Contents

Preface xvii

PART 1	PRINCIPLES OF QUALITY 1
	Chapter 1 Introduction to Quality 3
	QUALITY PROFILES: Motorola, Inc. and MidwayUSA 5
	Defining Quality 6 Transcendent (Judgmental) Perspective 6 Product Perspective 7 Value Perspective 7 Manufacturing Perspective 8 Customer Perspective 8 Integrating Quality Perspectives in the Value Chain 9 History of Quality Management 10 The Age of Craftsmanship 11 The Early Twentieth Century 12 Post-World War II 13 The U.S. "Quality Revolution" 13 Early Successes 14 From Product Quality to Total Quality Management 15 Management Failures 16 Performance Excellence 16 Emergence of Six Sigma 17 Current and Future Challenges 17
	Quality in Manufacturing 19 Manufacturing Systems 19
	Quality in Service Organizations 23 Contrasts with Manufacturing 23 Components of Service Quality 24 Quality in Business Support Functions 26 Quality and Competitive Advantage 27
	Quality and Business Results 29 Quality and Personal Values 30
	Summary of Key Points and Terminology 30
	QUALITY IN PRACTICE: The Evolution of Quality at Xerox

QUALITY IN PRACTICE: Quality Practices in Modern China 36 Review Questions 37 Discussion Questions 38 Projects, Etc. 39 Skilled Care Pharmacy 40 Chelsey's Restaurant 41 Deere & Company 42 Notes 44 Chapter 2 Foundations of Quality Management 47 Texas Nameplate Company, Inc. and MEDRAD 48 The Deming Philosophy 49 Deming's 14 Points 50 Profound Knowledge 55 The Juran Philosophy 60 The Crosby Philosophy 63 Comparing Deming, Juran, and Crosby 64 Other Quality Philosophers 64 A. V. Feigenbaum 65 Kaoru Ishikawa 65 Principles, Practices, and Techniques of Quality Management 66 Quality Management Principles 66 Quality Management Practices 67 Quality Management Techniques 67 Variation and Statistical Thinking 70 Understanding Variation 70 Deming's Red Bead and Funnel Experiments 72 Quality Management Systems 78 ISO 9000 Family of Standards 79 Building Effective Quality Management Systems 83 Summary of Key Points and Terminology 83 QUALITY IN PRACTICE: Bringing Quality Principles to Life at KARLEE 84 QUALITY IN PRACTICE: ISO 9000 and Sears' Quality Management System Review Questions 86 Discussion Questions 87 Projects, Etc. 89 The Disciplinary Citation 89 Santa Cruz Guitar Company 90 Walker Auto Sales and Service 91 The Quarterly Sales Report 91 Notes 92

Chapter 3 Customer Focus 95 Park Place Lexus and K&N Management 97 Customer Satisfaction and Engagement 98 The American Customer Satisfaction Index 99 Identifying Customers 100 Customer Segmentation 101 Understanding Customer Needs 102 Quality Dimensions of Goods and Services 103 The Kano Model of Customer Requirements 105 Gathering the Voice of the Customer 106 Analyzing Voice of the Customer Data 109 Linking Customer Needs to Design, Production, and Service Delivery 111 Building a Customer-Focused Organization 113 Customer Commitments 114 Customer Contact and Interaction 114 Selecting and Developing Customer Contact Employees 115 Service Recovery and Complaint Management 116 Managing Customer Relationships 119 Strategic Partnerships and Alliances 119 Customer-Focused Technology 119 Measuring Customer Satisfaction and Engagement 120 Designing Satisfaction Surveys 121 Analyzing and Using Customer Feedback 125 Why Many Customer Satisfaction Efforts Fail 129 Measuring Customer Loyalty 129 Summary of Key Points and Terminology 131 QUALITY IN PRACTICE: Harley-Davidson 131 Unique Online Furniture, Inc. 133 Review Questions 136 Discussion Questions 137 Problems 138 Projects, Etc. 141 Rosie's Pizzeria 142 Pauli's Restaurant and Microbrewery 143 First Internet Reliable Bank 144 Gold Star Chili: Customer and Market Knowledge 146 Notes 147 Workforce Focus Chapter 4 151

QUALITY PROFILES: Veterans Affairs Cooperative Studies Program Clinical Research Pharmacy Coordinating Center and PRO-TEC Coating Company 153

