1. Connotations of Quality

What is Quality?

Quality can be interpret as **"Customer's expressed and implied requirements are met fully"**. This is a core statement from which some eminent definitions of quality have been derived. They include: "the totality of features and characteristics of a product or service that bears on its ability to meet a stated or implied need" [ISO, 1994], "fitness for use" [Juran, 1988], and "conformance to requirement" [Crosby, 1979]. It is important to note that satisfying the customers' needs and expectations is the main factor in all these definitions. Therefore it is an imperative for a company to identify such needs early in the product/service development cycle. The ability to define accurately the needs related to design, performance, price, safety, delivery, and other business activities and processes will place a firm ahead of its competitors in the market. In 1992 Crosby broadened his definition for quality adding an integrated notion to it: "Quality meaning getting everyone to do what they have agreed to do and to do it right the first time is the skeletal structure of an organization, finance is the nourishment, and relationships are the soul." Some Japanese companies find that "conformance to a standard" too narrowly reflects the actual meaning of quality and consequently have started to use a newer definition of quality as "providing extraordinary customer satisfaction". There is a trend in modern day competition among Japanese companies to give you rather more in order to 'delight' you. So when you buy a lamp bulb which has a 'mean time between failure' of 1,000 hours, the Japanese manufacturer will try their best to ensure that you can get at least 20% more. Likewise, when you buy a Japanese brand video tape specifying 180 minutes, it can normally record up to 190 minutes. When you buy a 'mink' coat from a department store in Japan, they would invite you to store the fur coat in their temperature-control room during the hot summer season free-of-charge. They call these extra little things as 'extra-ordinary customer satisfaction' or 'delighting the customers'

1.1: Definition of Quality

Despite being in use for nearly 50 years, the term TQM still poses problems of definition for writers on quality, and consequently often remain a rather abstract term. There are a number of well-known quality definitions. ISO 8402 [ISO, 1986] defines quality as **"the totality of features and characteristics of a product or service that bears on its ability to meet a stated or implied need".** [Crosby, 1979] defines quality as **"conformance to requirement**". [Juran, 1988] defines quality as "fitness for use". Japanese companies found the old definition of quality **"the degree of conformance to a standard"** too narrow and consequently have started to use a new definition of quality as "user satisfaction" [Wayne, 1983]. Table below defines quality from the view point of different quality professionals and to provide a conceptual scheme for the discussion of TQM. This can be classified in three sections: Customer-base, Service and Manufacturing-base, and Value-based definition.

Customer-based Definitions

- Edwards [1968] Quality consists of the capacity to satisfy wants...

- Gilmore [1974] Quality is the degree to which a specific product satisfies the wants of a specific consumer. ·
- Kuehn & Day [1962] in the final analysis of the marketplace, the quality of a product depends on how well it fits patterns of consumer preferences.
- Juran [1988] Quality is fitness for use.
- Oakland [1989] The core of a total quality approach is to identify and meet the requirements of both internal and external customers.

Manufacturing & Service-based definitions

- Crosby [1979] Quality [means] conformance to requirements
- Price [1985] Do it right first time

Value-based definitions

- Broh [1982] Quality is the degree of excellence at an acceptable price and the control of variability at an acceptable cost.
- Feigenbaum [1983] Quality is the degree to which a specific product conforms to a design or specification
- Newell & Dale [1991] Quality must be achieved in five basic areas: people, equipment, methods, materials and the environment to ensure customer's need are met.
- Kanji [1990] Quality is to satisfy customers' requirements continually; TQM is to achieve quality at low cost by involving everyone's daily commitment.

2. Quality Dimensions- Product and Service

When it comes to measuring the quality of your services, it helps to understand the concepts of product and service dimensions. Users may want a key board that is durable and flexible for using on the wireless carts. Customers may want a service desk assistant who is empathetic and resourceful when reporting issues.
Quality is multidimensional. Product and service quality are comprised of a number of dimensions which determine how customer requirements are achieved. Therefore it is essential that you consider all the dimension that may be important to your customers.

Product quality has two dimensions.

