

POORNIMA M. CHARANTIMATH

TQM

TOTAL

QUALITY

MANAGEMENT



THIRD EDITION

Total Quality Management

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Total Quality Management

Third Edition

Poornima M. Charantimath
*Karnataka Law Society's Institute of Management
Education and Research, Belgaum*

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To my in-laws,

Late Sri. N. C. Charantimath

and

Late Smt. Lalita Devi Charantimath

About the Author



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Foreword

Traditionally, manufacturers and retailers lowered prices to clear inventory. Today, they're cutting prices because consumers are demanding it.

The recent global meltdown and recession has put great pressure on the organizations to produce the best quality products at the most affordable prices. Nano has already hit the market. The car has redefined the meaning of quality. It is not just a car—it is the automobile revolution. Novatium has come out with a PC for just Rs 3,000. Real estate now promises to give the best quality homes at previously unimagined prices. Telecom companies are reducing the cost of talk time every day. The price of white goods is coming down every day.

In the economy, struggling to come out of the recession, low price rules. The challenge is not just to produce great quality, but to provide the best quality in the most efficient and cost-effective manner. This book will enable organizations to maximize their quality of products and services through application of various quality improvement tools and minimize the cost by adoption of many proven techniques. It is important to know that quality is a “disciplined approach” and while lot of attention is paid to the technical side of quality, the human side of quality should not be forgotten. Quality is a passion to make a valuable contribution to the world we live in.

We are also in a world where today's breakthrough product is tomorrow's undifferentiated commodity. Innovation will drive the economy in the future and the companies have to play a proactive rule. Organizations must establish innovation as a mainstream business process with defined people, responsibilities and targets, failing which innovation will be rhetoric (lucky accident). Quality is completely linked to the present and the future needs of the customers, and hence innovation has become integral to quality—two sides of the same coin.

In this world of fast-changing expectations, innovation is the only insurance against irrelevance and the antidote to margin crushing competition. Besides providing the best quality at the most affordable prices, the companies will have to innovate new products, services, business models, sources of raw materials and delivery mechanisms. They must understand unmet customer needs and have the ability of translating unperceived and unarticulated needs of the customer into development of new products and services in the fastest possible time. Time is of essence and the companies must reduce their innovation cycle time to be present in the market before the competition. Innovation is the only way for high growth and sustainable competitive advantages.

This book on quality covers an extensive compilation of topics. I am sure the students of management and engineering, academicians and organizations will benefit a great deal from the extensive topics of Kaizen, breakthrough improvements, value analysis, TRIZ mechanism, TPM, quality management system and quality models given in this book.

I wish the readers great success in their quality and innovation journey through the third edition of this rich treasure of quality by Ms. Poornima Charantimath.

Pravin Rajpal
Indian Management Expert, FICCI Quality Forum
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Preface

Total quality management (TQM) is an approach to business that looks critically at the products and services a company provides in relation to the processes it employs to create them. It also focuses on the workforce to ensure that outputs fully satisfy customer requirements. Organizations that follow the TQM approach consistently meet or exceed customer requirements. TQM can, therefore, be referred to as a journey with the sky as the limit for excellence.

The first edition of *Total Quality Management* was written to help students develop a basic appreciation of quality concepts and learn the tools and techniques of TQM. The second edition of the book was updated and enlarged to conform to TQM's goal of continuous improvement. The third edition of the book has now been updated and enlarged based on changes happening in the industry.

■ CHANGES IN THE THIRD EDITION

The third enlarged and revised edition of *Total Quality Management* comprises of 18 chapters which embraces the art of managing the whole to achieve excellence. We all agree completely – the war for better quality must continue – which is why we continue to update and improve this book. The significant changes in the third edition include:

- **Chapter opening vignettes with a Picture:** Each chapter begins with a picture serve as ice-breakers and narrate the key concepts of the chapter through a powerful story around a customer or company for better understanding of the chapter.
- **Marginal additions:** Each page has provided with marginal additions to enhance learning.
- **Balanced coverage of the manufacturing and service sectors:** The manufacturing and service sectors have been covered in greater detail by showcasing real-world practices from the Indian and global scenarios.
- **Updated QMS ISO 9001:2015:** The revised version of Quality Management System (QMS) ISO 9001:2015 is explained is more compatible with other management systems such as ISO 14001:2015 Environmental Management System (EMS) and ISO 45001:2016 Occupation Health and Safety Management System, making it more effective and efficient to integrate with various other management systems.
- **Introduction to Integrated Management System:** Chapter 17 introduces an integrated management system (IMS) which combines all related components of a business into one system for easier management and operations. Quality (QMS), Environmental (EMS), and Occupation Health and Safety Management Systems (OHSMS) are often combined and managed as an IMS. This chapter also provides information on institutions supporting quality movement in India.
- **Updated ISO Management audit ISO 19011:2011 and ISO IEC 17021:2015:** Chapter 18 provides the revised version of ISO audit: ISO 19011: 2011 first and second party audit and ISO IEC 17021:2015 third party audit.
- **Comprehensive supplement package:** A complete supplement package comprising an instructors' manual, Power-Point lecture slides and multiple-choice questions support interactive teaching and learning.

