Benchmark different units or processes within your own organization to find best practices internally.
- **Industry leaders/best-in-class:** Learn from the best performers in your sector, or even across different industries, to discover innovative strategies.

- **Widely recognized standards:** Utilize established standards, norms, or frameworks as benchmarks where appropriate.

5. Adjust the Differences

- **Acknowledge differences:** When comparing your organization to others, account for variations in size, market, or other factors that could impact performance.

6. Plan the Benchmarking Process

- **Create a plan:** Develop a detailed plan for the entire benchmarking process, which includes data collection, analysis, implementation of changes, and ongoing monitoring.

WHAT TO BENCHMARK / AREAS OF BENCHMARKING

An organization can benchmark its business's processes, services, products, performance, and overall goals against industry leaders, competitors, or even internal teams to identify areas for improvement, innovation, and increased efficiency. Specific examples include comparing customer satisfaction scores, delivery times, operational efficiency, product quality, sales figures, marketing performance, and technological adoption. The areas of benchmarking are as follow:

- **Processes & Operations:** Analyze how teams, departments, or entire companies execute tasks and manage workflows to find more efficient methods.
- **Products & Services:** Compare the features, quality, and customer satisfaction of your products and services against those of other organizations.
- **Performance Metrics:** Benchmark key performance indicators (KPIs) such as sales volume, revenue, customer acquisition cost, and operational efficiency to gauge success and identify areas for growth.
- **Technology:** Evaluate the adoption and effectiveness of different technologies to understand how they drive competitive advantages.
- **Customer Experience:** Measure customer satisfaction, engagement, and loyalty to understand how your customer experience compares to others.

TYPES OF BENCHMARKING

Benchmarking, the process of comparing a company's performance against others, can be categorized into several types. The main types include internal benchmarking, external benchmarking, and further divisions like competitive, functional, process, performance, and strategic benchmarking.

Here's a more detailed breakdown:

1. Internal Benchmarking: This involves comparing different areas, teams, or processes within the same organization. For example, comparing the performance of one department

to another, or one production line to another, within the same company. This helps identify best practices within the organization and spread them across different units.

2. External Benchmarking: This involves comparing a company's performance against external entities, such as competitors or organizations in other industries. External benchmarking can be further categorized into:

- **Competitive Benchmarking:** Comparing your performance to direct competitors within the same industry.
- **Functional Benchmarking:** Comparing specific functions or processes to those of companies in different, but related, industries.
- **Strategic Benchmarking:** Analyzing the overall strategies of successful companies, regardless of industry, to identify potential strategic improvements.
- **Process Benchmarking:** Focusing on specific processes to identify best practices and areas for improvement.
- **Performance Benchmarking:** Assessing quantitative performance metrics against those of other organizations.
- **Financial Benchmarking:** Comparing financial performance metrics like profitability, revenue, or cost structure with competitors or industry standards.

3. Other Types of Benchmarking:

- **Generic Benchmarking:** Comparing processes that are not industry-specific, such as customer service or order fulfillment, across different industries.
- **Collaborative Benchmarking:** Working with other organizations to share data and best practices.
- **Technical Benchmarking:** Focusing on the technical aspects of products or processes.
- **International Benchmarking:** Comparing performance against organizations in other countries.

PITFALLS OF BENCHMARKING

Pitfalls of benchmarking in TQM include selecting inappropriate benchmarks, focusing on numbers over processes, neglecting internal strengths and context, using inaccurate or incomplete data, implementing changes without buy-in, and becoming complacent after minor gains. Other challenges involve the high cost of data collection, the potential for an overemphasis on competition, and resistance to change from employees. Common Pitfalls of benchmarking are:

1. Inaccurate or Irrelevant Comparisons

- **Choosing the Wrong Benchmarks:** Selecting partners or metrics that aren't aligned with the organization's specific context or goals.

- **"Apples to Oranges" Comparisons:** Making comparisons when too many variables are different, making the results meaningless.
2. **Data and Context Issues**
 - **Inaccurate or Flawed Data:** Using unreliable data for comparisons can lead to incorrect conclusions.
 - **Lack of Context:** Ignoring the unique internal and external factors of different organizations can lead to inappropriate adoption of best practices.
 3. **Focus and Strategy Problems**
 - **Focus on Numbers over Processes:** Concentrating only on performance metrics without understanding the underlying processes or how those results were achieved.
 - **Blind Adoption of Best Practices:** Adopting practices from other organizations without evaluating if they fit the specific culture, resources, and objectives of your own.
 4. **Internal and Implementation Hurdles**
 - **Resistance to Change:** Employees may resist the changes recommended by benchmarking results, leading to implementation failure.
 - **Insufficient Internal Assessment:** Failing to understand and address internal issues before benchmarking can result in misguided efforts and ineffective improvements.
 5. **Cultural and Strategic Missteps**
 - **Overemphasis on Competition:** Benchmarking can lead to a win-at-all-costs mentality, fostering a negative culture and distracting from genuine internal improvement.
 - **Complacency:** Gaining minor improvements from benchmarking can lead to a sense of complacency, hindering the pursuit of larger, strategic goals.

Discussion Questions:

1. What do you understand by benchmarking?
2. Describe the reasons behind benchmarking.
3. Describe the benchmarking process of the organization.
4. How will you make decision about the necessity of benchmarking in your organization? Explain.
5. How will you make decision about which areas of your organization need to be benchmark?
6. Classify and discuss the various types of benchmarking.
7. Describe the pitfalls of benchmarking.

Critical Discussion Questions:

1. Efficiency has been defined as “doing things better” and effectiveness as “doing better things.” Describe how benchmarking can be used to improve both efficiency and effectiveness.
2. Benchmarking studies are a search for two types of information—an understanding of best-in-class processes and the metrics that result. In your opinion, which piece of information is more important? Why?

Quality Management System

8

Unit Highlights

- Lesson – 1: Concept and Framework of Quality Management System
- Lesson – 2 and 3: ISO and Its Requirements
- Lesson – 4: Implementation & Documentation of QMS
- Lesson – 5: Quality Certification and Registration of Quality Management System

Technologies Used for Content Delivery

- ❖ BOUTUBE
- ❖ BOU LMS
- ❖ WebTV
- ❖ Web Radio
- ❖ Mobile Technology with MicroSD Card
- ❖ BTV Program
- ❖ Bangladesh Betar Program

Lesson 1: Concept and Framework of Quality Management System

After completion of this lesson you will be able to –

- *Describe the concept of quality management system.*
- *Identify the core components of a quality management system.*
- *Describe the common QMS framework.*

CONCEPT OF QUALITY MANAGEMENT SYSTEM

A Quality management system (QMS) is a formal framework of documented processes, procedures, and responsibilities designed to consistently meet customer needs and regulatory requirements, while also driving continuous improvement in products and services. Key components include quality planning, quality assurance, quality control, and quality improvement, all aimed at enhancing customer satisfaction and operational efficiency. A QMS relies on a systematic approach, data-driven decision-making, and a strong emphasis on ongoing learning and adaptation within an organization.

A QMS is a formal system that documents an organization's procedures, responsibilities, and processes for delivering quality products or services. It aims to ensure that outputs meet customer expectations and comply with relevant regulations. A QMS focuses on continuous improvement and efficiency throughout the organization.

A quality management system (QMS) is a documented framework of processes, policies, and procedures that an organization uses to ensure its products or services consistently meet and exceed customer expectations. The goal of a QMS is to improve efficiency, reduce waste, and manage risks by standardizing and continually improving business operations.

CORE COMPONENTS OF A QUALITY MANAGEMENT SYSTEM

A comprehensive QMS typically encompasses four main components:

1. **Quality Planning:** Identifying customer needs and developing the necessary service models and structures to meet them.
2. **Quality Assurance:** Implementing processes like audits and inspections to periodically verify that services are meeting customer and population needs.
3. **Quality Control:** Establishing clear quality measures, monitoring them, and taking corrective actions when performance falls short.
4. **Quality Improvement:** A continuous cycle of seeking opportunities to enhance processes, products, and systems based on data and feedback.

A QMS is built on a set of core components that guide how an organization achieves and maintains quality. Such as:

- **Quality policy and objectives:** The high-level statement of commitment to quality and specific, measurable goals that align with the organization's strategic direction.

- **Processes and procedures:** Step-by-step instructions and documented workflows that ensure tasks are performed consistently and correctly.
- **Document control:** A system for managing the creation, review, approval, distribution, and archival of all quality-related documents and records.
- **Training management:** Programs to ensure employees have the necessary skills and competence to perform their roles within the QMS.
- **Corrective and preventive action (CAPA):** A process for investigating the root cause of issues and implementing solutions to prevent them from recurring.
- **Audits:** Scheduled internal and external audits to verify compliance with QMS procedures and identify areas for improvement.
- **Management review:** Periodic meetings by senior leadership to assess the QMS's overall performance and effectiveness.
- **Data management:** The collection, storage, and analysis of data to support evidence-based decision-making for quality improvement.

COMMON QMS FRAMEWORKS

Many organizations base their QMS on recognized international standards and methodologies.

1. **ISO 9001:** The most widely used international standard for quality management. It provides a set of universal requirements for a QMS that can be applied to any organization, regardless of its size or industry.
2. **Total Quality Management (TQM):** A holistic management philosophy that emphasizes continuous, organization-wide efforts to achieve long-term customer satisfaction. It focuses on the active participation of all employees in improving processes.
3. **Six Sigma:** A data-driven methodology that uses statistical analysis to measure and improve processes, aiming to eliminate defects and reduce variability.
4. **Lean Manufacturing:** A system focused on eliminating waste from all business processes to increase efficiency and maximize customer value.
5. **Industry-specific standards:** Some industries have specialized QMS standards built on the ISO 9001 model with additional requirements, such as:
 - IATF 16949 for the automotive industry.
 - AS9100 for the aerospace and defense industries.
 - ISO 13485 for medical device manufacturers.

Lesson 2 and 3: ISO and Its Requirements

After completion of this lesson you will be able to –

- *Understand the concept of ISO and ISO series with their focus.*
- *Analyze the history of ISO.*
- *Describe the benefits of ISO registration.*
- *Operate your business followed by ISO requirements / standard clauses.*

CONCEPT OF ISO

The "ISO series of standards" refers to the numerous families of standards published by the International Organization for Standardization (ISO), which are grouped by subject matter, like the ISO 9000 family for quality management, the ISO 27000 family for information security, and the ISO 14000 family for environmental management. These standards provide a framework for organizations to manage processes, ensure quality, and achieve specific objectives, with some standards (like ISO 9001 and ISO 27001) outlining specific requirements for certification.

KEY ISO SERIES AND THEIR FOCUS

The important series of ISO and their focus are presented below:

- **ISO 9000 family:**
Focuses on quality management, providing fundamental concepts, principles, and requirements for establishing and maintaining effective quality management systems (QMS).
- **ISO/IEC 27000 family:**
Pertains to information security, offering requirements and guidelines for implementing information security management systems (ISMS) to protect data and systems.
- **ISO 14000 family:**
Deals with environmental management, helping organizations minimize their environmental impact by setting up environmental management systems.
- **ISO 31000 family:**
Provides principles and guidelines for managing risks within organizations.
- **ISO 45000 family:**
Addresses occupational health and safety, establishing requirements for managing risks and preventing work-related injuries and ill-health.
- **ISO 22000 family:**
Focuses on food safety management, outlining what an organization needs to control food safety hazards effectively.

- **ISO 22300 family:**

Concentrates on business continuity, helping organizations protect against, mitigate, and recover from disruptive events.

ISO (INTERNATIONAL STANDARDIZATION ORGANIZATION) AND ITS HISTORY

The International Organization for Standardization (ISO) was founded in 1946 in Geneva, Switzerland. Its mandate is to promote the development of international standards to facilitate the exchange of goods and services worldwide. ISO is composed of more than 90 member countries. The United States representative is the American National Standards Institute (ANSI).

The ISO Technical Committee (TC) developed a series of international standards for quality systems, which were first published in 1987. The standards (ISO 9000, 9001, and 9004) were intended to be advisory and were developed for use in two-party contractual situations and internal auditing. However, with their adoption by the European Community (EC) and a worldwide emphasis on quality and economic competitiveness, the standards have become universally accepted.

The fourth edition of ISO 9001 was released in the year 2008 and it replaced the third edition (ISO 9001:2000), which had been amended to clarify the points in the text and also to enhance the compatibility with ISO 14001:2004.

Most countries have adopted the ISO 9000 series as their national standards. Likewise, thousands of organizations throughout the world have quality systems registered to the standard. In the United States, the national standards are published by the American National Institute/American Society for Quality (ANSI/ASQ) as the ANSI/ASQ Q9000 series. Government bodies throughout the world, including the United States, are also using the standards. In India, Bureau of Indian Standards (BIS) adopts ISO certification standards under the dual numbering scheme.

In a two-party system, the supplier of a product or service would develop a quality system that conformed to the standards. The customers would then audit the system for acceptability. This two-party system results in both the supplier and customer having to participate in multiple audits, which can be extremely costly. This practice has been replaced by a third-party registration system.

A quality system registration involves the assessment and periodic surveillance audit of the adequacy of a supplier's quality system by a third party, who is a registrar. When a system conforms to the registrar's interpretation of the standard, the registrar issues a certificate of registration to the supplier. This registration ensures customers or potential customers that a supplier has a quality system in place and it is being monitored.

BENEFITS OF ISO REGISTRATION IN TQM

ISO registration provides a standardized, systemic framework that is a crucial starting point for implementing the broader cultural and operational philosophy of Total Quality Management (TQM). The benefits of ISO registration are discussed from different perspectives:

A) Strategic benefits of ISO for TQM

- **Creates a quality-focused mindset:** The process of seeking ISO certification forces an organization to develop a shared vision and formal quality policy, fostering an initial commitment to quality that is central to TQM. This top-down leadership helps embed a quality-centric culture throughout the company.
- **Enhances market reputation and competitiveness:** ISO certification is a globally recognized symbol of quality that builds trust with customers and stakeholders. This external validation supports TQM's aim of achieving long-term success through customer satisfaction, giving the company a significant competitive advantage.
- **Fosters a culture of continual improvement:** The Plan-Do-Check-Act (PDCA) cycle, a core component of ISO 9001, provides a clear methodology for implementing TQM's philosophy of continuous improvement. This cycle guides organizations to evaluate and refine processes regularly, ensuring they are always adapting and improving.

B) Operational benefits of ISO for TQM

- **Promotes a process-centered approach:** The ISO registration process requires organizations to define and document their key processes, clarifying roles and responsibilities. This structured, process-based approach is fundamental to TQM and helps eliminate waste, reduce errors, and increase operational efficiency.
- **Enables data-driven decision-making:** To achieve and maintain ISO certification, organizations must collect and analyze data on their quality metrics. This requirement for evidence-based decision-making strengthens a key TQM principle, allowing companies to identify root causes of problems and make more informed choices.
- **Increases employee engagement:** Implementing ISO standards clarifies objectives, improves internal communication, and provides employees with the tools and training to do their jobs effectively. This empowerment and clarity are essential for TQM, which relies on the total involvement of all employees in quality improvement.
- **Improves supplier relationships:** ISO certification provides a quality benchmark that strengthens the supply chain. It builds confidence with suppliers and partners, allowing for better collaboration and more consistent quality throughout the value chain, a core principle of TQM.

ISO 9000 REQUIREMENTS / STANDARDS CLAUSES

The standard has eight clauses: Scope, Normative References, Definitions, Quality Management Systems, Management Responsibility, Resource Management, Product and/or Service Realization, and Measurement, Analysis, and Improvement. The first three clauses are informational, while the last five are requirements that an organization must meet.

1. **Scope:** The purpose of the standard is for the organization to demonstrate its ability to provide a product that meets customer and regulatory requirements and to enhance customer satisfaction. This purpose is accomplished by evaluating and continually improving the system, rather than the product. The requirements of the standard are intended to be applicable to all types and sizes of organizations.
2. **Normative Reference:** ISO 9000:2005 Quality Management Systems considered as Fundamentals and vocabulary are a normative reference that provides applicable concepts and definitions.
3. **Terms and Definitions:** For the purposes of this standard, the terms and definitions given in ISO 9000:2000 apply. Throughout the text of this standard, the term “Product” also means “Service.”

