

## 6 Total Quality Management: Concepts and Quality Costs

### Learning objectives

- Understand the key principles and key elements of TQM
- Explain the core concepts of TQM
- Discuss the Total Quality Management Excellence Model (TQMEX)
- Understand the costs of poor quality

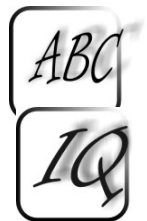


### Keywords

TQM, House of Quality, TQMEX, CoQ, quality costs

### Required skills

A general knowledge of management on the bachelor's degree level.



### Time requirements for the study

You will need approximately 90 minutes of your time to study this chapter.



## 6.1 Introduction

Total quality management (TQM) is an approach to business that looks critically not only at the products and services a company provides in relation to the process it employs to create them, but also at the workforce, to ensure that outputs fully satisfy customer requirements. This approach is called “total” because it encompasses everything the company does—all its processes and employees at every level in the company at all times. TQM is a management philosophy that seeks to integrate all organizational functions (marketing, finance, design, engineering, production and customer service, etc.) to focus on meeting customer needs and organizational objectives. TQM is a necessity. It is a journey that will never end. It is a totally integrated effort directed at gaining competitive advantage by continuously improving every facet of an organization’s activities.

One theory is that TQM was created as a result of a misinterpretation of the Japanese words for “control” and “management” since no difference exists between these words in Japanese. William Golimski, an American quality scholar and consultant, refers to Koji Kobayashi, former CEO of Nippon Electrical Company (NEC) as being the first to use the words TQM during a speech when he received the Deming prize in 1974. The American Society for Quality says that the term total quality management was used by the US Naval Air Systems Command in 1984 to describe its Japanese-style management approach to quality improvement since they did not like the word “control” in the term total quality control. The word “management” was then suggested by one of the employees, Nancy Warren. This is consistent with the story which states that the United States Navy Personnel Research and Development Center began researching the use of statistical process control (SPC), the works of Juran, Crosby, Ishikawa and the philosophy

of W. Edwards Deming to initiate performance improvements in 1984. This approach was first tested at the North Island Naval Aviation Depot.

### 6.2 Definitions of TQM

**TQM** is an integrated effort designed to improve quality performance at every level of the organization.

- Total:** Quality involves everyone and all the activities performed in the company.
- Quality:** Conformance to the requirements (meeting customer requirements).
- Management:** Quality can and must be managed.

Therefore, TQM is a process for managing quality. It is viewed as a continuous way of life and a philosophy of perpetual improvement in everything we do.

According to the British Standard BS 7850, TQM is defined as, “Management philosophy and company practices that aim to harness the human and material resources of an organization in the most effective way to achieve the objectives of the organization.”

TQM is defined as a management approach that tries to achieve and sustain long-term organizational success by encouraging employee feedback and participation, satisfying customer needs and expectations, respecting societal values and beliefs and obeying governmental statutes and regulations. Product, process, system, people and leadership form the five pillars of TQM. This is shown in Figure 6-1.

TQM is a management philosophy, a paradigm and an approach to continuous improvement in business through a new management model. The TQM philosophy evolved from the continuous improvement philosophy with a focus on quality as the main dimension of business. Emphasizing the quality of the product or service predominates under TQM. It expands beyond statistical process control to embrace a wider scope of management activities surrounding people and organizations by focusing on the entire process and not just simple measurements.

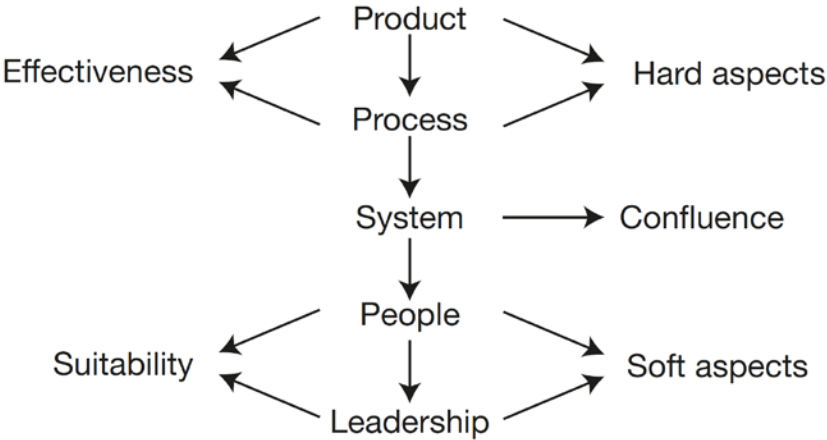


Fig. 6-1. Five pillars of TQM

TQM is a comprehensive management system which:

- Focuses on meeting the needs of the owners' or customers' by providing quality services at a cost that offers value to the owners/customers.
- Is driven by the quest for continuous improvement in all operations.
- Recognizes that everyone in the organization has internal or external owners or customers.
- Views an organization as an internal system with a common aim rather than as individual departments acting to maximize their own performances.
- Focuses on the way tasks are accomplished rather than simply on what tasks are accomplished.
- Emphasizes on teamwork.

### 6.3 Principles of TQM

Quality management principles are a set of comprehensive and fundamental rules or beliefs for leading and operating an organization (Figure 6-2). These are aimed at continually improving performances over the long-term, by focusing on customers while addressing the needs of all stakeholders.

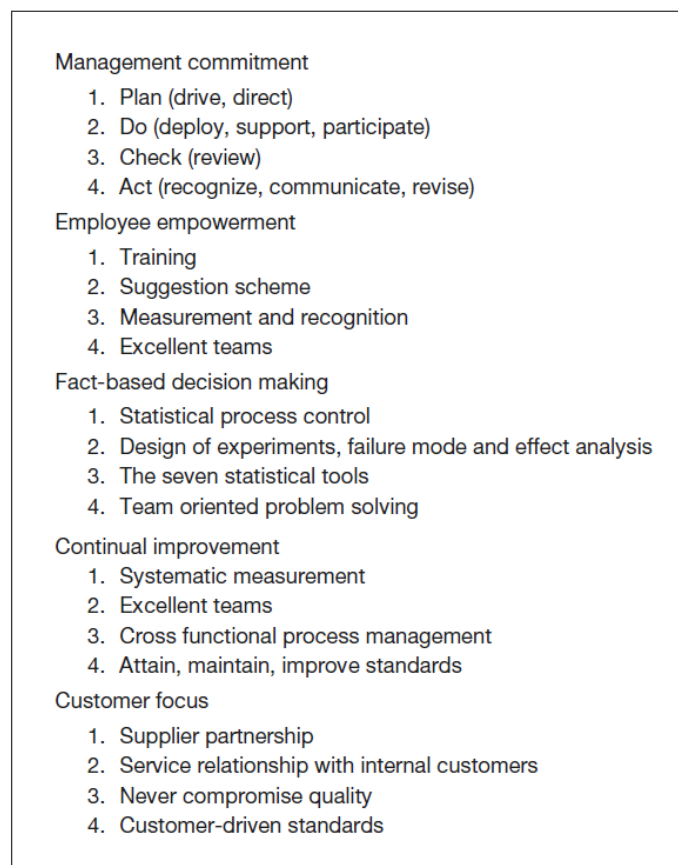


Fig. 6-2. The Key Principles of TQM

Quality management principles provide understanding and guidance on the application of quality management in an organization. As per the International Organization for Standardization (ISO), the following eight quality management principles can facilitate the creation of a quality work culture and successful implementation of quality management in any organization.