■ STRUCTURE OF THE BOOK

Total Quality Management (3/e) comprises 18 chapters, which focus on understanding the TQM philosophy, quality planning, statistical quality control, quality improvement and customer-driven quality. The key concepts discussed in each chapter are as follows:

Chapter 1 explains the various definitions of quality, importance of quality, different types and levels of quality, paradigms of quality, dimensions of product and service quality.

Chapter 2 focuses on the contributions made by American and Japanese quality gurus in the area of TQM.

Chapter 3 provides an insight into the evolution of TQM, identifies the common barriers to the implementation of TQM and also discusses the steps in implementing TQM & Total Quality Management Excellence (TQMEX) Model.

Chapter 4 explains leadership and corporate social responsibility (CSR), strategic quality management and also describes the importance of managing change in organizations.

Chapter 5 discusses the Deming Prize, the Malcolm Baldrige National Quality Award, the Ramakrishna Bajaj National Quality Award, the European Quality Award, the CII-EXIM Bank Award for Business Excellence, Tata Business Excellence model (TBEM), Rajiv Gandhi National Quality award, the International Quality Maturity Model and Capability Maturity Model Integration (CMMI).

Chapter 6 explains the important statistical concepts in quality management. It also describes process capability, sampling plans, quality assurance, quality policy and quality manual.

Chapter 7 discusses Six Sigma, Lean Six Sigma and the steps in implementing Six Sigma (DMAIC, DMADV and DFSS) and discusses various Six-Sigma training programmes.

Chapter 8 explains the seven quality control tools and the seven new management and planning tools.

Chapter 9 provides an insight into Kaizen, 5 S, company-wide quality control, quality function deployment, house of quality and the relevance of quality circles.

Chapter 10 explains creativity, innovation, the S curve, TRIZ, systematic inventive value augmentation, value analysis and value engineering.

Chapter 11 elaborates on the essence of benchmarking, evolution of benchmarking, process of benchmarking, types of benchmarking and the steps in the benchmarking process.

Chapter 12 deals with business process re-engineering (BPR), the principles and advantages of BPR, the methodology of BPR, the implementation phases and explains re-engineering in the manufacturing and the service industry.

Chapter 13 explains the relevance and importance of business process management.

Chapter 14 deals with the concept of total productive maintenance (TPM), the pillars of TPM and overall equipment effectiveness (OEE).

Chapter 15 focuses on customer relationship management (CRM), customer value management and CRM in the B2B and the B2C context.

Chapter 16 deals with the importance of TQM in the service sector. It introduces the concept of service quality and discusses models used for measuring and improving service quality.

Chapter 17 deals with quality management system ISO 9001:2015, EMS ISO 14001:2015, OHSAS ISO 45001:2016 and Integrated Management System. It explains the benefits of ISO certification and discusses the organisations promoting quality movement in India.

Chapter 18 discusses the standards for planning and performing management audits ISO 19011:2011 (first and second party audit) & ISO IEC 17021 2015 (third party audit), the standards for selecting auditors and the standards for managing audit programmes. It also explains steps to ISO certification, role of certification bodies and registration requirements.

KEY FEATURES

Chapter opening vignettes with a picture



Marginal additions are provided as Bird's-eye view to provide contents related to TQM concepts, examples from industry, best practices, etc.



Bird's-eye view:
If an automobile company finds a defect in one of their cars and initiates a product recall, customer reliability and the company's production will be affected because trust will be lost in the car's quality.

Bird's-eye view:
Quality is important to businesses but can be quite hard to define. A good definition of quality is: **"Quality is about meeting the needs and expectations of customers"**.

Bird's-eye view:
ISO 9000 2015 Definition of Quality
The adjective *quality* applies to objects and refers to the degree to which a set of inherent characteristics fulfills a set of requirements.

Each chapter contains several **boxes** that highlight innovative practices from the TQM arena.



Box 17.3 CII Institute of Quality

CII Institute of Quality is the leading authority in quality enhancement among organizations and industries. Over the past century, CII has provided Indian industries with the support, systems, and tools to make a mark in the competitive world. It is realized that the best way to enhance an organization's competitiveness is through the quality route.

