CHAPTER 8

BOOK COMPANION

Quality management became imperative for the manufacturing sector in the 1970s and 1980s, for service organizations in the 1980s and 1990s, and, finally, for the healthcare industry in the 1990s, culminating with the Institute of Medicine report *To Err Is Human*. This report detailed alarming statistics on the number of people harmed by the healthcare system and called for major improvement in the quality of healthcare as related to patient safety. The report recognized the need for systemic changes and called for innovative solutions to ensure improvement.

The healthcare industry is facing increasing pressure not only to increase quality but also to reduce costs. This chapter provides an introduction to quality management tools and techniques that are available and being used successfully by healthcare organizations. Chapter 8 covers the following major topics:

- Defining quality
- The costs of quality
- Quality programs including TQM/CQI, ISO 9000, the Baldrige criteria, and Six Sigma
- Six Sigma tools and techniques, including the DMAIC process, the seven basic quality tools, statistical process control, and process capability
- Other quality tools and techniques including quality function deployment, Taguchi methods, and poka-yoke

After completing this chapter, the reader should have a basic understanding of quality, quality programs, and quality tools. This understanding should enable readers to use the tools and techniques to begin improving quality in their organizations.

The author invites readers’ comments, recommended readings, website suggestions, or
any other material to be added to this webpage for this chapter or any other chapters. Please click here to send an e-mail. Be sure to include “Healthcare Operations Management, 2nd edition” in the subject line.

**Downloadable Resources**

*PowerPoint Slides for Chapter 8*

To access a PowerPoint presentation covering the key points of Chapter 8, click on the icon below to open/close the attachments panel:

![HC Ops 2 slides - Chapter 8.ppt](http://example.com)

**Excel Templates**

*SPC Charts*

Statistical process control (SPC) is a statistics-based methodology for determining when a process is moving “out of control.” All processes have variation in output. Some of the variation is caused by factors that can be identified and managed (assignable or special), and some of the variation is inherent in the process (common). SPC is aimed at discovering variation resulting from assignable causes so that adjustments can be made and “bad” output is not produced.

In SPC, samples of process output are taken over time, measured, and plotted on a control chart. From statistics theory, the sample means will follow a normal distribution. From the central limit theorem, 99.7 percent of sample means will be within $+/- 3$ standard errors of the overall mean and 0.3 percent will be outside those limits. A sample mean outside the $+/- 3$ standard error limits will be obtained only 3 times out of 1,000 if the process is working as it should. These $+/- 3$ standard error limits are the control limits on a control chart.

To access a template for quality control, click on the icon below to open/close the
The template contains mean charts, a range chart, a p chart, a c chart, process capability measurement, and a normal distribution.

**Quality Function Deployment**

Quality function deployment (QFD) is a structured process for identifying customer needs and wants and translating them into a product or process that meets those needs. The tool is most often used in the development phase of a new product or process, but also can be used to redesign an existing product/process. Typically, it will be found in a Design for Six Sigma (DFSS) project, where the goal is to design the process to achieve Six Sigma results. The QFD process uses a matrix called the *house of quality* to organize data in a usable fashion. To access a template for a QFD exercise, click on the icon below to open/close the attachments panel:

![Ch. 8 QFD Template.xls](image)

**Examples and Problem Data from the Text**

Chapter 8 contains a number of examples and problems. They are featured in the files attached to this PDF. Click on the icons to access them:

- Riverview Drug Prescription Process Map (You need Visio software to open this file.):
• Riverview Clinic Wait Time QC Example:

![RV clinic QC.xls]

• Turnaround Time, Problem 1, Data:

![Problem1 TAT data.xls]

• Riverview Customer Satisfaction, Problem 2, Data:

![Problem2 Riverview CS data.xls]

**Websites of Interest**

The quality movement in the United States and around the world has gained substantial momentum as can be seen by the extensive array of websites devoted to advancing this science. The authors have selected the following sites as excellent examples.

**Videos (available online)**

- [National Campaign Aims to Curb Hospital Mistakes](#)—PBS NewsHour with Jim Lehrer on the 100,000 Lives Campaign
- [The Original Dr. Deming Style Red Bead Experiment](#)—This training video accompanies a training product available from this site. It also provides an introduction to TQM. See Chapter 2 for links to more Deming videos.