1. **Customer-focused organization:** Organizations depend on their customers and, therefore, should focus on understanding the current and future needs of the customer, meet customer requirements and strive to exceed customer expectations while satisfying them. Customer-focused organizations produce products and services that are needed by the customer and provide customer satisfaction. This can be achieved by the following actions:
  - Identifying the customer's needs
  - Design a product, which responds to the customer's needs
  - Produce and deliver the product as per the design
  - Enhance after-sales service and handle complaints quickly
  - Measure customer satisfaction
  - Improve quality to delight the customer
2. **Leadership:** An organization's senior leaders need to set directions and create clear and visible quality values, high expectations and a customer-oriented approach. These values, directions and expectations need to address all stakeholders. The leaders need to ensure the creation of strategies, systems and methods for achieving excellence. Strategies and values should help guide all activities and decisions of the organization. The senior leaders must commit to the development of the entire workforce and should encourage participation, learning, innovation and creativity by all employees. Through their personal roles in planning, communication, review or organizational performance and employee recognition, the senior leaders need to serve as role models reinforcing values and expectations, and building leadership and initiative throughout the organization.
3. **Involvement of people:** People involvement is one approach to improving quality and productivity. Involving people at all levels enables full utilization of their abilities for the organization's benefit. This can be done by providing a good corporate work culture, providing an interesting work system and work environment and building the capabilities of people to perform the assigned tasks in the organization.
4. **Process approach:** A desired result is achieved more efficiently when related resources and activities are managed as a process.
5. **Systems approach to management:** Identifying, understanding and managing a system of interrelated processes for a given objective contributes to the efficacy and efficiency of the organization.

## 6.4 The Key Elements of TQM

Total quality is a description of the attitude, culture and organization of a company that strives to provide customers with products and services that satisfy their needs. The culture mandates quality in all aspects of the company’s operations, with processes being done right the first time every time and defects and waste eradicated from operations.

The term TQM has been coined to describe a philosophy that makes quality the driving force behind leadership, design, planning and improvement initiatives. For this, the organization needs to concentrate on eight key elements—ethics, integrity, trust, leadership, team-work, training, communication and recognition as shown in Figure 6-3. These elements can be divided into the following four groups—foundation, building bricks, binding mortar and roof.

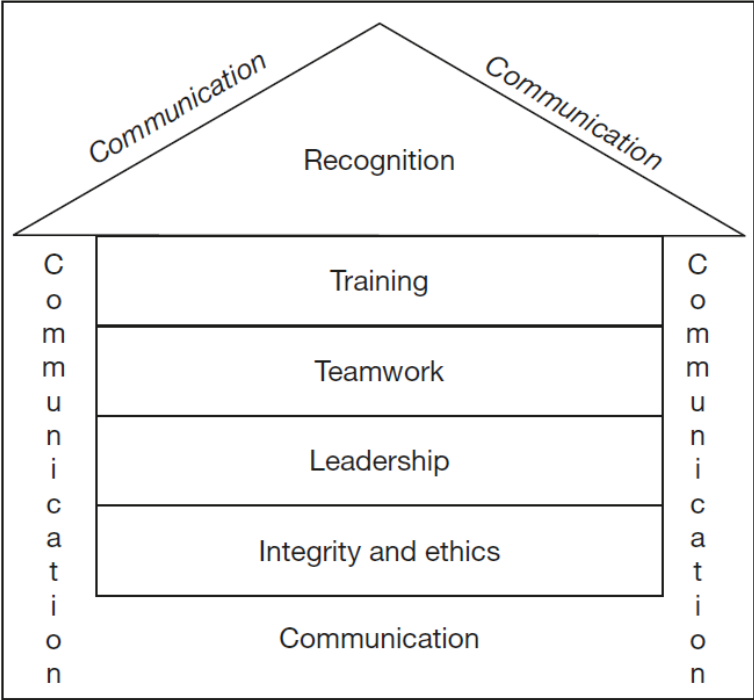


Fig. 6-4. TQM – Key Elements

**4.5 TQM Implementation**

Any organization wishing to implement TQM must understand clearly that TQM is not a management technique but a programme that initiates change. Like any other programme that initiates change, it needs to be designed, sequenced and managed. Adopting the right kind of method is one of the most crucial responsibilities of the senior management and the degree of success obtained will depend on their knowledge and understanding of these methods. TQM methods are unlikely to be very useful if not implemented properly. The following points must be kept in mind for the successful working of TQM in any organization.

1. Establishment of a corporate TQM steering committee and the formation of a TQM council at the unit level involving staff from senior management. A TQM centre can be formed to plan, manage and train employees for implementing TQM.

2. Selection of proper TQM methods required for the organization by conducting the required surveys based on the need and the organizational climate.
3. Complete knowledge for implementing TQM tools aimed at problem solving.
4. In order to make the TQM programme a success, a culture that focuses on customer satisfaction and permanent elimination of problems must be put in place.
5. Sustained and continuous effort must be made for company-wide TQM activities rather than view it as a one-time activity/project.