What started as the Total Quality Management Division (TQMD) of CII in the mid-eighties has now evolved as CII Institute of Quality. As a champion of the quality movement, CII IQ is powered by the responsibility of enriching the lives of its members, improving their workplaces, and making the world, at a large, a better place by applying quality tools, techniques, and systems. CII IQ provides the best of its kind training and consulting services to organizations to help improve their performance and set a standard of excellence.

CII IQ has tied up with several international organizations to bring their best practices to India. It has helped several organizations improve their total QMS besides helping them win recognitions such as the Deming Prize and the Japan Quality Medal. CII IQ opens a world of opportunities to improve the quality of workplace, communities, and lives by providing information, contacts, and more. It realizes the importance of creating sustainable programs that are critical to an organization's QMS.

Source: Adapted from <http://www.cii-iq.in/index.php/about-us> accessed July 2016

The **discussion forum** tests students' understanding of key concepts and facilitates interaction and knowledge sharing.



DISCUSSION FORUM

1. What is ISO?
2. How many times were the standards revised?
3. Which is the latest version of ISO and what are the major changes it introduces?
4. What are the quality management principles on which the QMS standards are based?
5. What are the benefits of ISO certification?
6. Identify the organizations providing strategic direction to quality movement in India.

Key terms enable readers to quickly go through the important concepts discussed in each chapter.



Key Terms

Aesthetics 13	Perceived Quality 13
Appraisal Cost 15	Performance 13
Assurance 13	Prevention Cost 15
Big Q 14	Process Level 10
Conformance 13	Psychological Criteria 4
Durability 13	Reliability 13
Empathy 14	Responsiveness 14
Exciting Quality 10	Serviceability 13
Expected Quality 8	SERVQUAL 13
External Failure Cost 16	Support Services 4
Features 13	Tangibles 13
Hidden Quality Cost 18	The Manufacturing-based Approach 5
Indifferent Quality 10	The Performer/Job Level/Task Design Level 11
Internal Failure Cost 16	The Product-based Approach 5
Little q 14	The Transcendent Approach 4
New Quality 14	The User-based Approach 5
Old Quality 14	The Value-based Approach 5
One-dimensional Quality 10	Total Quality Cost Curve 18
Optimum Quality Cost 18	Value for Price Paid 4
Organizational Level 10	Zone of Indifference 19

The **summary** recapitulates the main points discussed in the chapter.



SUMMARY

- The term quality has many different definitions, ranging from the conventional to those that are strategic. Conventional definitions of quality usually describe a quality item as one that wears well, is well constructed and will last for a long time. However, managers competing in the fierce international market are increasingly concerned with the strategic definition of quality—meeting customer requirements.
- David Garvin identified five major approaches to defining quality: The transcendent approach, the product-based approach, the user-based approach, the manufacturing-based approach and the value-based approach.
- Quality of goods and services can provide an organization with competitive edge. The role of quality needs no emphasis for a firm because it is the key to success in business to achieve customer satisfaction. Today “quality” is the watchword for the survival and growth of any organization in the global business environment. Quality increases profits in addition to enhancing the image of the company.
- An organization that is committed to quality must examine quality at three levels: organizational level, process level and the performer/job level/task/design level.
- Quality of design, quality of conformance and quality of performance are required to produce goods and services of consistent quality and costs.
- The five paradigms of quality are custom-craft paradigm, mass production paradigm, statistical quality control paradigm, total quality management paradigm and techno-craft paradigm
- David Garvin identified eight dimensions of product quality—performance, features, reliability, conformance, durability, serviceability, aesthetics and perceived quality. SERVQUAL dimensions of service quality are reliability, assurance, tangibles, empathy and responsiveness

A **case study** at the end of each chapter correlates quality management theories with their actual applications in the industry.



Case Study

Customer Relationship Management at Bharti

Bharti Tele-ventures is one of India's leading private sector telecom operators. Its cellular business, Airtel, is a leading mobile telephony brand. Like any telecom organization, Bharti considers information technology as a key business enabler. According to Amrita Gangotra, vice-president of Information Technology at Bharti, IT works as a support system as well as a key business driver.

The company has a wide area network (WAN) in place with a mix of leased lines and E1 and E3 lines. The company extends different applications to its dealers and partners through its extranet. The company also has procured a range of high-end servers from Sun and HP. The company also has a storage area network (SAN) in place because its daily storage requirements are in terabytes.

The main data centre is located in Gurgaon, Haryana. Bharti has procured billing, fraud management, revenue assurance and data warehousing software.

