



Quality: Conceptual Framework

LEARNING OBJECTIVES

After studying this chapter, you should be able to

- *define and explain the terms and definitions of quality*
- *understand the eight dimensions of quality*
- *understand the methods of generating ideas! for quality Improvement*
- *know the concept of inspection*

1.1 Introduction

Any customer will always think of quality and ask for quality products. Quality conveys the desirable values in the product and also the impression what customer expects from the product. It is the fitness for the purpose at the lowest cost, and thus, the quality of any product is regarded as the degree to which the product fulfills the requirement of a customer. It can be determined by the characteristics of design, size, materials, chemical composition, mechanical functioning, workmanship, finish and so on. It signifies the several attributes of a product such as durability, color, intrinsic properties, etc. Quality is always the result of an intelligent effort. In any organization, the quality function involves efforts of all the groups in the organization. Quality control is a deliberate and planned activity to integrate quality development, quality maintenance, and quality improvement, which plays a pivotal role for survival in the competitive world. Quality is not only the means for enlarging the share of export and sales of goods in the internal market, where there is agreeing inter-firm

competition, but it also aims at providing the right quality of goods to the customer, along with satisfaction. Quality control is based on the concept of variability, whether large or small, which is inevitable in any manufacturing process. The knowledge of quality enables us to detect the causes of external variation almost instantly during the course of manufacture and eliminate them before much damage is done to the process. The approach in quality control is, therefore, to prevent defects by simply inspecting them after manufacture.

1.2 What is Quality?

The word quality has a variety of definitions. Some of the definitions and their meaning are narrated in the following paragraphs:

Definition 1: *Quality is fitness for the purpose.*

Perhaps, this is the classical and oldest definition known. Every product or service is meant for certain purpose. The degree to which it can fulfill the purpose for which it is meant is the measure of its quality. This definition focuses on the usage and performance of the product. For example, the purpose of a pen is to write. Hence, the pen whichever writes well is treated as a good quality pen. Similarly, a mirror is meant for showing an image clearly. Thus, a quality mirror is that which shows the image with more clarity and sharpness without any blurs or distortions and so forth. However, this definition does not suffice to describe the quality of many products because most of the times the purpose of a product is not clearly defined or many products have multiple purposes. For instance, the purpose of a shirt is not just to cover or protect the body but also to exhibit elegance and aesthetics. In addition, the customer wants it to be durable, give comfort, be easily washable, be readily reusable, and so forth. Here, the quality of shirt is difficult to define with reference to a purpose. It has multiple purposes; hence, no single purpose is clearly demarcated. Similarly, the purpose of a chocolate is not clearly defined. Then how do we decide its quality? Therefore, this definition fails miserably at many occasions.

Definition 2: *Quality is degree of customer satisfaction.*

This definition is customer oriented, and customer's satisfaction is the pinnacle. By this definition, customer satisfaction is the measure of quality. Further, the customer is given the highest importance and is the ultimate decider of the quality. Of course, unless the customer is satisfied, no product can sustain in the market. For example, a hotel or a restaurant will be rated for its quality if and only if it can satisfy its customer. A doctor's quality is often measured by his patients' satisfaction on his treatment rather than his degrees and qualifications.

Though the degree of customer satisfaction is very important factor to measure the quality of a product or service, it is very difficult at times to determine the quality. For example, a poor woman may have high satisfaction on a cotton sari, while rich woman may be satisfied with a silk sari. Thus, can both saris be rated equally? This is because "the satisfaction of a customer" has no clear cut definition. One may be satisfied for simple thing while other may be satisfied only a higher level. Moreover, the satisfaction depends on customer's expectations and the actual. If the expectation is higher than the actual, the customer may be dissatisfied and if his expectations are less than the actual, he may be delighted. Thus, it is purely dependent on the customer's attitude, behavior, situation, and cultural and demographical factors.

Definition 3: *Quality is accuracy in meeting the specification or design.*

This definition is centered on the features of design and specifications. Obviously, a product that meets its pre-determined proven specifications is expected to perform well and satisfy the needs of the customer. The degree of accuracy in meeting the specification is a scale for quality measurement. The closer the accuracy, the higher is the quality. For instance, the quality of spectacles is estimated by the accuracy or closeness of its dimensions to the true values as specified in its design. Similarly, a wrist watch quality is spoken in terms of its accuracy of showing the time.

In fact, the terms *accuracy* and *precision* are more appropriate to discuss the quality of the product in terms of its variables but not attributes. For example, the quality of a sweet can be described by its taste, which is an attribute. The accuracy of meeting specification is not apt in this case. So this definition fails to explain the quality of the attribute-oriented products.

Definition 4: *Quality is meeting the standards or norms.*

People often compare a product or service with the best what they think (which they assume as a standard) or some predetermined norms or values. Of course, the standards vary local to global such as personal, local, companywide, nationwide, international, etc. The customers have a notion that a local quality product meets local standards, while an international product meets global standards. Thus, a quality product is one which should meet certain standards. This definition also focuses on the specifications or features or characteristics of the product or service.

The quality of a school or college is compared with certain preset standards or values. A standard book is one which follows certain specified norms. Thus, quality is to follow and maintain some standards.

Here, some questions arise such as

- What standards are to be followed for a new product?
- Who will set these standards?
- What about the standards of these standards?
- How do you check the quality of standards?

It is intuitive that the standards for a new product are imposed by the producer. Of course, the producer will obviously produce according to the needs, wants, or demand. Thus, these standards when established have to be evaluated thoroughly and validated and also fit in the moral, ethical, and legal environments. Otherwise, the quality of the product is questionable.