- **Physical dimension** - A product's physical dimension measures the tangible product itself and includes such things as length, weight, and temperature.
- **Performance dimension** - A product's performance dimension measures how well a product works and includes such things as speed and capacity.

While performance dimensions are more difficult to measure and obtain when compared to physical dimensions, but the efforts will provide more insight into how the product satisfies the customer.

Like product quality, service quality has several dimensions.

- **Responsiveness** - Responsiveness refers to the reaction time of the service.
- **Assurance** - Assurance refers to the level of certainty a customer has regarding the quality of the service provided.
- **Tangibles** - Tangibles refers to a service's look or feel.
- **Empathy** - Empathy is when a service employee shows that she understands and sympathizes with the customer's situation. The greater the level of this understanding, the better. Some situations require more empathy than others.
- **Reliability** - Reliability refers to the dependability of the service providers and their ability to keep their promises.

The quality of products and services can be measured by their dimensions. Evaluating all dimensions of a product or service helps to determine how well the service stacks up against meeting the customer requirements.

2.1: Quality Framework

Garvin proposes eight critical dimensions or categories of quality that can serve as a framework for strategic analysis: Performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality.

1. Performance

Performance refers to a product's primary operating characteristics. For an automobile, performance would include traits like acceleration, handling, cruising speed, and comfort. Because this dimension of quality involves measurable attributes, brands can usually be ranked objectively on individual aspects of performance. Overall performance rankings, however, are more difficult to develop, especially when they involve benefits that not every customer needs.

2. Features

Features are usually the secondary aspects of performance, the "bells and whistles" of products and services, those characteristics that supplement their basic functioning. The line separating primary performance characteristics from secondary features is often difficult to draw. What is crucial is that features involve objective and measurable attributes; objective individual needs, not prejudices, affect their translation into quality differences.

3. Reliability

This dimension reflects the probability of a product malfunctioning or failing within a specified time period. Among the most common measures of reliability are the mean time to first failure, the mean time between failures, and the failure rate per unit time. Because these measures require a product to be in use for a specified period, they are more relevant to durable goods than to products or services that are consumed instantly.

4. Conformance

Conformance is the degree to which a product's design and operating characteristics meet established standards. The two most common measures of failure in conformance are defect rates in the factory and, once a product is in the hands of the customer, the incidence of service calls. These measures neglect other deviations from standard, like misspelled labels or shoddy construction that do not lead to service or repair.

5. Durability

A measure of product life, durability has both economic and technical dimensions. Technically, durability can be defined as the amount of use one gets from a product before it deteriorates. Alternatively, it may be defined as the amount of use one gets from a product before it breaks down and replacement is preferable to continued repair.

6. Serviceability

Serviceability is the speed, courtesy, competence, and ease of repair. Consumers are concerned not only about a product breaking down but also about the time before service is restored, the timeliness with which service appointments are kept, the nature of dealings with service personnel, and the frequency with which service calls or repairs fail to correct outstanding problems. In those cases where problems are not immediately resolved and complaints are filed, a company's complaints handling procedures are also likely to affect customers' ultimate evaluation of product and service quality.

7. Aesthetics

Aesthetics is a subjective dimension of quality. How a product looks, feels, sounds, tastes, or smells is a matter of personal judgment and a reflection of individual preference. On this dimension of quality it may be difficult to please everyone.

8. Perceived Quality

Consumers do not always have complete information about a product's or service's attributes; indirect measures may be their only basis for comparing brands. A product's durability for example can seldom be observed directly; it must usually be inferred from various tangible and intangible aspects of the product. In such circumstances, images, advertising, and brand names - inferences about quality rather than the reality itself - can be critical.

3. Concept of Total Quality Management

(a) Continuous improvement of quality

Foremost among TQM concepts is the idea of continuous improvement of quality. The underlying aim of total quality management is to improve the quality of products and services in any organization. By so doing, productivity, employability and customer service are improved.

When an organization focuses on this concept of total quality management, they are able to achieve the best.

