**VIDYASAGAR UNIVERSITY**

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**CHAPTER-6**

Total Quality Management (TQM)

## What Is Total Quality Management (TQM)?

Total quality management (TQM) is the continual process of detecting and reducing or eliminating errors in manufacturing, streamlining [supply chain management](https://www.investopedia.com/terms/s/scm.asp), improving the customer experience, and ensuring that employees are up to speed with training. Total [quality management](https://www.investopedia.com/terms/q/quality-management.asp) aims to hold all parties involved in the production process accountable for the overall quality of the final product or service.

TQM was developed by William Deming, a management consultant whose work had a great impact on Japanese manufacturing. While TQM shares much in common with the Six Sigma improvement process, it is not the same as [Six Sigma](https://www.investopedia.com/terms/s/six-sigma.asp). TQM focuses on ensuring that internal guidelines and process standards reduce errors, while [Six Sigma looks to reduce defects](https://www.investopedia.com/articles/investing/102014/guide-six-sigma-black-belt.asp).

* Total quality management (TQM) is an ongoing process of detecting and reducing or eliminating errors.
* It is used to manufacture to streamline supply chain management, improve customer service, and ensure that employees are trained.
* The focus is to improve the quality of an organization's outputs, including goods and services, through continual improvement of internal practices.

## Primary Principles of Total Quality Management

TQM is considered a customer-focused process and aims for continual improvement of business operations. It strives to ensure all associated employees work toward the common goals of improving product or service quality, as well as improving the procedures that are in place for production.

## Industries Using Total Quality Management

While TQM originated in the manufacturing sector, its principles can be applied to a variety of industries. With a focus on long-term change over short-term goals, it is designed to provide a cohesive vision for systemic change. With this in mind, TQM is used in many industries, including, but not limited to, manufacturing, banking and finance, and medicine.

These techniques can be applied to all departments within an individual organization as well. This helps ensure all employees are working toward the goals set forth for the company, improving function in each area. Involved departments can include administration, marketing, production, and employee training.

# What is Kaizen ? - Five S of Kaizen

“Kaizen” refers to a Japanese word which means “improvement” or “change for the better”. **Kaizen is defined as a continuous effort by each and every employee (from the CEO to field staff) to ensure improvement of all processes and systems of a particular organization**. Work for a Japanese company and you would soon realize how much importance they give to the process of Kaizen. The process of Kaizen helps Japanese companies to outshine all other competitors by adhering to certain set policies and rules to eliminate defects and ensure long term superior quality and eventually customer satisfaction.

Kaizen works on the following basic principle.

“*Change is for good*”.

**Kaizen means “continuous improvement of processes and functions of an organization through change”**. In a layman’s language, Kaizen brings continuous small improvements in the overall processes and eventually aims towards organization’s success. Japanese feel that many small continuous changes in the systems and policies bring effective results than few major changes.

**Kaizen process aims at continuous improvement of processes not only in manufacturing sector but all other departments as well**. Implementing Kaizen tools is not the responsibility of a single individual but involves every member who is directly associated with the organization. Every individual, irrespective of his/her designation or level in the hierarchy needs to contribute by incorporating small improvements and changes in the system.



Following are the main elements of Six Sigma:

* Teamwork
* Personal Discipline
* Improved Morale
* Quality Circles
* Suggestions for Improvement

### Five S of Kaizen

“Five S” of Kaizen is a systematic approach which leads to foolproof systems, standard policies, rules and regulations to give rise to a healthy work culture at the organization. You would hardly find an individual representing a Japanese company unhappy or dissatisfied. Japanese employees never speak ill about their organization. Yes, the process of Kaizen plays an important role in employee satisfaction and customer satisfaction through small continuous changes and eliminating defects. Kaizen tools give rise to a well organized workplace which results in better productivity and yield better results. It also leads to employees who strongly feel attached towards the organization.

Let us understand the five S in Detail:

1. **SEIRI -** SEIRI stands for Sort Out. According to Seiri, employees should sort out and organize things well. Label the items as “Necessary”, ”Critical”, ”Most Important”, “Not needed now”, “Useless and so on. Throw what all is useless. Keep aside what all is not needed at the moment. Items which are critical and most important should be kept at a safe place.
2. **SEITION -** Seition means to Organize. Research says that employees waste half of their precious time searching for items and important documents. Every item should have its own space and must be kept at its place only.
3. **SEISO -** The word “SEISO” means shine the workplace. The workplace ought to be kept clean. De-clutter your workstation. Necessary documents should be kept in proper folders and files. Use cabinets and drawers to store your items.
4. **SEIKETSU-SEIKETSU** refers to Standardization. Every organization needs to have certain standard rules and set policies to ensure superior quality.
5. **SHITSUKE or Self Discipline -** Employees need to respect organization’s policies and adhere to rules and regulations. Self discipline is essential. Do not attend office in casuals. Follow work procedures and do not forget to carry your identity cards to work. It gives you a sense of pride and respect for the organization.

