

CONTENTS

Preface	xi
Acknowledgments	xv
About the Author	xix

SECTION I QUALITY BASICS 1

Chapter 1	Introduction to Quality	3
	Chapter Objectives	3
	Why Study Quality?	4
	History of Quality	4
	The Definition of Quality	4
	Modern Definitions of Quality	5
	Product Quality	7
	Service Quality	8
	Different Approaches to Defining Quality	9
	Five Approaches to Defining Quality	10
	Major Contributors to Our Understanding of Quality	11
	Summary	19
	Quality Definitions	20
	Discussion Questions	20
	Case Study 1.1: The Battle of the Gurus	21
	Exercises and Activities	22
	Supplementary Readings	23
	References	23
Chapter 2	Strategic Quality Management and Operationalizing Quality	25
	Chapter Objectives	25
	Strategic Quality Management	26
	The Strategic Planning Process	28
	Strategic Deployment	31
	Evaluation and Control	31
	Approaches to Monitoring Progress toward Strategic Goals	33
	Dimensions, Measures, and Metrics	34
	Methods of Obtaining Input from Customers	39
	Focus Groups	40
	Surveys	42
	Focus Groups and Surveys in Combination	43
	Summary	43
	Discussion Questions	43
	Problems	44

Case Study 2.1: Second National Bank	47
Exercises and Activities	48
Supplementary Readings	49
References	49
SECTION II QUALITY OF DESIGN	51
Chapter 3 Designing Quality into Products and Services	53
Chapter Objectives	53
The Seven Management Tools	54
Quality Function Deployment	57
Design for Six Sigma	59
Taguchi Robustness Concepts	60
Reliability	60
Types of Reliability Systems	61
Reliability Life Characteristic Concepts (e.g., Bathtub Curve)	67
Mean Time Between Failures	69
Modeling Product Life with Normal Distribution	71
Risk Assessment Tools and Risk Prevention	72
Failure Mode and Effects Analysis	73
Fault Tree Analysis (FTA)	76
Error Proofing	77
Summary	78
Discussion Questions	78
Problems	79
Case Study 3.1: Building the Better Mouse	82
Exercises and Activities	82
Supplementary Readings	83
References	83
Chapter 4 Innovation and Creativity in Quality	85
Chapter Objectives	85
Breakthrough (Radical) Improvement versus Incremental Improvement	86
Increasing Creativity	88
Organizational versus Individual Creativity	91
Designing the Innovative Organization	91
Elements of a Creative Organization	92
Tools and Techniques for Increasing Organizational Creativity	95
Increasing Individual Creativity	95
Myths about Individual Creativity	95
The Importance of Technological Forecasting	96

Summary	99
Discussion Questions	99
Case Study 4.1: Smallburg Community Bank	100
Exercises and Activities	100
Supplementary Readings	102
References	102

SECTION III QUALITY SYSTEMS TO ASSURE CONFORMANCE TO DESIGN

105

Chapter 5 Quality Systems and Quality Systems Auditing	107
Chapter Objectives	107
Quality Management Systems	108
Elements of a Quality Management System	108
ISO 9000	109
ISO/TS 16949 and QS-9000	111
Malcolm Baldrige National Quality Award (MBNQA)	117
Other Approaches	118
Six Sigma	119
Quality Auditing	120
Specific Types of Quality Audits	120
Performing a Quality System Audit	122
Quality Information Systems	123
Data Accuracy and Security	124
Quality Documentation Systems	126
Making Data Useful—Information Flows	128
Summary	129
Discussion Questions	129
Case Study 5.1: The First Audit	130
Exercises and Activities	131
Supplementary Readings	132
References	132
Chapter 6 Product, Process, and Materials Control	135
Chapter Objectives	135
Work Instructions	136
Classification of Quality Characteristics and Defects	138
Identification of Materials and Status	140
Lot Traceability	141
Materials Segregation Practices	142
Materials Review Board Criteria and Procedures	143
Supplier Management	145
Supplier Selection	146

