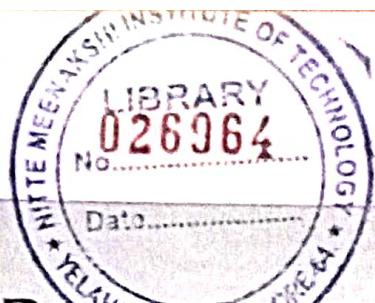


CHAPTER 1

Basic Concepts of Quality



LEARNING OBJECTIVES

- To understand meaning of the term “quality”
- To discuss importance of quality
- To analyse how to manage quality
- To understand quality dimensions of a product and service
- To explain the concept of cost of quality
- To discuss quality performance measures
- To describe the various milestones in the development of quality management thought



Introduction

The post-liberalization era has seen profound changes in the corporate world. Competition has forced many organizations to change to face the battle in the marketplace. The global recession has further fuelled the existing intense competition among the corporate for their piece of cake. Indeed, it has been the survival of the fittest. It has been well said that to survive in this turbulent times in the millennium any organization, profit or non profit, has to innovate, anticipate, and achieve excellence. All the three are necessary. Let us understand why. Innovation is on the list because it is the way you gain competitive advantage. Innovation coupled with excellence – which the Japanese have done so well is a very powerful combination. In the new millennium, no one organization will be the leader all the time. The top four or five positions within an industry will change frequently; you, therefore, need to anticipate which will allow you to be in the right place at the right time with your excellent innovative product or service. Excellence is at the base of the list because it is the base of the millennium. If you do not have the components of excellence viz. SPC, continuous improvement, benchmarking, the constant pursuit of excellence and the knowhow to do it right the first time then you don't even get to play the game.

Total Quality Management is a management approach that originated in the 1950s and has steadily become more popular since the early 1980s. Total quality is a description of the culture, attitude and organization of a company that strives to provide customers with products and services that satisfy their needs. The culture requires quality in all aspects of the company's operations, with processes being done right the first time and defects and waste eradicated from operations.

Total Quality Management, TQM, is a method by which management and employees can become involved in the continuous improvement of the production of goods and services. It is a combination of quality and management tools aimed at increasing business and reducing losses due to wasteful practices.

Some of the companies who have implemented TQM include Ford Motor Company, Phillips Semiconductors, SGL Carbon, Motorola, Toyota Motor Company etc.

What Is Quality?

Quality is defined in several ways and several quality Gurus have given definitions of quality from different dimensions. But when we look into the most of these definitions, we can find some common terms like "fitness for the purpose", "right first time", "customer satisfaction", "conformance to requirements", "value of money", "customer delight", "customer satisfaction" etc. Some of the popular definitions of quality are discussed below.

Quality is defined as fitness for the purpose at reasonable cost

— Joseph M. Juran

Quality is conformance to requirements

— Philip B. Crosby

Quality is totality of features and characteristics of a product or service that bears on its ability to meet stated or implied needs.

— ISO 8402

Quality is meeting or exceeding customer's expectations.

Thus, quality is defined in terms of customer needs, it is a measure of customer satisfaction; it ensures that no defectives reach the customers and it build image of the company.

Why do we care about Quality?

The Importance of quality can be judged from the following facts:

1. If 20 customers are dissatisfied with your service, 19 won't tell you. Fourteen of the 20 will take their business elsewhere.
2. Dissatisfied customers tell an average of 10 other people about their bad experience, 12% tell up to 20 people.
3. Satisfied customers will tell an average of five people about their positive experience.
4. It costs five times more to attract a new customer than to keep an existing one.
5. Ninety per cent of the dissatisfied customers will not buy from you again, and they won't tell you why.
6. In many industries, quality of service is one of the few variables that can distinguish a business from its competition.
7. Providing high quality service can save your business money. The same skills that lead to increased customer satisfaction also lead to increased employee productivity.
8. Customers are willing to pay more for better products and services.
9. Ninety-five per cent of dissatisfied customers will become loyal customers again if their complaints are handled well and quickly.

Quality Dimensions of a Product

1. **Performance:** Ability of the product to achieve its intended purpose.
2. **Reliability:** Capability of the product to perform consistently over its life cycle.
3. **Features:** The various attributes that supplement the product's performance. E.g. Additional features in Nokia handsets like camera, FM radio etc.
4. **Conformance:** Products meeting the specifications which are defined during design.
5. **Durability:** Degree to which products withstand stress without failure.

6. **Serviceability:** Ability of the company to provide after sales service and also availability of the spare parts needed for service requirements.
7. **Aesthetics:** This refers to how product appears which includes pleasing appearance, artistic look, etc.
8. **Perceived Quality:** Perceived quality refers to the perception of the customers about the quality of a product even before a product is purchased by them or even before a product is introduced in to the market.

MANAGERS DO NOT SEE IMMEDIATE NEED TO IMPROVE QUALITY: STUDY

Like any country that opens its economy, India has in the last 12 years seen much change in the way business and industries as a whole are now dealing with consumer demand and expectation with regard to quality of service, and quality of goods being sold. This is especially evident in the retail and food sectors.

The healthcare sector too has been bitten by the same bug. There has been a slow but sure shift in the way healthcare delivery is being perceived, by both providers and patients. Growing proliferation of the Internet and media vehicles are leading to an awareness about health among people which is fuelling their desire to remain healthy. Patients are demanding better quality of healthcare delivery; this, irrespective of in-patient services, outpatient services or even preventive care.

Yet the one question that remains unanswered is: what is quality in healthcare? How does a provider know they are providing the best quality of care at an affordable price? At the same time, how does a patient/consumer know they are getting value for money when it comes to treatment?

In the US, healthcare practitioners realized, as early as in the 1950s, that managing healthcare is going to be a Herculean task. Who was going to monitor the way treatment was being provided to patients? Who was going to monitor medical malpractice, patient safety, and who was going to translate this into financial costs, not the patient. Hence, there have, over the last few decades, been very significant developments and changes that have been implemented to highlight the quality of healthcare that countries are providing, and how healthcare providers can actually improve and aggressively assure quality in the way they deliver healthcare.

Several theories have been proposed and have been implemented, as to what quality in healthcare pertains to. Yet the easiest and most practical theory was given by Adelis Donabedian, the late quality healthcare guru in the US.

According to him, quality in healthcare encompassed and critical attributes: 1. Structure 2 Process 3. Outcome

Structure: This pertains to the "physical" aspects of healthcare delivery, including infrastructure, equipment, and human resources. E.g. Equipment requirements as per services being offered and accessibility of facility.

Process: This pertains to the procedures and protocols that all healthcare personnel, clinical and non-clinical have to conform to, so as to ensure appropriate and adequate delivery of healthcare services. E.g. Infection control procedures, protocols for patient case management.

Outcome: This specifically pertains to the well-being of the patient after delivery of healthcare provision. E.g. Mortality rates and case specific morbidity rates.

Taking a more detailed perspective, quality in Healthcare can also be divided into two specific parts –

1. Clinical 2. Non-clinical Clinical – Looking at the specific clinical aspects that go into delivery of quality healthcare, such as:

1. Clinical credentialing
2. Clinical audit
3. Clinical risk management (Including Infection Control)
4. Clinical outcome measurement
5. Clinical care pathways

Non-clinical – Looking at service quality aspects that go into delivery of Healthcare, such as:

1. Infrastructure and facilities management
2. Equipment management
3. Supplies and consumable management
4. IT Infrastructure and management
5. Hospitality management
6. Patient satisfaction

Apart from this, there are other specific areas such as non-clinical risk management, and accreditation. Why should any healthcare organization think of improving their quality?