The Case for CRM

During the initial stages of its operations, the company's systems were run manually. Only 40 per cent of customer issues were getting resolved. The company decided to equip itself with tools that would help in resolving 90 per cent of its customer issues. The company decided to opt for a CRM solution to manage customer expectations and provide them with innovative products and services.

Exercises enhance problem-solving skills and facilitate the application of concepts.



Exercises

- The standard error of measurement of the mean of measurement of a certain electrical characteristic of a product is determined to be 8 units. A sample consisting of 42 units of the product is taken under consideration. From this information, what is your estimate of the true standard deviation of the quality characteristic?
- A sampling plan may be specified in this way:
 $N = 200, n = 20, c = 1$.
Interpret the results.
- A sampling plan may be specified in this way:
 $N = 500, n_1 = 20, c_1 = 1, n_2 = 60, c_2 = 4$.
Interpret the results.
- For a sampling plan, $N = 1,200, n = 64$ and $c = 1$, determine the probability of acceptance of the following lots:
 - 0.5 per cent defective
 - 0.8 per cent defective
 - 1 per cent defective
 - 2 per cent defective
 - 4 per cent defective
 - 10 per cent defective
 Also, draw an OC curve.

Short-answer questions facilitate a review of the concepts discussed in each chapter.



Short-answer Questions

- Define quality.
- List David Garvin's five approaches to defining quality.
- Name the three levels of quality.
- What are the different types of quality?
- Mention the five paradigms of quality.
- What are Garvin's eight dimensions of product quality?
- What are the SERVQUAL dimensions of service quality?
- Differentiate between service quality and product quality.
- Differentiate between old quality and new quality.

Match the following

enables students to match the right terms and facilitates conceptual clarity.



Match the Following

a. Walter Shewart	Theory of profound knowledge
b. W. Edwards Deming	Quality trilogy
c. Joseph Juran	Total quality control
d. Armand Feigenbaum	<i>Gemba</i> Kaizen
e. Philip Crosby	Poka-yoke
f. Kaoru Ishikawa	Design of experiments
g. Genichi Taguchi	Father of quality circles
h. Shigeo Shingo	Four absolutes of quality
i. Masaaki Imai	Grandfather of quality control

Discussion questions

test students' learning of the subject and provide further opportunities for the application of concepts.



Discussion Questions

1. Why might a dictionary definition of quality be inadequate for a quality professional? Which of the definitions discussed in this chapter do you feel is the best? Why?
2. Which of Garvin's five approaches to defining quality makes the most sense to you and why?
3. Discuss what the different categories of quality costs might mean to your college and university. How can they be measured?
4. Why are cost of quality programmes valuable to managers?
5. Explain the three levels of quality and the key issues that must be addressed at each level.
6. How can quality and profitability be correlated?
7. What are the subjective and objective dimensions of quality?

Projects facilitate data collection and enable students to broaden their knowledge of the subject.



Projects

1. Visit a service organization and find out the costs associated with the poor quality. Prepare a two-page report.
2. Develop a portfolio of advertisements from newspapers and magazines and illustrate how quality is used in promoting these products. Do the advertisements suggest different definitions of quality?

■ THE TEACHING AND LEARNING PACKAGE

The student and instructor support resources provided with this book make learning and teaching a pleasurable experience. They include:

- An Instructors' Resource Manual that provides an analysis of all the case studies and answers to all the chapter-ending exercises in the book.
- PowerPoint lecture slides that outline the main theories discussed in the book and enable instructors to make effective presentations.

The instructors' manual and the PowerPoint slides are available at www.pearsoned.co.in/poornimamcharantimath.

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1

Quality Concepts



QUALITY NATURAL FOODS LIMITED

In its broadest sense, quality is a degree of excellence—the extent to which something is fit for its purpose. In the narrow sense, product or service quality is defined as conformance with requirements, freedom from defects or contamination, or simply a degree of customer satisfaction. A business would have no profits if it failed to create and retain satisfied customers. Providing products and services which meet customer needs and expectations creates satisfied customers. Anticipating future needs and expectations retains satisfied customers. Therefore, quality is vital to the survival of any enterprise.

Quality Natural Foods Ltd is a well-established and reputed food distribution company servicing the ethnic markets of Canada. It is a success story of its founders, Jar nail Singh and Sheila Singh, who understood the need for a high quality supplier of traditional ethnic products to the Asian market in Canada. Over 20 years, the company has acquired institutional knowledge, long-term relationships, and widespread recognition that continue to drive its growth. As a result, the company is now the leader in products and service for Asian ethnic population in Canada, serving retailers from coast to coast.