The Evolution of Workforce Management 154

High Performance Work Culture 155 Principles of Workforce Engagement and Motivation 158 Workforce Engagement 158 Employee Involvement 161 Motivation 162 Designing High-Performance Work Systems 164 Work and Job Design 165 Empowerment 167 Teamwork 169 Workplace Environment 175 Workforce Learning and Development 176 Compensation and Recognition 178 Performance Management 181 Assessing Workforce Effectiveness, Satisfaction, and Engagement 184 Measuring Workforce Engagement 186 Sustaining High-Performance Work Systems 187 Workforce Capability and Capacity 187 Summary of Key Points and Terminology 189 QUALITY IN PRACTICE: Training for Improving Service Quality at Honda 189 QUALITY IN PRACTICE: Improving Employee Retention Through Six Sigma 192 Review Questions 194 Discussion Questions 195 Projects, Etc. 197 The Dysfunctional Manager 197 Golden Plaza Hotel 198 The Hopeful Telecommuter 199 Nordam Europe, Ltd. 199 Notes 201 Chapter 5 Process Focus 205 Honeywell Federal Manufacturing & Technologies and Boeing Aerospace Support 207 Process Management 208 Identifying Processes and Requirements 209 Value-Creation Processes 209 Support Processes 210 Process Requirements 211 Process Design 213 Process Mapping 214 Process Design for Services 216 Design for Agility 218 Mistake-Proofing Processes 219 Process Control 221

Process Control in Manufacturing 223 Process Control in Services 224 Process Improvement 226 Continuous Improvement 228 Breakthrough Improvement 232 Managing Supply Chain Processes 234 Supplier Certification 235 Summary of Key Points and Terminology 236 K&N Management, Inc. 236 Building Japanese Quality in North America 239 **Review Questions** 240 Discussion Questions 241 Problems 243 Projects, Etc. 244 The State University Experience 245 Gold Star Chili: Process Management 246 IBM's Integrated Supply Chain 247 Notes 248

PART 2 TOOLS AND TECHNIQUES FOR QUALITY 251

Chapter 6 Statistical Methods in Quality Management 253 QUALITY PROFILES; Graniterock Company and Branch-Smith Printing Division 254 Basic Probability Concepts 255 Probability Distributions 259 Discrete Probability Distributions 259 Continuous Probability Distributions 262 Normal Distribution 263 Exponential Distribution 267 Statistical Methodology 268 Sampling 270 Descriptive Statistics 271 Statistical Analysis with Microsoft Excel 274 The Excel Descriptive Statistics Tool 274 The Excel Histogram Tool 275 Frequency Distribution and Histogram Spreadsheet Template 278 Statistical Inference 278 Sampling Distributions 279 Confidence Intervals 281 Hypothesis Testing 283 Analysis of Variance (ANOVA) 288 Regression and Correlation 289

Design of Experiments 290 Summary of Key Points and Terminology 296 Improving Quality of a Wave Soldering Process Through Design of Experiments 297 Applying Statistical Analysis in a Six Sigma Project at GE Fanuc 299 Review Questions 301 Problems 302 Projects, Etc. 305 Sizzlegrill Burrito House 305 Berton Card Company 306 The Battery Experiment 307 Notes 308 Design for Quality and Product Excellence Chapter 7 309 QUALITY PROFILES: Spicer Driveshaft and Poudre Valley Health System 310

Product Development 311 Concurrent Engineering 313 Design for Six Sigma 313 Concept Development and Innovation 315 Detailed Design 316 Quality Function Deployment 317 Target and Tolerance Design 325 The Taguchi Loss Function 328 Using the Taguchi Loss Function for Tolerance Design 333 Design for Reliability 334 Mathematics of Reliability 335 System Reliability 340 Design Optimization 344 Design Failure Mode and Effects Analysis 345 Fault Tree Analysis 350 Design for Manufacturability 350 Design and Environmental Responsibility 351 Design for Excellence 353 Design Verification 353 Design Reviews 354 Reliability Testing 354 Summary of Key Points and Terminology 355 QUALITY IN PRACTICE: Testing Audio Components at Shure, Inc. 355 Applying QFD in a Managed Care Organization 357 **Review Questions** 360