Supplier Evaluation	147
Summary	148
Discussion Questions	148
Case Study 6.1: The Case of the Missing Lot	149
Exercises and Activities	150
Supplementary Readings	150
References	150
 Chapter 7 Experimental Design	153
Chapter Objectives	153
Basic Concepts and Definitions	155
Experimental Design Characteristics	158
Types of Design	159
Single-Factor Design	159
One-Factor-at-a-Time Design	159
Full-Factorial Design	161
Fractional Factorial Design	163
Analysis of Results	164
Taguchi Methods of Experimental Design	167
Summary	170
Discussion Questions	170
Problems	171
Case Study 7.1: The Case of the Variable Laminates	173
Exercises and Activities	174
Supplementary Readings	176
References	176
 SECTION IV CONTROL AND IMPROVEMENT OF QUALITY	177
 Chapter 8 Quality Improvement Tools	179
Chapter Objectives	179
The Problem-Solving Process	180
The Seven Tools of Quality	182
Approaches to Continuous Quality Improvement	193
PDSA	194
DMAIC	194
Benchmarking	195
Summary	197
Discussion Questions	197
Problems	198
Case Study 8.1: Sour Grape Ice Cream	201
Case Study 8.2: The Westover Wire Works	202

Exercises and Activities	206
Supplementary Readings	209
References	209
Chapter 9 Metrology, Inspection, and Testing	211
Chapter Objectives	211
Metrology	212
Types of Gauges	213
Accuracy and Precision	216
Nondestructive Testing and Evaluation	223
Summary	223
Discussion Questions	224
Problems	224
Case Study 9.1: Somebody's Got a Problem	227
Exercises and Activities	227
Supplementary Readings	228
References	228
Chapter 10 Statistical Process Control	229
Chapter Objectives	229
SPC and Variation	230
Types of Data	231
Variables Control Charts	231
Concept of the Control Chart	232
Out of Control Signals	233
Patterns Leading to Modifying Control Limits	234
Constructing Variables Control Charts	236
x-Bar and Range Charts	237
x-Bar and s-Charts	241
Individual/Moving Range Charts	244
A Special Form of the x-bar Control Chart for Short Production Runs	246
Attributes Control Charts	249
Control Charts for Nonconforming Units	250
Control Charts for Nonconformities (Defects)	253
Process Capability	257
Summary	262
Discussion Questions	262
Problems	263
Case Study 10.1: Middle County Hospital	270
Case Study 10.2: Precise Molded Products, Inc.	274
Exercises and Activities	278
Supplementary Readings	279
References	279

Chapter 11	Acceptance Sampling	281
	Chapter Objectives	281
	When Acceptance Sampling is Appropriate	281
	Fundamentals of Sampling Theory	283
	Assessing Risk in Sampling Plans	284
	Methods of Sampling	289
	Sampling Types	291
	Sampling Plans	292
	Sampling Inspection by Attributes	292
	Sampling Inspection by Variables	301
	Dodge-Romig Sampling Plans	304
	Summary	306
	Discussion Questions	306
	Problems	307
	Case Study 11.1: The Turkell Stud Mill	308
	Exercises and Activities	309
	Supplementary Readings	310
	References	310
Chapter 12	Quality Costs	311
	Chapter Objectives	311
	The Categories of Quality Costs	312
	The Goal of a COQ System	315
	COQ Data Collection, Interpretation, and Reporting	318
	Integrating Quality Costs into the Quality Improvement System	321
	Summary	324
	Discussion Questions	324
	Problems	325
	Case Study 12.1: HI-HO YO-YO, Inc.	327
	Case Study 12.2: Acme, Ltd.	330
	Exercises and Activities	330
	Supplementary Readings	330
	References	331
SECTION V QUALITY MANAGEMENT		333
Chapter 13	Human Factors in Quality	335
	Chapter Objectives	335
	Barriers to Quality Improvement Efforts	336
	Human Resource Management	336
	Motivation Theories	337

Integration of the Classic Motivational Theories	339
Process Theories of Motivation	340
Employee Involvement and Teams	340
The Care and Feeding of Teams	341
Organization and Implementation of Quality Teams	341
Principles of Team Leadership and Facilitation	342
What is a Team?	342
Who Makes up a Team?	342
Roles and Responsibilities of the Team Leader	343
Selecting Team Members	346
Roles and Responsibilities of the Team Members	346
Roles and Responsibilities of the Facilitator	347
Critical Action Items in the Team Life Cycle	347
What Is a Team Charter?	347
General Information and Guidelines for Teams	351
Team Dynamics Management and Conflict Resolution	352
Stages of Group Development	354
Forming	354
Storming	355
Norming	356
Performing	357
Creating a Win-Win Situation	358
Consensus	358
Professional and Ethical Standards	361
Summary	362
Discussion Questions	363
Case Study 13.1: Tom's Team	363
Case Study 13.2: Self Directed Work Teams at BHI	364
Exercises and Activities	368
Supplementary Readings	368
References	369
Appendix A Table of Four-Digit Random Numbers	371
Appendix B Standard Normal Distribution Table	373
Bibliography	375
Index	385