Quality has been the primary consideration in the origin and policy of the business. The commitment to quality required investment in people and equipment, including appropriate facilities for receiving, handling, and storage under safe and hygienic conditions. Strict adherence to, and implementation of, quality measures assured that products procured and distributed by the company always matched high quality standards. Products are sourced from suppliers with international standards accreditation such as ISO and with whom ongoing contact was maintained. Quality is closely monitored to the point of the end users. The commitment to customers was ensured with adequate inventory, reliable distribution networks, and new product offerings.

“Quality is not an art, it is a habit.”

Aristotle

Upon completion of this chapter, you will be able to:

1. Understand the various definitions and the importance of quality
2. Describe the different types and levels of quality
3. Explain the five paradigms of quality
4. Understand the eight dimensions of product quality and the determinants of service quality
5. Describe the differences between old quality and new quality
6. Understand the costs of poor quality

Bird's-eye view:

If an automobile company finds a defect in one of their cars and makes a product recall, production will decrease because trust will be lost in the car's quality.

■ INTRODUCTION

We are surrounded by quality failures that are appallingly expensive in terms of money lost, opportunities foregone and grief incurred. Poor quality processes at its Bhopal pesticide plant cost the Union Carbide Corporation 420 million pounds in compensation claims in March 1989. More than 3,400 people have died since December 1984 after a cloud of deadly methyl isocyanate gas leaked out of a storage tank at the Bhopal plant and floated over a city of 672,000. It was the worst industrial accident in history with over 200,000 people hurt and 15,000–20,000 suffering lasting injuries. The pesticide factory simply lacked the quality and safety processes that exist in similar pesticide plants in Germany and America, which include towers that rain down foam to neutralize escaping gases.

With the liberalization of the Indian economy, the customer has gained in terms of better quality of products and services offered by both multinationals and domestic companies. The competition in the market has widened the choice for customers. Market dynamics have also moved markets from a seller's to a buyer's market. Quality, therefore, has become critical in view of the stiff competition and the need for Indian manufacturers and service providers to gain a stronghold in the international arena.

The twenty-first century can be termed as the century of quality. Quality is a key driver to market share and quality will have to be integrated into all aspects of a successful organization. Efficient production of quality goods and services is a challenge for most businesses today.

A mistake is also termed as an error. When found by the tester, it is termed as a defect. A defect accepted by the development team is called a bug, and when the build does not meet the requirements, it is termed a failure. From the point of view of the producer, a defect is a

product requirement that has not been met. Therefore, quality refers to meeting the product requirements. Increasing the quality of conformance usually results in closing the producer's gap. Thus, quality also enables meeting product requirements.

From the customer's point of view, a defect is anything that causes customer dissatisfaction. Therefore, quality is the degree of fitness permitting use. Freedom from deficiencies in manufacturing industries covers freedom from defects and errors in the product at the time of delivery and during servicing. Similarly, in service industries, it means freedom from errors during initial and future transactions. Quality of design enables achievement of required product features and quality of conformance enables achievement of freedom from deficiencies. Quality thus functions to build product features and offers freedom from deficiencies while incurring profit by closing the customer gap and delighting the customer. This is explained in further detail in the section on the "importance of quality."

Quality is an idea which changes with time. It is a perception; a moving target. Quality (from the Latin term *qualita*) is an attribute or a property. Attributes are ascribed by a subject whereas properties are possessed. Some philosophers assert that quality cannot be defined. Contemporary philosophy defines the idea of quality differently specially focusing on how to distinguish certain kinds of qualities from one another, which remains controversial.

The word "quality" has diverse definitions, ranging from the conventional to those that are strategic. Conventional definitions of quality usually describe a quality item as one that wears well, is well constructed and will last for a long time. However, managers competing in the fierce international marketplace are increasingly concerned with the strategic definition of quality—meeting customer requirements.

■ DEFINITIONS OF QUALITY

Quality is a subjective term for which each person has his or her own definition. In technical usage, quality can have two meanings: (1) the characteristics of a product or service that bear on its ability to satisfy stated or implied needs and (2) a product or service free of deficiencies.

—*American Society for Quality*

Quality should be aimed at the needs of the customer, present and future.

—*Dr Edward Deming*

Quality is the total composite of product and services characteristics of marketing, engineering, manufacturing and maintenance through which the product and service in use will meet the expectations of the customer.

—*Armand V. Feigenbaum*

Quality is the degree of excellence at an acceptable price and control of variability at an acceptable cost.

—*Robert A. Broh*

The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.


—*ISO 8402: Quality Vocabulary*

The totality of features and characteristics of a product or service that bear on its ability to satisfy a given need.