As part of the KSA-Technopak "Healthcare Outlook" study, senior managers from the country's top healthcare providers were quizzed over this, with an overwhelming majority saying that "with an occupancy rate of 85-100 per cent, we do not feel there is an immediate need to improve quality; patients come to us because we are already providing good quality services". However, the customer's point of view was a more contrasting picture, as 54 per cent of those surveyed said they were satisfied with the quality of care, 32 per cent stated that services provided were below expectations and 14 per cent stated they were extremely happy with services provided. In the West, implementation of risk management systems in healthcare has lead to the revelation of some startling facts.

Medical errors are one of America's leading causes of death and injury. It is estimated that as many as 44,000 to 98,000* people die in US hospitals each year as the result of medical errors. This means that more people die from medical errors than from motor vehicle accidents, breast cancer, or AIDS. In the UK there are approximately 5,000 deaths/year due to hospital acquired infections (HAI). Hospital admissions up to 7.8 per cent and 15,000 deaths/ year are partially attributed to the HAI and cost the NHS approximately 1000 million pounds a year in extended hospital stay and treatment.

In the US, there are approximately 700,000-needle stick injury cases reported per year – 86 per cent of occupational-related infectious disease transmissions result from needle stick injuries. Going by trends in developed healthcare markets, it is imperative that Indian healthcare providers woke up to the need for quality in the delivery of healthcare services, irrespective of the level at which healthcare is provided and the type of services provided.

Quality Dimensions of a Service

The box item below discusses the need for quality in healthcare services. The various quality dimensions of service are:

1. Performance – primary operating characteristics
2. Features – "bells and whistles"
3. Reliability – probability of operating for specific time and conditions of use
4. Conformance – degree to which characteristics match standards
5. Durability – amount of use before deterioration or replacement
6. Serviceability – speed, courtesy, and competence of repair
7. Aesthetics – look, feel, sound, taste, smell.

Managing Quality

Quality management is the process of identifying and administrating the activities needed to achieve the quality objectives of an organization. The process of managing quality involves three components namely quality planning, quality control and quality improvement.

Quality Planning

This includes activities related to

1. Establishing quality goals
2. Identifying customers and their needs
3. Developing product according to customer needs
4. Establishing process parameters
5. Establishing process controls to ensure quality

Quality Control

This includes activities related to

1. Identifying quality parameters
2. Identifying units of measurement
3. Setting standards
4. Measuring actual performance
5. Taking corrective actions for any deviations

Quality Improvement

This includes activities related to

1. Identifying need for improvement
2. Defining improvement projects
3. Organizing project teams
4. Diagnosing the causes
5. Providing remedies
6. Changing to new methods
7. Holding the gains of improvements

Terminologies used in Quality Management

What Is Quality Control?

Quality control refers to all those functions or activities that must be performed to fulfill the company's objectives.

It is systematic control of all those variables which affects the quality of a product. It also aims at prevention of defects.

Quality Control (QC) is a system of routine technical activities, to measure and control the quality of the inventory as it is being developed. The QC system is designed to:

1. Provide routine and consistent checks to ensure that there are no deviations;
2. Identify and address errors defect;
3. Document and record all quality related activities.

Quality control begins even before start of production activities and it includes developing a system to ensure high quality raw material, purchased parts and other supplies. It also ensures that during the production activities quality specifications are maintained. This process is continued till products are produced as per desired quality.

What is Inspection?

Inspection is the process of comparing actual quality characteristics of a product with a predetermined or specified set of standards in order to segregate good products from bad products.

What is Quality Assurance?

Quality assurance is any action directed toward providing customers with goods and services of appropriate quality.

It relies on comprehensive system of planning, documentation, statistical process control and certification of product.

Quality Assurance (QA) activities include a planned system of review procedures conducted by personnel not directly involved in the inventory compilation/development process.

What Is the difference between Quality Assurance, Quality Control and Inspection?

Many people and organizations are confused about the difference between Quality Assurance (QA), Quality Control (QC), and Inspection. They are closely related, but they are different concepts. Since all three are necessary to effectively manage the risks of developing and maintaining quality of products and services, it is important for managers to understand the differences. They are defined below:

1. ***Quality Assurance:*** A set of activities designed to ensure that the development and/or maintenance of process is adequate to ensure that a system will meet its objectives.
2. ***Quality Control:*** A set of activities designed to evaluate a developed and produced component or a final assembled product.
3. ***Inspection:*** The process of executing a system with the intent of finding defects.

QA activities ensure that the process is well defined and appropriate procedures are followed. Methodology and standards development are examples of QA activities. A QA review would focus on the process elements of a project – e.g., are requirements being defined at the proper level of detail. In contrast, QC activities focus on finding defects in specific deliverables – e.g., are the defined requirements the right requirements. Inspection is one example of a QC activity.

What is Total Quality Control (TQC)?

TQC can be defined as an effort at continuous quality improvement of all processes, products and services through universal participation that results in increased customer satisfaction, loyalty, and improved business results.

It expands QA philosophy beyond manufacturing operations to other areas of organizational life.

What is TQM?

TQM is corporate business management philosophy which recognizes that customer needs and business needs are inseparable.

TQM is a management philosophy that seeks to integrate all organizational functions (marketing, finance, design, engineering, and production, customer service, etc.) to focus on meeting customer needs and organizational objectives.

TQM views an organization as a collection of processes. It maintains that organizations must strive to continuously improve these processes by incorporating the knowledge and experiences of workers. The simple objective of TQM is "Do the right things, right the first time, every time". TQM is infinitely variable and adaptable. Although originally applied to manufacturing operations, and for a number of years only used in that area, TQM is now becoming recognized as a generic management tool, just as applicable in service and public sector organizations. There are a number of evolutionary strands, with different sectors creating their own versions from the common ancestor. TQM is the foundation for activities, which include:

1. Commitment by senior management and all employees
2. Meeting customer requirements
3. Reducing development cycle times
4. Just In Time/Demand Flow Manufacturing
5. Improvement teams
6. Reducing product and service costs
7. Systems to facilitate improvement
8. Line management ownership
9. Employee involvement and empowerment
10. Recognition and celebration
11. Challenging quantified goals and benchmarking
12. Focus on processes / improvement plans
13. Specific incorporation in strategic planning

This shows that TQM must be practiced in all activities, by all personnel, in manufacturing, marketing, engineering, R&D, sales, purchasing, HR, etc.

It focuses on total satisfaction of customer through continuous improvement.

- **Total:** Everyone associated with the company is involved in continuous improvement (including customers and suppliers)
- **Quality:** Customer's expressed and implied needs are fully met
- **Management:** Executives are fully committed

Basic Principles of TQM

Customer Focus

The customer is the principal judge of quality. Hence the success of any business depends on understanding and fulfilling the needs of the customer. Organizations must first understand customers' needs and expectations in order to meet and exceed them. Business organizations thus need to focus on all product and service attributes that contributed to perceived value to the customer and lead to customer satisfaction. Organizations must build relationships with customers. Customer-driven firms measure the factors that drive customer satisfaction. Customers also include employees and society at large.

Participation and Teamwork

Employees know their jobs best and therefore, how to improve them. Management must develop the systems and procedures that foster participation and teamwork. Empowerment better serves customers, and creates trust and motivation.

Employee success depends increasingly on having opportunities to learn and practice new skills. This can be fostered through teamwork. Teamwork and partnerships must exist both horizontally and vertically.