Problems 361

Contents

Projects, Etc. 365 CASES The Elevator Dilemma 366 Applying Quality Function Deployment to a University Support Service 366 Black Elk Medical Center 369 370 Notes 373

Measuring and Controlling Quality Chapter 8

QUALITY PROFILES: MESA Products, Inc. and Operations Management International, Inc. 374 Measurement for Quality Control 375 Common Quality Measurements 377 Cost of Quality Measures 382 Measurement System Evaluation 385 Metrology 386 Calibration 387 Repeatability and Reproducibility Analysis 389 Process Capability Measurement 393 Process Capability Indexes 397 Process Performance Indexes 401 Pre-Control 401 Statistical Process Control 403 Patterns in Control Charts 404 Control Charts for Variables Data 409 Constructing x- and Д-Charts 409 Process Monitoring and Control 411 Estimating Process Capability 411 Case Study: La Ventana Window Company 411 x- and s-Charts 418 Charts for Individuals 419 Control Charts for Attributes Data 423 Fraction Nonconforming (p) Chart 424 p-Charts with Variable Sample Size 425 ир-Charts for Number Nonconforming 428 Charts for Nonconformances 431 c-Charts 433 u-Charts 433 Summary of Control Chart Construction 436 Implementing Statistical Process Control 438 Basis for Sampling 439 Sample Size 439 Sampling Frequency 439 Location of Control Limits 440 Practical Guidelines 440

Summary of Key Points and Terminology 441 QUALITY IN PRACTICE: Using a u-Chart in a Receiving Process 441 QUALITY IN PRACTICE: Applying SPC to Pharmaceutical Product Manufacturing 444 Review Questions 448 Problems 448 CASES Control of TFE's at Hallenvale Hospital 454 Morelia Mortgage Company 455 Montvalley Short-Haul Lines, Inc. 456 Skyhigh Airlines 458

Notes 459

Chapter 9 Process Improvement and Six Sigma 461

QUALITY PROFILES: Iredell-Statesville Schools and Caterpillar Financial Services Corporation 462

Process Improvement Methodologies 463 The Deming Cycle 463 Creative Problem Solving 467 Custom Improvement Methodologies 467 **DMAIC 468** Six Sigma 469 Evolution of Six Sigma 469 Principles of Six Sigma 471 The Statistical Basis of 3.4 DPMO 471 Implementing Six Sigma 474 Project Management and Organization 475 Selecting Six Sigma Projects 476 Using the DMAIC Process 479 DMAIC Tools and Techniques 479 Define 482 Measure 485 Analyze 489 Improve 494 Control 495 Lean Tools for Process Improvement 495 Lean Six Sigma 498 Lean Six Sigma in Services 499 Summary of Key Points and Terminology 501 QUALITY IN PRACTICE: An Application of Six Sigma to Reduce Medical Errors 501

QUALITY IN PRACTICE: Applying Process Improvement Tools to an Order Fulfillment Process 503

Contents xiii

Review Questions 506 Discussion Questions 506 Problems 507 Projects, Etc. 510 **CASES** LT, Inc. 510 Rockstone Tires 514 Janson Medical Clinic 514 Freadilunch Restaurant 515 Notes 516

PART 3 BEYOND QUALITY MANAGEMENT: MANAGING FOR PERFORMANCE EXCELLENCE 519

Chapter 10 The Baldrige Framework for Performance Excellence 521

QUALITY PROFILES: Heartland Health and the Cedar Foundation 525

The Criteria for Performance Excellence 526

Criteria Evolution 532 The Baldrige Award Process 533 Using the Baldrige Criteria 535 Impacts of the Baldrige Program 536 Baldrige and the Deming Philosophy 537

International Quality and Performance Excellence Programs 538

European Quality Award 538 Canadian Awards for Business Excellence 539 Australian Business Excellence Award 540 Quality Awards in China 541 Baldrige and National Culture 542