Though this definition seems to be correct, it has a pitfall. The standards and norms are not fixed throughout the world for all the products and services. So, local standards are adapted. In such cases, a product of good quality at one place may not be treated as of good quality at other place; the same “good quality product” may sometimes be unfit also. For example, an electrical appliance that can withstand 120 V may be of good quality in some country where the supply is 120 V, while it may not even fit at another country where the standard supply is 240 V.

Definition 5: *Quality is the degree to which a specific product is preferred over competing products of equivalent standard.*

As discussed in the above definition, the standards vary from place to place and situation to situation. Sometimes, the customer is even unaware of what the standard is. Hence, the customer often compares with

the nearest equivalent product or service and rates accordingly. Thus, the quality of a product or service is determined by the degree by which it is preferred over the competitor's product.

While purchasing a television, we check the features of various brands and compare. To choose a school for our children, we compare the schools in our vicinity. We choose a hotel by comparing it with the nearest competitor, but not with the one out of our reach. Thus, the quality of a product or service is determined by the comparison with the nearest competitor. We often use this definition to select a better one out of the available. However, it does not mean that the one not selected is not having any quality. Further, the one selected also is only a better one among the available but cannot assure the best quality. After all, we can say it is the better or best of local quality (local maximum but may not be global maximum). When there is no other equivalent (monopoly) available, the product quality is forcefully accepted. Another possibility is competitive malpractices by misinterpretation.

Definition 6: *Quality is the degree to which a class of products possesses potential satisfaction for people in terms of price, availability, guarantee, durability, etc.*

This definition is concentric on the ability of the product or service that the extent of satisfaction it can give to the customer in terms of its features or characteristics such as price, durability, reliability, and so forth. A customer, while buying a product, often demands for these essential characteristics. This definition also indicates that quality is measured in a multi-dimensional scale. For example, if you are purchasing a refrigerator, you want the best performance but at the lowest possible price with maximum reliability for long period (durability) having good aesthetics by color, size, design, ease of operation, and so on. In fact, all these points are the dimensions of quality and you cannot expect all the dimensions at their best. However, you can think of optimum levels of these dimensions on your product. Thus, quality is not measured on a multi-dimensional scale, and some dimensions cannot be quantified (attributes) for some products. It is very difficult to measure the quality of service-based products unless you experience them such as the quality of a lawyer, the driver of your car, and so on. Therefore, this definition makes the measurement of the quality of a product complicated due to multi-dimensions since the number of dimensions and its parameters are also not fixed and you can go on adding the dimensions to the list. Thus, rating and ranking a product is complex, and the degree of excellence in particular dimension of a product or service is not easily recognized or even goes unrecognized.

Definition 7: *Quality is degree of excellence.*

The crux of this definition is the best characteristic or feature of the product or service which the customer, when recognizes, will use to rate its quality.

The quality of a teacher or a student or an actor or a player is often recognized by the performance in the relevant field of interest. However, the excellence is not consistent. Thus, the definition contradicts the decisions taken at different situations. Further, the decision on quality by this definition depends on one's own perceptions and hence does not stand long.

Definition 8: *J.M. Juran defines quality as "The degree to which a specific product satisfies the wants of the customer or conforms to the design or specification."*

This definition combines the two basic dimensions of quality, viz., satisfying the needs of customer and conforming to the specification. These two dimensions were first identified by J.M. Juran, one of the great quality gurus, who made both ends meet. He also noticed two key points of the two sides. The key point on

the product or producer is to conform to the design. According to Juran, the conformance to the specification makes the product perform well. On the other side, he opines that the customer can be satisfied by fulfilling his wants (or needs). This definition says that if the product confirms the design and fulfills the requirements, it is termed as a quality product. If that is so, almost every product is a quality product. For example, a pen from an international repute and a local brand; if both confirm to the specification, then they should be rated same quality. Rather, the local one should be rated high if it can satisfy the customer's need due to its availability. Therefore, this definition seems to be somewhat incomplete as it is not showing attention on some features such as availability, price, reliability, durability, etc., which do not appear in specifications or designs and are often not stated by the customer. Further, the customer's intended needs often go unidentified which can better satisfy the customer.

1.2.1 Finally, What is "Quality?"

We started with the question "what is quality?" and we have scanned various philosophical definitions to answer this question. But no philosophy could give us a satisfactory definition. Though various theories have been developed, no single theory could satisfy all. Then shall we conclude all these definitions are waste and useless? Is the question "what is quality?" answerless? Though all these definitions seem to be correct in some occasions, it further created a confusion what definition is to be applied to which product or service. So, we need to develop a definition that can answer any situation combining all these philosophies. Thence, a comprehensive and perspective thinking is required to develop such a definition.

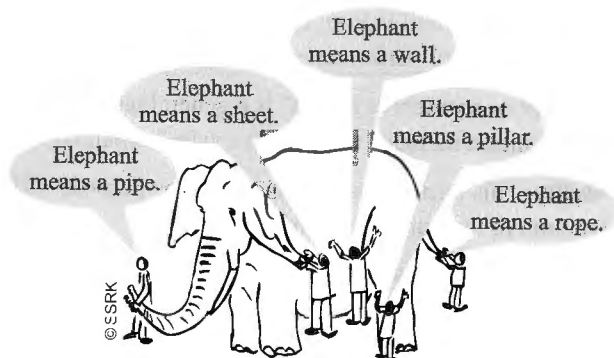
Let us recall the story of *five blinds*. There were five blind people who were taken to an elephant. They were asked to describe what an elephant is.