(b) Focus on the customer

Another TQM concept is a central focus on the customer. The customers are the internal and external recipients of an organization's products. Therefore, the needs of customers and their desires define quality for the organization.

In turn, the organization uses this 'definition' to meet and exceed the customer's expectations.

(c) Operations improvement

Furthermore, systematic improvement of operations is another concept of total quality management. Every work done in an organization follows a chain or process. These processes account for 80-85% of the quality of work and productivity of employees. This concept establishes that work processes should be studied, through individuals or teams, to identify lapses or complexities.

As such, solutions can be proffered to prevent them from occurring in the future, the cost will be reduced and quality achieved.

(d) Human resources

The concept of human resources development is one of the concepts of total quality management. Organizations that employ total quality management principles are committed to employee learning and development. These principles require that management trust that well-trained staff can do the jobs assigned to them properly.

In addition, human resource development includes providing the training required in a quality improvement work environment as well as extensive education to help employees keep up-to-date on their jobs.

(e)TQM leadership

Similarly, another concept of TQM is about management responsibility for TQM leadership. Managers are responsible to lead the transformation of an organization to imbibe the culture of quality. They must accept the responsibility for continuous quality improvements and be dedicated to empowering others.

Hence, the goal of management will be to ensure that everyone does a better job and act as a facilitator and catalyst for total quality in the organization.

4. EVOLUTION OF TOTAL QUALITY MANAGEMENT

Total quality Management (TQM) is defined as both as philosophy and a set of guiding principles that represent the foundation of a continuously improving organization.

Basic Approach TQM requires six basic concepts:

1. A commitment and involved management to provide long-term top-to-bottom organizational support.

2. An unwavering focuses on the customer, both internally and externally.

3. Effective involvement and utilization of the entire work force.

4. Continuous improvement of the business and production process.

5. Treating suppliers as partners.

6. Establish performance measures such as uptime, percent nonconforming, absenteeism and customer satisfaction should be determined for the process. Quantitative data are necessary to measure the continuous quality improvement activity.

Table 1 GURUS OF TQM:

Shewhart	Control chart theory PDCA Cycle
Deming	Statistical Process Control
Juran	Concepts of Shewhart Return on Investment
Feiganbaum	Total Quality Control Management involvement Employee involvement Company wide quality control
Ishikawa	Cause and Effect diagram Quality circle concept
Crosby	Quality is Free Conformance to requirement
Taguchi	Loss function concept Design of Experiments

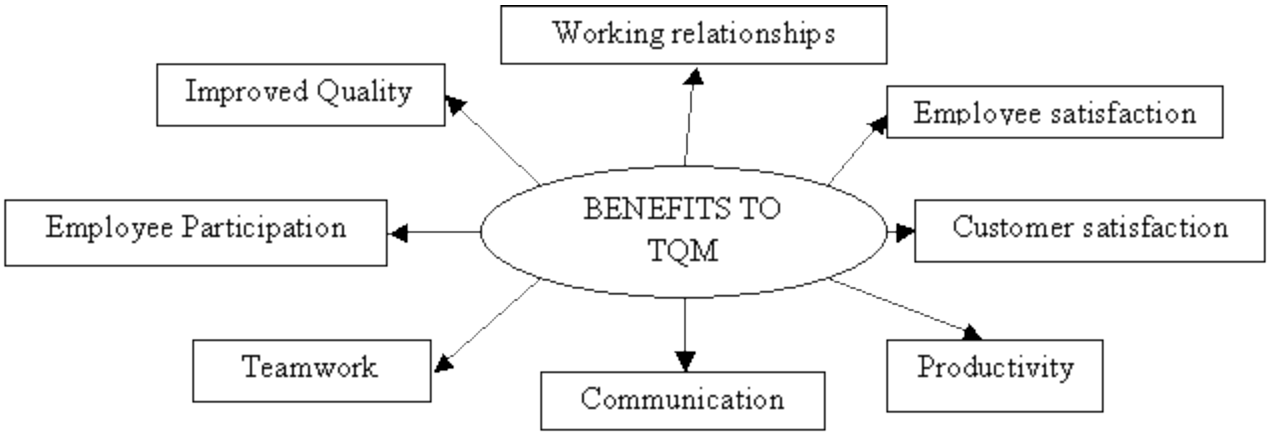

Figure 1. Benefits to TQM

A quality management system is a management technique used to communicate to employees what is required to produce the desired quality of products and services and to influence employee actions to complete tasks according to the quality specifications.