Baldrige, ISO 9000, and Six Sigma 543

Summary of Key Points and Terminology 548

QUALITY IN PRACTICE: Leveraging Baldrige at AtlantiCare 548

QUALITY IN PRACTICE: Branch-Smith Printing Division's Baldrige Journey 550

Review Questions 552

Discussion Questions 553

Projects, Etc. 554

CASES Triview National Bank—Understanding Key Organizational Factors 554

Triview National Bank—Assessing Customer Focus 554

Triview National Bank—Assessing Workforce Focus 555 Notes 555

Chapter 11 Strategy and Performance Excellence 557 QUALITY PROFILES: Freese and Nichols, Inc. and Premier, Inc. 559 The Scope of Strategic Planning 560 Strategy Development Processes The Baldrige Organizational Profile 564 Developing Strategies 567 Strategy Deployment 567 Hoshin Kanri (Policy Deployment) 569 Linking Human Resource Plans and Business Strategy 571 The Seven Management and Planning Tools 573 Using the Seven Management and Planning Tools for Strategic Planning 573 Organizational Design for Performance Excellence 578 Core Competencies and Strategic Work System Design 582 Summary of Key Points and Terminology 584 QUALITY IN PRACTICE: Integrating Six Sigma with Strategic Planning at Cigna 584 QUALITY IN PRACTICE: Strategic Planning at Branch-Smith Printing Division 586 Review Questions 588 Discussion Questions 589 Projects, Etc. 590 A Strategic Bottleneck 590 Clifton Metal Works 591 Triview Bank—Core Competencies and Work Systems Design 592 Triview Bank—Strategic Planning 592 Notes 592 Chapter 12 Measurement and Knowledge Management for Performance Excellence 595 Wainwright Industries, Inc. and Baptist Hospital, Inc. 596 The Value and Scope of Performance Measurement 597 The Balanced Scorecard 598 Performance Measurement in the Baldrige Criteria 601 Designing Effective Performance Measurement Systems 604 Selecting Performance Measures 605 Linking Measures to Strategy 606 Aligning Strategic and Process-Level Measurements 607 Auditing the Measurement System 609 Analyzing and Using Performance Data 610 The Role of Comparative Data 613 Performance Review 614 Managing Information Resources 615

Knowledge Management 617 Knowledge Transfer 619 Summary of Key Points and Terminology 622 QUALITY IN PRACTICE: Using the Balanced Scorecard at the United States Postal Service 622 QUALITY IN PRACTICE: Knowledge Management at ConocoPhillips 625 Review Questions 626 Discussion Questions 627 Projects, Etc. 628 CASES Coyote Community College 628 Triview Bank: Identifying Key Performance Measures 631 Triview Bank: Measurement, Analysis, and Knowledge Management 632 Notes 632 **Chapter 13** Leadership for Performance Excellence 635 QUALITY PROFILES: The Studer Group and Saint Luke's Hospital of Kansas City 636 Leadership Competencies and Practices 637 Strategic Leadership 639 Leadership Systems 641 Leadership Theory and Practice 643 Contemporary and Emerging Leadership Theories 644 New Perspectives on the Practice of Leadership 648 Leadership, Governance, and Societal Responsibilities 649 Organizational Governance 651 Societal Responsibilities 652 Summary of Key Points and Terminology 653 QUALITY IN PRACTICE: Leadership at Advocate Good Samaritan Hospital 653 QUALITY IN PRACTICE: Leadership Changes at Alcoa 656 Review Questions 658 Discussion Questions 658 Projects, Etc. 659 **CASES** Johnson Pharmaceuticals 659 Triview Bank—Leadership 660 Notes 660 Chapter 14 Building and Sustaining Quality and Performance Excellence 663

QUALITY PROFILES: Montgomery County Public Schools and the City of Coral Springs 664

xvi Contents

Organizational Culture and Change 665 Changing Organizational Culture 666 Barriers to Change 670 Strategies for Quality and Performance Excellence 671 Best Practices 671 Principles for Effective Implementation 673 The Journey Toward Performance Excellence 675 The Life Cycle of Quality Initiatives 675 Organizational Learning 678 Self-Assessment 681 Challenges in Small Organizations and Nonprofits 684 A View Toward the Future 686 Summary of Key Points and Terminology 687 QUALITY IN PRACTICE: Merging Divergent Quality Systems at Honeywell 687 QUALITY IN PRACTICE: Integrating Quality Frameworks at Veridian Homes 690 Review Questions 692 Discussion Questions 692 Projects, Etc. 692 CASES Distinguished Ad Agency 693 The Parable of the Green Lawn 694 The Yellow Brick Road to Quality 695 Notes 696

APPENDICES

- A Tables A-3
- B Factors for Control Charts A-5
- C Random Digits A-6

Bibliography B-1

Index 1-1