The one who touched the *trunk* said that an elephant is a *pipe*. The second one who touched its *ears* described elephant as a *sheet*. The third one who touched the *body* narrated elephant as a *wall*. The fourth one who touched the *leg* said that an elephant means a *pillar*. And the fifth blind who touched the *tail* told that an elephant is a *rope*.

In this story, imagine the elephant as the "quality" and the blinds as the "philosophers" or

"theorists" who developed these definitions. One theorist who focuses on utility says that quality is fitness for use. A customer-centered philosopher defines quality as customer satisfaction. A manufacturer may assume quality as meeting the specifications. A marketer may feel quality means to fulfill the needs of the customer. Another thinker perceives that quality is to meet some preset standards. The theorists conveyed their findings according to the situations they saw for various products or services in the environment they felt.

The story indicates a moral that things seem to be in the way you look at them and you perceive them. In fact, all the answers given by the five blinds are partially or "locally" correct, but all are wrong globally, i.e., when you see elephant as a whole. Suppose that the figure is shown to you in close up without showing the overall elephant figure, you would certainly describe the figures as blinds did. Thence, as long as we do



not broaden our view and unless we have the outlook on overall effectiveness of the meaning conveyed by philosophy, any definition will be as good as “one of the blinds.”

In single sentence, if one cannot visualize “quality” as the overall perspective, he is just a “blind,” though he may be still right to his situation. And that is why the quality is seen as “totality.” So quality is totality of the product or service. Thus, one should see the concept of quality management under “total” view.

1.2.2 Definition of Quality According to TQM (As Defined in ISO 9000)

Quality is the totality of features and characteristics of a product or service or information that can bear upon its ability to satisfy the stated or implied needs of the customer.

Meaning and Explanation

This comprehensive definition of quality (according to ISO 9000) can also resolve all the international conflicts. The definition is perfectly framed such that it can include any definition of quality referred earlier. It can answer all the weaknesses of any definition given hitherto. The key words in this definition that make it more powerful are as follows:

Totality: This word refers to the completeness in all respects.

Features and characteristics: Quality is generally specified through features or characteristics or both. These two terms are the core conceptual points of the definition “conforming to the specifications.” When quality is exhibited in both these respects, the specification is automatically confirmed. A television has the characteristics of performance, while features such as number of channels, picture-in-picture, and clarity.

Product or service: “Product” is a general term which, in fact, refers to both goods and services. However, the definition included the term “services” separately. Further, “information” is also included in services.

Ability: This term refers to “fitness for the purpose.” The product should have the capability to perform the function or the purpose it is meant for.

Satisfy: A product should ultimately satisfy its user. Thus, the definition “customer satisfaction” is chief for measuring product quality.

Stated or intended needs: Sometimes we state the need, while other times, needs are intended. The meaning is inherently found in the name of some products. For instance, if you ask for a pen, it is meant for writing, which is an intended need. But if you ask for water, it need not be for drinking. It could be for washing or any other purpose. Therefore, you need to “state” the need as “drinking water.”

Customer: Although several synonymous terms are available such as consumer, user, end user, buyer, purchaser, etc., the term customer is used. A customer is the potential one who has the probability of acquiring the product or getting the service. Thus, the term covers all the possible potentialities.

Closely looking at the definition, we can observe that the ISO definition is so comprehensive that all the earlier definitions are embedded. “The totality of features and characteristics” means “the confirmation of all specifications.” “A product or service that can bear upon its ability” conveys the meaning of “fitting for the

purpose.” Finally, the meaning of “customer satisfaction” is conveyed in the words “to satisfy the stated or intended needs of customer.”

1.3 Basic Terminology Related to Quality

Some of the noteworthy terms and definitions often used while studying quality management are explained in this section.

Quality assurance: All planned tasks and actions are necessary to demonstrate that the product or service satisfies the given customer requirements. It is the assurance that the product or service meets the criteria of the customer and is similar to the auditing aspect which ensures that the financial records reported in a company’s financial statement are correct.

Quality control: All operational techniques are necessary to satisfy all quality requirements. Inclusive in quality control is process monitoring and the elimination of root causes of unsatisfactory product or service quality performance.

Thought for Quality Managers (TQM I.1)

Choose a group of people and ask them to define the term “quality.” Based on their definitions, discuss their perception level on quality.

Note

Even though the terms quality assurance and quality control sound similar (and some companies use them interchangeably), they are not the same terms. Quality control has more to do with the actions on the production floor to control the quality level, while quality assurance speaks about the reliability of the quality control on the product or service.

Internal customer: This is the next person within the company who receives the product or service.

External customer: This is the end user of the product or service.

Customer requirements: These are the performance standards associated with specific customer needs.

Detection: It is a reactive strategy that attempts to identify and correct a faulty product or service after it has been produced.

Prevention: It is a proactive strategy that attempts to identify and correct a faulty product or service before it has been produced. A general example of prevention is vaccination to prevent a disease. A more pertinent example is identification and correction during the design phase or development stage, or production monitoring and controlling of process parameters that have been proven to strongly influence output characteristics.

Defect: It is a state or condition of nonconformance to customer requirements that makes the product or service unusable.

Inspection: It is the act of measuring, checking, analyzing, examining, and testing characteristics of an item, product, or a process, and comparing that result to the specified requirements to determine the degree of conformity.

Productivity: It is a measure of output to input.

Specifications: These are specific and measurable attributes that convey the customer requirements.

1.4 Accuracy and Precision

In quality jargon, the two confusing terms that we often come across are accuracy and precision. These two terms look to be same, but are distinctly different. Let us distinguish these two terms here.