#### 4.5 TQM Excellence Model (TQMEX)

The TQMEX Model advocates an integrated approach in order to support the transition to systems management, which is an ongoing process of continuous improvement that begins when the company commits itself to managing by quality. The model illuminates the elements that help us to understand the TQM philosophy and its implementation company-wide.

It is necessary to develop a conceptual model in order to have a systematic approach to TQM. TQMEX model is a sequence of steps arranged logically to serve as a guideline for the implementation of a process in order to achieve the ultimate goal. The idea was to develop a universally applicable step-by-step guideline by including the recognized practices of TQM as shown in Figure 6-5.

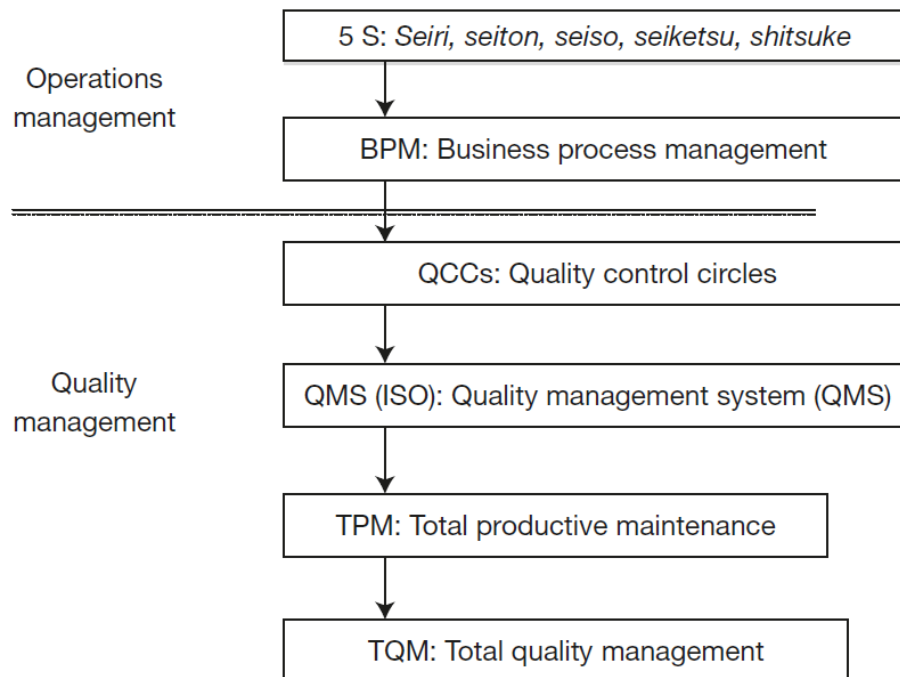


Fig 6-5. The TQMEX Model

## 4.6 Cost of Quality (CoQ)

Cost of quality measures the impact of quality of any business. It is defined as the cost of those activities, which an organization or process has incurred over and above the minimum costs required to do the job well. This is the amount of money a business loses because its products or services failed to secure customer satisfaction in the first place. Businesses lose money every day due to poor quality. For most businesses, these losses can range from 15 per cent to 30 per cent of their total costs. By addressing COQ, companies can look to adding 10 per cent to 15 per cent of the total costs to the bottom line without any capital investment.

Any cost associated with correcting failure or waste comes under quality costs, as do any assurance or approval activities built in to cushion customers from the effects of such failures. A further set of activities are those in which organizations attempt to prevent such failures from occurring at all. Cost of quality is, therefore, the sum of all costs a company invests into the release of a quality product/service.

Cost of quality has two main components—cost of conformance and cost of non-conformance. Cost of conformance is the cost of providing products or services as per the required standards. This can be termed as a good amount spent (prevention and appraisal costs). Cost of non-conformance refers to failure costs associated with a process not operating according to the requirements. This can be termed as unnecessary amount spent (internal and external failure costs).

$$\text{Cost of Quality} = \text{Cost of Conformance} + \text{Cost of Non-conformance}$$

Essentially, quality costs are defined as the total costs incurred by (1) Investing in the prevention of non-conformance to requirements, (2) Appraisal of a product or service for conformance to requirement and (3) Failure to meet requirements.