**Podcasts (Audiocasts)**

- [Diagramming Processes for Six Sigma](#)—a presentation of the various functions in Visio that can be used in Six Sigma; from Microsoft
**Software**

Students and working professionals engaged in quality improvement work will find these software packages useful. All these packages have a limited time free trial use.

**StatTools**—an Excel add-in for statistical analyses.

**Minitab**—fairly inexpensive spreadsheet-based statistical software that can perform more powerful statistical analyses than Excel

**Microsoft Visio**—process mapping software

**Tools**

Specific Six Sigma tools are also available online:

**Plan-Do-Study-Act (PDSA) Worksheet (IHI Tool)**

**SERVQUAL**—description of the SERVQUAL instrument for measuring perceptions of service quality and links to other resources

**Tutorials**

To use Six Sigma tools effectively, some practice is necessary. These tutorials provide exercises to build skills.

**Microsoft Visio**—from Microsoft

**Seven Basic Quality Tools**—an overview of the seven tools; from ASQ

**PDCA**—In this interactive exercise, students organize process improvement steps following the PDCA model.

**Six Sigma DMAIC Roadmap**—an extensive discussion with links to tools and other resources related to each step

**Statistical Process Control (SPC) Resource Center**—an overview with links to other resources

**Statistical Process Control (SPC)—A Wayworld Tutorial**—an introduction to the basics of SPC
What is Process Capability?—a fairly technical tutorial from NIST

Process Capability Analysis—answers to common questions about process capability

Yield the Right Way—explanation of rolled throughput yield

Benchmarking—overview from ASQ

Demonstrations

Process Capability Index—applet demonstrating Cp and Cpk

Taguchi Loss Function—applet demonstrating the Taguchi Loss Function

Data Sources

A key element in quality improvement is benchmarking. Here is a useful resource.

Association for Benchmarking Health Care

Philosophies/Programs/People

Philosophies/Programs

The quality movement has a number of programs committed to advancing this science. Here are selected links:

Malcolm Baldrige National Quality Award—overview from ASQ

ISO 9000 and Other Standards—overview from ASQ

Six Sigma—overview from ASQ

iSixSigma.com—Links to a variety of resources to help business professionals successfully implement quality in their organizations. Resources include short descriptive articles, checklists, forms, and links to other useful websites.
People

Many individuals have advanced the quality movement in the United States and Japan. Here are links to related websites.

Crosby, Phillip B., more on Crosby

Garvin, David A.

Ishikawa, Kaoru, more on Ishikawa

Juran, Joseph, more on Juran

Taguchi, Genichi

List of Organizations

Organizations

The following organizations have made quality improvement their primary mission.

American Productivity and Quality Center (APQC)

American Society for Quality (ASQ)

Baldrige National Quality Program (BNQP)

Institute for Healthcare Improvement (IHI)

Institute of Medicine (IOM)

International Organization for Standardization (ISO)

Midwest Business Group on Health (MBGH)

Additional Readings

Case Studies (available online)

Healthcare Related Quality Case Studies—from ASQ

Six Sigma Practices—from Healthcare Informatics online

The Promise of Six Sigma—from Creative Healthcare USA
Improving Communication and Documentation Concerning Preliminary and Final Radiology

Reports—from NAHQ

Articles

Cost of Quality (COQ)—overview from ASQ

Revamping Healthcare Using DMAIC and DFSS—article contrasting DMAIC with DFSS

The Essential Six Sigma—overview of Six Sigma and a discussion of how successful implementation can improve the bottom line

Six Sigma Program Success Factors—Six Sigma philosophy says it is necessary to determine key input variables in a process to manage and optimize the process output. This article outlines key factors for successful Six Sigma program implementation.

Process Capability: Understanding the Concept—analogy to aid in understanding this concept

Road Map for Quality Improvement: A Guide for Doctors—short article presenting the essentials of quality improvement that every physician should know

Mistake-Proofing the Design of Health Care Processes is a synthesis of practical examples from the real world of healthcare on the use of process or design features to prevent medical errors or the negative impact of errors. It contains over 150 examples of mistake-proofing that can be applied in health care—and in many cases relatively inexpensively. From AHRQ.

Reports

Crossing the Quality Chasm Slide Set—PowerPoint slides related to the Institute of Medicine’s report Crossing the Quality Chasm: Health Care for the 21st Century
Books (available online)


Books (links to sources referenced in Chapter 8)