—*The European Organization for Quality Control Glossary (1981)*

Quality is meeting the requirements of customers, both internal and external, for defect-free products services and business processes.

—*IBM*

 **Bird's-eye view:**
Definitions of Quality:

- a. Conformance to requirements
- b. A degree of excellence
- c. Totality of characteristics which act to satisfy a need
- d. Fitness for use
- e. Fitness for purpose
- f. Freedom from defects
- g. Delighting customers

Fitness for use or purpose is a definition of quality that evaluates how well the product performs for its intended use.

—Joseph Juran

Quality is the conformance to requirements/specifications. This is a definition of quality to find out, how well a product or service meets the targets and tolerances determined by its designers.


—Philip Crosby

Quality is the loss (from function variation and harmful effects) a product causes to society after being shipped, other than any losses caused by its intrinsic functions.

—Dr Genichi Taguchi

Quality is meeting and exceeding the present and future requirements of the customer on a continuous basis.

—Poornima Charantimath

 **Bird's-eye view:**

Quality is important to businesses but can be quite hard to define. A good definition of quality is: **“Quality is about meeting the needs and expectations of customers”.**

■ Customer-driven Definitions of Quality

Value for price paid: Quality is defined in terms of the utility of the product or service for the price paid.

Support services: Quality is defined in terms of the support provided after the product or service is purchased.

Psychological criteria: A way of defining quality that focuses on judgemental evaluations of what constitutes product or service excellence.

The common definitions of quality are summarized below:

1. Conformance to requirements (Crosby, 1979)
2. Fitness for use (Juran, 1979)
3. Continual improvement (Deming, 1982)
4. As defined by the customers (Ford, 1984; 1990)
5. Loss to society (Taguchi, 1987)
6. Six Sigma (Harry and Stewart—Motorola, 1988)
7. Zero defects (Crosby, 1979)
8. Meeting and exceeding present and future requirements of customer on a continuous basis (Charantimath, 2006)

■ GARVIN'S APPROACHES TO DEFINING QUALITY

David Garvin identified five major approaches to defining quality.¹ The five approaches are as follows:

■ 1. The Transcendent Approach

Quality is recognized through learning and experience defined in terms of innate excellence. In this view “quality is synonymous with ‘innate excellence’ and is absolute and universally recognizable.” This is the approach which aligns most closely with Socrates’ question “What is the fine?” from *Greater Hippias*. This approach implies that there is a construct called quality that is universally applicable. This is the approach that forms the basis for

philosophical debate. Some say it is of little practical utility. Others argue that the transcendent approach is “the fundamentally most important approach to thinking about quality—particularly in the quality of design of breakthrough products and services.”

■ 2. The Product-based Approach

Quality is precise and measurable; it can be ranked on various attributes and is an inherent part of the product. In this regard, quality is “a precise and measurable variable” which is a composite of all the attributes that describe the degree of excellence of a product. This approach is illustrated by a draft of the ISO 8402 standard which stated that “quality is the degree to which a product possesses a specified set of attributes necessary to fulfill a stated purpose.”

■ 3. The User-based Approach

This is an approach to assure that the customer’s voice is incorporated during product design and is reflected in consumer demand curves. While this approach has been practical in the design of products based on incremental innovations, it is of limited value in designing products based on radical innovations. Products based on radical innovation enter a market that may not exist and where customers may not be able to articulate their needs. In the case of radical innovation, the transcendent approach may be of more than just philosophical interest.

■ 4. The Manufacturing-based Approach

Quality is defined as conformance to specifications; reduce costs by reducing the number of deviations with a focus on engineering and manufacturing practices. W. Edwards Deming criticizes this approach as “the absurdity of meeting specifications.” “Specifications don’t tell you what you need...Just to meet specifications—what you think the customer requires—no. That won’t keep you in business.” Taguchi argues that the manufacturing-based approach is fundamentally flawed. He says that simply meeting specifications is not good enough. He developed the quadratic loss function, which showed that losses increased exponentially as a parameter deviated from its target value.

Others argue that conformance to specifications is a practical approach to defining quality, if and only if, the specifications are derived from customer requirements (user-based approach). Philip Crosby goes so far as to say that, “we must define quality as ‘conformance to requirements’ if we are to manage it.” Instead of thinking of quality in terms of goodness or desirability (transcendent approach), we are looking at it as a means of meeting requirements. Quality means conformance. No quality is non-conformance.

■ 5. The Value-based Approach

Quality is defined as performance or conformance at an acceptable cost. In this approach, quality is defined in terms of costs and prices. A quality product is one that provides performance at an acceptable price or conformance at an acceptable cost. Philip Crosby also endorses this approach. This blends the value-based approach with the manufacturing-based approach.