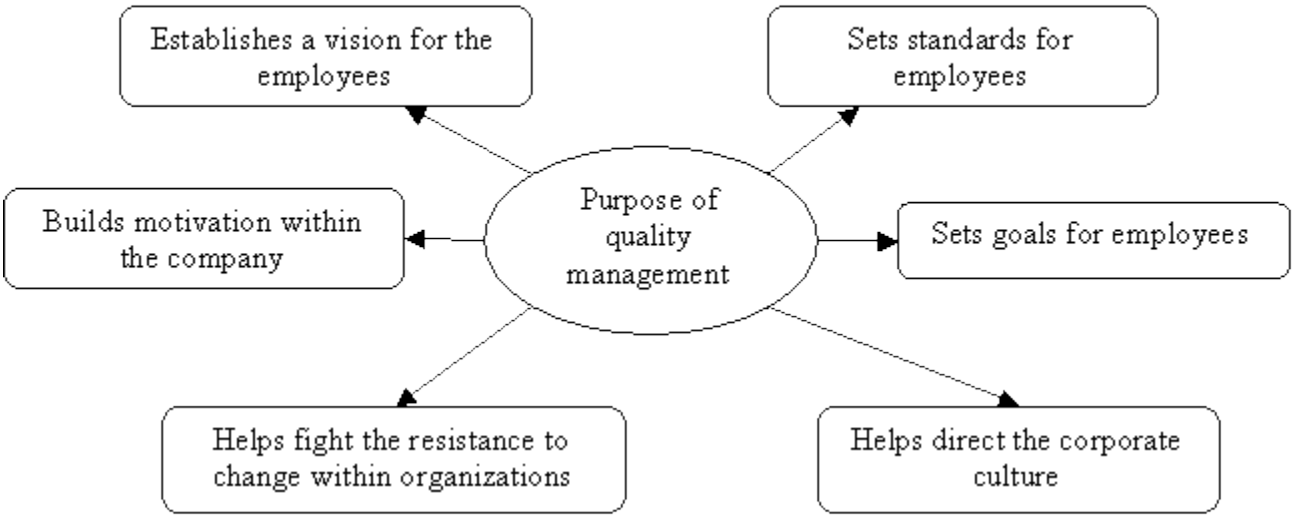

Figure 2. Purpose of quality management

The concept of quality has existed for many years, though its meaning has changed and evolved over time. In the early twentieth century, quality management meant inspecting products to ensure that they met specifications. In the 1940s, during World War II, quality became more statistical in nature. Statistical sampling techniques were used to evaluate quality, and quality control charts were used to monitor the production process. In the 1960s, with the help of so-called "quality gurus," the concept took on a broader meaning. Quality began to be viewed as something that encompassed the entire organization, not only the production process. Since all functions were responsible for product quality and all shared the costs of poor quality, quality was seen as a concept that affected the entire organization. The meaning of quality for businesses changed dramatically in the late 1970s. Before then quality was still viewed as something that needed to be inspected and corrected. However, in the 1970s and 1980s many U.S. industries lost

market share to foreign competition. In the auto industry, manufacturers such as Toyota and Honda became major players. In the consumer goods market, companies such as Toshiba and Sony led the way. These foreign competitors were producing lower-priced products with considerably higher quality. To survive, companies had to make major changes in their quality programs. Many hired consultants and instituted quality training programs for their employees. A new concept of quality was emerging. One result is that quality began to have a strategic meaning. Today, successful companies understand that quality provides a competitive advantage. They put the customer first and define quality as meeting or exceeding customer expectations. Since the 1970s, competition based on quality has grown in importance and has generated tremendous interest, concern, and enthusiasm. Companies in every line of business are focusing on improving quality in order to be more competitive. In many industries quality excellence has become a standard for doing business. Companies that do not meet this standard simply will not survive. As you will see later in the chapter, the importance of quality is demonstrated by national quality awards and quality certifications that are coveted by businesses. The term used for today's new concept of quality is total quality management or TQM.