Accuracy: Accuracy is the dimension or measurement that indicates how close the measured value is to the true value.

Precision: It is a measure that indicates how frequently a dimension is able to be produced. It is about repeatability.

Let us now distinguish these two terms clearly with some examples.

Example 1: In shooting, we can distinguish these terms very clearly. These are portrayed in Figures 1.1 and 1.2.

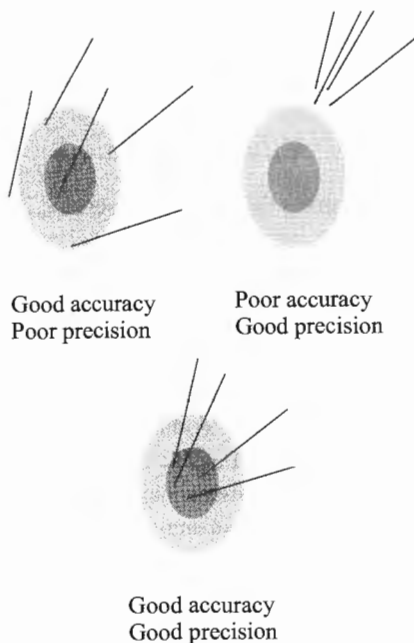


Figure 1.1

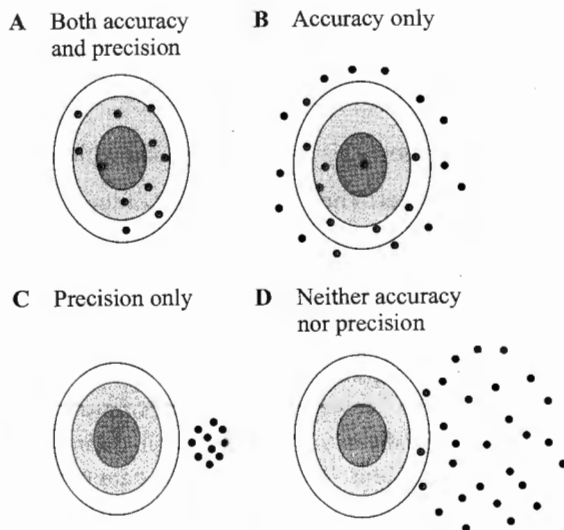


Figure 1.2

Example 2: In production, we can distinguish the term manufacturing of a dimension. These are shown in the following set of Figure 1.3.

1.5.1 Eight Dimensions of Quality

The parameters through which the quality of a product or service is assessed are called the quality dimensions of that product or service.

Though there are several dimensions, the following eight dimensions are considered to be the most significant in assessing the quality for any product or service (see Figure 1.4).



Figure 1.4 Eight dimensions of quality

Features or characteristics: This dimension refers to the following questions:

- What features and characteristics does the product possess (e.g., 1000 W sound in a television, flat picture, big screen, etc.)?
- What additional or special features does the product have (e.g., picture-in-picture, woofer, etc.)?
- What flexibility do we have in the features or characteristics (e.g., a television may be used in a radio mode, etc.)?

Performance: This dimension speaks on how well the product runs or performs (in terms of, say, sound effects, picture clarity while running in a TV, etc.).

Aesthetics and/or appearance: This dimension speaks about the beauty and aesthetics of a product (e.g., color, design, etc.).

Durability: It tells us about how long the product will work.

Reliability: This aspect speaks about the following questions:

- What is the probability of the product to survive without breakdown?
- What is the guarantee that the product will not fail?

Serviceability: This dimension speaks on the following aspects:

- How easily, cheaply are the spare parts available and can be replaced?
- How frequently is the service required?
- What is the cost of servicing or repair or replacement?

Safety: This dimension speaks on the following aspects:

- What care has the manufacturer taken so that the product does not harm the humans, assets, and environment?
- How much safe and secure is the product or service?

Customer service: This dimension speaks on the following aspects:

- How is the behavior of the seller before, during, and after sale of the product?
- Treatment given by the sales staff to the customer.

1.6 Methods of Generating Ideas for Quality Improvement

This section discusses some methods of generating ideas for improving quality.

Brainstorming: All the relevant people are convened for a brainstorming session and the problem is explained clearly to the group. Every member must present one idea for the improvement. Repetition of any idea is not allowed. In the first session, at least 100 ideas are recorded (for this, the convener of the meeting may take several rounds. The difficulty to generate ideas increases progressively in the second round, third round, and so on). In the second session, the ideas will be screened and reduced to half or one-fourth, based on feasibility, possibility, or certain other factors. Further analysis and deep discussions are conducted to bring out the best three ideas in the third session. The brainstorming committee then records, elaborates, and develops the ideas and sends the recommendation to higher authorities for approval and implementation.

Quality circles: A small group of people relevant to a certain area form a “quality circle,” who frequently meet and identify some quality problems of the shop floor. They discuss the problem thoroughly and bring out various possible and feasible remedies and solutions. Then these ideas are developed, and necessary experiments are done. If the experiments are encouraging, the circle members then record, elaborate, and develop the ideas and send the recommendations to higher authorities for approval and implementation.

Interviewing: This is the simplest method of obtaining ideas from experienced, intellectual, and field experts. These ideas may be developed and recommendations may be sent to higher authorities for approval and implementation.

Benchmarking: Identify a critical process (which is denoted as bench mark) or area that needs improving. Identify an organization that excels in this process. Contact the management of such organization. Then compare, analyze the data, and improve the critical process.