■ QUALITY MANAGEMENT

Quality management is a method for ensuring that all the activities necessary for the design, development and implementation of a product or service are effective and efficient with

Bird’s-eye view:

ISO 9000 2015 Definition of Quality

The adjective *quality* applies to objects and refers to the degree to which a set of inherent characteristics fulfills a set of requirements.


Bird’s-eye view:

An *object* is any entity that is either conceivable or perceivable and an inherent characteristic is a feature that exists in an object.

Bird’s-eye view:

The *quality of an object* can be determined by comparing a set of inherent characteristics against a set of requirements.

David Garvin identified five major approaches to defining quality. The five approaches are: The Transcendent approach; The Product-based approach; The User-based approach; The Manufacturing-based approach and The value-based approach.


 **Bird's-eye view:**

Quality management includes all the activities that organizations use to direct, control, and coordinate quality.

respect to the system and its performance. Quality control, quality assurance and quality improvement are the three main components of quality management. Quality management focuses not only on product quality, but also on the means to achieve it. Quality management, therefore, uses quality assurance and the control of processes as well as products to achieve more consistent quality.

■ IMPORTANT QUALITY TERMS

- **Quality improvement** can be distinguished from quality control in that quality improvement refers to purposeful change of a process to improve the reliability of achieving an outcome.
- **Quality control** is the ongoing effort to maintain the integrity of a process to maintain the reliability of achieving an outcome.
- **Quality assurance** is the planned or systematic action necessary to provide enough confidence that a product or service will satisfy the given requirements of quality.

 **Bird's-eye view:**

QA and QC both are part of Quality Management however QA is focusing on preventing defect while QC is focusing on identifying the defect.

Quality Control vs Quality Assurance

Quality control is product-oriented and focuses on defect identification. It deals with adherence to requirements. It refers to quality-related activities associated with the creation of project deliverables and are performed after the product is developed. Quality control is used to verify pf deliverables are of acceptable quality and that they are complete and correct. Examples of quality control activities include inspection, deliverable peer reviews, and testing process.

Quality assurance is process-oriented and focuses on defect prevention. It is generic and does not concern the specific requirements of the product being developed. It refers to the process used to create the deliverables, and can be performed by a manager, client, or even a third party reviewer. Quality assurance activities are determined before production work begins and these activities are performed while the product is being developed. Examples of quality assurance include process checklists, project audits and methodology, and standards development. Table 1.1 provides the differences between quality control and quality assurance.

Table 1.1 *Quality Control vs Quality Assurance*

Quality Control	Quality Assurance
It is a set of activities for ensuring quality in products. The activities focus on identifying defects in the actual products produced.	It is a set of activities for ensuring quality in the processes by which products are developed.
It aims to identify and correct defects in the finished product and is a reactive process.	It aims to prevent defects with a focus on the process used to make the product. It is a proactive quality process.
The goal is to identify defects after a product is developed and before it is released.	The goal is to improve development and test processes so that defects do not arise when the product is being developed.
Finding and eliminating sources of quality problems through tools and equipment so that customer's requirements are continually met.	It establishes a good quality management system and conducts assessment of its adequacy and periodic conformance audits of the operations of the system

(Continued)

Table 1.1 (Continued)

Quality Control	Quality Assurance
The activities or techniques used to achieve and maintain the product quality, process, and service.	Prevention of quality problems through planned and systematic activities including documentation is done.
It is usually the responsibility of a specific team that tests the product for defects.	All team members involved in developing the product are responsible for quality assurance.
It is a corrective tool	It is a managerial tool.
Statistical quality control (SQC) is a part of quality control.	Statistical process control is a part of quality assurance.
Validation/Software testing is an example of quality control.	Verification is an example of quality assurance.

■ IMPORTANCE OF QUALITY

The quality of goods and services can impart a competitive edge to an organization. The importance of quality is stated in the sentence—“No quality, no sales. No sale, no profit. No profit, no jobs.” The role of quality needs no further emphasis because it is the key to success in business and for the achievement of customer satisfaction. Today “quality” is the watchword for the survival and growth of any organization in the global business environment. Quality increases profits in addition to enhancing the image of the company. Things done right 99.9% of the time means:

- One hour of unsafe drinking water per month
- Two unsafe landings at O’Hare Airport each day
- 16,000 lost pieces of mail per hour
- 20,000 incorrect drug prescriptions per year
- 500 incorrect surgical operations per week
- 50 newborn babies dropped each day by doctors
- 22,000 cheques per hour deducted from wrong accounts
- 32,000 missed heartbeats per person each year

Box 1.1 discusses how quality initiatives taken at HCL Infosystems enable the company to fulfill its mission of providing world-class information technology solutions and services to its customers.