To fully understand the TQM movement, we need to look at the philosophies of notable individuals who have shaped the evolution of TQM. Their philosophies and teachings have contributed to our knowledge and understanding of quality today. Their individual contributions are summarized in Table 2.

Table 2

Time	Focus	
Early 1900s	Inspection	Old Concept of Quality: Inspect for quality after production.
1940s	Statistical sampling	
1960s	Organizational quality focus	
1980s and Beyond	Customer driven quality	New Concept of Quality: Build quality into the process. Identify and correct causes of quality problems.

Walter A. Shewhart was a statistician at Bell Labs during the 1920s and 1930s. Shewhart studied randomness and recognized that variability existed in all manufacturing processes. He developed quality control charts that are used to identify whether the variability in the process is random or due to an assignable cause, such as poor workers or miscalibrated machinery. He stressed that eliminating variability improves quality. His work created the foundation for today's statistical process control, and he is often referred to as the "grandfather of quality control".

W. Edwards Deming is often referred to as the **"father of quality control."** He was a statistics professor at New York University in the 1940s. After World War II he assisted many Japanese companies in improving quality. The Japanese regarded him so highly that in 1951 they established the Deming Prize, an annual award given to firms that demonstrate outstanding quality. It was almost 30 years later that American businesses began adopting Deming's

philosophy. A number of elements of Deming's philosophy depart from traditional notions of quality.

Table 3

Quality Guru	Main Contribution
Walter A. Shewhart	–Contributed to understanding of process variability. –Developed concept of statistical control charts.
W. Edwards Deming	–Stressed management's responsibility for quality. –Developed "14 Points" to guide companies in quality improvement.
Joseph M. Juran	–Defined quality as "fitness for use." –Developed concept of cost of quality.
Armand V. Feigenbaum	–Introduced concept of total quality control.
Philip B. Crosby	–Coined phrase "quality is free." –Introduced concept of zero defects.
Kaoru Ishikawa	–Developed cause-and-effect diagrams. –Identified concept of "internal customer."
Genichi Taguchi	–Focused on product design quality. –Developed Taguchi loss function.

The first is the role management should play in a company's qualityimprovement effort. Historically, poor quality was blamed on workers — on their lack of productivity, laziness, or carelessness. However, Deming pointed out that only 15 percent of quality problems are actually due to worker error. The remaining 85 percent are caused by processes and systems, including poor management. Deming said that it is up to management to correct system problems and create an environment that promotes quality and enables workers to achieve their full potential. He believed that managers should drive out any fear employees have of identifying quality problems, and that numerical quotas should be eliminated. Proper methods should be taught, and detecting and eliminating poor quality should be everyone's responsibility. Deming outlined his philosophy on quality in his famous "14 Points." These points are principles that help guide companies in achieving quality improvement. The principles are founded on the idea that upper management must develop a commitment to quality and provide a system to support this commitment that involves all employees and suppliers. Deming stressed that quality improvements cannot happen without organizational change that comes from upper management. After W. Edwards Deming, Dr. Joseph Juran is considered to have had the greatest impact on quality management. Juran originally worked in the quality program at Western Electric. He became better known in 1951, after the publication of his book Quality Control Handbook. In 1954 he went to Japan to work with manufacturers and teach classes on quality. Though his philosophy is similar to Deming's, there are some differences. Whereas Deming stressed the need for an organizational "transformation," Juran believes that implementing quality initiatives should not require such a dramatic change and that quality management should be embedded in the organization. One of Juran's significant contributions is his focus on the definition of quality and the cost of quality. Juran is credited with defining quality as fitness for