5W2H Thinking: Write the questions with 5W (What, Where, Who, When, and Why) and 2H (How and How much). Put these questions to experts and field workers and other relevant people. Compile and consolidate the answers to arrive at one single solution. Then contact the management of the organization. Analyze

the data and improve the critical process. Send the recommendation to top management who will take the decision.

Terminal Questions Checkpoint (TQC 1.1)

Terminal questions on content

1. Define "quality" according to ISO 9000. Explain the terms involved in it.
2. Write any three definitions of quality and explain them.
3. List out and briefly explain the dimensions of quality.

Terminal questions on concept

4. "Quality is fitness for use." Do you agree? Justify your answer.
5. "Quality means the degree of excellence." Explain.
6. How do you improve the quality of a given product? Explore some methods and explain them.
7. Why a particular product is good in quality in the views of a person while others may not feel so? Explore some reasons by taking some examples.
8. What are the dimensions of quality that influence the quality of a product? Discuss the impact of these dimensions on the quality of a product of your choice?

Thought for Quality Managers (TQM 1.3)

Choose a problem such as "how to improve the performance of students in your institution." Conduct a brainstorming session and bring out the conclusion. Give the same problem to a small group identified as "quality circle" (to be coordinated by you) and ask them to give a conclusion after a thorough study.

1.7 Inspection

A component or product, which is manufactured, is required to perform certain functions. The act of checking whether "a component actually does the intended job or not" is called inspection. It means checking the acceptability of the manufactured product. It measures the qualities of product in terms of pre-decided standards. Its strength, hardness, shape, surface finish, chemical composition, dimensions, etc., may specify product quality.

1.7.1 Types of Inspection

Inspection can be categorized as per the quantity of inspection or the stage of inspection. We have discussed these categories in detail here.

Based on the Quantity of Inspection

Based on the number of components (or parts or items or units) taken for inspection, we categorize inspection into two types. These are as follows:



Do You Know?

Inspection and testing

are the two confusing terms often we use for checking the quality of a product or service. Though these two terms are synonymously used, there is little difference between these two. The Inspection is more appropriate to use when we check the quality of a product while testing is befitting for quality checking of the process and service or information. Further, for a product or a system, the specifications are inspected while the performance is tested.

1. **Census or 100% inspection:** This is the inspection carried out on each and every item or components with all the required parameters. When a product or process so demands, this type of inspection is adapted owing to the reasons that it is time consuming and expensive. If the item or product is very costly or hazardous or has a probability of developing consequential problems in the future, it must undergo 100% inspection only. Examples of this type of inspection are preparation of voters list, inspection of a television, etc.
2. **Sampling inspection:** When all the items are alike (homogenous), it is not worth the time and money to inspect every item. In such a case, inspection of one or a few items is sufficient. This type of inspection is called sampling and is defined as the inspection carried out on randomly selected few (sample) items or space from the population (or universe), and the results so obtained are attributed to the entire lot/population/universe. This inspection is preferred to reduce the cost and time of inspection.

At times, we have to necessarily choose sampling inspection (e.g., testing of brick strength, bombs, etc.), while at some other times, 100% inspection ought to be selected. In some other cases, we may be left with an option.



Sir! It's not possible to have endurance test on every watch

Based on the Stage of Inspection

Based on the status of production or manufacturing process, inspection may be categorized into the following five types:

1. **Inward or receipts inspection:** Raw materials for manufacturing a product are inspected at the receiving stage itself. These materials are inspected at the buyer's site or in the supplier's premises. This inspection is used to eliminate those materials that are not in conformance with the standards and are likely to cause trouble during processing.

If it is a process industry or project industry, the inspection is carried out on the facilities/amenities and the product or service that is going to be processed. For example, we inspect all the possible features and characteristics (and performance, if possible) of a television or a refrigerator or a flat or any item before buying to check if it is conforming to the specification. Similarly, the materials coming into an industry are inspected to check if they conform to the specification in the receipts.

2. **Regular interval inspection or routine inspection:** During the production process, the materials or the operation may be inspected at a very regular interval. The intention of this inspection is to forestall any defective product instead of passing it to the next stage, which will attract unnecessary production, labor, and overhead costs. Further, this will help correct the process or machine at a very early stage of

Thought for Quality Managers (TQM I.4)

Recollect some situations (at least last cases) you have inspected for quality of product or service and the parameters and the stage at which you have inspected. Record them.

generation of the failure. This reduces quality costs in terms of stopping the furtherance but induces the cost of inspection and disturbs/interrupts the production if there are frequent intervals. Thus, a cost-benefit analysis is to be made to determine the optimum number of inspections (i.e., frequency of inspection runs). For example, the unit tests conducted during the learning process in courses of curriculum of school children or internal assessment tests in university are often scheduled at regular intervals (normally once in three to four weeks).

3. **Critical point inspection or stage inspection:** Any production process can be divided into certain stages and this is often done for the ease of administration and execution. Among all these stages of production process, a few stages or points can be observed to be critical where close attention and care is needed. In stage inspection, products are inspected at such critical stages. For example, the inspections conducted by the field officers of banks when they release the loans for housing constructions use this type of methodology which is generally scheduled in three important stages, namely, foundation stage, roofing stage, and flooring/plastering stage.
4. **Outward or final inspection:** This inspection is carried out at the final stage of the product, just before the product goes into customer's hands. It involves various procedures to ensure that bad quality products are not delivered to customers. A defective product delivered to customer may prove more disastrous than when it is with the producer. For example, any product or process industry before sending their product or service will carry out thorough inspections.
5. **Roving inspection or patrolling:** Unlike the product moving in other inspections, the inspector will be moving in this inspection. There are no other options to adopt in the situations where the product cannot be moved or is heavy or costly to move. The inspector walks around on the shop floor from machine to machine and checks samples of the work of various machine operators or workers. This helps in catching errors during the process itself. Further, this can alert the operator and improve the process also.