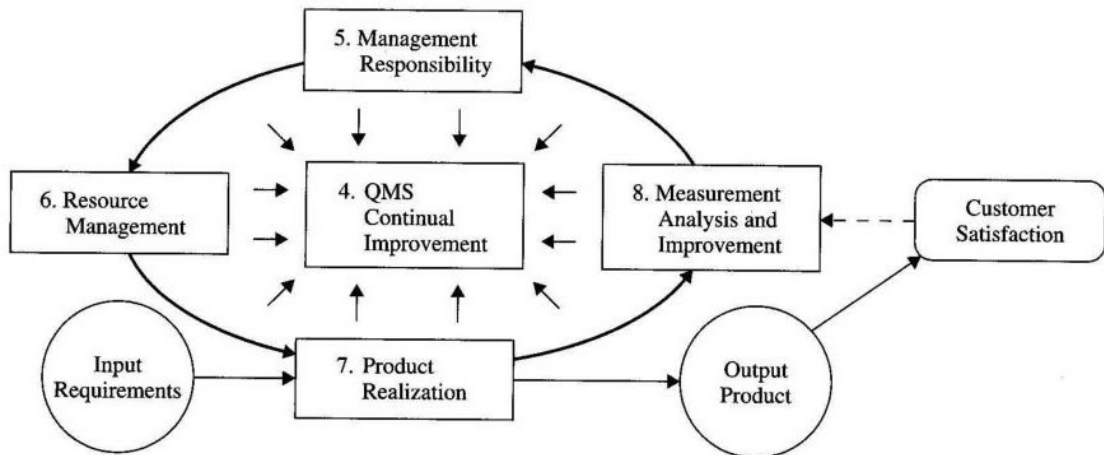


Figure: Model of a Process-Based Quality Management System

4. QUALITY MANAGEMENT SYSTEM (QMS)

4.1 General Requirements: The organization shall establish, document, implement, and maintain a QMS and continually improve its effectiveness. The organization shall (a) determine the processes needed for QMS and their applications throughout the organization, (b) determine their sequence and interaction, (c) determine criteria and methods for effective operation and control of these processes, (d) ensure the availability of resources and information necessary to support and monitor these processes, (e) monitor, measure wherever applicable, and analyze these processes, and

(f) implement actions to achieve planned results and continual improvement of these processes.

4.2 Documentation

4.2.1 General Documentation: General documentation shall include (a) statements of a quality policy and quality objectives, (b) a quality manual, (c) required documented procedures and records, (d) needed documents to ensure effective planning, operation, and control of processes, and records. The extent of the documentation will depend on the organization's size and type of activities; the complexity of the processes and their interactions; and the competency of the employees. For example: a small organization may verbally notify a manager of an upcoming meeting, whereas a large organization would need written notification.

4.2.2 Quality Manual: A quality manual shall be established and maintained that includes (a) the scope of the QMS with details and justification for any exclusions, (b) the documented procedures or reference to them, and (c) a description of the interaction among the QMS processes.

4.2.3 Control of Documents: Documents required by the QMS shall be controlled. Records are special type of documents. A documented procedure shall be in place to define the controls needed to (a) approve documents prior to use, (b) review, update, and re-approve as necessary, (c) identify the current revision status, (d) ensure that current versions are available at the point of use, (e) ensure that documents are legible and readily identified, (f) identify and distribute documents of external origin, and (g) provide for the prompt removal of obsolete documents and suitably identify any that may be retained.

4.2.4 Control of Records: Records which are established to provide evidence of conformity to requirements and the effective operation of QMS shall be controlled. A documented procedure shall be established to define the controls needed for the identification, storage, protection, retrieval, retention and disposition of records. Records shall remain legible, readily identifiable and retrievable.

5. MANAGEMENT RESPONSIBILITY

5.1 Management Commitment: Top management shall provide evidence of their commitment to the development, implementation, and continual improvement of the QMS by (a) communicating the need to meet customer, legal, and regulatory requirements, (b) establishing a quality policy, (c) ensuring that quality objectives are established, (d) conducting management reviews, and (e) ensuring the availability of resources.

5.2 Customer Focus: Top management shall ensure that customer requirements are determined and met with the aim of enhancing customer satisfaction.

5.3 Quality Policy: Top management shall insure that the quality policy (a) is appropriate to the organization's purpose or mission, (b) includes a commitment to comply with requirements and continually improve the effectiveness of the QMS, (c) provides a framework for establishing and reviewing the quality objectives, (d) is communicated and understood within the organization, and (e) is reviewed for continuing stability. The quality policy gives the overall intention and direction of the organization related to quality.

5.4 Planning:

5.4.1 Quality Objectives: Top management shall ensure that quality objectives are established at relevant functions and levels within the organization and include product requirements. They shall be measurable and consistent with the quality policy. In addition, they should ensure that customer expectations are met. Quality objectives are something sought or aimed for related to quality.

5.4.2 Quality Management System Planning: Top management shall ensure that the planning of the QMS is accomplished in order to meet the requirements of the QMS as stated in the General Requirements, as well as the Quality Objectives. In addition, the integrity of the QMS is maintained when changes are planned and implemented.

5.5 Responsibility, Authority, and Communication

5.5.1 Responsibility and Authority: Top management shall ensure that responsibilities and authorities are defined and communicated within the organization. Responsibilities can be defined in job descriptions, procedures, and work instructions. Authorities and interrelationships can be defined in an organization chart.

5.5.2 Management Representative: Top management shall appoint a member the of organization's management, regardless of his/her other duties, who shall have the responsibility and authority that includes (a) ensuring that processes needed for the QMS are established, implemented, and maintained, (b) reporting to top man agement on the performance of the QMS and any need for improvement, and (c) ensuring the promotion of awareness of customer requirements throughout the organization.

5.5.3 Internal Communication: Top management shall ensure that appropriate communication channels are established within the organization and that communication takes place regarding the QMS. Typical communication techniques are management workplace briefing, recognition of achievement, bulletin boards, e-mail, and in-house news brochures.

5.6 Management Review

5.6.1 General: Top management shall review the QMS at planned intervals to ensure its continuing suitability, adequacy, and effectiveness. This review shall include assessing opportunities for improvement and the need for changes to the QMS including the quality policy and quality objectives.

5.6.2 Review Input: The input to the review shall include information on (a) results of audits, (b) customer feedback, (c) process performance and product conformity, (d) status of corrective and preventive actions, (e) follow-up actions from previous management reviews, (f) changes that could affect the QMS, and (g) recommendations for improvement.

5.6.3 Review Output: The output from the review shall include any decisions and actions related to (a) improvement of the effectiveness of the QMS and its processes, (b) improvement of the product related to customer requirements, and (c) identification of resource needs. Top management can use the outputs as inputs to improvement opportunities.

6. RESOURCE MANAGEMENT

6.1 Provision of Resources: The organization shall determine and provide the resources needed (a) to implement and maintain the QMS and continually improve its effectiveness, and (b) to enhance customer satisfaction by meeting customer requirements. Resources may include people, infrastructure, work environment, information, suppliers, natural resources, and financial resources.

6.2 Human Resources

6.2.1 General: Personnel performing work that affects conformity to product requirements shall be competent on the basis of appropriate education, training, skills, and experience. Conformity to product requirements can be affected directly or indirectly by personnel performing any task within the QMS.

6.2.2 Competence, Training, and Awareness: The organization shall (a) determine the necessary competence for personnel performing work affecting conformity to product requirements, (b) where applicable, provide training or take other actions to achieve the necessary competence, (c) evaluate the effectiveness of the actions taken, (d) ensure that its personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives, and (e) maintain appropriate records of education, training, skills, and experience. Competency is defined as the demonstrated ability to apply knowledge and skills.

6.3 Infrastructure: The organization shall determine, provide, and maintain the infrastructure needed to achieve conformity to product requirements. Infrastructure includes, as applicable (a) buildings, workspace, and associated utilities, (b) process

equipment (both hardware and software), and (c) supporting services (such as transport, communication or information systems).

6.4 Work Environment: The organization shall determine and manage the work environment needed to achieve conformity to product requirements. Creation of a suitable work environment can have a positive influence on employee motivation, satisfaction, and performance.

7. PRODUCT REALIZATION

7.1 Planning of Product Realization: The organization shall plan and develop the processes needed for product realization. Planning of product realization shall be consistent with the requirements of the other processes of QMS. In planning product realization, the organization shall determine the following, as appropriate: (a) quality objectives and requirements for the product; (b) the need to establish processes and documents, and to provide resources specific to the product; (c) required verification, validation, monitoring, measurement inspection, and test activities specific to the product and the criteria for product acceptance; and (d) records needed to provide evidence that the realization processes and resulting product or service meet requirements.

7.2 Customer-Related Processes

7.2.1 Determination of Requirements Related to the Product: The organization shall determine (a) requirements specified by the customer, including the requirements for delivery and post-delivery activities, (b) requirements not stated by the customer but necessary for specified or intended use, where known, (c) statutory and regulatory requirements applicable to the product, and (d) any additional requirements considered necessary by the organization. Post-delivery activities include, for example, actions under warranty provisions, contractual obligations such as maintenance services and supplementary services such as recycling or final disposal.

7.2.2 Review of Requirements Related to the Product: The organization shall review the requirements related to the product. This review shall be conducted prior to the organization's commitment to supply a product to the customer ensuring that: (a) product requirements are defined, (b) contract or order requirements differing from those previously expressed are resolved, and (c) the organization has the ability to meet the defined requirements. Records of the results of the review and actions arising from the review shall be maintained.

7.2.3 Customer Communication: The organization shall determine and implement effective arrangements for communicating with customers in relation to (a) product information, (b) inquiries, contracts, or order handling, including amendments, and (c) customer feedback, including customer complaints.

7.3 Design and Development

7.3.1 Design and Development Planning: The organization shall plan and control the design and development of the product. During the design and development planning, the organization shall determine (a) the design and development stages, (b) the review, verification and validation that are appropriate to each design and development stage, and (c) the responsibilities and authorities for design and development. The organization shall manage the interfaces between different groups involved in design and development to ensure effective communication and clear assignment of responsibility.

7.3.2 Design and Development Inputs: Inputs relating to product requirements shall be determined and records shall be maintained. These shall include (a) functional and performance requirements, (b) applicable statutory and regulatory requirements, (c) where applicable, information derived from previous similar designs, and (d) other requirements essential for design and development. Requirements shall be complete, unambiguous and not in conflict with each other.

7.3.3 Design and Development Outputs: The outputs of design and development shall be in a form suitable for verification against the design and development input and shall be approved prior to release. Design and development outputs shall (a) meet the input requirements for design and development, (b) provide appropriate information for purchasing, production, and service provision, (c) contain or reference product acceptance criteria, and (d) specify the characteristics of the product that are essential for its safe and proper use.

7.3.4 Design and Development Review: At suitable stages, systematic reviews of design and development shall be performed in accordance with planned arrangements (a) to evaluate the ability of the results of design and development to meet requirements, and (b) to identify any problems and propose necessary actions. Participants in such reviews shall include representatives of functions concerned with the design and development stage(s) being reviewed.

7.3.5 Design and Development Verification: Verification shall be performed in accordance with planned arrangements to ensure that the design and development outputs have met the design and development input requirements. Records of the results of the verification and any necessary actions shall be maintained. Verification confirms, through objective evidence, that the specified requirements have been fulfilled.

7.3.6 Design and Development Validation: Design and development validation shall be performed in accordance with planned arrangements to ensure that the resulting product is capable of meeting the requirements for the specified application or intended use, when known. Wherever practicable, validation shall be completed prior to the

delivery or implementation of the product. Validation confirms, through objective evidence, that the requirements for a specific intended use have been fulfilled.

7.3.7 Control of Design and Development: Changes in Design and development shall be identified and records maintained. The changes shall be reviewed, verified and validated, as appropriate, and approved before implementation. The review of design and development changes shall include evaluation of the effect of the changes on constituent parts and product already delivered.

7.4 Purchasing

7.4.1 Purchasing Process: The organization shall ensure that purchased product conforms to specified purchase requirements. The type and extent of control applied to the supplier and the purchased product shall be dependent upon the effect of the purchased product on subsequent product realization or the final product. The organization shall evaluate and select suppliers based on their ability to supply product in accordance with the organization's requirements. This standard does not apply to items such as office and maintenance supplies, unless they are a product.

7.4.2 Purchasing Information: Purchasing information shall describe the product to be purchased, including where appropriate (a) requirements for approval of product, procedures, processes, and equipment, (b) requirements for qualification of personnel, and (c) QMS requirements. The organization shall ensure the adequacy of specified requirements prior to their communication to the supplier.

7.4.3 Verification of Purchased Product: The organization shall establish and implement the inspection or other activities necessary for ensuring that purchased product meets specified purchase requirements. Where the organization or its customer intends to perform verification at the supplier's premises, the organization shall state the intended verification arrangements and method of product release in the purchasing information.

7.5 Production and Service Provision

7.5.1 Control of Production and Service Provision: The organization shall plan and carry out production and service provision under controlled conditions. Controlled conditions shall include, as applicable (a) the availability of information that describes the characteristics of the product, (b) the availability of work instructions, as necessary, (c) the use of suitable equipment, (d) the availability and use of monitoring and measuring equipment (e) the implementation of monitoring and measurement, and (f) the implementation of product release, delivery, and post-delivery activities.

7.5.2 Validation of Processes for Production and Service Provision: The organization shall validate any processes for production and service provision where the resulting output cannot be verified by subsequent monitoring or measurement, and as a

consequence, deficiencies become apparent only after the product is in use or the service has been delivered. Validation shall demonstrate the ability of these processes to achieve planned results. The organization shall establish arrangements for these processes including, as applicable (a) defined criteria for review and approval of the processes, (b) approval of equipment and qualification of personnel, (c) use of specific methods and procedures, (d) requirements for records, and (e) revalidation.

7.5.3 Identification and Traceability: Where appropriate, the organization shall identify the product by suitable means throughout product realization. The organization shall identify the product status with respect to monitoring and measurement requirements throughout product realization. In some industry sectors, configuration management is a means by which identification and traceability are maintained.

7.5.4 Customer Property: The organization shall exercise care with customer property while it is under the organization's control or being used by the organization. The organization shall identify, verify, protect and safeguard customer property provided for use or incorporation into the product. If any customer property is lost, damaged, or otherwise found to be unsuitable for use, the organization shall report this to the customer and maintain records.

7.5.5 Preservation of Product: The organization shall preserve the product during internal processing and delivery to the intended destination in order to maintain conformity to the requirements. This preservation shall include identification, handling, packaging, storage, and protection.

7.6 Control of Monitoring and Measuring Equipment

The organization shall establish processes to ensure that monitoring and measurement can be carried out and are carried out in a manner that is consistent with the monitoring and measurement requirements. Where necessary to ensure valid results, measuring equipment shall (a) be calibrated (standardized) or verified or both at specified intervals or prior to use, against measurement standards, (b) be adjusted or re-adjusted as necessary, (c) have identification in order to determine its calibration status (d) be safeguarded from adjustments that would invalidate the measurement result, and (e) be protected from damage and deterioration during handling, maintenance and storage. In addition, the organization shall assess and record the validity of the previous measuring results when the equipment is found not to conform to requirements. The organization shall take appropriate action on the equipment and any product affected.

8. MEASUREMENT, ANALYSIS, AND IMPROVEMENT

8.1 General

The organization shall plan and implement the monitoring, measurement, analysis, and improvement processes needed (a) to demonstrate conformity to product requirements

(b) to ensure conformity of the QMS, and (c) to continually improve the effectiveness of the QMS. This shall include determination of applicable methods, including statistical techniques, and the extent of their use.

8.2 Monitoring and Measurement

8.2.1 Customer Satisfaction: The organization shall monitor information relating to customer perception as to whether the organization has met customer requirements. The methods for obtaining and using this information shall be determined. Monitoring customer perception can include inputs from sources such as customer satisfaction surveys, customer data on delivered product quality, user opinion surveys, lost business analysis, compliments, warranty claims and dealer reports.