use rather than simply conformance to specifications. As we have learned in this chapter, defining quality as fitness for use takes into account customer intentions for use of the product, instead of only focusing on technical specifications. Juran is also credited with developing the concept of cost of quality, which allows us to measure quality in dollar terms rather than on the basis of subjective evaluations. Juran is well known for originating the idea of the quality trilogy: quality planning, quality control, and quality improvement. The first part of the trilogy, quality planning, is necessary so that companies identify their customers, product requirements, and overriding business goals. Processes should be set up to ensure that the quality standards can be met. The second part of the trilogy, quality control, stresses the regular use of statistical control methods to ensure that quality standards are met and to identify variations from the standards. The third part of the quality trilogy is quality improvement. According to Juran, quality improvements should be continuous as well as breakthrough. Together with Deming, Juran stressed that to implement continuous improvement workers need to have training in proper methods on a regular basis.

Another quality leader is **Armand V. Feigenbaum**, who introduced the concept of total quality control. In his 1961 book Total Quality Control, he outlined his quality principles in 40 steps. Feigenbaum took a total system approach to quality. He promoted the idea of a work environment where quality devel- opments are integrated throughout the entire organization, where management and employees have a total commitment to improve quality, and people learn from each other's successes. This philosophy was adapted by the Japanese and termed "company-wide quality control".

Phillip B. Crosbyis another recognized guru in the area of TQM. He worked in the area of quality for many years, first at Martin Marietta and then, in the 1970s, as the vice president for quality at ITT. He developed the phrase **"Do it right the first time"** and the notion of zero defects, arguing that no amount of defects should be considered acceptable. He scorned the idea that a small number of defects is a normal part of the operating process because systems and workers are imperfect. Instead, he stressed the idea of prevention. To promote his concepts, Crosby wrote a book titled Quality Is Free, which was published in 1979. He became famous for coining the phrase "quality is free" and for pointing out the many costs of quality, which include not only the costs of wasted labor, equipment time, scrap, rework, and lost sales, but also organizational costs that are hard to quantify. Crosby stressed that efforts to improve quality more than pay for themselves because these costs are prevented. Therefore, quality is free. Like Deming and Juran, Crosby stressed the role of management in the quality improvement effort and the use of statistical control tools in measuring and monitoring quality.

Kaoru Ishikawa is best known for the development of quality tools called **cause-and-effect diagrams, also called fishbone or Ishikawa diagrams**. These diagrams are used for quality problem solving, and we will look at them in detail later in the chapter. He was the first quality guru to emphasize the importance of the "internal customer," the next person in the production process. He was also one of the first to stress the importance of total company quality control, rather than just focusing on products and services. Dr. Ishikawa believed that everyone in the company needed to be united with a shared vision and a common goal. He stressed that quality initiatives should be pursued at every level of the organization and that all employees should be

involved. Dr. Ishikawa was a proponent of implementation of quality circles, which are small teams of employees that volunteer to solve quality problems.

Dr. Genichi Taguchi is a Japanese quality expert known for his work in the area of product design. He estimates that as much as 80 percent of all defective items are caused by poor product design. Taguchi stresses that companies should focus their quality efforts on the design stage, as it is much cheaper and easier to make changes during the product design stage than later during the production process. Taguchi is known for applying a concept called design of experiment to product design. This method is an engineering approach that is based on developing robust design, a design that results in products that can perform over a wide range of conditions. Taguchi's philosophy is based on the idea that it is easier to design a product that can perform over a wide range of environmental conditions than it is to control the environmental conditions. Taguchi has also had a large impact on today's view of the costs of quality. He pointed out that the traditional view of costs of conformance to specifications isincorrect, and proposed a different way to look at these costs. Let's briefly look at Dr. Taguchi's view of quality costs. According to the traditional view of conformance to specifications, losses in terms of cost occur if the product dimensions fall outside of the specified limits. However, Dr. Taguchi noted that from the customer's view there is little difference whether a product falls just outside or just inside the control limits. He pointed out that there is a much greater difference in the quality of the product between making the target and being near the control limit. He also stated that the smaller the variation around the target, the better the quality. Based on this he proposed the following: as conformance values move away from the target, loss increases as a quadratic function. According to the function, smaller differences from the target result in smaller costs: the larger the differences, the larger the cost. The Taguchi loss function has had a significant impact in changing the view of quality cost.What characterizes TQM is the focus on identifying root causes of quality problems and correcting them at the source, as opposed to inspecting the product after it has been made. Not only does TQM encompass the entire organization, but it stresses that quality is customer driven. TQM attempts to embed quality in every aspect of the organization. It is concerned with technical aspects of quality as well as the involvement of people in quality, such as customers, company employees, and suppliers. Here we look at the specific concepts that make up the philosophy of TQM.