Kaizen focuses on continuous small improvements and thus gives immediate results.

Juran’s Quality Trilogy

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The famous Quality Trilogy was first developed and written by Joseph M. Juran. As you all know, Juran is a management consultant and an Engineer, specialized in Quality management.

The Quality Trilogy explained by Juran is: Any organization taking up a journey in Quality Management will have to have three Processes in place, which are: i) Quality Planning ii) Quality Control and iii) Quality Improvement. Though the above three may sound similar, they have different objectives and serve different purposes of Quality Management.

Let us have a look at these components one by one:



1. **Quality Planning:** As with all management activities and processes, Quality journey begins with planning the activities that needs to be done to adhere to the Vision, Mission and Goals of the organization and to comply with customer and compliance requirements.Quality Planning comprises of i) Understanding the customer, ii) Determining their needs, iii) Defining the product/service features, specifications iv)Designing the product/service v) Devising the processes that will enable to meet the customer needs.
2. **Quality Control:** Once the processes are defined, the responsibility is now with operations, to adhere to the processes and specifications required by the product/service. For this purpose periodic checks and inspection has to be done, metrics need to be tracked, to ensure that the process is in control and meets specifications and the metrics need the set target. Wherever there is a defect a corrective and preventive action needs to be done, and root cause has to be arrived at. Also the deviation in the metrics and process audit results need to be monitored and corrected for meeting the required target as specified by the processes.
3. **Quality Improvement:** However robust the process design and the product features are, there are chances that it may fail to meet customer requirements and design targets. It might be due to some special causes that are present in the system and might be due to change in business scenarios, customer requirements, market completion and many more forces. The role of Quality Improvement is to identify and prove the need for improvement from the exiting performance levels even though they meet the target and devise means and ways to achieve the new target and implement them successfully.

All the three processes are interlinked and will affect one another in due course of the journey. Thus the processes are corrected individually and streamlined to help each other in Quality Management journey, the end objective.

Quality Circle:

A **quality circle** or **quality control circle** is a group of [workers](https://en.wikipedia.org/wiki/Worker) who do the same or similar work, who meet regularly to identify, analyze and solve work-related problems. It consists of minimum three and maximum twelve members in number.[[1]](https://en.wikipedia.org/wiki/Quality_circle#cite_note-1) Normally small in size, the group is usually led by a supervisor or manager and presents its solutions to [management](https://en.wikipedia.org/wiki/Management); where possible, workers implement the solutions themselves in order to improve the performance of the organization and motivate employees. Quality circles were at their most popular during the 1980s, but continue to exist in the form of [Kaizen](https://en.wikipedia.org/wiki/Kaizen) groups and similar worker participation schemes.[[2]](https://en.wikipedia.org/wiki/Quality_circle#cite_note-2)

Typical topics for the attention of quality circles are improving [occupational safety and health](https://en.wikipedia.org/wiki/Occupational_safety_and_health), improving [product design](https://en.wikipedia.org/wiki/Product_design), and improvement in the workplace and [manufacturing processes](https://en.wikipedia.org/wiki/Manufacturing_process_management). The term *quality circles* was most accessibly defined by Professor Kaoru Ishikawa in his 1985 handbook, "What is Total Quality Control? The Japanese Way"[[3]](https://en.wikipedia.org/wiki/Quality_circle#cite_note-3) and circulated throughout Japanese industry by the [Union of Japanese Scientists and Engineers](https://en.wikipedia.org/wiki/Union_of_Japanese_Scientists_and_Engineers) in 1960. The first company in Japan to introduce Quality Circles was the Nippon Wireless and Telegraph Company in 1962.[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia%3ACitation_needed)] By the end of that year there were 36 companies registered with JUSE by 1978 the movement had grown to an estimated 1 million Circles involving some 10 million Japanese workers. The movement built on work by Dr. [W. Edwards Deming](https://en.wikipedia.org/wiki/W._Edwards_Deming) during the Allied [Occupation of Japan](https://en.wikipedia.org/wiki/Occupation_of_Japan), for which the [Deming Prize](https://en.wikipedia.org/wiki/Deming_Prize) was established in 1950, as well as work by [Joseph M. Juran](https://en.wikipedia.org/wiki/Joseph_M._Juran) in 1954.[[4]](https://en.wikipedia.org/wiki/Quality_circle#cite_note-4)[[5]](https://en.wikipedia.org/wiki/Quality_circle#cite_note-5)

Quality circles are typically more formal groups. They meet regularly on company time and are trained by competent persons (usually designated as facilitators) who may be personnel and industrial relations specialists trained in human factors and the basic skills of problem identification, information gathering and analysis, basic statistics, and solution generation.[[6]](https://en.wikipedia.org/wiki/Quality_circle#cite_note-6) Quality circles are generally free to select any topic they wish (other than those related to salary and terms and conditions of work, as there are other channels through which these issues are usually considered).[[7]](https://en.wikipedia.org/wiki/Quality_circle#cite_note-7)[[8]](https://en.wikipedia.org/wiki/Quality_circle#cite_note-8)

Quality circles have the advantage of continuity; the circle remains intact from project to project. (For a comparison to Quality Improvement Teams, see Juran's [*Quality by Design*](https://en.wikipedia.org/wiki/Quality_by_Design)*.*[[9]](https://en.wikipedia.org/wiki/Quality_circle#cite_note-9)).