8.2.2 Internal Audit: The organization shall conduct internal audits at planned intervals to determine whether the QMS (a) conforms to the planned arrangements, to the requirements of this standard, and to the requirements established by the organization, and (b) is effectively implemented and maintained. An audit program shall be planned, taking into consideration the status and importance of the processes and areas to be audited, as well as the results of previous audits. The audit criteria, scope, frequency, and methods shall be defined. The selection of auditors and conduct of audits shall ensure objectivity and impartiality of the audit process.

8.2.3 Monitoring and Measurement of Processes: The organization shall apply suitable methods for monitoring and, where applicable, measurement of the QMS processes. When planned results are not achieved, correction and corrective action shall be taken, as appropriate. When determining suitable methods, it is advisable that the organization considers the type and extent of monitoring or takes measures appropriate to each of its processes in relation to their impact on the conformity to product requirements and on the effectiveness of the quality management system.

8.2.4 Monitoring and Measurement of Product and Service: The organization shall monitor and measure the characteristics of the product to verify that product requirements have been met. This shall be carried out at appropriate stages of the product realization process in accordance with the planned arrangements. The release of product and delivery of service to the customer shall not proceed until the planned arrangements have been satisfactorily completed, unless otherwise approved by a relevant authority and, where applicable, by the customer.

8.3 Control of Nonconforming Product

The organization shall ensure that product which does not conform to product requirements is identified and controlled to prevent its unintended use or delivery. A document procedure shall be established to define the controls and related responsibilities and authorities for dealing with nonconforming product. The organization shall deal with nonconforming product in one or more of the following

ways: (a) by taking action to eliminate the detected nonconformity; (b) by authorizing its use, release or acceptance under concession by a relevant authority; and (c) by taking action to preclude its original intended use or application, (d) by taking action appropriate to the effects of the non-conformity, when non-conforming product is detected after delivery or use has started.

8.4 Analysis of Data

The organization shall determine, collect, and analyze appropriate data to demonstrate the suitability and effectiveness of the QMS and to evaluate where continual improvement of the effectiveness of the QMS can be made. The analysis of data shall provide information relating to (a) customer satisfaction, (b) conformity to product requirements, (c) characteristics and trends of processes and products, and (d) suppliers.

8.5 Improvement

8.5.1 Continual Improvement: The organization shall continually improve the effectiveness of the QMS through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions, and management review.

8.5.2 Corrective Action: The organization shall take action to eliminate the causes of nonconformities in order to prevent recurrence. Corrective actions shall be appropriate to the effects of the nonconformities encountered. A documented procedure shall be established to define requirements for (a) reviewing nonconformities (including customer complaints), (b) determining the causes of nonconformities, (c) evaluating the need for action to ensure that nonconformities do not recur, (d) determining and implementing action needed, (e) records of the results of action taken, and (f) reviewing the effectiveness of the corrective action taken.

8.5.3 Preventive Action: The organization shall determine action to eliminate the causes of potential nonconformities in order to prevent their occurrence. Preventive actions shall be appropriate to the effects of the potential problems. A documented procedure shall be established to define requirements for (a) determining potential nonconformities and their causes, (b) evaluating the need for action to prevent occurrence of nonconformities, (c) determining and implementing action needed, (d) records of results of action taken, and (e) reviewing the effectiveness of the preventive action taken. Preventive action is taken to prevent occurrence while corrective action is taken to prevent reoccurrence.

Lesson 4: Implementation & Documentation of QMS

After completion of this lesson you will be able to –

- *Implement the quality management system.*
- *Prepare documentation of quality management system.*

IMPLEMENTATION OF QUALITY MANAGEMENT SYSTEM

There are a number of steps that are necessary to implement a quality management system.

1. **Top Management Commitment:** The most important step in implementing a quality system that will meet or exceed an ISO 9000 standard is to acquire the full support of upper management. The chief executive officer (CEO) must be willing to commit the resources necessary to achieve certification. Without the CEO's support, the process may continuously run into unnecessary roadblocks or even be doomed to failure.
2. **Appoint the Management Representative:** Once the commitment has been made, the next step is the appointment of a management representative. This person is responsible for coordinating the implementation and maintenance of the quality system and is the contact person for all parties involved in the process, both internal and external. The implementation of the quality system should involve everyone in the organization.
3. **Awareness:** This step requires an awareness program. Because the process is going to affect every member of the organization as well as require their input, since everyone should understand the quality system. They should know how it will affect day-to-day operations and the potential benefits. This information can be relayed (transmitted) through short, one-hour awareness training sessions. Be sure everyone knows the intent of the standard.
4. **Appoint an Implementation Team:** After everyone has been informed of the organization's intentions to develop the quality system, an implementation team should be assembled. This team should be drawn from all levels and areas of the organization so that it is representative. Committees for each of the five clauses may be used. The team should identify the QMS processes and their sequence and interaction.
5. **Training:** The implementation team, supervisors, and internal audit team should be trained. This activity can be accomplished by sending team leaders for training the other team members or by bringing them in-house for training covering all team members through a one- or two-day session.
6. **Time Schedule:** This activity develops a time schedule for the implementation and registration of the system. This time frame will vary, depending on the size and type of organization and the extent of its existing quality system. Most organizations can complete the entire process in less than 1.5 years. The implementation process should be divided into manageable units.
7. **Select Element Owners:** The implementation team selects owners for each of the system elements. Many of these owners will be members of the implementation team.

- Owners may be assigned more than one element. Each owner has the option of selecting a team to assist in the process. The more people involved, the more effective the system.
8. **Review the Present System:** Perform a review of the present quality system. Copies of all the quality manuals, procedures, work instructions, and forms presently in use are obtained. These documents are sorted into the system elements to determine what is available and what is needed to complete the system. This activity is a gap analysis and can be performed by the element owners and their teams or by an external consultant.
 9. **Write the Documents:** Prepare written quality policy and procedure manuals. These can be combined into one document. Write appropriate work instructions to maintain the quality of specific functions. This process should involve every employee, because the best person to write a work instruction is the one who performs the job on a regular basis. However, it is important to be prudent when creating documentation. Too much documentation or complicated documentation will destroy the system.
 10. **Install the New System:** Integrate the policies, procedures, and work instructions into the day-to-day workings of the organization, and document what is being done. It is not necessary for all elements to be implemented at the same time.
 11. **Internal Audit:** Conduct an internal audit of the quality system. This step is necessary to ensure that the system is working effectively and to provide management with information for the comprehensive management review. Minor corrections to the system are made as they occur. A cross-section of trained people should be used for the audit team.
 12. **Management Review:** Conduct a management review. The management review is used to determine the effectiveness of the system in achieving the stated quality goals. The system is revised as needed.
 13. **Pre-assessment:** This step is optional. If a good job has been done on the previous steps, pre-assessment is not necessary.
 14. **Registration:** *This step has three parts: choosing a registrar, submitting an application, and conducting the registrar's system audit.* Considerations in choosing a registrar include cost, lead time, customers' acceptance of the registrar, the registrar's accreditation, and familiarity with your industry. The application for registration should also include supplying the registrar with the policy and procedure manuals for their review. The time involved in the registrar's system audit will vary depending on the size and complexity of the organization and the number of auditors involved. A registrar's audit usually lasts one to three days and will consist of an opening meeting to describe the process the auditors will follow, the audit itself, and a closing meeting to discuss the findings of the audit. Some of these steps, such as documentation, internal auditing, and registration are described in greater detail in the sections that follow.

Some pitfalls to successful implementation are:

- Using a generic documentation program or another organization’s documentation program.
- Over documentation or documentation that is too complex.
- Using external consultants without internal ownership and involvement.
- Limiting documentation to text rather than other types of media.
- Neglecting to obtain top management’s involvement.
- Developing a system that does not represent what actually occurs.

DOCUMENTATION OF QUALITY SYSTEM

A quality system is the method used to ensure that the quality level of a product or service is maintained. The system documentation can be viewed as a hierarchy containing four tiers, as shown in the figure. All documentation moves from one level to the next in descending order. If the system is properly structured, changes at one level will seldom affect the levels above it. The tiers are discussed below:

A) Policy: The first tier of documentation is the policy manual. This is the document that defines what will be done and why. A quality policy manual should be written so it is clear, precise, practical, and easy to understand.

The reason (what and why) is stated as a quality policy statement. This statement should be a short, simple definition of the organization’s quality intentions. For example:

We are committed to add value to customer’s operations by providing quality logistics services through good management practices in the entire supply chain.

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The remainder of the policy manual addresses what will be done to comply with the standard being used. Another way of looking at the policy manual is to think of it as the commandments of the system. Each element of the standard is addressed individually and usually requires one page or less.

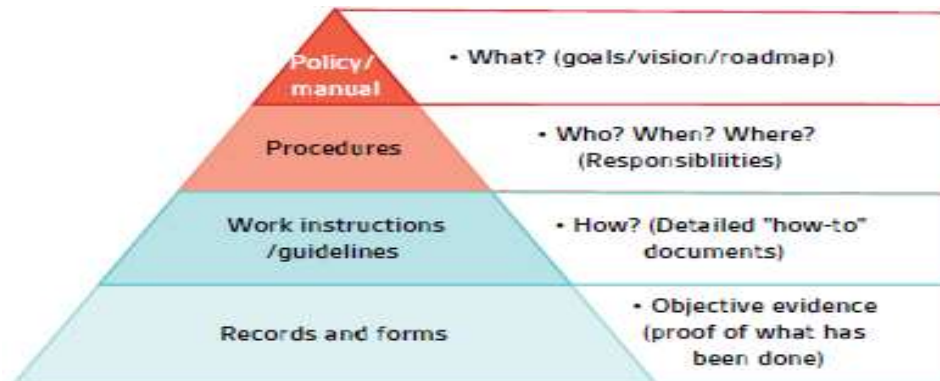


Figure: Documentation Pyramid

B) Procedure: The second tier of documentation is the quality procedures. These procedures describe the methods that will be used to implement and perform the stated policies. The procedures define who should perform specific tasks, when the task should be done, and where documentation will be made showing that the task was performed. Procedures should be oriented to all members so that they apply to all areas within the organization. They dictate the strategies that will be used to ensure the quality of the system. Procedures are more detailed than the policies; however, they, too, should be written in a manner that will allow for easy understanding.

It should be noted that procedures are not required for all elements. Many organizations combine the policy and procedures into one document. A procedure is needed if its absence would adversely affect the activity.

C) Work Instructions: Work instructions are usually department, machine, task, or product oriented and spell out how a job will be done. These instructions are the most detailed of the documentation hierarchy. A work instruction may be in the form of a detailed drawing, recipe, routing sheet, specific job function (for example, turn nut four turns clockwise), photograph, video, or simply a sample for comparison of conformity. The writing of a work instruction is to best carried out by the employee who performs the task.

However, a documentation specialist may be needed to do the actual writing. This method also creates a pride of ownership in the document, making it more likely to be carried out. Additionally, employee participation helps to ensure that future improvements will be suggested.

D) Records: Records are a way of documenting that the policies, procedures, and work instructions have been followed. Records may be forms that are filled out, a stamp of approval on a product, or a signature and date on some type of document, such as a routing sheet. Records are used to provide traceability of actions taken on a specific product or batch of products. They provide data for corrective action and a way of recalling products, if necessary.

Document Development: Although documentation is required by the system, its most important purpose is to provide guidelines for internal quality management. In this respect it can be considered one approach to the road of continuing quality improvement and business success.

To begin creating the documentation system, the implementation team should gather all the existing policies, procedures, work instructions, and forms that are presently in use. Each document should be reviewed and an attempt should be made to fit it into one of the elements. If a document does not appear to pertain to any element, it should be set aside.

In addition, the team should decide if the document is currently accurate and up to date. If it is not, it should be updated or discarded.

Now it is time to involve as many employees as possible. Remember, writing the documents will probably be the easy part of the implementation process. The more people involved in the creation of the system, the greater the likelihood the system will perform satisfactorily. If the organization is large enough, a team of three or more members should be appointed for each element. The team members should come from all areas of the organization, not just from the management or quality areas. Each team is assigned an owner and charged with the responsibility of writing the policy and procedures for that element. They can also be given the responsibility of interviewing personnel and writing the necessary work instructions and applicable documentation forms. A consultant may be needed during this phase to facilitate the team's activities.

As the documents are produced, the implementation team becomes the review committee. If changes appear necessary, suggestions are made and reviewed with the team. When the documents have been completed, they should be formatted in a manner that will allow for simple and effective document control.

Lesson 5: Quality Certification and Registration of Quality Management System

After completion of this lesson you will be able to –

- *Know about the documents and actions needed for quality certification.*
- *Perform the registration process of quality management system in Bangladesh.*
- *Choose a registrar for QMS registration.*

REQUIRED DOCUMENTS AND ACTIONS FOR QUALITY CERTIFICATION

To successfully apply for registration, you must prepare and organize the following materials:

- **Application form:** A completed application form provided by the certification body.
- **Applicable legal licenses:** This may include trade licenses, factory licenses, and environmental clearance certificates.
- **Registration deed and No-Objection Certificate (NOC).**
- **QMS documentation:** The quality manual, standard operating procedures, and other quality-related documents.
- **Audit reports:** Records of internal audits and management reviews documents.
- **BSTI approval (if applicable):** Necessary for food and certain other items.
- **Post-registration maintenance:** After registration how the activities to be maintained.
- **Undergo surveillance audits:** The certification body will conduct annual surveillance audits to ensure ongoing compliance.
- **Maintain continual improvement:** Use the Plan-Do-Check-Act (PDCA) cycle to identify non-conformities and continuously improve your quality management system.
- **Undergo re-certification:** Every three years, a re-certification audit is required to renew your certificate.

QUALITY MANAGEMENT SYSTEM REGISTRATION PROCESS IN BANGLADESH

In Bangladesh, a quality system can be registered through two primary methods:

- A) Obtaining a Certification Mark (CM) license from the government body, the Bangladesh Standards and Testing Institution (BSTI), and
- B) Achieving certification from an internationally recognized body, most commonly the International Organization for Standardization (ISO)

Method 1: BSTI Certification Mark (CM) license

For products manufactured and sold locally, especially food items and other consumer goods, a Certification Mark (CM) license from the BSTI is often mandatory.

Procedure for obtaining a BSTI CM license:

1. **Application:** The manufacturer or importer submits an application to the BSTI on a prescribed form, along with all necessary and relevant documents.
2. **Factory inspection:** After receiving the application, the BSTI arranges an inspection of the factory. An inspection report is prepared to verify that the necessary facilities and processes are in place to produce a standard product.
3. **Sample collection and testing:** If the inspection report is satisfactory, BSTI officers collect product samples on a random basis. The samples are then tested in a BSTI-approved laboratory to ensure the test parameters conform to the relevant Bangladesh Standard (BDS).
4. **License issuance:** If the test results are satisfactory, a license is granted for a period of three years. A license and marking fee must be paid.
5. **License renewal:** The license can be renewed for a subsequent three-year period by following a similar inspection and testing procedure before it expires.

Key information collected during inspection includes:

- General company information.
- Details about raw materials and the manufacturing process.
- Packing and marking details.
- Laboratory and inspection procedures.
- Hygienic and environmental conditions, particularly for food processing plants.

Method 2: ISO Certification

ISO certification, such as the widely used ISO 9001 for quality management, is an internationally recognized standard. It is not managed directly by the BSTI but is conducted by accredited third-party certification bodies.

Procedure for obtaining ISO certification:

1. **Select a standard:** Determine the most appropriate ISO standard for your business. Common examples include ISO 9001 for quality management, ISO 14001 for environmental management, and ISO 22000 for food safety.
2. **Implement the standard:** Establish and implement a quality management system (QMS) that meets all the requirements of the chosen ISO standard. This involves developing policies, procedures, and controls.
 - Quality policy: A formal statement of your organization's commitment to quality.
 - Quality objectives: Measurable goals for improving products and services.

- Quality manual: An overview of the QMS structure.
 - Standard operating procedures (SOPs): Detailed, step-by-step instructions for consistent operations.
3. **Conduct an internal audit:** Perform an internal audit to evaluate your management system against the ISO standard's requirements. This helps identify any areas of non-compliance before the formal audit.
 4. **Select a certification body:** Choose an accredited certification body recognized by the International Accreditation Forum (IAF) to perform the external audit.
 5. **Certification audit:** The audit is typically conducted in two stages:
 - **Stage 1 (Documentation review):** An auditor will visit to review your QMS documentation and assess your readiness for the main audit.
 - **Stage 2 (On-site audit):** A comprehensive on-site audit is performed to verify that your QMS is implemented and functioning effectively. Auditors will check your processes, interview employees, and verify your records.
 6. **Certification issuance:** After a successful Stage 2 audit, the certification body issues the ISO certificate. If non-conformities are found, you will be required to take corrective actions.
 7. **Maintaining certification:** ISO certification is typically valid for three years. You will need to undergo annual surveillance audits to ensure continued compliance. A recertification audit is required at the end of the three-year cycle.