The quality movement and quality systems have had many different names or terms of reference in the past few decades, and might look like a short-lived business management trend at first glance. With everincreasing competition and consumer expectations, professionals and business managers cannot ignore quality issues and expect to maintain or improve their competitive position. Quality systems, time and again, have been responsible for substantial increases in the bottom line of businesses in every industry and have given organizations the boost they need to meet overall goals and objectives. Organizations that do not accept that quality improvement is going to be ingrained into every part of their business are not going to be around to see what the future brings.

5. Inspection

An inspection is an activity such as measuring, examining, testing or gauging one or more characteristics of a product and comparing the results with specified requirements in order to establish whether conformity is achieved for each characteristic. (This definition comes from the ISO 2859 standard, which is derived from MIL-STD 105 E.)

The term inspection refers to the activity of checking products, whereas audit applies to analyzing manufacturing processes and/or systems. The quality inspector usually follows a pre-established checklist that is based on the product specifications. Inspected products can be the components used for production, semi-finished goods, or (most often) finished goods before shipment to a customer.

5.1: Types of Quality Inspections

There are mainly three tools at the disposal of buyers, to check on the quality of their suppliers' products. Each buyer should try to choose the solution(s) that best fit(s) her needs.

It all depends on the risks in production:

(A). Pre-production inspection (or "initial production inspection")

"Garbage in, garbage out": a factory usually cannot turn defective inputs (components, or raw materials) into good products. And the problems are much harder to detect once the materials are embedded in the final product.

Thus, to decrease quality risks, **the inputs can be inspected prior to production**. Some samples can be taken randomly and checked visually (or sent to a laboratory for tests). Also, the buyer should clearly define what inputs are acceptable before he gives any order.

An experienced inspector can also **examine the making of a prototype/sample**, to make sure of two things:

- Has the factory understood the technical files? Do they know what product the client wants?
- Has the development team clearly communicated the requirements to the manufacturing team? Is the equipment for mass production similar to that used for making prototypes?

Sometimes, **production has already started** when a pre-production inspection takes place. It allows the inspector to examine the process, and sometimes to check a few finished products. However, in this case, the factory might refuse to stop production (to avoid disruption of the lines), even though the inputs are not conforming or the process is not satisfactory.

Generally speaking, pre-production inspections are adapted to customized and complex products. More standard items should be inspected during production.

(B): During production inspection ("in-line" or "in-process" inspection)

Should a buyer wait until the end of production, before doing an inspection? In case products are defective, the following problems might arise:

- The factory has to rework (loss of time).
- If the products cannot be repaired, the factory should re-order components, and re-produce (which means long delays, and a financial loss for the factory).
- The supplier might refuse to repair or re-produce, particularly if the previously-agreed specifications are ambiguous.

Typically, in an in-line inspection, the first products that got out of the line are inspected for conformity. If issues are raised at this stage, **the factory can immediately take some corrective actions and avoid delays**.

Also, based on the production start date and the number of products already finished, **the buyer can have a fair idea about the shipment schedule**.

A third advantage of in-line inspections is that the buyer knows where the goods are produced. Some suppliers show a factory to a buyer, and then sub-contract the production in another workshop (this happens every day in China).

What it means is that third-party inspectors can either check the first finished products getting out of the line or come in at a later stage and select samples from a larger pool of finished goods.

In any case, in-process products are rarely checked, even though it can be very valuable. It takes a trained technician to reliably detect errors on unfinished products.