Automatic **process control** in [continuous production processes](https://en.wikipedia.org/wiki/Continuous_production) is a combination of [control engineering](https://en.wikipedia.org/wiki/Control_engineering) and [chemical engineering](https://en.wikipedia.org/wiki/Chemical_engineering) disciplines that uses [industrial control systems](https://en.wikipedia.org/wiki/Industrial_control_system) to achieve a production level of consistency, economy and safety which could not be achieved purely by human manual control. It is implemented widely in industries such as oil refining, pulp and paper manufacturing, chemical processing and power generating plants.

There is a wide range of size, type and complexity, but it enables a small number of operators to manage complex processes to a high degree of consistency. The development of large automatic process control systems was instrumental in enabling the design of large high volume and complex processes, which could not be otherwise economically or safely operated.

The applications can range from controlling the temperature and level of a single process vessel, to a complete chemical processing plant with several thousand [control loops](https://en.wikipedia.org/wiki/Control_loop).

Processes can be characterized as batch, continuous, or hybrid.[*[citation needed](https://en.wikipedia.org/wiki/Wikipedia%3ACitation_needed%22%20%5Co%20%22Wikipedia%3ACitation%20needed)*] Batch applications require that specific quantities of raw materials be combined in specific ways for particular duration to produce an intermediate or end result. One example is the production of adhesives and glues, which normally require the mixing of raw materials in a heated vessel for a period of time to form a quantity of end product. Other important examples are the production of food, beverages and medicine. Batch processes are generally used to produce a relatively low to intermediate quantity of product per year (a few pounds to millions of pounds).

A continuous physical system is represented through variables that are smooth and uninterrupted in time. The control of the water temperature in a heating jacket, for example, is an example of continuous process control. Some important continuous processes are the production of fuels, chemicals and plastics. Continuous processes in manufacturing are used to produce very large quantities of product per year (millions to billions of pounds). Such controls use [feedback](https://en.wikipedia.org/wiki/Feedback_control) such as in the [PID controller](https://en.wikipedia.org/wiki/PID_controller) A PID Controller includes proportional, integrating, and derivative controller functions.

Applications having elements of batch and continuous process control are often called hybrid applications.

**Chapter-7**

**CAD/CAM/CIM**

CAD/CAM is an acronym for computer-aided design and computer-aided manufacturing. The use of A CAD system used for Boeing airplanes. © Ed Kashi/Phototake NYC. Reproduced by permission. computers in design and manufacturing applications makes it possible to remove much of the tedium and manual labor involved. For example, the many design specifications, blueprints, material lists, and other documents needed to build complex machines can require thousands of highly technical and accurate drawings and charts. If the engineers decide structural components need to be changed, all of these plans and drawings must be changed. Prior to CAD/CAM, human designers and draftspersons had to change them manually, a time consuming and error-prone process. When a CAD system is used, the computer can automatically evaluate and change all corresponding documents instantly. In addition, by using interactive graphics workstations, designers, engineers, and architects can create models or drawings, increase or decrease sizes, rotate or change them at will, and see results instantly on screen.

CAD is particularly valuable in space programs, where many unknown design variables are involved. Previously, engineers depended upon trial-and-error testing and modification, a time consuming and possibly life-threatening process. However, when aided by computer simulation and testing, a great deal of time, money, and possibly lives can be saved. Besides its use in the military, CAD is also used in civil aeronautics, automotive, and data processing industries.

CAM, commonly utilized in conjunction with CAD, uses computers to communicate instructions to automated machinery. CAM techniques are especially suited for manufacturing plants, where tasks are repetitive, tedious, or dangerous for human workers.

Computer integrated manufacturing (CIM), a term popularized by Joseph Harrington in 1975, is also known as autofacturing. CIM is a programmable manufacturing method designed to link CAD, CAM, industrial [robotics](https://science.jrank.org/pages/5904/Robotics.html), and machine manufacturing using unattended processing workstations. CIM offers uninterrupted operation from raw materials to finished product, with the added benefits of quality assurance and automated assembly.

CAE (computer aided [engineering](https://science.jrank.org/pages/2514/Engineering.html)), which appeared in the late 1970s, combines software, hardware, graphics, automated analysis, simulated operation, and physical testing to improve [accuracy](https://science.jrank.org/pages/22/Accuracy.html), effectiveness, and productivity.