CRITERIA OF REGISTRAR SELECTION

At the time of making a decision about registrar selection the following criteria need to be fulfilled. Such as:

1. **Qualifications and Experience:** A company should check the number of companies that have been registered by, their experience in particular industries or sectors, and their customers' structure, such as size and location. It is also helpful to know the registrar's financial condition to be assured that it will stay in business. The registrar should remain current by participating in the Independent Association of Accredited Registrars.
2. **Certificate Recognition:** The registrar must be approved by a regulatory agency such as RAB or NABCB. It must be recognized by existing and potential customers. The registrar should provide references and prior customer feedback. It may be helpful to interview prior customers.
3. **The Registration Process:** The registrar should have a structured registration procedure that is tailored to the organization's needs. They should be responsive to requests. The registrar should not only evaluate the system but also identify opportunities for more efficient practices. Additionally, the ability of the registrar to perform multiple types of audits such as environmental, quality, security, and workplace safety need to be considered.

4. **Time and Cost Constraints:** The evaluation should include the lead time necessary prior to the audit. In addition, the evaluation should include the time and cost required for the initial audit and the surveillance audits. Be cautious about additional fees such as the use of a subcontractor that has expert knowledge or language skills.
5. **Auditor Qualifications:** The ISO 19011 auditing standard requires that auditors: (1) know the standard, (2) know the types of processes, the organization, and the customers, and (3) have the knowledge, temperament, and experience to be credible. Because the auditor and registrar are exposed to sensitive information about the organization, it is vital that a nondisclosure policy be maintained. It is also vital that the auditor has no conflict of interest with the organization. The registrar should provide proof of qualifications, knowledge, and experience. The organization should be able to refuse a particular auditor and have a suitable replacement found.

It is wise to take time to select the best registrar for an organization's needs in order to avoid dissatisfaction.

Discussion Questions:

1. Describe the concept of a quality management system.
2. Identify and describe the core components of a quality management system.
3. Describe the common QMS framework.
4. What do you understand the concept of ISO?
5. Describe the various ISO series with their focus.
6. Discuss the history of ISO.
7. Describe the benefits of ISO registration. Describe the benefits when an organization is ISO certified.
8. Describe the ISO requirements / standard clauses.
9. How can you implement the quality management system in your organization?
10. How you can prepare documentation of a quality management system.
11. What are the documents and actions needed for quality certification?
12. Describe the performance of registration process of a quality management system in Bangladesh.
13. What should be the criteria for the selection of a registrar in case of registration of QMS? Discuss.

Quality Function Deployment

9

Unit Highlights

- Lesson – 1 and 2: Conceptualizing Quality Function Deployment and Voice of Customer
- Lesson – 3, 4 and 5: House of Quality

Technologies Used for Content Delivery

- ❖ BOUTUBE
- ❖ BOU LMS
- ❖ WebTV
- ❖ Web Radio
- ❖ Mobile Technology with MicroSD Card
- ❖ BTV Program
- ❖ Bangladesh Betar Program

Lesson 1 and 2: Conceptualizing Quality Function Deployment and Voice of Customer

After completion of this lesson you will be able to –

- *Understand the concept of quality function deployment.*
- *Have an idea of the QFD team.*
- *Describe the benefits of QFD.*
- *Assess the voice of the customers.*
- *Organize the customers' information.*

CONCEPT OF QUALITY FUNCTION DEPLOYMENT (QFD)

Quality function deployment (QFD) is a planning tool used to fulfill customer expectations. It is a disciplined approach to product design, engineering, and production and provides in-depth evaluation of a product. An organization that correctly implements QFD can improve engineering knowledge, productivity, and quality and reduce costs, product development time, and engineering changes. Quality function deployment focuses on customer expectations or requirements, often referred to as the voice of the customer. It is employed to translate customer expectations, in terms of specific requirements, into directions and actions, in terms of engineering or technical characteristics, that can be deployed through:

- Product planning
- Part development
- Process planning
- Production planning
- Service industries

Quality function deployment is a team-based management tool in which customer expectations are used to drive the product development process. Conflicting characteristics or requirements are identified early in the QFD process and can be resolved before production. Quality function deployment helps identify new quality technology and job functions to carry out operations.

This tool provides a historical reference to enhance future technology and prevent design errors. Results of QFD are measured based on the number of design and engineering changes, time to market, cost, and quality. It is considered by many experts to be a perfect blueprint for quality by design. Quality function deployment enables the design phase to concentrate on the customer requirements, thereby spending less time on redesign and modifications.

THE QFD TEAM

When an organization decides to implement QFD, the project manager and team members need to be able to **commit a significant amount of time** to it, especially in the early stages. The priorities of the projects need to be defined and told to all departments within the

organization so team members can budget their time accordingly. Also, the scope of the project must be clearly defined so questions about why the team was formed do not arise. One of the most **important tools in the QFD process is communication.**

There are two types of QFD teams — *designing a new product and improving an existing product.* In case of **new product teams**, they are composed of members from marketing, design, quality, finance, and production. The **existing product team** usually has fewer members, because the QFD process will only need to be modified. Time and inter-team communication are two very important factors that each team must utilize to their fullest potential. Using time effectively is the essential resource in getting the project done on schedule. Using inter-team communication to its fullest extent will alleviate unforeseen problems and make the project run smoothly.

Team meetings are very important in the QFD process. The team leader needs to ensure that the meetings are run in the most efficient manner and that the members are informed about it. The meeting format should have some way of measuring how well the QFD process is working. Meeting should be flexible, duration may be varied depending on the situations. Whether the meeting is shorter or longer the team always focuses on a quality improvement goal.

BENEFITS OF QFD

Quality function deployment was originally implemented to reduce start-up costs. The benefits of QFD are discussed below:

1. **Improves Customer Satisfaction:** Quality function deployment looks past the usual customer response and attempts to define the requirements in a set of basic needs, which are compared to all competitive information. All competitors are evaluated equally from customer and technical perspectives. Management can then place resources where they will be the most beneficial in improving quality. As a result the customer satisfaction are expected to be improved. This is also important when an organization's employee leaves a particular project and a new employee is hired.
2. **Reduces Implementation Time:** Fewer engineering changes are needed when using QFD, and, when used properly, all conflicting design requirements can be identified and addressed prior to production. By using QFD, critical items/paths are identified and can be monitored from product inception to production that reduce implementation time. Toyota reports that the quality of their product has improved by one-third since the implementation of QFD.

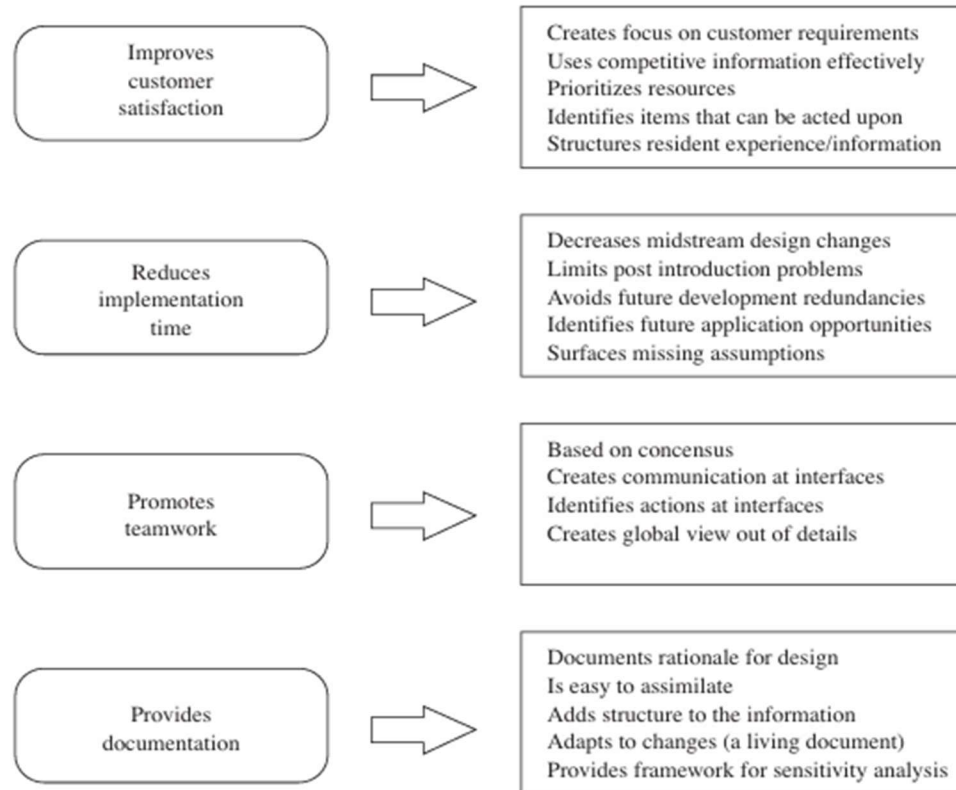


Figure: The benefits of QFD

- Promotes Teamwork:** Quality function deployment forces a horizontal deployment of communication channels. Inputs are required from all facets of an organization, from marketing to production to sales, thus ensuring that the voice of the customers. This activity avoids misinterpretations, opinions, and miscues. In other words, the left hand always knows what the right hand is doing. Efficiency and productivity always increase with enhanced teamwork.
- Provides Documentation:** A database for future design or process improvements is created by QFD. Data that are historically scattered within operations, frequently lost and often referenced out of context, are now saved in an orderly manner to serve future needs. Quality function deployment is also very flexible when new information is introduced or things have to be changed on the QFD matrix.

THE VOICE OF THE CUSTOMERS

Since QFD concentrates on customer expectations and needs, a considerable amount of effort is put into research to determine customer expectations. Therefore, the voice of the customers needs to be considered throughout the overall cycle time in bringing a product to the market that satisfies the customer.

The driving force behind QFD is that the *customer dictates the attributes of a product*. Words used by the customers to describe their expectations are often referred to as the voice of the customer. *Sources for determining customer expectations are focus groups, surveys, complaints, consultants, standards, and federal regulations*. It is the job of the QFD team to analyze these customer expectations into more specific customer requirements. Customer requirements must be taken literally and not incorrectly translated into the reality.

Quality function deployment begins with marketing to determine what exactly the customer desires from a product. During the collection of information, the QFD team must continually ask and answer numerous questions, such as:

- What does the customer really want?
- What are the customer's expectations?
- Are the customer's expectations used to drive the design process?
- What can the design team do to achieve customer satisfaction?

There are different types of customer information and ways that an organization can collect data, as shown in the following figure. The organization can search (solicited) for the information, or the information can be volunteered (unsolicited) to the organization. Solicited and unsolicited information can be further categorized into measurable (quantitative) or subjective (qualitative) data. Furthermore, qualitative information can be found in a routine (structured) manner or haphazard (random) manner.

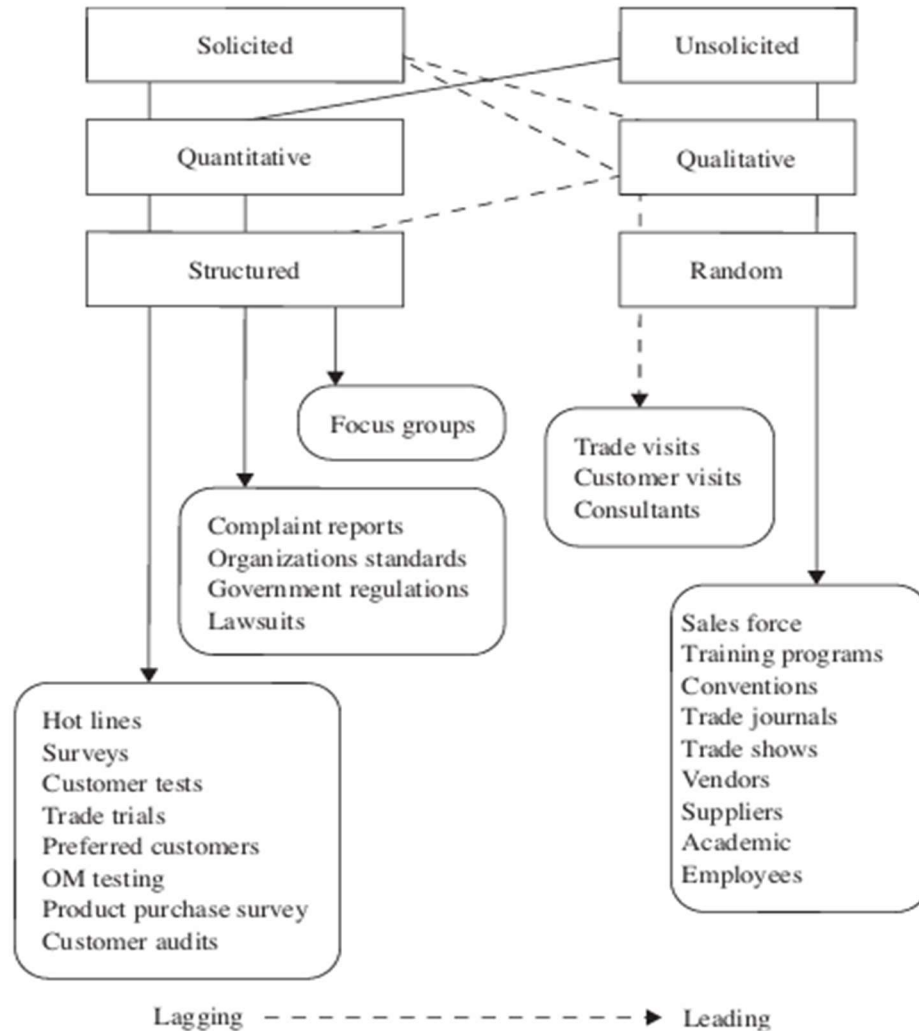


Figure: Types of Customer Information and How to Collect It

Customer information, sources, and data collection method can be described as follows:

- ***Solicited, measurable, and routine data*** are typically found through customer surveys, market surveys, and trade trials; working with preferred customers; analyzing products from other manufacturers; and buying back products from the field. This information tells an organization how it is performing in the current market.
- ***Unsolicited, measurable, and routine data*** tend to take the form of customer complaints or lawsuits. This information is generally disliked; however, it provides valuable learning information.
- ***Solicited, subjective, and routine data*** are usually gathered from focus groups. The objective of these focus groups is to find out the likes, dislikes, trends, and opinions about current and future products.

- *Solicited, subjective, and haphazard data* are usually gathered from trade visits, customer visits, and independent consultants. These types of data can be very useful; however, they can also be misleading, depending on the quantity and frequency of information.
- *Unsolicited, subjective, and haphazard data* are typically obtained from conventions, vendors, suppliers, and employees. This information is very valuable and often relates the true voice of the customer.

The goal of QFD is not only to meet as many customer expectations and needs as possible, but also to exceed customer expectations. Each QFD team must make its product either more appealing than the existing product or more appealing than the product of a competitor.

ORGANIZATION OF INFORMATION FROM CUSTOMERS

Now that the customer expectations and needs have been identified and researched, the QFD team needs to process the information. Numerous methods include affinity diagrams, interrelationship diagrams, tree diagrams, and cause-and-effect diagrams. These methods are ideal for sorting large amounts of information. The affinity diagram, which is ideally suited for most QFD applications where large number of information can be organized.

Affinity Diagram

The affinity diagram is a tool that gathers a large amount of data and subsequently organizes the data into groupings based on their natural interrelationships. An affinity diagram should be implemented when –

- Thoughts are too widely dispersed or numerous to organize.
- New solutions are needed to circumvent the more traditional ways of problem solving.
- Support for a solution is essential for successful implementation.