**1. Prevention costs:** These are the costs associated with trying to prevent failure and arise from efforts to keep defects at bay. Prevention activities lead to the reduction of failure and appraisal costs. The motto is prevention rather than appraisal. The activities associated with prevention costs are training and education, market research, quality planning, quality improvement projects, supplier evaluation, design review, contract review, field trials and preventive maintenance.

**2. Appraisal costs:** These are costs to determine conformance with quality standards and performance requirements. These costs arise from detecting defects. Appraisal activities are associated with discovery of defects rather than their prevention. The activities associated with appraisal costs are inspection, checking, auditing, surveying, inquiries, prototype testing, vendor surveillance and calibration of measuring and test equipment.

**3. Failure costs:** The costs resulting from products or services not conforming to requirements or customer/user needs are termed failure costs and can be divided into categories such as internal and external failure costs.

- *Internal failure costs:* Internal failure costs arise when results of work fail to reach designated quality standards, and are detected before transfer to the

customer takes place. Activities associated with internal failure costs are scrap, rework, downgrading, design changes and corrective action.

- *External failure costs:* These costs occur when the product or service is offered to the customer and found to be defective. External failure costs can be higher than internal failure costs because the stakes are much higher. These may also influence the company's reputation leading to a loss in customers. These costs include post-release customer and technical support. External failure costs occur when the product or service from a process fails to reach designated quality standards, and is not detected until after transfer to the customer. Activities associated with external failure costs are returned products, product recalls, rejected services, unhappy customers, warranty claims, processing/investigation of customer complaints, interest charges on delayed payment due to quality problems.

**Total quality costs:** The sum of all the above costs. It represents the difference between the actual cost of a product or service and what the reduced cost would be if there were no possibility of substandard service, failure of products or defects in their manufacture. Figure 6-6 displays various cost elements.

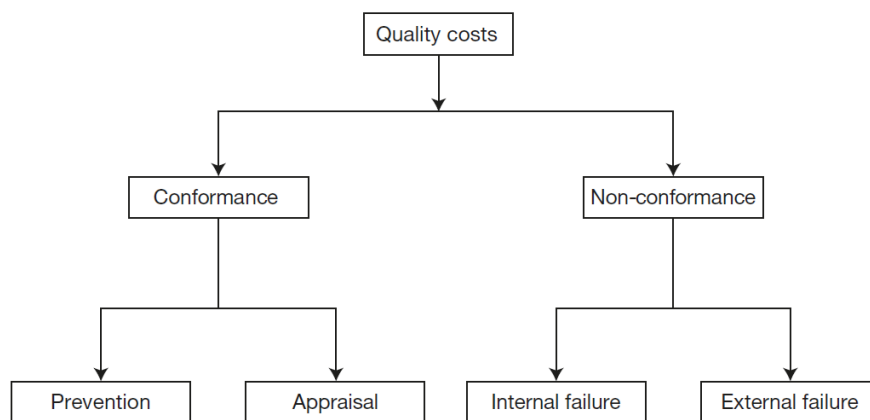


Fig. 6-6. Various Quality Cost Elements

### *Hidden Quality Costs*

There are also costs incurred when trying to understand the costs of poor quality. Figure 6-7 illustrates both the obvious and hidden costs for a manufacturing company. These hidden costs include:

- Potential lost sales.
- Costs of redesign due to poor quality.
- Costs of changing manufacturing processes due to the inability to meet quality requirements.
- Costs of software changes attributed to quality reasons.
- Extra manufacturing costs due to defects.
- Scrap not reported.



- Costs included in standards because history shows that a certain level of defects is inevitable and allowances should be made when formulating the standards.
- Excess process costs for creating an acceptable product.

