**CHAPTER FIVE**

**QUALITY MANAGEMENT AND CONTROL**

**5.0 Introductions**

**QM** is the way of managing for the future, and is far wider in its application than just assuring **product or service quality** – it is a way of **managing people and business processes** to ensure complete customer satisfaction at every stage, internally and externally. QM, combined with effective leadership, results in an organization doing the right things right, first time. This core must be surrounded by commitment to quality, communication of the quality message, and recognition of the need to change the culture of the organization to create total quality.

**5.1 What is quality?**

A frequently used definition of quality is “**Delighting the customer** by fully meeting their **needs and expectations**”. These may include performance, appearance, availability, delivery, reliability, maintainability, cost effectiveness and price.

Quality is ‘the totality of features and characteristics of a product or service that bears on its ability to satisfy a given needs’.

Quality refers to the **ability of a product or service** to consistently meet or exceed customer’s expectation.

Quality means **getting what you are paying for**. People are willing to spend more in the hope that the extra money spent will bring them the peace of mind that comes with services and products that are trust worthy.

Quality is some **prescribe or desired characteristics present** in raw materials; semi finished, or finished items.

It is fitness for purpose, degree of preference, degree of excellence, fulfillment of the promises made to the customer; quality of design etc.

**Dimensions of Product Quality**
• **Performance**– *main characteristics of the product*
• **Aesthetics**– *appearance, feel, smell, taste*
• **Special features**– *extra characteristics*
• **Conformance**– *how well the product conforms to design specifications*
• **Reliability**– *consistency of performance*
• **Durability**– *the useful life of the product*
• **Perceived quality**– *indirect evaluation of quality*
• **Service-ability**– *handling of complaints or repairs*

**Dimensions of Service Quality**
• **Convenience**– *the availability and accessibility of the service*
• **Reliability**– *ability to perform a service dependably, consistently, and accurately*
• **Responsiveness**– *willingness to help customers in unusual situations and to deal with problems*
• ***Time–*** *the speed with which the service is delivered*
• ***Assurance–*** *knowledge exhibited by personnel and their ability to convey trust and confidence*
• ***Courtesy–*** *the way customers are treated by employees*
• ***Tangibles–*** *the physical appearance of facilities, equipment, personnel, and communication materials*
• ***Consistency–*** *the ability to provide the same level of good quality repeatedly*
**The Determinants of Quality**
**Quality of Design – intention of designers to include or exclude features in a product or service.** The starting point of producing quality in products begins in the “design phase”. Designing decisions may involve product or service size, shape and location. When making designs, designers must keep in mind customer wants, production or service capabilities, safety and liability, costs, and other similar considerations.
**Quality of conformance- It refers to the degree to which goods and services conform to the intent of the designer**. Quality of conformance can easily be affected by factors like: capability of equipment used, skills, training, and motivation of workers, extent to which the design lends itself to production, the monitoring process to assess conformance, and the taking of corrective action.
**Ease of use - refers to the ease of usage of the product or services for the customers.** The term “ease of use” refers to user instructions. Designing a product with “ease of use” increases the chances that the product will be used in its intended design and it will continue to function properly and safely. Without ease of use, companies may lose customers, face sales returns, or legal problems from product injuries. Ease of use also applies to services. Manufacturers must make sure that directions for unpacking, assembling, using, maintaining, and adjusting the product are included. Directions for “What to do when something goes wrong” should also be included. Ease of use makes a consumer very happy and can help retain customers.
**Services offered to the customer after delivery.** There will be times when products may fail or problems with usage may occur. This is when “Service after delivery” is important through recall and repairs of the product, adjustment, replacement or buys back, or reevaluation of a service.
Having good quality is a **competitive advantage** against others who offer similar products or services in the marketplace.
**In addition, good quality can:**

* **Raise Company's Reputation**
* **Rationalize Premium Prices**
* **Decrease Liability Costs**
* **Increase Productivity**
* **Increase Customer Loyalty**
* **Increase Customer Satisfaction**

*Poor quality result in*

* **loss of business and existing market share**
* **legal liability**
* **lack of productivity**
* **increased costs**

**5.2 Total Quality Management (TQM)**

Total Quality Management (TQM) is a philosophy that says that **uniform commitment to quality in all areas of an organization** promotes an organizational culture that meets consumers' perceptions of quality.