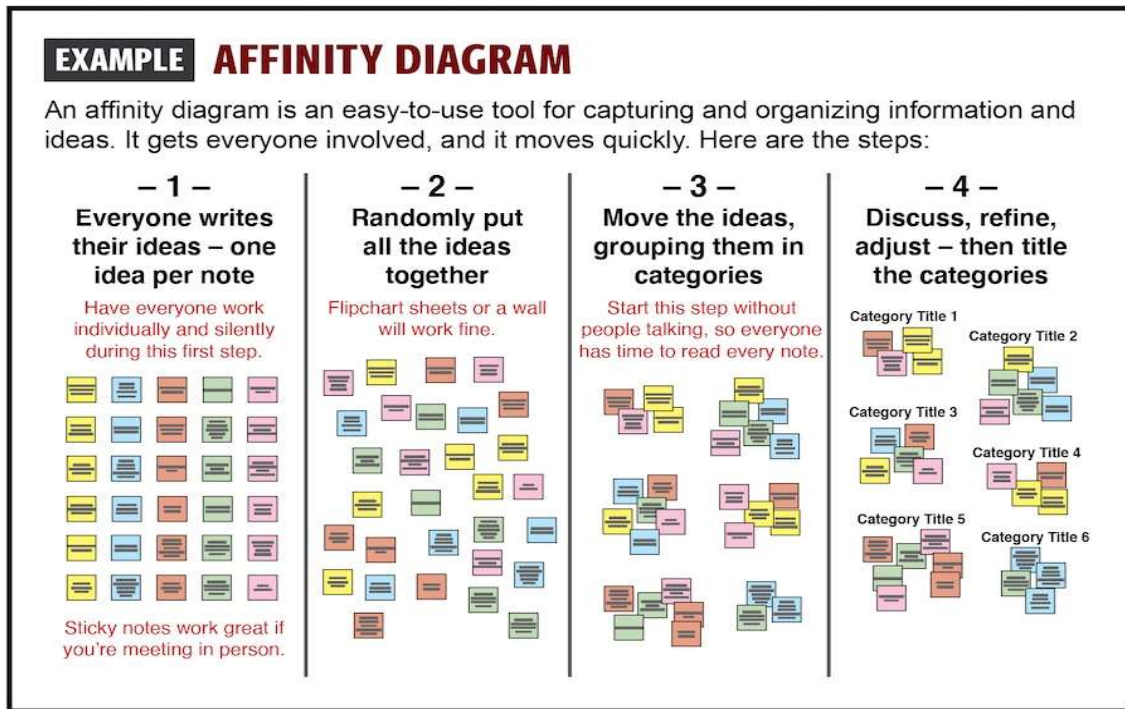


Figure: Affinity diagram

This method should not be used when the problem is simple or if a quick solution is needed. The team needed to accomplish this goal effectively should be a multidisciplinary one that has the needed knowledge to delve into the various areas of the problem. A team of six to eight members should be adequate to assimilate all of the thoughts. Constructing an affinity diagram requires four simple steps:

1. Phrase the objective.
2. Record all responses.
3. Group the responses.
4. Organize groups in an affinity diagram.

The first step is to phrase the objective in a short and concise statement. It is imperative that the statement be as generalized and vague as possible.

The second step is to organize a brainstorming session in which responses to this statement are individually recorded on cards and listed on a pad. It is sometimes helpful to write down a summary of the discussion on the back of the cards so that, in the future when the cards are reviewed, the session can be briefly explained.

Next, all the cards should be sorted by placing the cards that seem to be related into groups. Then, a card or a word is chosen that best describes each related group, which becomes the heading for each group of responses. Finally, lines are placed around each group of responses, and related clusters are placed near each other with a connecting line.

Lesson 3, 4 and 5: House of Quality

After completion of this lesson you will be able to –

- Understand the concept of house of quality and its parts.
- Build a house of quality for your organization.
- Apply the quality function deployment process in the organization.

HOUSE OF QUALITY

The primary planning tool used in QFD is the house of quality. The house of quality translates the voice of the customer into design requirements that meet specific target values and matches them against how an organization will meet those requirements. The structure of QFD can be thought of as a framework of a house, as shown in the following figure.

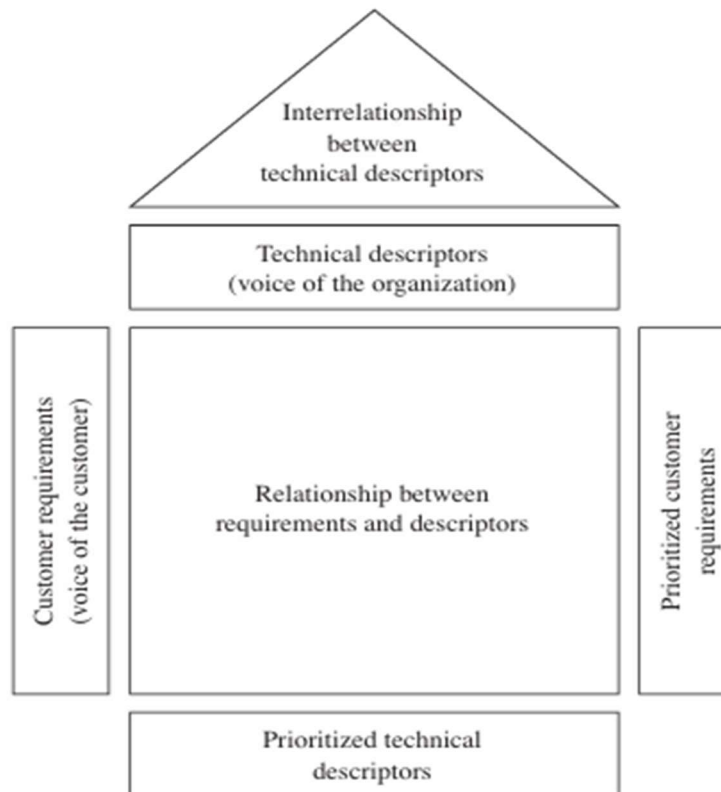


Figure: House of Quality

The parts of the house of quality are described as follows:

- The exterior walls of the house are **the customer requirements**. On the left side is a listing of **the voice of the customer**, or what the customer expects in the product. On the right side are **the prioritized customer requirements**, or the planning matrix.

- Listed are items such as customer benchmarking, customer importance rating, target value, scale-up factor, and sales point.
- The **ceiling, or second floor, of the house contains the technical descriptors**. Consistency of the product is provided through engineering characteristics, design constraints, and parameters.
 - The **interior walls of the house are the relationships between customer requirements and technical descriptors**. Customer expectations (customer requirements) are translated into engineering characteristics (technical descriptors).
 - The **roof of the house is the interrelationship between technical descriptors**. Trade-offs between similar and/or conflicting technical descriptors are identified.
 - The **foundation of the house is the prioritized technical descriptors**. Items such as the technical bench marking, degree of technical difficulty, and target value are listed.

This is the basic structure for the house of quality; once this format is understood, any other QFD matrices are fairly straightforward.

BUILDING HOUSE OF QUALITY

The matrix that has been mentioned may appear to be confusing at first, but when one examines each part individually, the matrix is significantly simplified. A basic house of quality matrix is shown in the following figure:

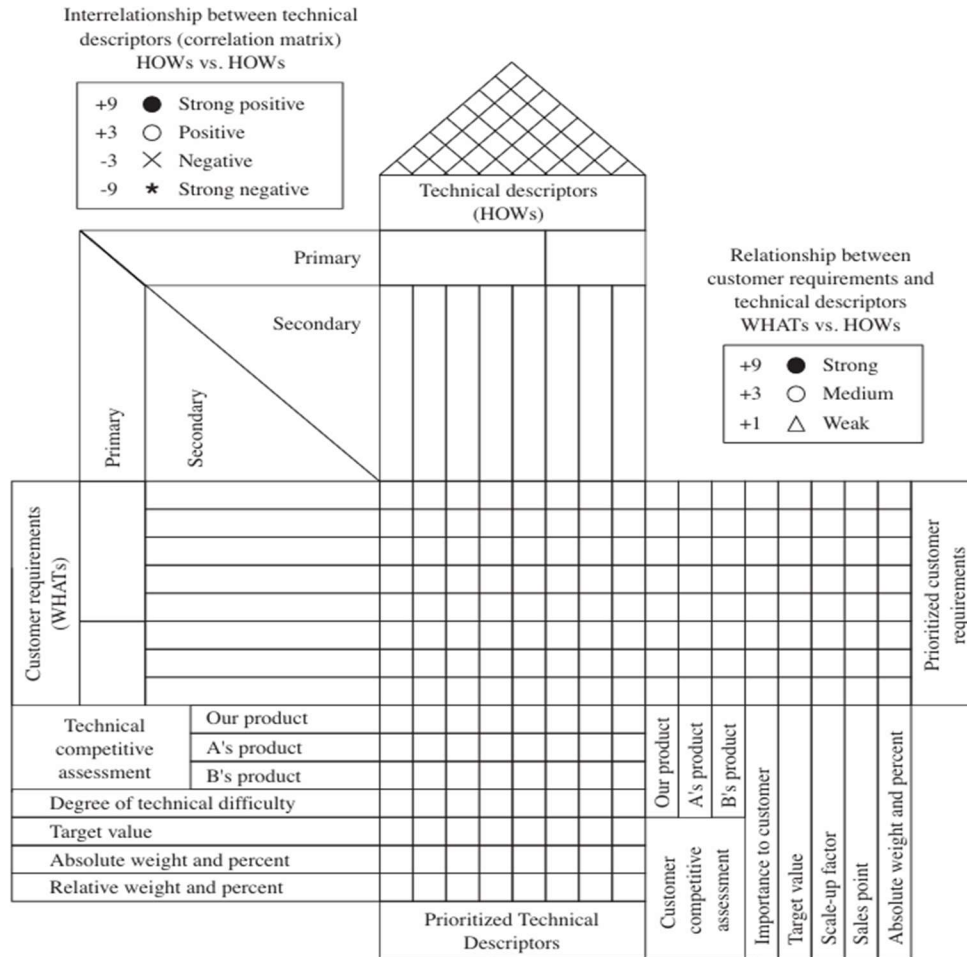


Figure: Basic House of Quality Matrix

There is a considerable amount of information contained within this matrix. It is easier to understand once each part of the matrix is discussed in detail.

Step 1—List Customer Requirements (WHATs)

Quality function deployment starts with a list of goals/objectives. This list is often referred to the WHATs that a customer needs or expects in a particular product. This list of primary customer requirements is usually vague and very general in nature. Additionally, the list of secondary customer requirements are more detailed and needed to support the primary customer requirements. In other words, a primary customer requirement may encompass numerous secondary customer requirements. Finally, the list of customer requirements is divided into a hierarchy of primary, secondary, and tertiary customer requirements. For example, a primary customer requirement might be dependability and the corresponding secondary customer requirements could include reliability, longevity, and maintainability. The customer requirements are presented in the figure below:

		Primary	Secondary	Tertiary
Customer requirements (WHATs)	Aesthetics	Reasonable cost		
		Aerodynamic look		
		Nice finish		
		Corrosion resistant		
	Performance	Lightweight		
		Strength		
		Durable		

Figure: Refinement of customer requirement

Two primary customer requirements might be aesthetics and performance. Secondary customer requirements under aesthetics might be reasonable cost, aerodynamic look, nice finish, and corrosion resistance. Furthermore, it is not necessary to break down the customer requirements to the tertiary level.

Step 2—List Technical Descriptors (HOWs)

The customer needs and expectations have been expressed in terms of customer requirements, the QFD team must come up with engineering characteristics or technical descriptors (HOWs) that will affect one or more of the customer requirements. These technical descriptors make up the ceiling, or second floor, of the house of quality. Each engineering characteristic must directly affect a customer’s perception and be expressed in measurable terms.

Implementation of the customer requirements is difficult until they are translated into counterpart characteristics. Counterpart characteristics are an expression of the voice of the customer in technical language. Each of the customer requirements is broken down into the next level of detail by listing one or more primary technical descriptors for each of the customer requirements. This process is similar to refining marketing specifications into system-level engineering specifications. These secondary technical descriptors can include part specifications and manufacturing parameters that an engineer can act upon. This process of refinement is continued until every item on the list is actionable. Finally, the list of technical descriptors is divided into a hierarchy of primary, secondary, and tertiary technical descriptors, as shown in the figure below:

	Primary	Secondary	Tertiary
Technical descriptors (HOWs)	Material selection	Steel	
		Aluminum	
		Titanium	
	Manufacturing process	Welding	
		Die casting	
		Sand casting	
		Forging	
		Powder metallurgy	

Figure: Refinement of Technical Descriptor

This level of detail is necessary because there is no way of ensuring successful realization of a technical descriptor if the engineering staff does not know how to accomplish. For example, a customer requirement for an automobile might be a smooth ride. This is a rather vague statement; however, it is important when selling of an automobile. Counterpart characteristics for a smooth ride could be dampening, anti-roll, and stability requirements, which are the primary technical descriptors. Brainstorming among the engineering staff is a suggested method for determining the technical descriptors.

Step 3—Develop a Relationship Matrix between WHATs and HOWs

The next step in building a house of quality is to compare the customer requirements and technical descriptors and determine their respective relationships. Finding the relationships between the customer requirements and the technical descriptors can become very confusing, because each customer requirement may affect more than one technical descriptor, and vice versa. Here one's need to structure an L-shaped diagram and develop a relationship matrix.

i) STRUCTURING AN L-SHAPED DIAGRAM

One way to reduce the confusion associated with determining the relationships between customer requirements and technical descriptors is to use an L-shaped matrix, as shown in the figure below. The L shape, which is a two-dimensional relationship that shows the intersection of related pairs of items, is constructed by turning the list of technical descriptors perpendicular to the list of customer requirements. The L-shaped matrix makes interpreting the complex relations very easy and does not require a significant amount of experience.

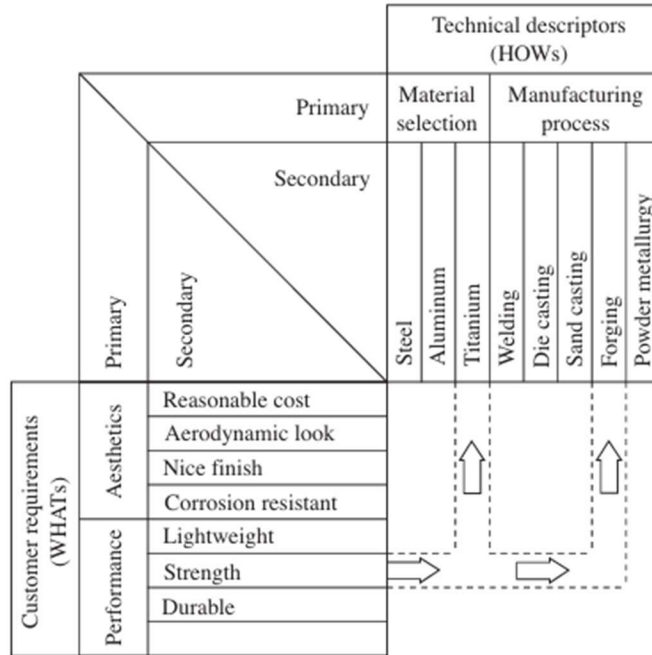


Figure: Structuring an L-shape diagram

ii) RELATIONSHIP MATRIX

The inside of the house of quality, called the relationship matrix, is now filled in by the QFD team. The relationship matrix is used to represent graphically the degree of influence between each technical descriptor and each customer requirement. This step may take a long time, because the number of evaluations is the product of the number of customer requirements and the number of technical descriptors.

Customer requirements (WHATs)		Primary / Secondary		Technical descriptors (HOWs)							
				Material selection			Manufacturing process				
				Steel	Aluminum	Titanium	Welding	Die casting	Sand casting	Forging	Powder metallurgy
Aesthetics	Reasonable cost	●	●	△	●	○	●	○	△		
	Aerodynamic look		△	△	△	●	○	○	●		
	Nice finish	○	●	●	△	●	△	○	●		
	Corrosion resistant	△	●	●	△	○	○	○	○		
Performance	Lightweight	△	●	●					△		
	Strength	●	○	●	△	○	○	●	△		
	Durable	●	○	○	△	●	○	●	○		

Relationship between customer requirements and technical descriptors WHATs vs. HOWs

+ 9	●	Strong
+ 3	○	Medium
+ 1	△	Weak

Figure: Adding Relationship Matrix to the House of Quality

It is common to use symbols to represent the degree of relationship between the customer requirements and technical descriptors. For example,

A solid circle represents a strong relationship.