Process Focus

A process is a sequence of activities that is intended to achieve some result. Improving the process will automatically improve its results and thus better products and services. Quality of products and services is derived from well designed and well executed work processes. Improvement in work processes will lead to major reductions in scrap and defects and hence lower costs.

Continuous Improvement

TQM is mainly concerned with continuous improvement in all work, from high level strategic planning and decision-making, to detailed execution of work elements on the shop floor. It stems from the belief that mistakes can be avoided and defects can be prevented. It leads to continuously improving results, in all aspects of work, as a result of continuously improving capabilities, people, processes, technology and machine capabilities.

Continuous improvement must deal not only with improving results, but more importantly with improving capabilities to produce better results in the future. The five major areas of focus for capability improvement are demand generation, supply generation, technology, operations and people capability.

A central principle of TQM is that mistakes may be made by people, but most of them are caused, or at least permitted, by faulty systems and processes. This means that the root cause of such mistakes can be identified and eliminated, and repetition can be prevented by changing the processes.

There are three major mechanisms of prevention:

1. Preventing mistakes (defects) from occurring (Mistake-proofing or Poka-Yoke).
2. Where mistakes can't be absolutely prevented, detecting them early to prevent them being passed down the value added chain (Inspection at source or by the next operation).
3. Where mistakes recur, stopping production until the process can be corrected, to prevent the production of more defects. (Stop in time).

Kaizen ✓

"Kai" in Japanese means Change and "Zen" means good. The literary meaning of Kaizen is "change for good".

Kaizen is the Japanese philosophy of continuous improvement by all the employees in an organization so that they perform their tasks a little better each day. It is a never-ending journey centred on the concept of starting each new day with the principle that the methods can always be improved.

The road to excellence is not the major break-through, but small continuous improvements which result in real cost savings, higher quality or better productivity.

Four Pillars of TQM

1. Satisfying customers
2. System/process approach
3. Improvement tools
4. People

Differences between Traditional Management and TQM

Table 1.1 Differences between Traditional Quality and TQM		
Characteristics	TQM Approach	Traditional Approach
Management Understanding and attitude	Considers quality management as an essential part of the company system	Tends to blame quality department for quality problems
Quality organization status	Quality management as essential part of the company system	Considers that quality is hidden in manufacturing or operations

Contd...

Problem handling	Emphasis on prevention of problems	Fire fighting approach
Quality improvement action	Continuous activity	No organizational activity
Priority	Quality is topmost priority	Profit is topmost priority
Focus	Customer satisfaction	Management's requirements
Organization	Networking across and among the functions	Hierarchical-Vertical
Span of control	Large span of control, authority pushed to lower levels	Short span
Responsibility for quality	With top management	Delegated to subordinates
Employee	High involvement and participation	Very less participation
Strategic planning	Quality planning is integrated to strategic business planning	Focus on financial and marketing issues
Team work	High emphasis	Very low

Cost of Quality

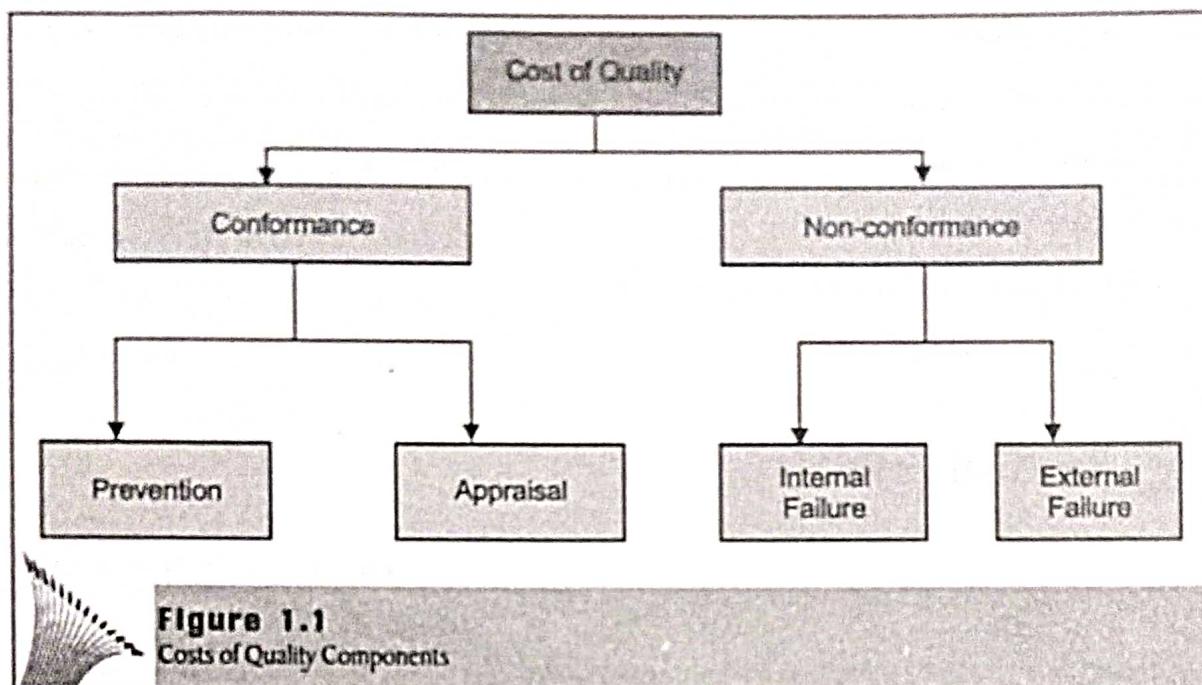
Cost of quality (COQ) is defined as the sum of everything that would not have been necessary if everything else was done right the first time. According to quality guru A.V. Feigenbaum, cost of quality is defined as "Those costs associated with the creation and control of quality as well as the evaluation and feedback of conformance of quality, reliability and safety requirements, and those costs associated with the consequences of failure to meet the requirements both within the factory and in the hands of the customer".

The "cost of quality" isn't the price of creating a quality product or service. It's the cost of NOT creating a quality product or service.

- Every time work is redone, the cost of quality increases. Obvious examples include:
1. The reworking of a manufactured item.
 2. The retesting of an assembly.
 3. The rebuilding of a tool.
 4. The correction of a bank statement.
 5. The reworking of a service, such as the reprocessing of a loan operation or the replacement of a food order in a restaurant.

Quality costs are the total of the cost incurred by:

1. Investing in the prevention of nonconformance to requirements.
2. Appraising a product or service for conformance to requirements.
3. Failing to meet requirements.



Prevention Costs

These are the costs of all activities specifically designed to prevent poor quality in products or services.

Prevention costs are associated with design, implementation, maintenance, and planning prior to actual operation in order to avoid defects from happening.

The emphasis is on the prevention of defects in order to reduce the probability of producing defective products. Prevention activities lead to reduction of appraisal costs and both type of failures (internal and external). The motto is "Prevention rather than appraisal".

Examples for prevention costs are the costs of:

1. New product review
2. Quality planning
3. Supplier capability surveys
4. Process capability evaluations
5. Quality improvement team meetings
6. Quality improvement projects
7. Quality education and training
8. Market research
9. Contract review

10. Design review
11. Field trials
12. Supplier evaluation
13. Process plan review
14. Design and manufacture of jigs and fixtures
15. Preventive maintenance

Appraisal Costs

These are the costs associated with measuring, evaluating or auditing products or services to assure conformance to quality standards and performance requirements.