**Total quality management** (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 empowers the total organization, from the **employee to the CEO,** with the responsibility of ensuring quality in their respective products and services, and Management of their processes through the appropriate process improvement channels.

**TQM is for the most part common sense**.

• 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.

• Therefore, TQM is the art of managing the whole to achieve excellence.

The TQM philosophy focuses on **teamwork, increasing customer satisfaction, and lowering costs.**

Organizations implement TQM by encouraging **managers and employees** to collaborate across functions and departments, as well as with **customers and suppliers**, to identify areas for improvement, no matter how small. Organizations shift responsibility for quality control from **specialized departments to all employees**. Thus, total quality management means a shift from a **bureaucratic to a decentralized approach to control.**

An effective TQM program has numerous benefits. Financial benefits include **lower costs, higher returns on sales and investment, and the ability to charge higher rather than competitive prices.** Other benefits include improved access to global markets, higher customer retention levels, less time required to develop new innovations, and a reputation as a quality firm. Only a small number of companies use TQM because implementing an effective program involves much time, effort, money, and patience. However, firms with the necessary resources may gain major competitive advantages in their industries by implementing TQM.

**Customers and suppliers and quality control**

There exist in each department, each office, each home, a series of customers, suppliers and customer supplier interfaces. These are “the quality chains”, and they can be broken at any point by one person or one piece of equipment not meeting the requirements of the customer, internal or external.

**Customers (internal and external)**

• Who are my customers?

• What are their true needs and expectations?

• How do, or can, I find out what these are?

• How can I measure my ability to meet their needs and expectations?

• Do I have the capability to meet their needs and expectations?

(If not, what must I do to improve this capability?)

**Suppliers (internal and external)**

• Who are my internal suppliers?

• What are my true needs and expectations?

• How do I communicate my needs and expectations to my suppliers?

• Do my suppliers have the capability to measure and meet these needs and expectations?

• How do I inform them of changes in my needs and expectations?

**The essential components of TQM – commitment & leadership**

TQM is an approach to improving the competitiveness, effectiveness and flexibility of an organization for the benefit of all stakeholders. It is a way of planning, organising and understanding each activity, and of removing all the wasted effort and energy that is routinely spent in organizations. It ensures the leaders adopt a strategic overview of quality and focus on prevention not detection of problems. Whilst it must involve everyone, to be successful, it must start at the top with the leaders of the organization.

**Managerial considerations**

 The following is a list of points that leaders should consider; they are a distillation of the various beliefs of some of the quality gurus:

• The organization needs a long-term commitment to continuous improvement.

• Adopt the philosophy of zero errors/defects to change the culture to right first time

• Train people to understand the customer/supplier relationships

• Do not buy products or services on price alone – look at the total cost

• Recognize that improvement of the systems must be managed

• Adopt modern methods of supervising and training – eliminate fear

• Eliminate barriers between departments by managing the process

• Eliminate goals without methods, standards based only on numbers,

• Constantly educate and retrain – develop experts in the organization

• Develop a systematic approach to manage the implementation of TQM

• Commitment from the leaders

• Involvement of all of the organization’s people

**Some Basic Tenets/code of belief of TQM**

1. The customer determines quality

2. Improving quality requires the establishment of effective quality metrics. We must speak with data not just opinions.

3. People working within systems create quality.

4. Quality requires a commitment toward sustained continuous improvement.

5. Prevention not detection is the key to producing high quality. We must design quality into products and reduce variability.

6. Top Management must provide leadership and support for all quality initiatives.

 **Quality specification**

 **Quality specifications** are detailed requirements that define the [quality](https://simplicable.com/new/quality)of a product, service or process.

Quality includes **tangible elements** such as measurements and **intangible elements** such as smell and taste.

**5.3 Six-sigma and Continuous improvement**

**What is Six -Sigma?**

The Six Sigma name comes from the concept of **standard deviation**, a statistically derived value represented by the lower case Greek letter sigma: σ. the **variations** of processes and their output products are typically measured in the number of **standard deviations from the mean.** A good company typically operates between 3 and 4 sigma.