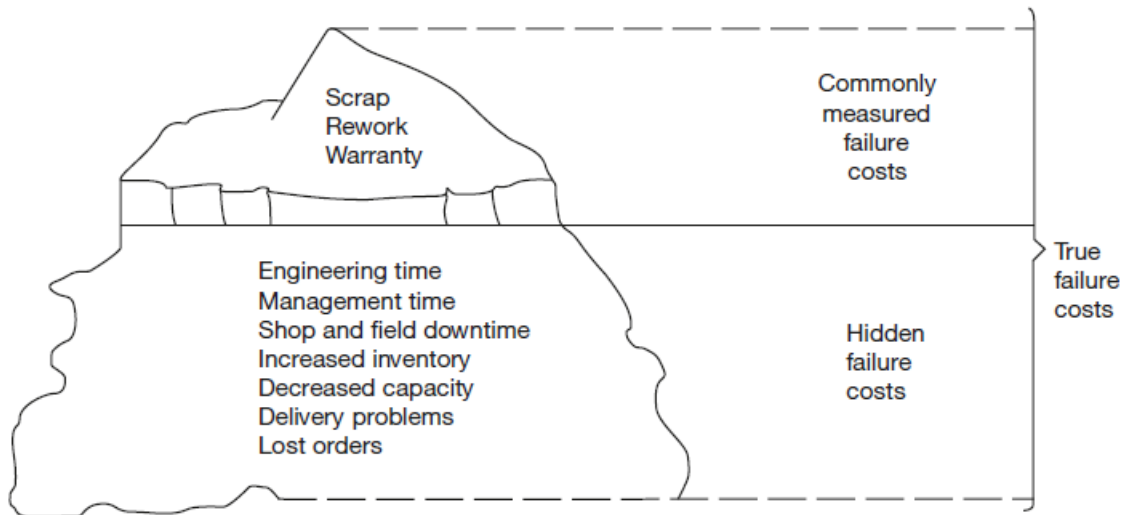


Fig. 6-7. Hidden Costs of Poor Quality

### *Total Quality Costs*

This is the sum of prevention costs, appraisal costs and failure costs. It represents the difference between the actual cost of a product or service and what the reduced cost would be, if there was no possibility of substandard service, failure of products, or defects in their manufacture. Figure 6-8 shows a model for optimum quality cost and the total quality cost curve.

The optimum quality cost model shows the following three curves:

1. Failure costs: These equal zero when the product is 100 per cent perfect, and the costs rise to infinity when the product is 100 per cent good, and fall to infinity when the product is 100 per cent defective.
2. Costs of appraisal plus prevention: These costs are zero when the product is 100 per cent defective and rise as perfection is achieved.
3. Total quality cost curve: The sum of curves 1 and 2. It represents the total cost of quality per good unit of the product.

Total quality cost curve divides into three zones. The zone a company is in can usually be identified from the prevailing ratios of the quality costs in the principal categories as follows:

**Zone of Improvement Projects:** This is the left-hand portion of the total quality cost curve. Failure costs constitute more than 70 per cent of the total quality costs while prevention costs are less than 10 percent of the total. In such cases, there are opportunities for reducing total quality costs by improving the quality of conformance. The approach is to

identify specific improvement projects and pursue them to improve the conformance, thereby reducing the costs of poor quality, especially failure costs.

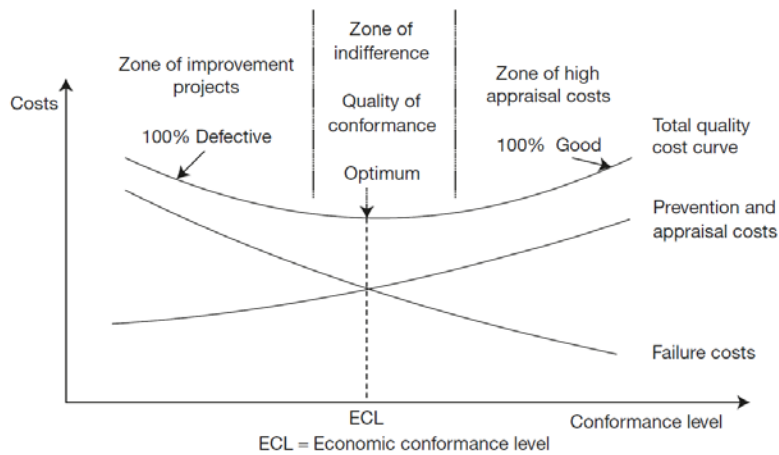


Fig. 6-8. Model for optimum quality cost

**Zone of High Appraisal Costs:** This is the right-hand portion of the total quality cost curve. It is usually characterized by the fact that appraisal costs exceed failure costs. In such cases there are also opportunities to reduce costs.