A single circle represents a medium relationship.

A triangle represents a weak relationship.

The box is left blank if no relationship exists.

It can become difficult to comprehend and interpret the matrix if too many symbols are used. Each degree of relationship between a customer requirement and a technical descriptor is defined by placing the respective symbol at the intersection of the customer requirement and technical descriptor, as shown in the figure above.

The symbols that are used to define the relationships are now replaced with numbers; for example,

● = 9
○ = 3
△ = 1

These weights will be used later in determining trade-off situations for conflicting characteristics and determining an absolute weight at the bottom of the matrix. After the relationship matrix has been completed, it is evaluated for empty rows or columns. An empty row indicates that a customer requirement is not being addressed by any of the technical descriptors. Thus, the customer expectation is not being met. Additional technical descriptors must be considered in order to satisfy that particular customer requirement. An empty column indicates that a particular technical descriptor does not affect any of the customer requirements and, after careful scrutiny, may be removed from the house of quality.

Step 4—Develop an Interrelationship Matrix between HOWs

The roof of the house of quality, called the correlation matrix, is used to identify any interrelationships between each of the technical descriptors. The correlation matrix is a triangular table attached to the technical descriptors, as shown in the figure of next page:

Symbols are used to describe the strength of the interrelationships; for example,

A solid circle represents a strong positive relationship.

A circle represents a positive relationship.

An X represents a negative relationship.

An asterisk represents a strong negative relationship.

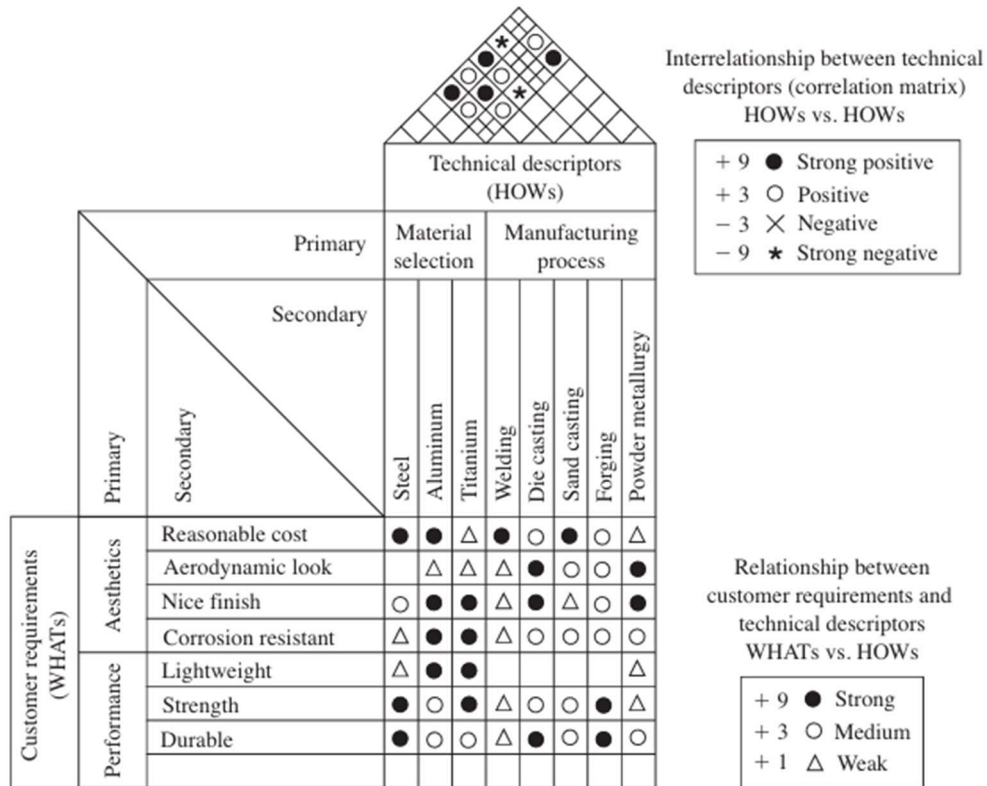


Figure: Adding an Interrelationship Matrix to the House of Quality

The symbols describe the direction of the correlation. In other words, a strong positive interrelationship would be a nearly perfectly positive correlation. A strong negative interrelationship would be a nearly perfectly negative correlation. This diagram allows the user to identify which technical descriptors support one another and which are in conflict. Conflicting technical descriptors are extremely important because they are frequently the result of conflicting customer requirements and, consequently, represent points at which tradeoffs must be made. Tradeoffs that are not identified and resolved will often lead to unfulfilled requirements, engineering changes, increased costs, and poorer quality. Some of the tradeoffs may require high-level managerial decisions, because they cross functional area boundaries.

An example of tradeoffs can be seen in the design of a car, where the customer requirements of high fuel economy and safety yield technical descriptors that conflict.

Step 5—Competitive Assessments

The competitive assessments are a pair of weighted tables (or graphs) that depict item by item how competitive products compare with the current organization’s products. The competitive assessment tables are separated into two categories, customer assessment and technical assessment.

i) CUSTOMER COMPETITIVE ASSESSMENT

The customer competitive assessment is the block of columns corresponding to each customer requirement in the house of quality on the right side of the relationship matrix, as shown in the following figure. The numbers 1 through 5 are listed in the competitive evaluation column to indicate a rating of 1 for worst and 5 for best. These rankings can also be plotted across from each customer requirement, using different symbols for each product.

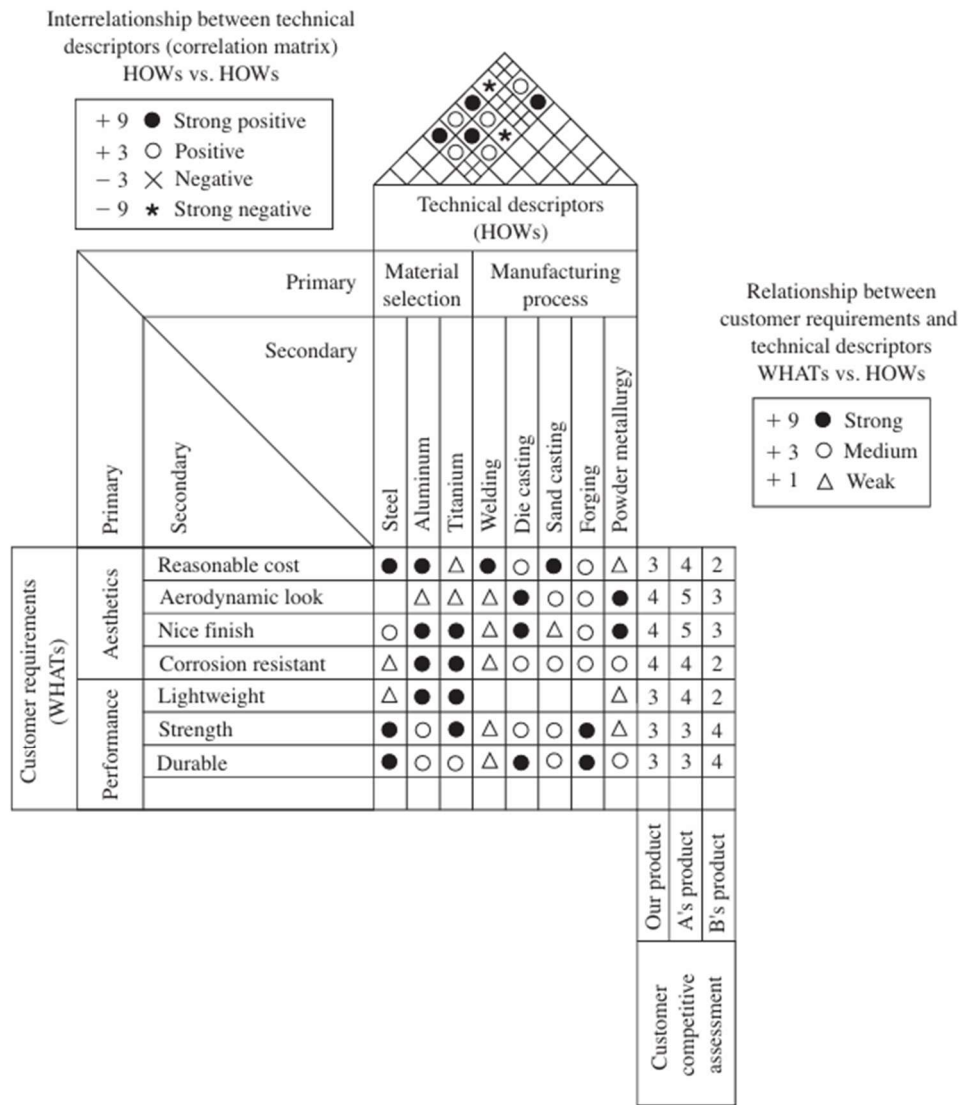


Figure: Adding the Customer Competitive Assessment to the House of Quality

The customer competitive assessment is a good way to determine if the customer requirements have been met and identify areas to concentrate on in the next design. The customer competitive assessment also contains an appraisal of where an organization stands relative to its major competitors in terms of each customer requirement.

ii) TECHNICAL COMPETITIVE ASSESSMENT

The technical competitive assessment makes up a block of rows corresponding to each technical descriptor in the house of quality beneath the relationship matrix, as shown in the following figure. After the respective units have been established, the products are evaluated for each technical descriptor.

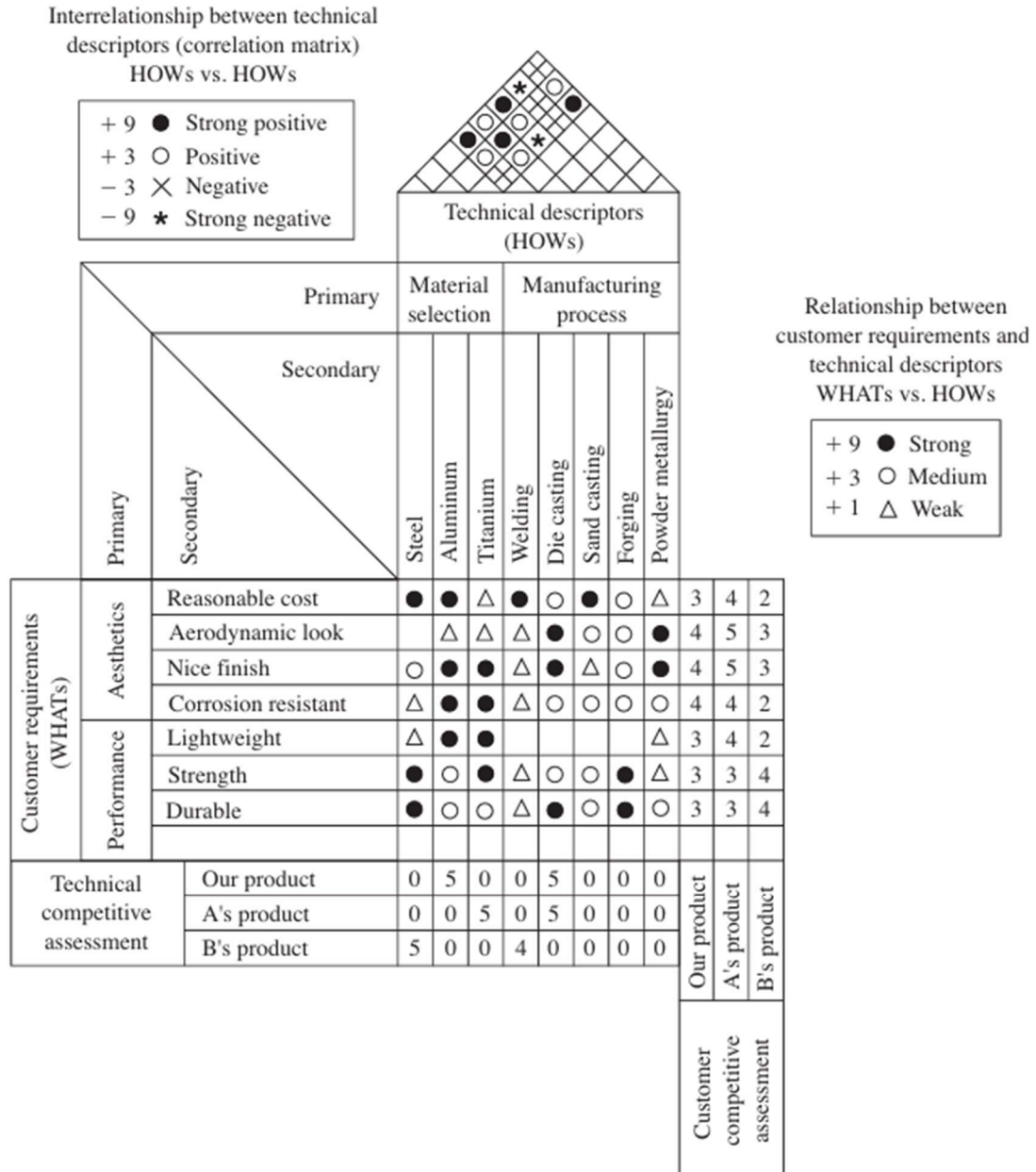


Figure: Adding Technical Competitive Assessment to the House of Quality

Similar to the customer competitive assessment, the test data are converted to the numbers 1 through 5, which are listed in the competitive evaluation row to indicate a rating, 1 for

worst and 5 for best. These rankings can then be entered below each technical descriptor using the same numbers as used in the customer competitive assessment.

Customer requirements and technical descriptors that are strongly related should also exhibit a strong relationship in their competitive assessments. If an organization’s technical assessment shows its product to be superior for the competition, then the customer assessment should show a superior assessment. If the customer disagrees, then a mistake in engineering judgment has occurred and should be corrected.

Step 6—Develop Prioritized Customer Requirements

The prioritized customer requirements make up a block of columns corresponding to each customer requirement in the house of quality on the right side of the customer competitive assessment as shown in the figure below.