It **identifies and prevents** "defects" in manufacturing and service-related processes to anticipate, and achieve or exceed total customer satisfaction.

**Six Sigma** is a business strategy that seeks to identify and eliminate causes of **errors** or **defects** or **failures** in business processes by focusing on **outputs** that are critical to customers. It is a **measure of quality** that strives for near elimination of defects using the application of statistical methods. A **defect** is defined as anything which could lead to customer dissatisfaction.

The central core of the Six Sigma concept is a six-step protocol for **process improvement.** These steps are as follows:

1. Identify the product characteristics wanted by the customer.

2. Classify the characteristics in terms of their criticality.

3. Determine if the classified characteristics are controlled by part and/or process.

4. Determine the maximum allowable tolerance for each classified characteristic.

5. Determine the process variation for each classified characteristic.

6. Change the design of the product, process, or both, to achieve Six Sigma process performance.

**What is Objective of the Six-Sigma?**

The primary objective of the Six Sigma methodology is the **implementation of a measurement based strategy**, which focuses on process and sub-processes improvement through the application of Six Sigma best practice such as DMAIC and DMADV.

The Six Sigma DMAIC (Define, Measure, Analyze, Improve, and Control) method is applied for **improving existing processes and looking for incremental improvement**.

The Six Sigma DMADV (Define, Measure, Analyze, Design, and Verify) is applied for **developing new processes or products** at Six Sigma quality levels. It can also be employed if a current process requires more than just incremental improvement.

 **Continuous Process Improvement (CPI)**

CPI is a concept that recognizes the **world is constantly changing** and any process that is satisfactory today may not provide the same value tomorrow. CPI is a holistic approach that is applicable to projects because it supports quality goals by making **gradual improvements** in processes and sub-processes that tend to repeat themselves over several projects, or often within a project.

Continuous improvement (CI) is a management philosophy that approaches the challenge of products and process improvement as **never ending process of achieving small wins.** It is an integral part of total quality Management. CI seeks continual improvement of machinery, material, labour utilization and productions methods through application of suggestion and ideas from team members.

One of the techniques assisting in continuous improvement is by generating new ideas. This is achieved by 5WH method.

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **5WH** | **Description** | **Counter measure** |
| Subject matter | What? | What is being done? Can this task being eliminated? | Eliminate in necessary tasks |
| Purpose | Why? | Why is the task necessary?Clarify the purpose |
| Location  | Where? | where is it being done?Does it have to be done there? | Change the sequence or combination |
| Sequence  | When? | When it is the best time to doit?does it have to be done then? |
| People | Who? | who is doing it?Should someone else doit?Why I am doing it? |
| Method  | How? | How is it being done?Is this the best method?Is there some other way? | Simplify the task |

The CPI procedure is as follows:

1. **Define and standardize (sub) processes:** Document current understanding; maintain and update formal standards; measure performance against current standards.

2. **Assess (sub) process performance:** Measure process; assess performance against goals and customer needs; select improvement targets.

3. **Improve (sub) processes:** Use teams for shared processes; pursue individual improvement; follow improvement cycle (similar to the Deming Plan-Do-Check-Act cycle) of

* Standardize
* Do
* Check
* Act

4. **Measure progress:** Measure performance against goals and standards; evaluate customer satisfaction, evaluate method and document results; continuously improve.

**5.4 COSTS OF QUALTY MANAGEMENT**

Some costs fall with higher quality, but common sense says that there will be some costs that rise. Unfortunately, it is quite difficult to identify the costs of quality, largely because accounting systems do not separate them from other costs. There are several costs associated with quality:
**Appraisal costs** - costs of activities designed to ensure quality or uncover defects
**Prevention costs** - costs of prevention defects from occurring
**Failure costs** - Costs caused by defective parts or products or by faulty services
**Internal failures** - failures discovered during production
**External failures** - failures discovered after delivery to the customer
**Return on quality (ROQ)** - an approach that evaluates the financial return of investments in quality

**COMPENENTS QUALTY COST**

**1. Prevention costs**

These are the **costs incurred to prevent defects** happening. The quality of a product is set at the **design stage,** so the best way to guaranteeing high quality is by designing, a good product in the first place. Prevention costs cover all aspects of quality that are, designed into a product, together with costs incurred **to ease production** and **reduce** the chance of making a defect. They include **direct costs** such the use of better materials, inclusion of features to ensure good quality, and extra time to make the product. They also include **indirect costs** of employee training, pilot runs, testing prototypes, designing and maintaining control systems, improvement projects, etc.