Appraisal costs are spent to detect defects to assure conformance to quality standards. Appraisal cost activities sums up to the "cost of checking if things are correct". The appraisal costs are focused on the discovery of defects rather than prevention of defects.

These include the costs of:

1. Incoming and source inspection/test of purchased material
2. In-process and final inspection/test
3. Product, process or service audits
4. Calibration of measuring and test equipment
5. Associated supplies and materials testing
6. Proto type testing
7. Vendor surveillance
8. Final inspection
9. Laboratory testing / measurement
10. Depreciation cost for measuring instruments
11. Quality audits.

Failure Costs

These are failure costs are the costs resulting from products or services not conforming to requirements or customer/user needs. Failure costs are divided into internal and external failure categories.

Internal Failure Costs

There are failure costs occurring prior to delivery or shipment of the product, or the furnishing of a service, to the customer. Internal failure costs occurs when results of work fail to reach designated quality standards, and are detected before transfer to the customer takes place.

Examples for the internal failure costs are the costs of:

1. Scrap
2. Rework
3. Re-inspection
4. Re-testing
5. Material review
6. Downgrading
7. Design changes/ corrective action
8. Scrap due to design changes
9. Excess inventory
10. Rectification / reject disposition of purchased material
11. Downtime of plant and machinery
12. Trouble-shooting and investigation of defects

External Failure Costs

Failure costs occurring after delivery or shipment of the product and during or after furnishing of a service to the customer are known as external failure costs.

External failure costs occur when the product or service from a process fails to reach designated quality standards, and is not detected until after transfer to the customer.

Examples for external failure costs are the costs of:

1. Processing customer complaints
2. Customer returns
3. Warranty claims
4. Product recalls
5. Processing / investigation of customer complaint
6. Repair/replacement of sold goods
7. Product liability and litigation costs
8. Interest charges on delayed payment due to quality problems
9. Loss of customer goodwill and sales.

Total Quality Costs

Total cost of quality is the sum of the above costs. This represents the difference between the actual cost of a product or service and what the reduced cost would be if there were no possibility of substandard service, failure of products or defects in their manufacture.

Table 1.2
Components of Costs of Quality

COQ Category	Typical Descriptions (may vary between different organizations)	Examples
Internal failure costs	Costs associated with internal losses (ie. within the process being analyzed)	Off-cuts, equipment breakdowns, spills, scrap, yield, productivity
External	Costs external to the process being analyzed (ie. occur outside, not within). These costs are usually discovered by, or affect third parties (eg. customers). Some external costs may have originated from within, or been caused, created by, or made worse by the process being analyzed. They are defined as external because of where they were discovered, or who is primarily or initially affected.	customer complaints, latent defects found by the customer, warranty
Preventive	Costs associated with the prevention of future losses: (eg. unplanned or undesired problems, losses, lost opportunities, breakdowns, work stoppages, waste, etc.)	Planning, mistake-proofing, scheduled maintenance, quality assurance
Assessment	Costs associated with measurement and assessment of the process.	KPIs, inspection, quality check, dock audits, third party audits, measuring devices, reporting systems, data collection systems, forms

Quality Performance Measures

Measurement of performance is a major requirement for any organization and all effective organizations recognize that if they cannot measure quality performance, they cannot manage it. Performance indicators are selected on the basis of critical success factors for achievement of desired results. Some of the important performance measures are listed below.

Process Performance Measures

1. Schedule/delivery performance measures
2. Quality

3. Downtime
4. Expediting costs
5. Inventory levels
6. Work-in process levels

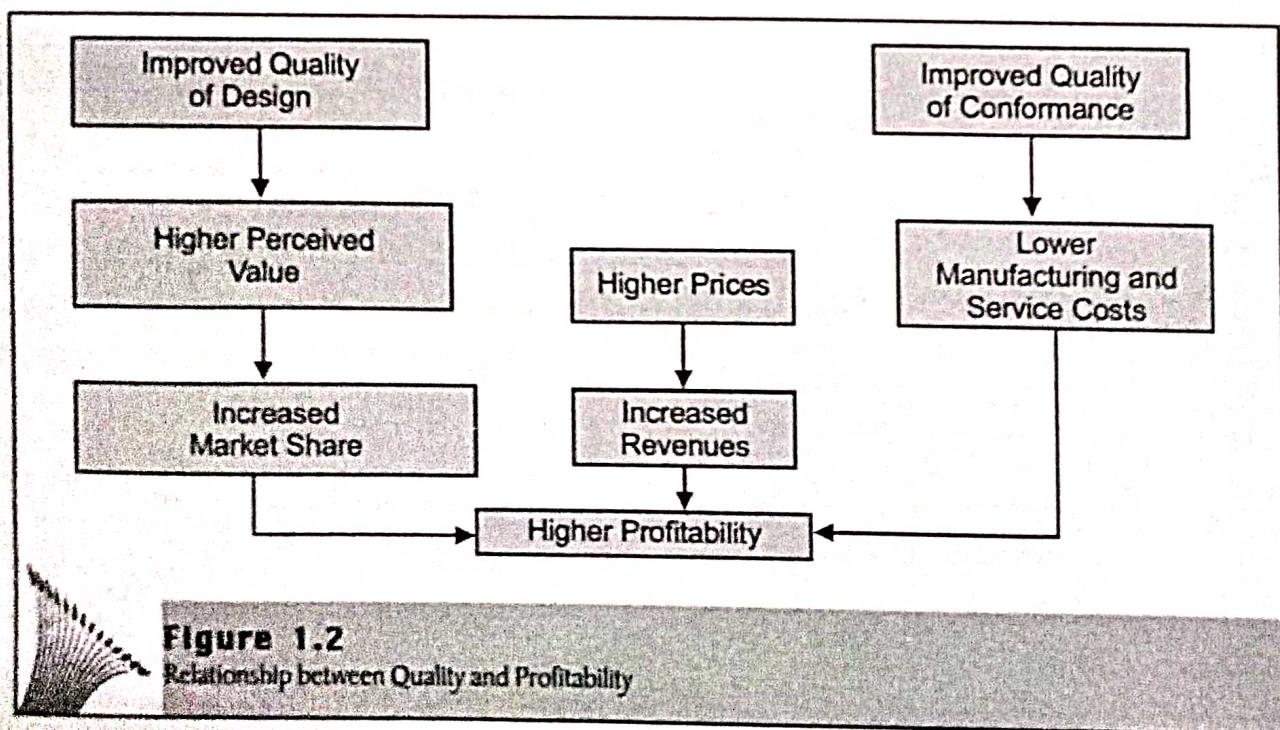
Product or Service Performance Measures

1. Scrap
2. Rework
3. Downtime
4. Repair costs
5. Warranty costs
6. Complaints

Organizational Performance Measures

1. Market share
2. Retained customers
3. Brand
4. Profits

Relation between Quality and Profitability





PRINCIPLES AND PRACTICE

TOPICS DISCUSSED

Definition, basic approach, gurus of TQM. TQM Framework, awareness, defining quality review, obstacles, benefits of TQM.

INTRODUCTION

Motives and goal of any business establishment or organisation is profit making or in other words business is made only with the intention of earning profit. Profit can be earned provided the customer buys the product. A product will be bought by the customer only when the quality of the product is as desired by the customer.

Quality is not confined to products manufactured in industry but also for service sectors such as educational institutes, hospitals, transportation, hotel industries etc. Earlier machine operators, shop floor supervisors, administrative staffs were held responsible for the poor quality and has to face the ire of the customer directly.