**Zone of Indifference:** This is the central area of the total quality cost curve. In this zone, the failure costs are usually about half the quality costs while prevention costs are about 10 per cent of the quality costs. In the indifference zone, the optimum has been reached in terms of worthwhile quality improvement projects to be pursued. Continuous improvement is always desirable, but the projects compete against other worthwhile projects, which have not yet attained optimum levels.

The costs associated with poor quality are due to both sporadic and chronic quality problems (see Figure 6-9). A sporadic problem is a sudden, adverse change in the status quo, which requires remedy through restoration of the status quo. A chronic problem is a long-standing, adverse situation, which requires remedy through a change in status quo.

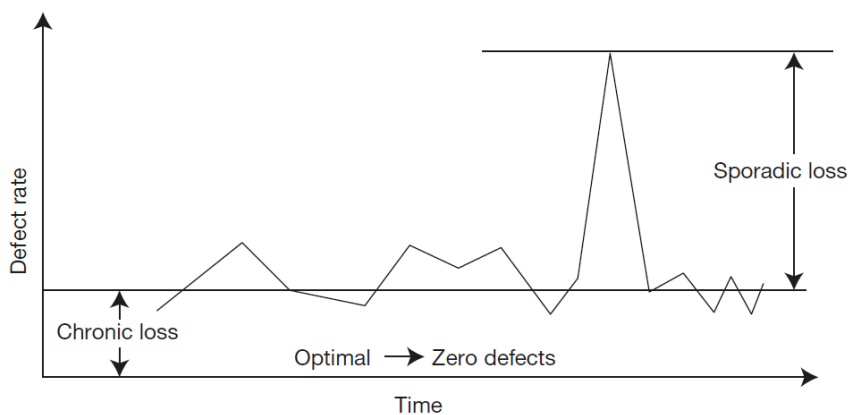


Fig. 6-9. Sporadic and Chronic Quality Problems

## Summary



TQM is an integrated effort designed to improve the quality of performance at every level of the organization. Product, process, system, people and leadership are the five pillars of TQM. TQM is a comprehensive management system.

Four stages can be identified in the evolution of TQM. They are inspection-based, system of quality control, quality assurance and total quality management. The seven phases in the development of TQM are operator inspection, foremen inspection, quality control department 100 per cent inspection, SQC, SPC, SPS and Six Sigma.

The key principles of TQM are customer-focused organization, leadership, the involvement of people, a process approach, a systems approach to management, continuous improvement, a factual approach to decision making and mutually beneficial supplier relationships. The eight key elements of TQM are ethics, integrity, trust, training, teamwork, leadership, recognition and communication.

The core concepts of TQM are used to drive the process of continuous improvement. They are explained by the criteria such as customer satisfaction, internal customer satisfaction, all work is a process, measurement, synergy in teamwork, people make quality, continuous improvement cycle and prevention.

Fitness for use is achieved through two components: product features and freedom from deficiencies. There are four categories of quality costs. The first two are prevention and appraisal costs, which are incurred by a company in attempting to improve quality. The last two costs are internal and external failure costs, which are the costs of quality failures that the company wishes to prevent. The costs associated with poor quality are due to both sporadic and chronic quality problems. A sporadic problem is a sudden, adverse change in the status quo, which requires remedy through restoring the status quo. A chronic problem is a long-standing adverse situation, which requires remedy through changing the status quo.

## Review questions

1. Explain the TQMEX model.
2. Compare the traditional organization with a TQM organization.
3. Discuss the prerequisites of TQM.
4. What are the steps for implementing a TQM programme?
5. Describe the barriers in implementing a TQM programme.
6. Explain the benefits of TQM with an example.
7. Describe each of the four costs of quality: prevention, appraisal, internal failure and external failure.
8. Describe how each type of cost would change (increase, decrease or remain the same) if we designed a higher quality product that was easier to manufacture.

9. Draw the total quality cost curve.
10. Discuss how quality and profit are related.
11. Describe hidden quality costs.

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