**2. Appraisal costs**

These are the costs of making sure the designed quality is actually achieved. As units move through their process, they are inspected to make sure they actually reach the quality specified in the design. Related costs include **sampling, inspecting, testing and all the other elements of quality control.** The appraisal costs also cover **administrations and audits** for quality programmes.

**3. Internal failure costs**

 Any units that **do not meet the specified quality** are scrapped, returned to an earlier point in the process, or repaired. The cost of this forms part of the internal failure cost, which is the total cost of making defective products that are detected somewhere **within the process.**

Part of the internal failure costs come **directly** from the loss of material, wasted labour, wasted machine time in making the defective item, extra testing, duplicated effort, and so on. Another part comes from the **indirect costs** of higher stock levels, longer lead times, extra capacity needed to allow for scrap and rejections, loss of confidence, etc.

**4. External failure costs**

Producers normally give a guarantee with their products, and are responsible for correcting any faults. If a unit goes through the entire production process, is delivered to a customer, and is then found to **be faulty**, the producer must bring it back from the customer and replace, rework or repair it as necessary. The cost of this work is part of the external failure cost, which is the total cost of making defective units that **are not detected within the process**, but are recognized as **faulty by customers.**

**5.5 Process control chart**

Control charts have long been used in manufacturing, stock trading algorithms, and process improvement methodologies like Six Sigma and Total Quality Management (TQM).

The purpose of a control chart is to set upper and lower bounds of acceptable performance given normal variation. In other words, they provide a great way to monitor any sort of process you have in place so you can learn how to improve your poor performance and continue with your successes.

* Control Chart: an important tool in PC
	+ *Purpose:* to monitor process output to see if it is random (in control) or not (out of control).
	+ A time ordered plot representative sample statistics obtained from an on going process (e.g. sample means).
	+ Upper and lower control limits define the range of acceptable variation.
* Quality control is a process that measures output relative to standard, and acts when output doesn't meet standards.
* The purpose of quality control is to assure that processes are performing in an acceptable manner.
* Companies accomplish quality control by monitoring process output using statistical techniques.

Inspection

* Inspection is an appraisal activity that compares goods or services to a standard.
* Inspection can occur at three points:

 - before production: is to make sure that inputs are acceptable.

 - during production: to make sure that the conversion of inputs into outputs is proceeding in an acceptable manner.

 - after production: to make a final verification of conformance before passing goods to customers

* Inspection before and after production involves acceptance sampling procedure.
* Monitoring during the production process is referred as process control

## Control Chart Examples: How To Make Them Work In Your Organization

* **Budget**: You can use your control charts to examine your percentage of spend each month. If you spend over 15% of your budget in one particular spring month, that is extremely helpful to know right away so you can cut back over the rest of the year. Or, if you spend less than 8% of your budget for a couple months in a row, you’ll know you may have a little wiggle room in the months to come.
* **Retention rate**: Some organizations feel like they need a little turnover to keep the organization healthy. If you’re retaining your talent at a rate above your normal control limit, you’ll know that you may not be evaluating staff very selectively. You’ll want to be sure to identify the reasons you may be retaining so many employees to see if this is positive news or if an HR process is broken. But if your retention rate is increasing or it drops below your lower control limit, you’ll be able to determine how to move that trend the other direction and dedicate more resources to recruiting for a period of time.
* **Employee or citizen surveys**: At ClearPoint, we do quarterly customer support feedback surveys to see how our clients feel we’re doing. If we’re doing something that is having a positive effect, we want to know what it is and continue to do it well. But if we’re falling below our normal control limit, we’ll want to note that something needs to change. This could be anything from having better customer service response time to changing a particular feature in our software that is frustrating or difficult to use.