Box 1.1 Quality at HCL Infosystems Ltd

HCL Infosystems is India’s premier IT services, solutions, and distribution company enabling organizations to attain and sustain competitive advantage by leveraging information and communication technologies. It is a leader in IT services and solutions with a comprehensive portfolio of capabilities spanning IT and system integration services, digitally-enabled learning, career development solutions, value-added distribution of technology, and mobility products. The philosophy of quality at HCL Infosystems is as follows:

We shall deliver defect-free products, services, and solutions to meet the requirements of our external and internal customers, the first time, and every time.

Bird’s-eye view:

Quality is associated with consistency. A client who is satisfied and happy with the first buying experience needs and wants to be equally happy on each further occasion. Or even happier.

HCL's pursuit of quality in all its endeavours is one of the key elements behind its success in the global marketplace. Quality journey began at HCL Infosystems in the late 1980s. It believes in the total quality management philosophy as a means for continuous improvement and customer satisfaction. Its concept of quality addresses people, processes, and products. The tryst for continuous quality improvement is never-ending in HCL Infosystems. The organization strives to maintain high-quality standards, to fulfill their mission to provide world-class information technology solutions and services, and to enable to serve their customers better.

HCL Infosystems received the prestigious CMMI (Capability Maturity Model Integration) Maturity Level 5 certification for its Jaipur Development Centre (JDC).

At the World Congress, the company won global awards for excellence in quality management and leadership. Speaking on the occasion, Anand Prakash, Vice President—Quality commented, 'We are honoured to be felicitated by the World Quality Congress awards, which recognizes world-class standards of quality attained by organizations across India. The award recognizes our commitment to create an enabling environment for HCL Infosystems to attain and sustain the highest standards of quality and services levels for our customers and partners.'

Source: www.hcl.com, last accessed in February 2016.

■ QUALITY AND PROFIT

Listen to the president of a specialty casting manufacturing company: "Our scrap and rework costs this year were five times our profit. Because of those costs, we have had to increase our selling price and we subsequently lost market share. Quality is no longer a technical issue; it is a business issue."

The above statement reveals that quality improves the image of a company in the market. Earlier quality was a technical issue mainly dependent on inspection. But today, quality needs to be integrated with the system. Therefore, quality is gradually becoming a strategic issue given its direct link to profit.

Bird's-eye view:

Quality is fitness for use. Fitness for use is achieved through two components: product features and freedom from deficiencies.

Fitness for use is achieved through two components: product features and freedom from deficiencies. Product features in manufacturing industries cover performance, reliability, durability, ease of use, serviceability, aesthetics, options, reputation, etc. In service industries, they cover accuracy, timeliness, completeness, friendliness, courtesy, anticipation of customer needs, aesthetics, the service provider's knowledge and reputation, etc. Product features have a major effect on sales income through market share and premium prices and include the quality of design. Improving the quality of design generally leads to higher costs.

Freedom from deficiencies in manufacturing industries covers freedom from defects and errors in the product at the time of delivery and servicing. Similarly, in service industries, it means freedom from errors during the initial and future service transactions. Both also include error-free billing and other business processes. Freedom from deficiencies has a major impact on costs through lower waste, lower warranty costs and lower cycle times. Freedom from deficiencies refers to the quality of conformance. Increasing the quality of conformance usually results in lower costs. In addition, greater conformance means fewer complaints and, therefore, increased customer satisfaction.

Figure 1.1 shows how product features and freedom from deficiencies integrate and lead to higher profit.

The approach taken by quality management for product features on the one hand and freedom from deficiencies on the other is characterized by dramatic differences. The former is proactive, while the latter is reactive. Managers, who are adept at one, need not necessarily

Fig. 1.1 Quality and Profit



excel in the other. There are dramatic differences within the manufacturing as well as the service industries, for example, assembly versus chemicals in the former and healthcare versus banking in the case of the latter.

DISCUSSION FORUM

1. Discuss why it is important to study matter.
2. Discuss the three levels of quality.
3. Define quality.
4. Discuss the different types of quality in small groups.

TYPES OF QUALITY

In order to produce goods and services of consistent quality and costs, three types of quality are recognized.² They are as follows:

1. Quality of design
2. Quality of conformance
3. Quality of performance

1. Quality of Design

The quality of design is based on the use of market research to identify the product characteristics which connote quality to customers. Quality of design begins with consumer

Bird's-eye view:

Quality of design, quality of conformance and quality of performance are required to produce goods and services of consistent quality and costs. As quality improves profit increases.