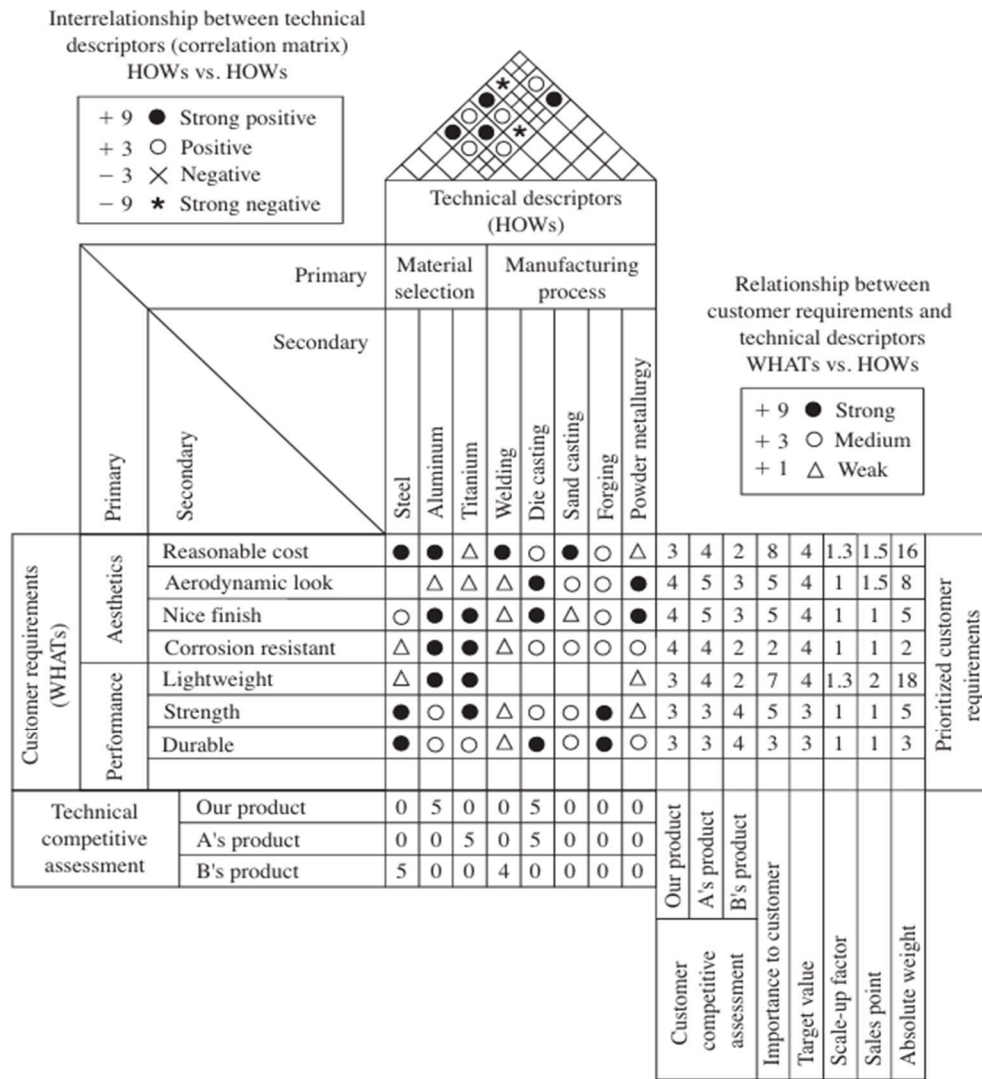


Figure: Adding Prioritized Customer Requirements to the House of Quality

These prioritized customer requirements contain columns for importance to the customer, target value, scale-up factor, sales point, and an absolute weight.

i) IMPORTANCE TO CUSTOMER

The QFD team or the focus group ranks each customer requirement by assigning it a rating. Numbers 1 through 10 are listed in the importance to customer column to indicate a rating of 1 for least important and 10 for very important. Assigning ratings to customer requirements is sometimes difficult, because each member of the QFD team might believe different requirements should be ranked higher. The importance rating is useful for prioritizing efforts and making trade-off decisions.

ii) TARGET-VALUE

The target-value column is on the same scale as the customer competitive assessment (1 for worst, 5 for best can be used). This column is where the QFD team decides whether they want to keep their product unchanged, improve the product, or make the product better than the competition.

iii) SCALE-UP FACTOR

The scale-up factor is the ratio of the target value to the product rating given in the customer competitive assessment. The higher the number, the more effort is needed. Here, the important consideration is the level where the product is now and what the target rating is, and deciding whether the difference is within reason. Sometimes there is not a choice because of difficulties in accomplishing the target. Consequently, the target ratings often need to be reduced to more realistic values.

iv) SALES POINT

The sales point tells the QFD team how well a customer requirement will sell. The objective here is to promote the best customer requirement and any remaining customer requirements that will help in the sale of the product. For example, the sales point is a value between 1.0 and 2.0, with 2.0 being the highest.

v) ABSOLUTE WEIGHT

Finally, the absolute weight is calculated by multiplying the importance to customer, scale-up factor, and sales point:

$$\text{Absolute Weight} = (\text{Importance to Customer})(\text{Scale-up Factor})(\text{Sales Point})$$

After summing all the absolute weights, a percent and rank for each customer requirement can be determined. The weight can then be used as a guide for the planning phase of the product development.

[For instance, for reasonable cost, the absolute weight is $8 \times 1.3 \times 1.5 = 16$. The absolute weight for designing a handlebar stem for a mountain bike is shown in the figure above. Note that the numbers for absolute weight are rounded off in the Figure.]

Step 7—Develop Prioritized Technical Descriptors

The prioritized technical descriptors make up a block of rows corresponding to each technical descriptor in the house of quality below the technical competitive assessment, as shown in the figure to the next page.

These prioritized technical descriptors contain the degree of technical difficulty, target value, and absolute and relative weights. The QFD team identifies technical descriptors that are most needed to fulfill customer requirements and need improvement. These measures provide specific objectives that guide the subsequent design and provide a means of objectively assessing progress and minimizing subjective opinions.

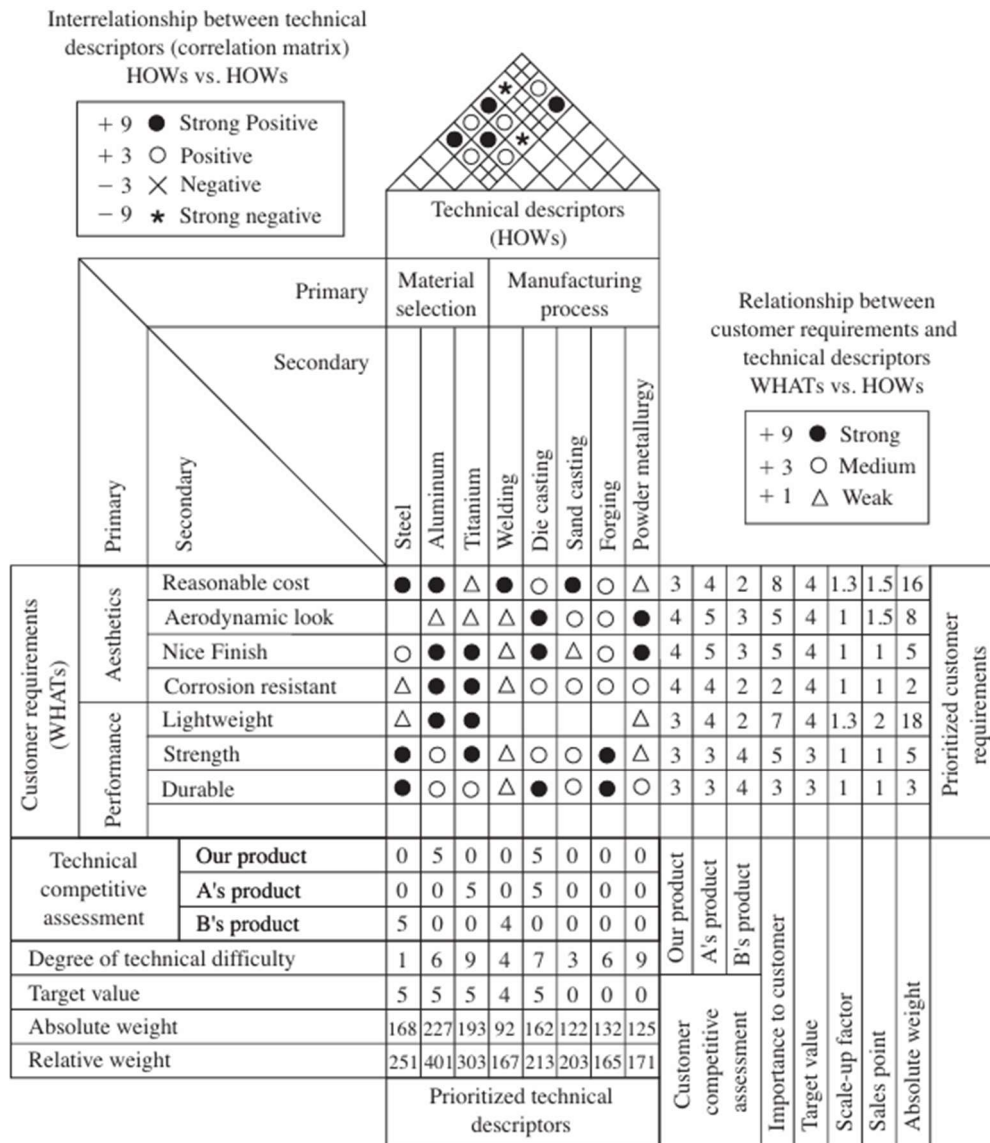


Figure: Adding Prioritized Technical Descriptors to the House of Quality

i) DEGREE OF DIFFICULTY

Many users of the House of Quality add the degree of technical difficulty for implementing each technical descriptor, which is expressed in the first row of the prioritized technical descriptors. The degree of technical difficulty, when used, helps to evaluate the ability to implement certain quality improvements.

ii) TARGET VALUE

A target value for each technical descriptor is also included below the degree of technical difficulty. This is an objective measure that defines values that must be obtained to achieve the technical descriptor.

iii) ABSOLUTE WEIGHT

The last two rows of the prioritized technical descriptors are the absolute weight and relative weight. A popular and easy method for determining the weights is to assign numerical values to symbols in the relationship matrix symbols, as shown previously in the figure (Step 3: Relationship Matrix). The absolute weight for the j th technical descriptor is then given by

$$a_j = \sum_{i=1}^n R_{ij} C_i$$

Where,

a_j = row vector of absolute weights for the technical descriptors ($i = 1, \dots, m$)

R_{ij} = weights assigned to the relationship matrix ($i = 1, \dots, n, j = 1, \dots, m$)

c_i = column vector of importance to customer for the customer requirements ($i = 1, \dots, n$)

m = number of technical descriptors

n = number of customer requirements

iv) RELATIVE WEIGHT

In a similar manner, the relative weight for the j th technical descriptor is then given by replacing the degree of importance for the customer requirements with the absolute weight for customer requirements. It is –

$$b_j = \sum_{i=1}^n R_{ij} d_i$$

Where,

b_j = row vector of relative weights for the technical descriptors ($j = 1, \dots, m$)

d_i = column vector of absolute weights for the customer requirements ($i = 1, \dots, n$)

Higher absolute and relative ratings identify areas where engineering efforts need to be concentrated. The primary difference between these weights is that the relative weight also includes information on customer scale up factor and sales point.

These weights show the impact of the technical characteristics on the customer requirements. Along with the degree of technical difficulty, decisions can be made concerning where to allocate resources for quality improvement. Each QFD team can customize the house of quality to suit their particular needs. For example, columns for the number of service complaints may be added.

QFD PROCESS

The Quality Function Deployment (QFD) process translates customer needs into product specifications through a four-phase system: Product Planning (the "House of Quality"), Part Deployment, Process Planning, and Production Planning. Each phase builds on the last, using matrices to cascade customer requirements from the product level down to manufacturing processes and ensuring the final product meets customer expectations.

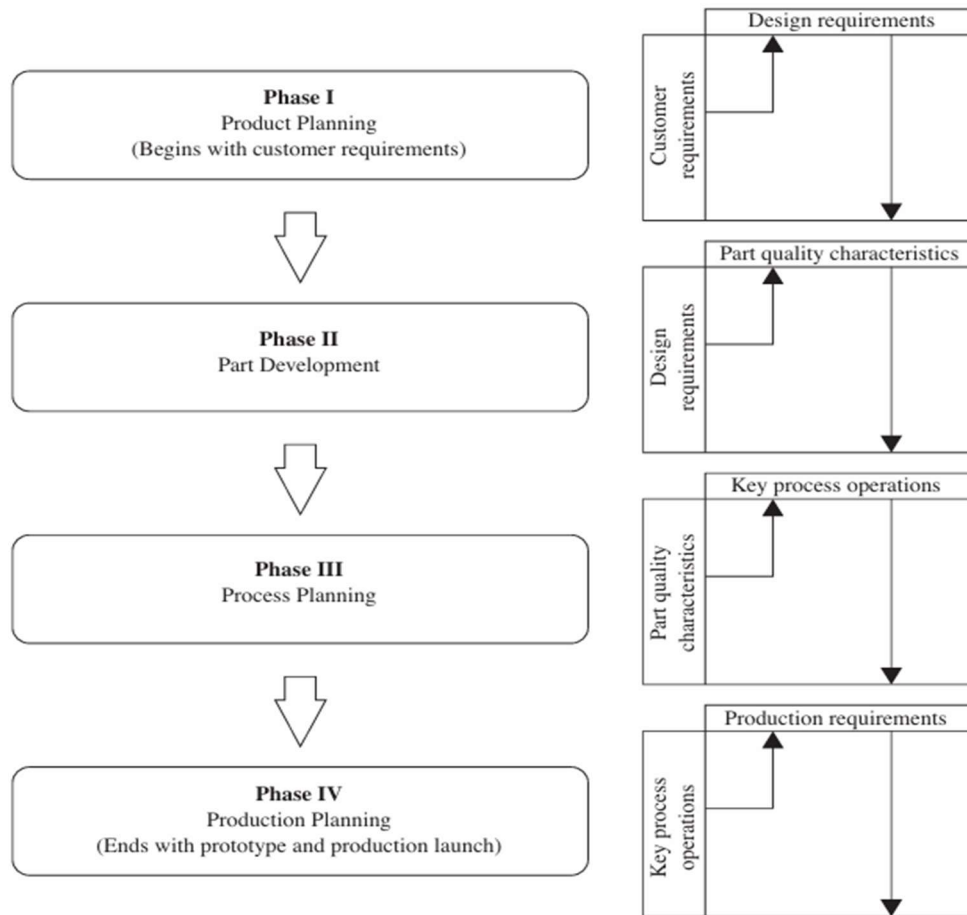


Figure: QFD Process

Here are the details of the process:

1. **Product Planning (The House of Quality)**

- **Identify Customer Needs:** Gather information to understand what customers want and need from a product.
- **Create the "House of Quality":** This matrix visually maps customer needs ("What") against technical product requirements ("How").
- **Analyze and Prioritize:** Use the matrix to determine the relationship and importance of each technical requirement, prioritizing those that best satisfy customer needs.
- **Competitive Analysis:** Incorporate competitor performance data to set measurable target values for the product.

2. **Part Requirements / Deployment**

- **Translate to Part Specifications:** Convert the identified product characteristics into specific requirements for sub-assemblies and components.
- **Define Critical Parts:** Focus on the critical part characteristics that will directly impact the final product's ability to meet customer needs.

3. **Process Planning**

- **Identify Key Process Operations:** Determine the manufacturing steps, parameters, and equipment needed to produce the designed parts.
- **Develop the Process Plan:** Create a detailed plan outlining how the product will be manufactured.

4. **Production Planning**

- **Establish Quality Controls:** Define the quality control methods, performance indicators, and monitoring procedures for the production process.
- **Monitor Production:** Track the manufacturing process to ensure adherence to the established requirements and to verify that the final product meets quality standards.

Discussion Questions:

1. What do you understand by quality function deployment?
2. What is a QFD team? Classify the types of QFD teams.
3. Describe the benefits of QFD.
4. What is the voice of customers? How will you assess the voice of customer?
5. How can you organize the customers' information?
6. Describe the concept of house of quality and state the parts of the House of Quality.
7. How can a House of Quality be built for an organization?
8. Discuss the steps of the quality function deployment process in an organization.

Critical Discussion Questions:

1. Working individually or in a team, list four or more primary customer requirements for one or more of the following production items or service industries. Also, refine the primary customer requirements to a second level.
 - (a) Mountain bike
 - (b) Racing bike
 - (c) Pizza
 - (d) Textbook
 - (e) Automatic teller machine
 - (f) Automobile cruise control
 - (g) Coffee maker
 - (h) Computer mouse
 - (i) Rechargeable drill/driver
 - (j) University academic department
 - (k) Call center
 - (l) Restaurant
 - (m) Hospital or medical center
 - (n) Department store
 - (o) Website for computer sales
 - (p) Hair salon
 - (q) Grocery store.

Total Productive Maintenance

10

Unit Highlights

- Lesson – 1 and 2: Introducing Total Productive Maintenance
- Lesson – 3: Total Productive Maintenance Strategy and Steps

Technologies Used for Content Delivery

- ❖ BOUTUBE
- ❖ BOU LMS
- ❖ WebTV
- ❖ Web Radio
- ❖ Mobile Technology with MicroSD Card
- ❖ BTV Program
- ❖ Bangladesh Betar Program

Lesson 1 and 2: Introducing Total Productive Maintenance

After completion of this lesson you will be able to –

- *Describe the concept of total productive maintenance.*
- *Understand the goals of total productive maintenance.*
- *Assess the areas where TPM can be beneficial.*
- *Describe the pillars of TPM.*
- *Assess the benefits and disadvantages of TPM.*

CONCEPT OF TOTAL PRODUCTIVE MAINTENANCE

Total Productive Maintenance (TPM) is the process of keeping the current plant and equipment at their highest productive level through the cooperation of all areas of the organization. Generally, the first task is to break down the traditional barriers between maintenance and production personnel so that they can work together.

Analyzing TPM into its three words, we have:

Total = All-encompassing by maintenance and production individuals working together.

Productive = Production of goods and services that meet or exceed customers' expectations.

Maintenance = Keeping equipment and plant in as good as or better than the original condition at all times.