For example, the inspections carried out by night patrolling of police, inspections carried out on ship building, aeronautics, etc.

1.7.2 Role of Inspection

Inspection serves a three-fold purpose as follows:

1. Problem (or defect) identification or forecast
2. Problem (or defect) prevention
3. Problem (or defect) elimination

Problem Identification

Effective problem identification requires checks at the completion of every stage of the production process. However, inward inspection at every stage, i.e., inspecting the incoming components before the operator takes them for processing can identify and eliminate the defect to move further. In addition, a culture of self-checking by the person who makes or processes a component can eradicate the problem. For this, every individual of the company should be trained thoroughly on the quality culture in general and the quality concepts in particular.

The problem can be identified at the earliest stage if the operator is advised to do the following:

You can go home now! It is scientifically proven that the virus is in diagnostic computer ... Not in you



- Inspect the material that he receives for processing and stop processing the defective, if any.
- Inspect while processing and stop moving defectives further.

Problem Prevention

Prevention is better than cure.

A stitch in time saves nine.

Thus, inspection should be oriented to forestall the conversion into a defect or failure or damage. A defect is like a headache that should be given attention immediately before it turns as a deeper malaise. The presence of a defective or a borderline part should result in a thorough investigation to locate the cause of the problem so that it can be totally eradicated or eliminated. Hence, it should be stopped in the intermediate stage itself to prevent the continuation of the defect till its final stage. Inward inspection, stage inspection, regular interval inspection are some ways to do so. Final inspection is the final gate to eliminate the defective product to go into customer's hands.

Every individual of the company should have the quality consciousness with following two objectives:

- One should be trained to gauge the occurrence of failure.
- One should stop the defective immediately if noticed.

Problem Elimination

Simply identifying the problem will not make the product qualitative. One should see that the problem should be completely eliminated and eradicated. The general methods quality managers suggest are as follows:

- Forecast the problem in advance if possible and forestall it.
- Analyze the root cause for the occurrence of problem and solve by eliminating the cause.
- Never allow the problem to occur again if it is identified.

Inspection should never be used as a disciplinary mechanism. For instance, a release of managerial grip on defects will indeed produce a reduction in the number of rejects. If it is gripped tight, it obviously increases the rejection rate. However, this is only because operators will refuse to process any component, which is the tiniest bit suspect, even though it meets the standards. Consequently, the decrease in defects at the final stage of production masks massive waste at the intermediate stages. Alternatively, such release of grip may tempt operators to pass borderline and even defective products in order to increase production.

A good precept to observe when designing inspection systems is "the customer is the ultimate inspector." In one way, the best form of inspection is one which reflects anxiousness to please. If we were expecting the visit of an important visitor, to impress the visitor, would we not be checking and double-checking here, there, and everywhere?

Effective control is a dynamic control, fully alert, and seeking and anticipating problems.

1.8 Systems of Quality Control

Quality control is a systematic and scientific system involving the application of industrial and statistical techniques to control the quality of the manufactured product. The various systems of quality control can be grouped into the following three classes:

1.8.1 Statistical Quality Control

Statistical quality control is a quality control system that performs inspection, testing, and analysis to conclude whether the quality of each product is as per the laid quality standards or not. Statistical quality control makes inspection more reliable, and at the same time, less costly. It uses three scientific techniques, namely, sampling inspection, analysis of data, and control charting.

1.8.2 Managerial Quality Control

The development of a product is basically engineering the development of quality evaluation through improved inspection procedures. The knowledge of causes and defects and their rectification is quality control engineering. The efficient use of the engineering and statistical concept is the managerial aspect of quality control.

1.8.3 Total Quality Control

Total quality control consists of quality design and quality process as discussed here.

Quality design: Under quality design, the standards are set and the research on product as well as marketing research is done continually. The principle of prototype model is developed.

Quality process: Under this head, there are two inspections:

1. **Inspection in laboratories:** This is done on a sample basis and has a low degree of representation. The raw material is inspected and the final inspection also takes place here.
2. **Inspection of various stages of production (in-process control):** Here, the following actions are to taken:
 - (a) Piloting the quality of running
 - (b) Process conformance
 - (c) In-process control

1.9 Objectives of Quality Control

The main objectives of a quality control programme in an industry are as follows:

- Evaluation of quality standards of outgoing and incoming material/product.
- Judging the conformity of the process to the established standards and taking suitable action if any deviations are noted.
- Extraction of optimum quality obtainable under given conditions.
- Improvement of quality and productivity by process control/experimentation.
- Developing procedures for good vendor–vendee relations.
- Inculcating quality control consciousness both within and out of the organization.

1.10 Quality in Service Organizations

Is quality important to goods only? Obviously, your answer will be “no.” For example, though hygienic, hot, and best quality food is served to you in a high-class restaurant, if the butler behaves rudely and serves in an unpleasant manner, would you be happy with the food alone? Never; it is because we treat the service also as part of quality.

Frankly speaking, more or less, all organizations can be treated as service organizations to an extent. Even purely manufacturing organizations do not merely sell a product but provide some after-sales service, training or advice, installations, warranty/guarantee, repair, maintenance, etc., which involve service. On the other hand, in pure service organizations, such as police, security services, banks, education, hospitals, consultancies, etc., there is often a “product” that changes hands to some extent. For example, guns and security equipment with the police and credit cards and monetary instruments in a bank are some goods to mention in this context. To understand the quality aspects in service organizations, one should first understand the similarities and differences in product and service and the proportion mix of these two.