To bring the quality level of a production to the desired level of the customer many elements such as raw material, machine, process, quality check, instrument, workforce vendors, management are all responsible. Each one has to play his/her role judiciously, with only goal of customers satisfaction by providing the product/and or service to the expected level of quality.

Customers have become the ruler of any business organization and hence can dictate the organization in terms of quality level with economical price, sufficient warranty and service on demand.

Now the growth of the organisation, and the customer satisfaction is the responsibility of each and everyone involved in the organization including the top management. To achieve this goal of growth, profit making, customer satisfaction, one has to adopt Total Quality Management.

TQM as such is a technique which enhances the traditional business and guarantees the survival and growth of the organization in this competitive world by ultimately achieving the customer satisfaction. TQM cannot be implemented overnight, it is a long term implementation. It requires the willingness, dedication of each and every person involved in the organization.

TQM brings a change in culture. Adoption of TQM will bring a revolutionary change in the product/ and or service.

TQM will provide quality product/and or service, resulting in economic productivity. This will enhance the competitive position in the market resulting in higher profit and growth, provide a sense of security among workers and hence a satisfying workplace.

1.1 DEFINITION

Total Quality Management (TQM) is the integration of all functions and processes within an organization in order to achieve continuous improvement of quality of goods and services with a goal of customer satisfaction.

Total Quality Management is the application of qualitative methods and human resources to improve all the process and functions within an organisation and exceed customer needs of the present and for the future. TQM integrates fundamental management techniques, existing improvement efforts and technical tools under a disciplined approach.

Concept of TQM : TQM is based on number of ideas. It means thinking about quality in terms of all functions of the organization and is a start to finish process that integrates interrelated functions at all levels. It is a system approach that considers every interaction between various elements of the organisation. Thus the overall effectiveness of the system are higher than the sum of the individual outputs from the subsystems.

The subsystems include all the organizational functions in the product cycle such as (a) **design** (b) **planning** (c) **production** (d) **distribution** and (e) **field services**. The management subsystems also require integration including (a) **strategy with a customer focus** (b) **tools of quality** and (c) **employee involvement**. A successful organisation is one that consciously seeks and exploits opportunities for improvement at all levels. The load bearing structure is **customer satisfaction** and the **watchword is continuous improvement**.

1.2 BASIC APPROACH TO TQM

There are six factors that are necessary for the basic approach to TQM. They are

1. A committed and dedicated management to provide a long-term, top-to-bottom organization support.
2. A fixed and rigid focus on the customer within the organisation and also external to the organisation.
3. Effective involvement and proper utilization of entire work force and human resources.
4. Continuous improvement of the business and the production process.
5. Treating vendors as partners.
6. Establish performance measures for the process.

The six factors of TQM listed above outline an excellent way to run an organization. A brief explanation of each TQM factors (concept) could make the reader to get a overall glimpse of TQM.

1. **Committed and involved management:** Management commitment and involvement is very much necessary in the quality program. A quality council must be established to develop a clear vision, set long term goals, and direct the quality program of the organisation. An annual event of quality improvement program must

be held, involving input from the entire workforce of the organisation. Management should participate on quality improvement teams and also act as guides and coaches to other teams. TQM is a continual activity that must be taken as a culture.

- 2. Rigid focus on customer:** The main factor influencing the effective TQM program is **customer**. An excellent opportunity to satisfy customer is by satisfying internal customer. Listening to the '*voice of the customer*' is a key factor and emphasizes on design, quality and defect prevention. Do it right first time and every time for the customer satisfaction.
- 3. Effective involvement and utilization of workforce:** TQM is an organization with wide challenge and is responsibility of everyone in the organisation. Training should be imparted in Statistical Process Control (SPC) and other quality related skills to all personnel to actively participate on project teams. Including internal customer and supplier on project team will have added advantages. Personnel affected by the plan must be involved in the development as they understand the process better than others. Worker must be encouraged not only to do their job but also to think on how to improve the same. People at the lowest level must be empowered to perform in optimum manner.
- 4. Continuous improvement:** There must be continual attempt to improve all business and processes. Quality improvement projects such as on-time delivery, order entry efficiency, billing error rate, customer satisfaction, cycle time, and scrap reduction and supplier management are the right places to begin with. Techniques such as SPC, benchmarking, quality function deployment (QFD), ISO 9000, and design of experiments are excellent tools for solving problems.
- 5. Treating suppliers as partners:** About 40 per cent of the products and services in an organisation are bought out and hence the supplier quality must be outstanding. A supplier should be treated as a partner of the organisation and it should be clear to all the supplier that his/her success or failure depends on the success or failure of the organization which depends on the quality of product/service supplied by him/her. The focus on the brought -out components /services should be more on life-cycle cost and quality, rather than on the price. It is advisable to maintain a few numbers of suppliers so that true partnering can occur.
- 6. To establish performance measures:** Performance measures such as uptime, nonconforming, absenteeism and customer satisfaction should be established to each functional area. The measures should be displayed at all key places so that everyone can see it.

Aim of TQM or Overall Objective of TQM

The overall objective of TQM is to provide a quality product and/or service to customers needs/ satisfaction. This in turn will increase demand and hence productivity and decrease production cost. Obviously with increased quality and lower price, the market place will be improved. This series of events will allow the organisation to achieve its objectives of profit and long-term growth with greater ease. In addition, the workforce will have job security and create a satisfying workplace.

Elements of TQM concepts

The six TQM concepts mentioned earlier support the philosophies of customer focus, continuous improvement, defect prevention and recognition that responsibility for quality is shared by all employees of the organisation.

The basic elements of TQM concepts are

1. Sustained management commitment to quality.
2. Focus on customer requirements and expectations.
3. Prevention of defects rather than detecting them.
4. Recognizing the responsibility for quality that lies with every one in the organization.
5. Quality measurement.
6. Continuous improvement approach.
7. Root cause corrective action.
8. Employee involvement and empowerment.
9. The synergies of team work.
10. Continuous process improvement.
11. Statistical approach.
12. Benchmarking.
13. Inventory reduction.
14. Value improvement.
15. Supplier teaming.
16. Training and education.