Total Productive Maintenance (TPM) is a strategy for improving equipment reliability and productivity by involving all employees in a proactive approach to maintenance, with a goal of "perfect production" (no breakdowns, no defects, and no accidents). It shifts responsibility for routine tasks like cleaning and inspection from maintenance personnel to machine operators, allowing them to identify issues early and increasing their ownership of the equipment.

The total maintenance function should be directed towards the elimination of unplanned equipment and plant maintenance. The objective is to create a system in which all maintenance activities can be planned and not interfere with the production process. With the help of maintenance technicians, operators spent part of their work time keeping their equipment in good running order. Recent technical advances have given us more tools to perform the maintenance function.

GOALS OF TOTAL PRODUCTIVE MAINTENANCE

The main goals of Total Productive Maintenance (TPM) are to achieve zero breakdowns, zero accidents, and zero defects, ultimately leading to perfect production by maximizing equipment effectiveness (OEE). This is accomplished by increasing the overall productivity and efficiency of the equipment and production processes through the

proactive, collaborative involvement of every employee and department in the organization. Here's a breakdown of the primary goals of TPM:

- **Zero Breakdowns (Downtime):** Eliminate unscheduled downtime by focusing on planned and autonomous maintenance, ensuring machinery is always available.
- **Zero Accidents:** Foster a safer work environment by involving employees in hazard identification and prevention.
- **Zero Defects:** Produce high-quality, non-defective products by addressing and eliminating the root causes of production losses.
- **Increased Overall Equipment Effectiveness (OEE):** Improve the performance, availability, and quality of equipment by integrating preventive and autonomous maintenance.
- **Employee Engagement and Ownership:** Involve all employees, from operators to management, in identifying and solving problems, creating a shared sense of ownership and commitment to continuous improvement.
- **Reduced Costs and Wastage:** Minimize costs associated with maintenance, repair, rework, and wasted resources by improving equipment reliability and process efficiency.
- **Optimized Production Processes:** Streamline and standardize production and administrative processes to eliminate waste and improve flow, contributing to overall productivity and profitability.

AREAS THAT BENEFIT FROM TOTAL PRODUCTIVE MAINTENANCE

Lost productivity has a direct impact on the revenue generated from manufacturing operations. Preventing these losses is crucial not only to ensure facility safety and control equipment expenses but also to support smooth operations. Overall equipment effectiveness (OEE) losses typically fall into one of six categories:

- **Unexpected breakdowns:** This includes equipment failures, unplanned maintenance and equipment repairs that disrupt operations without warning.
- **Setup and transitions:** Equipment and tool set-up times, transition processes, equipment adjustments and resource shortages all result in lost equipment availability.
- **Short-term equipment stoppages:** These include small disruptions — such as sensor blockages, mechanical jams and dirty components which don't require maintenance staff to resolve and typically halt operations for five minutes or less.
- **Reduced operation speed:** Equipment wear and tear (deterioration), misaligned components and incorrect machinery settings can all reduce the speed at which each asset is able to operate.

- **Production quality issues:** When manufactured items possess defects or otherwise fail to meet quality assurance standards, they must be repaired and scrapped, resulting in material waste and production loss for the facility.
- **Equipment value:** A lack of preventive maintenance increases the damage suffered by the assets, degrading their performance and longevity.

PILLARS OF TOTAL PRODUCTIVE MAINTENANCE

A total productive maintenance system improves equipment reliability, availability and longevity by encouraging proactive, preventive maintenance techniques that are supportive for entire workforce. These maintenance activities are categorized into eight distinct pillars supporting the TPM program:

1. **Autonomous Maintenance:** Certain maintenance tasks don't require the specialized skillsets of a maintenance professional. Autonomous maintenance empowers machine operators to take ownership of their equipment and perform this routine maintenance on their own, resulting in better equipment care and less unplanned downtime.
2. **Focused Improvement (Kaizen):** Collaborative teams of cross-functional personnel work together to identify and implement strategic upgrades to equipment operation practices. By bringing together perspectives from multiple disciplines, these teams offer diverse inputs to continue identifying opportunities for continuous improvement.
3. **Planned Maintenance:** Instead of waiting for equipment to slow down or suffer damage, planned maintenance schedules maintenance work at optimal times for the improved performance of the machinery. This maintenance can also be scheduled at periods of low activity or when the equipment is not in use, preventing productivity loss.
4. **Quality Management:** Address product defects and other quality-related causes of productivity loss by identifying and eliminating the root cause of those defects. Quality management uses root cause analysis methods to reduce the number of defects that appear in production processes, and to identify and address any defects that do develop.
5. **Early Equipment Management:** As TPM systems develop knowledge base on equipment maintenance grows, this collective expertise can foster better equipment management practices in the early stages of an asset's lifespan. Machine operators and other personnel can be on boarded to new equipment faster, resulting in better and more streamlined early-stage maintenance.
6. **Training & Education:** Continued training and education help address knowledge gaps among all stakeholders involved in the equipment maintenance process. This ongoing education increases the ability of operators and other personnel to perform autonomous maintenance, support focused improvement and facilitate early equipment management as their skills and expertise increase over time.

7. **Safety, Health & Environment:** A clean, safe work environment reduces the risk of work-related accidents and other health hazards. TPM supports the ultimate goal of creating an accident-free workplace where safety issues never disrupt the flow of operations.
8. **TPM in Administration:** TPM's holistic approach to equipment maintenance creates new efficiencies and capabilities for site administrators. More controlled, efficient and active work operations makes it easier to schedule work orders, forecast revenue generation and expenses, and execute order processing, procurement and other tasks supporting the manufacturing floor.

BENEFITS OF TOTAL PRODUCTIVE MAINTENANCE

A properly implemented TPM system delivers a range of business outcomes that support greater productivity, efficiency and revenue potential. The operational impact of total productive maintenance includes the following:

- **Decreased breakdowns and production delays:** Proactive maintenance reduces the frequency of equipment failures and unplanned outages for your machinery. Greater equipment uptime decreases the loss created by production delays and work stoppages.
- **Reduced operational and maintenance costs:** Preventing a repair is always less costly in terms of material expense and productivity loss than responding to an equipment failure. TPM enables equipment efficiencies that can reduce the total cost of ownership for the assets.
- **Better overall asset performance:** Equipment not only suffers fewer failures, but it is able to operate with greater speed, efficiency and longevity.
- **Standardizing work to industry best practices:** In addition to potentially supporting regulatory compliance, TPM brings manufacturing operations in line with the leading best practices for sustainability, safety and efficiency.
- **Safer equipment:** Your employees are less exposed to potential hazards, preserving their health while reducing the risk of accidents that could force a work stoppage.

DISADVANTAGES OF TOTAL PRODUCTIVE MAINTENANCE

While businesses can realize significant benefits by implementing a TPM system, this approach isn't a foolproof (perfect) method for addressing productivity loss especially when it's implementation is not supported with appropriate resourcing. The disadvantages of total productive maintenance include:

- **The need to create a detailed plan with clear goals and milestones:** Developing this long-term strategy and checklists can be difficult, especially when stakeholders have different views on what those goals should be. Implementing TPM requires a significant commitment to shifting the organization's goals around maintenance.

- **Everyone in the organization must buy (accept) into this approach:** If operators and other key personnel aren't committing to supporting TPM, this system has a high risk of failure.
- **Upfront costs for employee training and maintenance:** While achieving TPM implementation through strategic and administrative changes, it requires some resourcing to set up employees for success in their roles.

Lesson 3: Total Productive Maintenance Strategy and Steps

After completion of this lesson you will be able to –

- Develop and implement the TPM strategy.
- Implement the steps of total productive maintenance in the organization.

5S FOUNDATION OF TOTAL PRODUCTIVE MAINTENANCE / STEPS IN IMPLEMENTING TPM STRATEGY

The first step in implementing a TPM strategy is to set down a foundation that helps in facility creation at work environment that fosters organization, productivity and sustainable support for a quality maintenance program. This foundation, known as the 5S framework, was first developed by a Japanese pioneer of TPM systems.



Figure: 5S Model / Steps of TPM Strategy

The 5S foundation stems from the five Japanese words that outline the requirements of this framework:

- **Sort (*seiri*):** Any non-essential items in the workspace should be removed.
- **Straighten (*seiton*):** Once remove these non-essential items from the workspace, the remaining essential items should be organized.
- **Shine (*seiso*):** The decluttered (untidy) workspace should be cleaned and inspected by maintenance managers.
- **Standardize (*seiketsu*):** Maintenance leaders should develop and document standards for completing the sort-straighten-shine processes, including timelines for how often these tasks should be completed.
- **Sustain (*shitsuke*):** After establishing these processes, management should provide ongoing oversight to make sure standards continue to be met.

One benefit of implementing the 5S foundation is that its requirements are intuitive and don't require any technical skill. This makes it easy for any employee to support the goals of this framework. A clean, well-managed, productive space then makes it easier to implement an effective TPM program.

STEPS OF TOTAL PRODUCTIVE MAINTENANCE

Total Productive Maintenance (TPM) is an extension of the Total Quality Management (TQM) philosophy to the maintenance function. Seven basic steps get an organization started toward TPM:

1. Management learns the new philosophy.

One of the most difficult things for senior management to deal with is change. They need to learn about TPM and how it will affect their operations. There are many successful examples; there are also many organizations that have tried various techniques to improve performance and failed. Benchmarking with a successful organization will provide valuable information.

TPM is merely trying to tap into an unused resource, the brain power and problem-solving ability of all the organization's employees. Thus, it is necessary to allow people to make decisions because management is still responsible for the performance of the organization. It does, however, represent a different way of managing.

Many organizations have had the flavor-of-the-month approach to changing management techniques. This approach has led to credibility problems with employees. Management is changed and the new manager does not build on past accomplishments but develops a "new system" that will presumably solve all of the organization's problems. Lack of ownership cause low morale and dissatisfaction with management. Ownership should be based on what is good for the customer and for the employees that serve the customer.

Initially this change will require more work by management. Eventually, it will mean less work as all individuals start solving their own problems.

2. Management promotes the new philosophy.

Senior management must spend significant time in promoting the system. They must sell the idea and let the employees know that they are totally committed to its success. If the belief in the new philosophy and commitment are not there, then positive results will not happen. A long-term commitment to the new philosophy is required. It has been proven by other organizations to be a better way of doing business.

Management should lead the way by practicing the new philosophy. One of the best ways to implement the new philosophy is just to start doing it. In other words, start giving the maintenance and production personnel more autonomy. Management must first build credibility, and the best way to accomplish that task is to change first and lead the way.

3. Training is funded and developed for everyone in the organization.

Teach the philosophy to managers at all levels. Begin with senior management, and work down to first-line supervisors.

Don't just teach the HOW, also teach the WHY. Senior management must spend time learning about and understanding the ramifications of applying this philosophy to their organization. Some managers may need to be replaced or make early retirement because they will not change their way of dealing with people. Those managers who readily respond to the new philosophy should also be identified.

Middle management must learn how to deal with the team approach and become familiar with how small autonomous work groups function. This organizational level seems to have the greatest difficulty with this type of change. In recent years, downsizing has come at the expense of middle managers. The philosophies that are promoted within TPM and TQM do lead to flatter management structures. When people are allowed to make their own decisions, organization do not need as many layers of managers to make sure employees are doing their job correctly.

First-line supervisors need to learn their role in what most likely will be in new environment. Supervisors who have been used to guiding their groups will find this an easy transition. The day of the autocratic manager has disappeared. A highly-educated workforce does not tolerate that management style. In reality, a supervisor is only as good as their ability to coach their team.

Employees need to learn about the various tools used in performing their tasks as part of an autonomous work group. A great benefit of TPM is the cross-pollination of ideas between maintenance technicians and production operators.

4. Areas of needed improvement are identified.

There are usually some machines that seem to be on the verge of breaking down or require an excessive amount of maintenance. Employees who work with the equipment on a daily basis are better able to identify these conditions than anyone else in the organization. Coordination between an implementation team of operators and technicians is essential to coordinate the process. This action will build credibility and start the organization towards TPM.

The following measurements were developed by the Japanese and are accepted by most practitioners. Six major loss areas need to be measured and tracked:

Downtime Losses

1. Planned
 - a. Start-ups
 - b. Shift changes
 - c. Coffee and lunch breaks

- d. Planned maintenance shutdowns
- 2. Unplanned Downtime
 - a. Equipment breakdown
 - b. Changeovers
 - c. Lack of material

Reduced Speed Losses

- 3. Idling and minor stoppages
- 4. Slow-downs

Poor Quality Losses

- 5. Process nonconformities
- 6. Scrap

These losses can be quantified into three metrics and can be summarized into one equipment effectiveness metric. Equations for these metrics follow.

Downtime losses are measured by **equipment availability (A)** using the equation

$$A = \left(\frac{T}{P} \right) \times 100$$

Where,

- A= availability
- T = operating time (P – D)
- P = planned operating time
- D= downtime

Reduced speed losses are measured by tracking **performance efficiency (E)** using the equation

$$E = \left(\frac{C \times N}{T} \right) \times 100$$

Where,

- E= performance efficiency
- C= theoretical cycle time
- N= processed amount (quantity)

Poor quality losses are measured by tracking the **rate of quality products (R)** produced using the equation

$$R = \left(\frac{N - Q}{N} \right) \times 100$$

Where,

- R= rate of quality products
- N= processed amount (quantity)
- Q= nonconformities

Equipment effectiveness (EE) is measured as the product of the decimal equivalent of the three previous metrics using the equation

$$EE = A \times E \times R$$

Where,

EE = equipment effectiveness, or overall equipment effectiveness (OEE)

The target for improvement is 85% equipment effectiveness.

5. Performance goals are formulated.

Goals should be set after the improvement needs are identified. A good first goal is to establish the timeframe for fixing the first prioritized problem. Technicians and operators will probably want it done faster than management because it causes them more problems on a daily basis. Identifying needs and setting goals begins the process of getting the organization to work together as a team.

6. Development of implementation plan.

At this stage, development and implementation an overall plan of action is carried out for training all employees. Plans for developing the autonomous work groups should take place during the training phase.

Plans are to be implemented for the teams of maintenance technicians and operators who work on troublesome problems. Priorities can be set and management can make a commitment with resources to correct some of the basic problems. At this point, employees should have input into how these autonomous teams are structured.

Part of the planning process should take into consideration that autonomous work groups will change over time. As processes and procedures are improved, the structure of the whole organization will change. It would be unreasonable not to expect autonomous work groups to change also.

7. Autonomous work groups are established.

Autonomous work groups are established based on the natural flow of activity. **First**, make the operator responsible for the equipment and the level of maintenance that he is capable of performing. **Next**, identify the maintenance personnel who work in certain areas or have certain skill levels. Operators and maintenance personnel are brought together, resulting in an autonomous work group. These groups must have the authority to make decisions about keeping the equipment in first-class running order.

The structure of autonomous work groups will vary with different applications and types of industries. Employee Involvement provides the necessary information to determine the structure.

Maintenance technicians are also consultants to the operating personnel. They train operators about how to do certain tasks, such as oiling, minor troubleshooting, and set-ups. The overall goal of the autonomous work group is to reduce the occasions for maintenance

activity. Skilled technicians are utilized more effectively in doing major overhauls and assisting with troubleshooting problems that the autonomous work group cannot handle.

Discussion questions:

1. Describe the concept of total productive maintenance.
2. Describe the goals of total productive maintenance.
3. Identify and assess the areas where TPM can be benefited.
4. Describe the pillars of TPM.
5. Assess the benefits and disadvantages of TPM.
6. How will you implement the TPM strategy by following due steps.
7. Develop the steps of total productive maintenance in your organization.

Critical Discussion Questions:

1. Find the equipment effectiveness percentage for an organization with the following data.
Schedule is one ten-hour shift, five days per week.
 - i) Total downtime allowed is 9% of schedule.
 - ii) Actual run time to theoretical has averaged 92% over the past six months.
 - iii) Quality acceptance rate has been running at 98%.
2. The bearing department is planning their schedule for the following week. They need an understanding of last week's performance. The schedule called for two 8-hour shifts per day for five days. Down time charged to production averaged 76 minutes per day. Downtime charged to maintenance averaged 135 minutes per day. Calculate the actual running time and the percentage of available time and equipment effectiveness.