1.10.1 Characteristics of Services

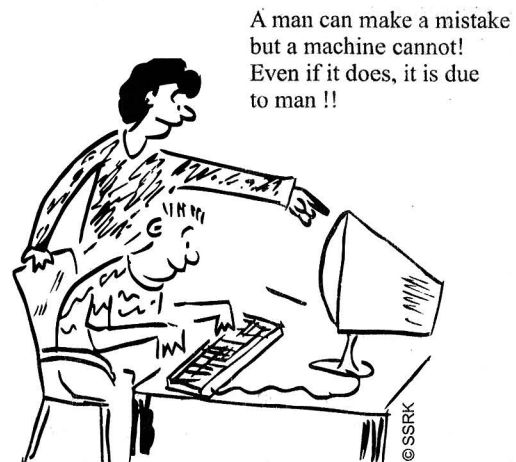
Intangibility: Services cannot be quantified, as they are invisible. They can only be felt. For example, the service rendered by a doctor is felt but cannot be quantified.

Inseparability: A service cannot be separated from the owner (server) of the service. This ownership cannot be transferred from one person to another. For instance, a teacher’s skill, knowledge, and the style of delivering a lecture cannot be separated from him/her; the way can be done in the case of goods.

Heterogeneity: The services of the same kind also differ from one situation to other. A lawyer may serve (argue) differently even though the cases are same or similar.

Perishability: Services are perishable. They stay with the service provider lifelong. Goods, unlike services, have a specific life (or shelf-life) after which they expire or vanish or become obsolete.

Ownership: Goods owned by one can be transferred to another. Unlike goods, service rendered by a person is owned and it cannot be transferred.



1.10.2 Differences Between Goods and Services

A distinction between goods and services is given in Table 1.1 and list of services is given in Table 1.2. The goods and service continuum is shown in Figure 1.5.

Table 1.1 Distinction between features and characteristics of goods and services

S. no.	Goods (Products)	Services
1.	Goods are physically visible	Services are invisible
2.	Goods are tangible	Services are intangible
3.	They have specific life period	No specific life
4.	These have transferability of ownership	No transferability of ownership
5.	Goods are non-perishable	Services are perishable
6.	Goods of same kind have homogeneity	Services of same kind are heterogenic

Table 1.2 List of services

<p><i>Utilities</i></p> <ul style="list-style-type: none"> • Electricity • Water Supply • Sanitary services • Fire services 	<p><i>Insurance, banking, and finance</i></p> <ul style="list-style-type: none"> • Banking • Shares and stock brokers • Credit card services • Insurance services 	<p><i>Law forcing, civil, administrative, and defense services</i></p> <ul style="list-style-type: none"> • Police • Army • Air force • Navy • Judiciary • Civil administration • Municipal services
<p><i>Transport and communication</i></p> <ul style="list-style-type: none"> • Roadways • Railways • Air ways • Water ways • Telephone and telecommunication • Mobile communication • All India Radio • Television, Doordarshan • Postal services • Electronic mailing • Courier services • Packers and mover • Cargos 	<p><i>Business, professional, and scientific activities</i></p> <ul style="list-style-type: none"> • Advertising and market research • Consultancy • Accountancy and chartered accounts • Legal assistance • Medical assistance • Hospitals • Medicines, medical assistance • Educational and research • Academic institutions and Colleges • Universities • Maintenance and repairs • Leasing • Employment agencies 	<p><i>Leisure and recreation</i></p> <ul style="list-style-type: none"> • Cinemas and theaters • Clubs • Gymnasiums • Restaurants • Hotels • Video game parlors • Self-improvement courses
<p><i>Distributive trades</i></p> <ul style="list-style-type: none"> • Wholesale Distribution • Carrying and forwarding • Retailing • Dealer • Agency 		<p><i>Miscellaneous</i></p> <ul style="list-style-type: none"> • Health clubs • Domestic help • Beauty parlors • Dry cleaning, washerman service, etc. • Matrimonial service

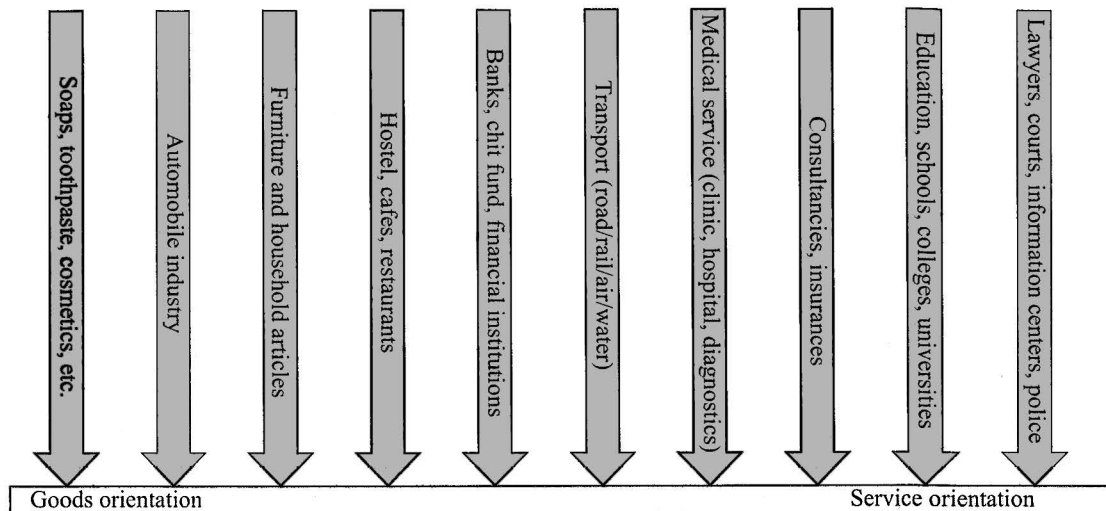


Figure 1.5 Goods–service continuum

Terminal Questions Checkpoint (TQC 1.2)

Terminal questions on content

1. Classify the types of “inspections.” Explain with examples.
2. List out and briefly explain the various costs of quality. How are they related?
3. What are the objectives of quality control?
4. What are the characteristics of quality that is to be observed in the case of services?
5. Describe the role of inspection in quality control.