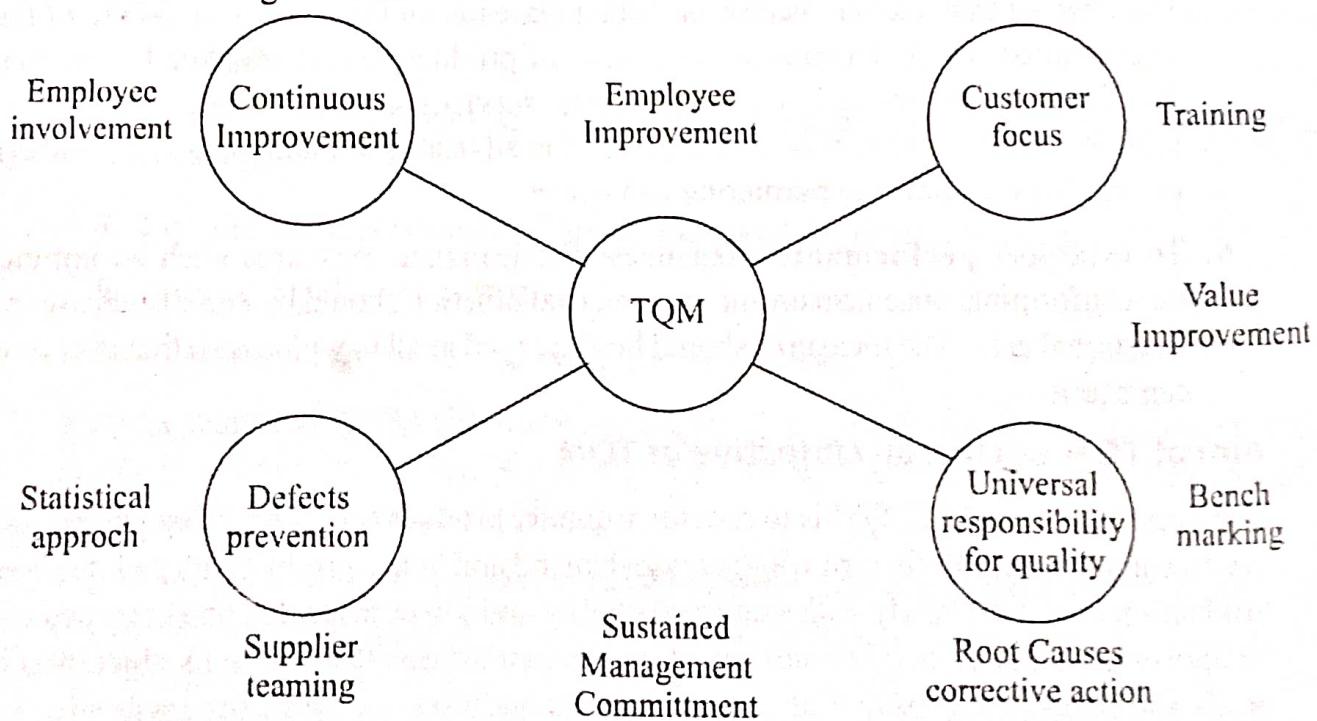


Figure 1.1: Elements of TQM Concepts

1.3 GURUS OF TQM

Gurus are those eminent persons who have made rich contribution at different levels to reach the concept of TQM. There are seven Gurus of TQM who are mainly responsible for the development of TQM through their rich experience in Quality Control in various organization at various levels. The **seven Gurus** are

1. Walter A. Shewhart
2. W. Edward Deming
3. Joseph M. Juran
4. Armond V. Feiganbaum
5. Kooru Ishikawa
6. Phillip B. Crosby
7. Genichi Taguchi

1.4 CONTRIBUTIONS OF GURUS

Shewhart: Developed control chart theory, control limits, assignable and chance causes of variation and rational subgroups. He has authored “Economic Control of Quality of Manufacturing Products”, which is regarded as a complete and thorough work of the basic principles of quality control.

Deming: Deming was a doctorate in Physics. He has the maximum influence on quality management and was a trained statistician. He recognised the importance of viewing management processes statistically and taught course on Quality Control to US National Defence and realised that teaching statistics to engineers and workers does not solve quality problems. Unfortunately his message of quality to higher-level managers in US were ignored, but the same were appreciated and followed by Japanese. This resulted in him being responsible for providing foundation for the quality miracle and resurgence of Japan as an economic superpower. His 14 points on Quality Management provide theory for management to improve quality, productivity and achieve competitive position in the market. Number of books have been authored by Deming on quality productivity and other related topics.

Joseph juran: Born in Romania in 1904 and later in 1912 shifted to United States. Much of his time were spent as a Corporate Industrial Engineer engaged in writing, editing and publishing Handbook on Quality Control which is quite popular even today. He got exposed to work of Shewhart. Also taught quality principles to Japanese and was a principal force in their quality recognition. He was also of the opinion as that of Deming's that the huge loss of sales at U.S. business at that time was due to huge cost of poor quality.

Juran sought to improve quality by working within the system familiar to midlevel managers. He proposed a simple definition of quality “fitness fortune”. His focus was on three major quality processes.

They are

1. Quality planning
2. Quality Control
3. Quality Improvement

and these are termed as **Quality Trilogy**.

On the same lines with that of Deming, he also emphasized on identifying and reducing sources of variation to improve quality. According to him quality involves determining what to control, establishing units of measurement for objective evaluation of data, establishing standards of performance, measurement of actual performance, interpretation of the differences between actual performance and the standard and finally taking action on the performance.

Juran specified a detailed program for quality improvement. This program involved the following steps:

- (i) the need for improvement
- (ii) identification of specific project for improvement
- (iii) support for the project
- (iv) diagnosing the causes
- (v) proving remedies for the causes etc.

Feiganbaum: He was the elected founder chairman of the board of the International Academy of Quality, which attracted the active participation of European Organisation for Quality Control, Union of Japanese scientists and Engineers and The American Society for Quality.

Feiganbaum is best known for coining the phrase **Total Quality Control** which he defined as 'an effective system for integrating the quality development, quality maintenance and quality improvement efforts of the various groups in the organization which enabled production and services at most economical level with full customer satisfaction.'

According to his view quality is a strategic business tool that requires involvement of each and every person in the organization and quality cost as a measurement and evaluation tool. His philosophy on quality is summarised in three steps. They are

- (1) Quality leadership,
- (2) Modern Quality Technology
- (3) Organisational Commitment.

Quality Leadership: which emphasizes on sound planning than reaction to failure and the management must maintain a constant and continuous focus and lead the quality effort.

Modern Quality Technology: This involves the integration of office staff, engineers and shop floor personnel in the process who continually evaluate and implement new techniques to satisfy customers.

Organisational Commitment: Imparting continuous training and motivating the entire workforce and involving quality in business planning will indicate the importance of quality and to provide an opportunity for including the same in all aspects of the organization's activities.

He also popularised the concept of **hidden factory** which described the portion of plant capacity wasted due to poor quality.

Ishikawa : Ishikawa was a student of Deming, Juran and Feiganbaum. He was responsible for introducing total quality control for Japanese and because of him Japan enjoyed the world wide acclaim and success that it has today. He developed **cause and effect diagrams** (one of the SPC tool) is also referred to as **Ishikawa diagram**.

He influenced the development of a participative and bottom up view of quality which have become the trade mark of the Japanese approach to quality management. In addition he was able to get the attention of top management and persuade them that company wise approach to quality was necessary for total success.

He reduced the reliance of quality professionals and quality department by promoting greater involvement of all employees of the organisation by his concept of total quality.

According to him also total quality begins with the customer and therefore, understanding customer's need is the basis of improvement and complaints should be received in the right spirit and actively sought. A few of key elements of his philosophy are

- (i) Quality begins with education and end with education.
- (ii) Knowing the customers requirement is the first step in quality.
- (iii) The ideal state of quality control is that point where inspection is no longer necessary.
- (iv) Removal of root cause rather than the symptoms.
- (v) Quality control is the responsibility of each and everyone involved (including vendors) in the organization.
- (vi) Means and objects should not be confused with each other.
- (vii) Quality first and profit later.
- (viii) Top management should accept the facts submitted by the sub-ordinates in the right spirit.
- (ix) Use of simple tool for analysis and problem solving will solve most of the problems in the organization.
- (x) Variation is a natural phenomenon and any data without variation is a false data.

Crosby: He rose from a line inspector to corporate vice-president for quality at International Telephone and Telegraph (ITT) in a span of 14 years.

His approach for quality was primarily behavioral. He emphasized using management and organizational process rather than techniques approach to change corporate culture and attributes. This approach fit well within the existing organisation.

He has authored several popular books and his first book titled 'Quality free' was largely responsible for bringing quality to the attention of top corporate managers in U.S.A. In fact it changed the way management look at quality. The essence of his quality philosophy lies in what he calls the 'Absolute of Quality Management' and the "Basic Elements of Improvement".