(C): Final random inspection ("pre-shipment inspection")

This is **the most popular type of QC inspection for importers**. It takes place once all the products are finished and ready for shipment.

Note: A “packed product” is ready for shipment (i.e. in a closed export carton with full shipping marks). In many cases, the inspector accepts up to 20% of unpacked products per reference. This way, the inspection can often take place without delaying the shipment.

The conformity of the products is checked against a list of criteria defined by the buyer (product quantity, workmanship, function, safety, aspect, size, packing…).

Buyers are advised to ask their inspectors to keep track of which cartons were opened. This way, a 2nd “spot” inspection can give an idea of how seriously the control was performed.

Of the three inspections presented in this article, **this is the only one where the total quantity of products can be counted, and where samples of finished products can be drawn in a truly random manner**–and thus be representative of the whole batch.

As a result, the results of final inspections are more reliable. And some buyers assume that the inspectors should “guarantee” the quality of the whole order quantity when the inspection is passed. Unfortunately, it is impossible for several reasons.

6. Statistical Quality Control (SQC)

Statistical Quality Control SQC developed in the United States in 1930-40 by **W.A Shewhart**, and used for decades in American and Japanese companies. The basic approach consist the following steps;

1. Awareness that a problem exists
2. Determine the specific problem to be solved
3. Diagnose the causes of the problem
4. Determine and implement remedies to solve the problem
5. Implement controls to hold the gains achieved by solving the problem

Statistical Quality Control is one of the most known and popular in the several process control methods. This technique is used to:

- Analyze a work process or its outputs
- Identify variations through date
- Take appropriate action in order to achieve statistical control
- Improve the capacity of the process

Statistical Quality Control (SQC) is the term used to describe the set of statistical tools used by quality professionals. SQC is used to analyze the quality problems and solve them.
Statistical quality control refers to the use of statistical methods in the monitoring and maintaining of the quality of products and services.
All the tools of SQC are helpful in evaluating the quality of services. SQC uses different tools to analyze quality problem.

1) Descriptive Statistics

2) Statistical Process Control (SPC)
3) Acceptance Sampling

Descriptive Statistics involves describing quality characteristics and relationships. SPC involves inspect random sample of output from process for characteristic. Acceptance Sampling involve batch sampling by inspection.

Objective of Statistical Quality Control

Quality Control is very important for an every company. Quality control includes service quality given to customer, company management leadership, commitment of management, continuous improvement, fast response, actions based on facts, employee participation and a quality driven culture.

The main objectives of the quality control module are to control of material reception, internal rejections, clients, claims, providers and evaluations of the same corrective actions are related to their follow-up. These systems and methods guide all quality activities. The development and use of performance indicators is linked, directly or indirectly, to customer requirements and satisfaction, and to management.

Tools for Statistical Quality Control

Every process depends on gathering and analysis of data what are profuse in any organization that is involved in the process problem. The basic tools are:

- Data Collection
- Data Display

Data Collection

A check sheet is useful in assembling and compiling data concerning a problem. It uses for data collection to view for any unwanted element. The functions of a check sheet are

- Production process distribution checks
- Defective item checks
- Defect location checks
- Defect cause checks
- Checkup confirmation checks

Data Display

When a company collects data it is converted on to various types of charts and forms for the purpose of display and analysis of data. Charts have different types as:

- A bar graph (present simple data and easy understood)
- A scatter diagram (relationship between two types of data)
- A histogram (distribution of data in term of frequency)
- A Pareto diagram (statistical tool in problem analysis)

Quality Standards and Guidelines

- Quality standards are defined as documents that provide requirements, specifications, guidelines, or characteristics that can be used consistently to ensure that materials, products, processes, and services are fit for their purpose.
- Standards provide organizations with the shared vision, understanding, procedures, and vocabulary needed to meet the expectations of their stakeholders. Because standards present precise descriptions and terminology, they offer an objective and authoritative basis for organizations and consumers around the world to communicate and conduct business.

Principles of Quality Standards