Terminal questions on concept

6. What are the situations warranting to choose sample inspection or census (100% inspection)? Give examples.
7. What is meant by managerial quality control? How is it different from product quality control?
8. Distinguish between the goods and services with reference to quality control aspects.
9. Do you think high cost item is of high quality? Discuss in the backdrop of various types of costs of quality.

Summary

This chapter introduces the basic terminology and various concepts of quality. Various quality definitions are given and discussed and critically evaluated the conceptual meanings with suitable and practical examples. The eight dimensions of quality, methods of generating ideas for quality improvement, the concept of inspection, systems of quality control, and objectives of quality control are discussed in this chapter. A little light is thrown on the

quality of service organizations, differences between goods and services, and various types of services.

Thought for Quality Managers (TQM 1.5)

Think of any other product or service that is not included in the list given here and try to fit it on the scale of goods–service continuum.

Key Concepts

1. **Quality:** The totality of features and characteristics of a product or service or information that can bear on its ability to satisfy the stated or implied needs of the customer.
2. **Customer:** The potential one who has the probability of acquiring the product or getting the service.
3. **Internal customer:** The next person within the company who receives the product or service.
4. **External customer:** The end user of the product or service.
5. **Quality assurance:** The assurance that the product or service meets the criteria of the customer, and ensures that the records reported in a company's statement are correct.
6. **Quality control:** All operational techniques necessary to satisfy all quality requirements; including process monitoring and the elimination of root causes of unsatisfactory product or service quality performance.
7. **Statistical quality control:** A quality control system that performs inspection, testing, and analysis to conclude whether the quality of each product is as per the laid quality standards or not using statistical tools.
8. **Managerial quality control:** The development of a product basically engineering the development of quality evaluation through improved inspection procedures.
9. **Customer requirements:** The performance standards associated with specific customer needs.
10. **Detection:** It is a reactive strategy that attempts to identify and correct a faulty product or service after it has been produced.
11. **Prevention:** It is a proactive strategy that attempts to identify and correct a faulty product or service before it has been produced.
12. **Defect:** A state or condition of nonconformance to customer requirements that makes the product or service unusable.
13. **Inspection:** The act of measuring, checking, analyzing, examining, and testing characteristics of an item, product, or a process, and comparing that result to the specified requirements to determine a degree of conformity.
14. **Census or 100% inspection:** This is the inspection carried out on each and every item or components with all the required parameters.
15. **Sampling Inspection:** The inspection of one or few items which can represent an entire lot.
16. **Inward or receipts inspection:** The materials inspected at the buyer's site or in the supplier's premises before taking up for production.
17. **Regular interval inspection or routine inspection:** During the production process, the materials or the operation may be inspected at regular intervals.
18. **Critical point inspection or stage inspection:** A production process inspected at few stages or points demarcated as critical.
19. **Outward or final inspection:** The inspection carried out at the final stage of the product, just before the product goes into customer's hands.
20. **Roving inspection or patrolling:** Unlike the product moving in other inspections, the inspector will be moving in this inspection.
21. **Productivity:** A measure of output to input.
22. **Specifications:** Specific and measurable attributes that convey customer requirements.
23. **Accuracy:** The dimension or measurement that indicates how close the measured value is to the true value.
24. **Precision:** A measure that indicates how frequently a dimension is able to be produced. It is about repeatability.
25. **Performance:** How well the product runs or performs with its features or characteristics.
26. **Durability:** How long the product will work.
27. **Reliability:** The probability of not failing.
28. **Serviceability:** How easily and cheaply are the spare parts available and can be replaced.
29. **Safety:** How much safe and secure is the product or service.
30. **Customer service:** How the behavior of the seller is before, during, and after sale of the product and the treatment given by the sales staff to the customer.
31. **Brainstorming:** It is the exploration of ideas for solving a problem by assembling the relevant intellectual people.
32. **Quality circles:** A small group of people relevant to a certain area who frequently meet and identify,

- analyze and try to solve some quality problems of the shop floor.
33. **Delphi:** The method of obtaining ideas from experienced, intellectual, and field experts.
 34. **Benchmarking:** Identifying an organization that excels in the process and comparing, analyzing the data to improve the critical process.
 35. **5W2H thinking:** Writing the questions with 5W (What, Where, Who, When and Why) and 2H (How and How much) and trying to get answers to improve the critical process.
 36. **Quality design:** The setting of standards and marketing research and developing the principle of prototype model with reference to quality aspects.
 37. **Intangibility:** Those aspects that cannot be quantified.
 38. **Inseparability:** The inability of separation of characteristic or feature from the owner.
 39. **Heterogeneity:** The property of differing from one to other.
 40. **Perishability:** The property of not having storability.
 41. **Ownership:** The property of having all right on (owning) a thing.