According to him "doing it right the first time" is less expensive than the cost of detecting and correcting non-conformities. His book on "Quality Without Tears" contains four of his absolutes of quality management. They are

- (i) Quality is conformance to requirement
- (ii) Prevention of the nonconformance is the objective, not appraisal.
- (iii) The performance standard is zero defect and not 'that is close enough'.
- (iv) The measurement of quality is the cost of non-conformance.

G. Taguchi: Taguchi was a Japanese engineer explained the economic value of reducing variation this philosophy was strongly advocated by Deming.

He contributed for improving engineering approaches to product design. According to him specification limit became meaningless while designing a product insensitive to variation in manufacture.

He recommended certain techniques of experimental design to identify the most important design parameters in order to minimise the effect of uncontrollable factors on product variation. His approach to quality was to identify and attack parameters responsible for quality problem in the design state rather than reaching to problems later at the production stage.

1.5 TQM FRAMEWORK

TQM framework consists of the Gurus of TQM, their contributions towards principles and practices and or tool and techniques for TQM. Figure 1.2 shows the framework for the TQM system.

The framework begins with the Gurus of TQM with their knowledge on quality.

The framework shows the principles and practices of TQM in the form of people and relationship. The framework also contains different tools and techniques developed by these gurus. The principles and practices and tools and techniques are for product or service and realization ultimately aiming at the customer's satisfaction.

The contribution of each of the gurus to TQM have been explained in brief earlier. A few of the principle and practices and also the tools and techniques have been dealt later.

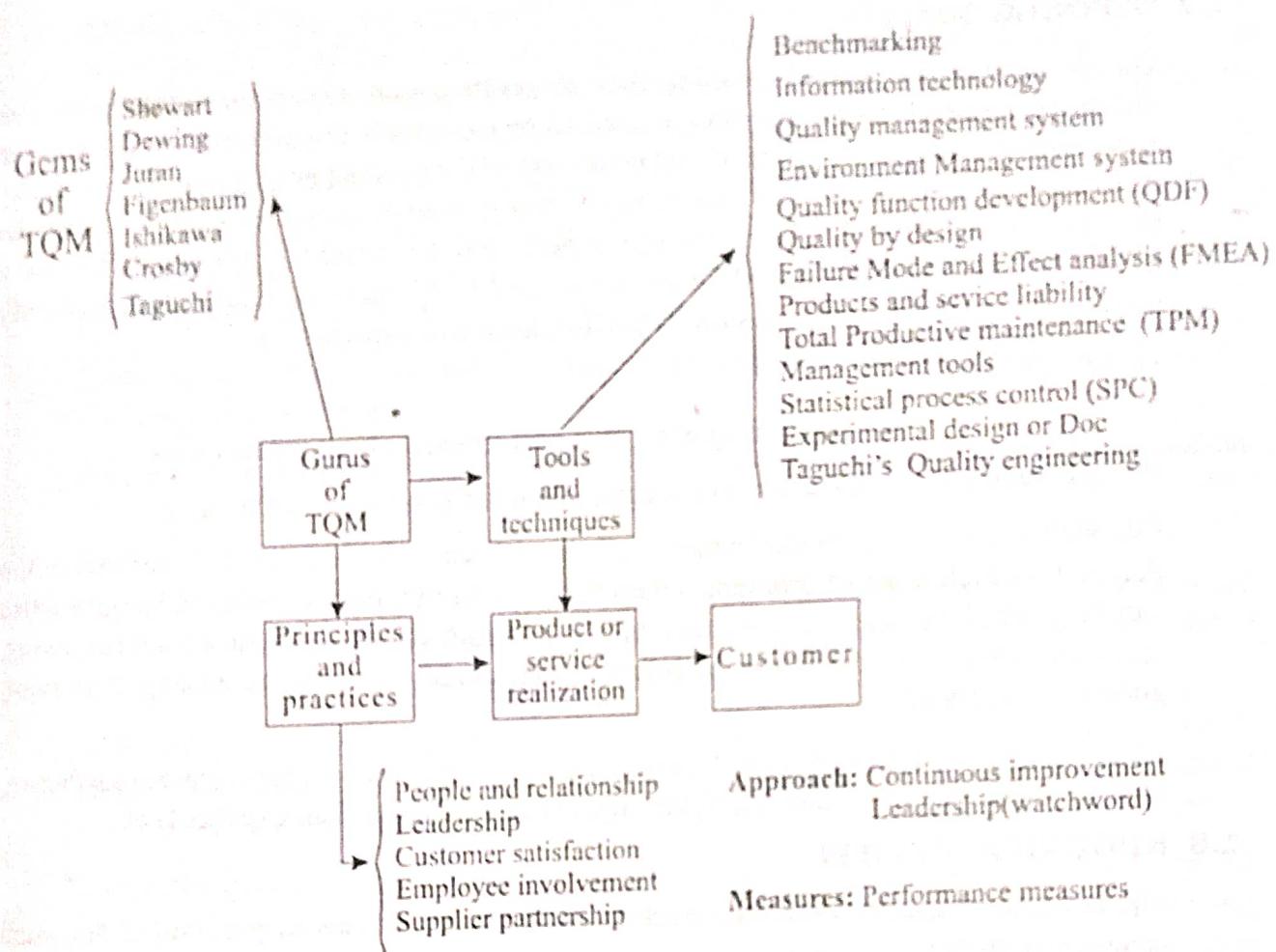


Figure 1.2: TQM Framework

1.6 AWARENESS OF TQM

Adoption of TQM in an organization will begin only when quality of the product or the services need to be improved to continue the business. This awareness of improvement of quality gets into mind only when the organization loses its foothold in the market or management realises that quality and productivity go hand in hand. Awareness also occurs in an organisation when TQM is made mandatory by the customer or the management realizes that to compete in the domestic and international market, TQM is a better way to run the organization or business.

Improving the methods of production, process and productivity may not help the organization to market its product until and unless quality of the product or service is of the market level.

Many organizations market their product/service at a very low price without even thinking of the repeated order and are not able to sell their product/service any more, realizing later that an organization is recognised or branded because of its quality product/service. A new attitude has emerged among the organization, that is survival depends on quality rather than cost as the customer wants value for his money.

1.7 DEFINING QUALITY

Quality as such has varied meaning such as performance, appearance, fitness for use and so on. Generally term 'quality' is used when we usually think in terms of product or services. These expectations are based on the use of the product and its cost. For example, a customer expects a better service in an AC coach, than in an ordinary coach. When the performance of a product exceeds our expectation we consider that product to be a quality product, but not a method for measuring quality. A better method adopted to quantify quality of a product or depends on its performance and expectation.

$$\text{i.e. } Q = (P/E)$$

where Q is quality; P is performance; E is expectations

If $P > E$ then we will have a better feeling about the product or service.

ISO 9000 - 2000 has provided a more definitive definition of quality. It is defined as the degree to which a set of inherent characteristics fulfills requirements. Characteristics can be quantified such as hardness, tensile strength etc or qualitative such as sweet, spicy etc. Degree in the reference refers to that quality that can be adjudged as poor, good and excellent.

Other terms to which quality can be associated are: Performance, appearance (aesthetic), feature (we say better features), reliability, durability (more than expected) etc.

1.8 HISTORICAL REVIEW

The concept of quality even date back to early history. Stones of pyramid is one such instance of quality.

During the Middle Ages in Europe craftsmen served as both manufacturer and inspector. Craftsman who dealt directly with the customer took considerable pride in workmanship.

During early periods the product manufactured were not complicated and hence quality was not affected. With complicated products and specialization of jobs, it became necessary to inspect products after manufacture.

The history of quality control dates back to the beginning of the industry. During the industrial revolution the concept of specialisation was introduced. Here the workers were able to produce a part or a product in which they were specialized, resulting in decrease in workmanship.

During the first half of the twentieth century inspection was the primary means of quality control. Manufacturers were able to ship good quality products at a greater cost. Defects were present, but removed by inspection. Thousands of people were engaged as inspectors for this purpose. Separate quality departments were set up but this led to unrest among the workers and passing on the responsibility of quality only on quality department.

In the early 1900s many of the fundamental quality practices were introduced by Henry Ford.

In 1920 Shewart, Dodge, Edwards, Deming and other pioneers of quality assurance developed many useful techniques for improving quality and solving quality problems and

introduction of SQC the application of statistical method for controlling quality. During World War II U.S. military began using statistical sampling procedures, the war production board offering free training course on statistical method which produced quality specialist. SQC was adopted by both industries and defence.

In late 1940s and early 1950s, shortage of civilian goods resulted in production gaining the top priority without any importance to quality. During this time Juran and Deming introduced SQC techniques to Japanese to aid in their rebuilding effort and after some time continuous improvement culture (Kaizen) was developed.

1980s was a period of remarkable change and growing awareness of quality by consumers, industry and government.

As business and industry began to focus on quality, the US government recognized the importance of quality on the nation's economy and in 1984 designated October as quality month.

Late 1980s and through 1990s interest in quality grew at an unprecedented rate, companies making significant stride in improving quality. In 1994 quality practices were extended to the service sector and into non-profit organisation.

Although quality initiatives focussed initially on reducing defects and errors in products and services, through different tools and techniques, it was felt that lasting improvement could not be accomplished without significant attention to the quality of management.

Managers began to realize that factors like listening to customers, development of long-term relationship, development of strategy, performance measurement, reward, training of employees, act as leaders etc., are the true enablers of quality, customer satisfaction and business results. They recognized the importance of 'quality management'. With the practice of quality principles into their management systems the notion of **total quality management** or TQM became popular.

1.9 BOTTLENECKS FOR IMPLEMENTATION OF TQM (OBSTACLES)

TQM cannot be implemented so easily. Many organisations especially the small ones which are comfortable with their current status are satisfied with the performance, profit and customers, will see little need for TQM until they begin to lose market.

Even if an organisation tries to implement TQM, it will not be a smooth implementation. There will be obstacles to its successful implementation. The most common of them as per Robert J. Masters are :

- a. Lack of management commitment
- b. Inability to change over to new culture.
- c. Improper planning
- d. Lack of continuous training and education.
- e. Incompatible organisational structure and isolated individuals and departments.
- f. Ineffective measurement techniques and lack of access to data and results.

- g. Paying inadequate attention to internal and external customers.
- h. Inadequate use of empowerment and teamwork.
- i. Failure to continually improve.

1.10 BENEFITS OF TQM

Implementation of TQM has two types of benefits to the organisation. They are

- a. Tangible or direct benefits
- b. Intangible or indirect benefits.

Tangible benefits are

- | | |
|-----------------------------|--------------------------------|
| a. Better quality product | b. Improvement in productivity |
| c. Reduced quality costs. | d. Increased market |
| e. Increased profitability. | f. Reduced employee grievances |

Intangible benefits

- a. Effective team work
- b. Enhancement of job interest.
- c. Improvement in human relation and work area morale
- d. Participation culture of the employees.
- e. Customer satisfaction
- f. Economic growth of the organisation
- g. Enhanced problem solving capacity
- h. Better image of the organization.

1.11 TQM EXEMPLARY ORGANIZATION

Motorola is a pioneer in electronic products having around 99000 employees working at 53 centres world wide. In 1987 the company launched an ambitious drive for a tenfold improvement in the quality of its products and services.

They succeeded and now many of its products are best in the class. The company's quality goal is simply stated "Zero defects in everything we do". The corporate objective of 'total customer satisfaction' is carried out in the form of a printed card and by every manager. Corporate and business managers were provided with pagers to make themselves available to the customers, and also they visit the customers regularly to find out their likes and dislikes about Motorola products and services.

The information, along with data gathered through an effective network system is used as guide for planning improvement and production development.

Motorola's cycle-time reduction is even more ambitious; the clock starts ticking the moment a product is conceived. 40% of the workers training is devoted to quality matters ranging

from general principles of quality improvement to designing for manufacturability. All the achievements of Motorola are due to implementation of TQM and hence is a TQM exemplary organization.

All along it has been mentioned at many places that TQM requires a cultural change. Table 1.1 gives a comparison of typical quality element between organizations with and without TQM.

TABLE 1.1

Quality element	Organization without TQM	Organization with TQM
Definition	Product oriented	Customer oriented
Properties	Second to service and cost	First among equals of service and cost
Decisions (Plan)	Short-term	Long-term
Emphasis	Detection	Prevention
Errors	Operations	System
Responsibility	Quality control	Every one
Problem solving	Managers	Team
Procurement	Price	Life Cycle Cost Partnership
Manager's Role	Plan, assign, control and enforce	Delegate, coach, facilitate and mentor

Quality consciousness is on the increase along with the purchasing power.

Quality is not confined to products produced in an industry, but also for the other different service sectors.

SUMMARY OF KEY POINTS

- TQM is the application of quantitative methods and human resources to improve all the process and functions within an organization and exceed customer needs of the present and for the future.
- The load bearing structure is customer satisfaction and the watchword is continuous improvement.
- There are six concepts of TQM, which outline an excellent way to run an organization.
- The overall objective of TQM is to provide a quality product and/or service to customer needs and satisfaction through the concept of continuous improvement.
- There are seven gurus of TQM who have contributed significantly to the six concepts of TQM.
- Deming, Juran and Crosby are recognized as the top three international leaders of modern quality.

- Quality is the predictable degree of uniformity and dependability at low cost and suited to market – Deming's quality definition.
- Juran's philosophy seeks to provide change within the current management system. Quality is reflected as fitness for use, and quality trilogy planning, control and improvement provides a program for quality assurance in organizations.
- Crosby's approach to quality is summarised in his absolutes of Quality management. He places more emphasis on behavioral change rather than on the use of statistical techniques as recommended by Deming and Juran.
- Feigenbaum coined the term 'total quality control' and was responsible for developing cost of quality approaches.
- Kaoru Ishikawa was instrumental in the Japanese quality movement, particularly in recommending a company-wide quality control approach, the use of quality circles and problem solving tools such as cause and effect diagnosis.

QUESTIONS FOR REVIEWS AND DISCUSSIONS

1. Define TQM. Explain the concept of TQM.
2. List out the six basic concepts of TQM and briefly explain them.
3. What is the overall objective of TQM? Briefly explain the contribution of each to TQM concepts.
4. Draw a block diagram showing the elements of TQM concepts.
5. Who are the Gurus of TQM ? Briefly explain the contribution of each to TQM.
6. List out the tools and techniques contributed by guru of TQM.
7. Write in brief the historical review of TQM, giving the sequence of events that took place towards the concept of TQM.
8. Is implementation of TQM very easy? Substantiate your answers.
9. List out the tangible (direct) and intangible (indirect) benefits of TQM.
10. Explain with an example a TQM exemplary organisation.
11. Enumerate the differences between organizations with and without TQM under different factors or quality element.
12. What are the bottlenecks for implementation of TQM.
13. List out the benefits of TQM.