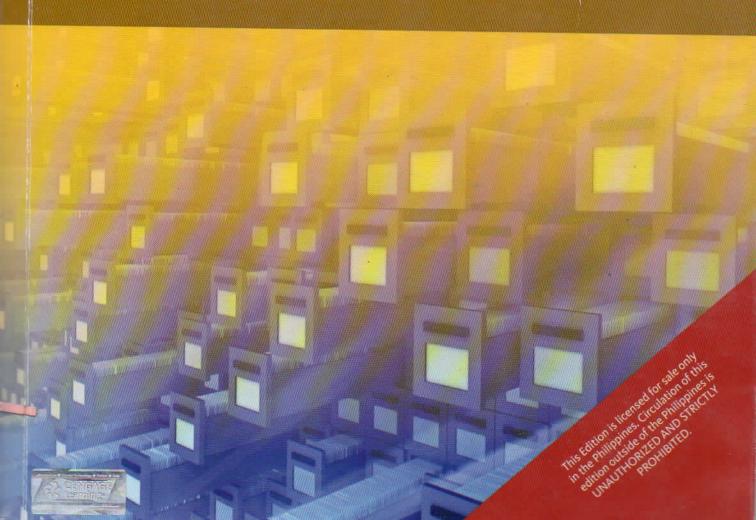


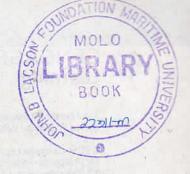
TOTAL QUALITY MANAGEMENT

Ninth Edition

James R. Evans • William M. Lindsay



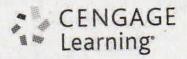




Total Quality Management

Ninth Edition

James R. Evans | William M. Lindsay



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 6 User 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 31

OUALITY IN PRACTICE: Quality Practices in Modern China 36 Review Ouestions 37 Discussion Questions 38 Projects, Etc. 39 CASES Skilled Care Pharmacv 40 Chelsey's Restaurant 41 Deere & Company 42

Notes 44

Foundations of Quality Management 47 Chapter 2

QUALITY PROFILES: 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 85

Review Questions 86

Discussion Questions 87

Projects, Etc. 89

CASES 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 S	Chapter 3	Customer	Focus	95
----------------------------	-----------	----------	-------	----

QUALITY PROFILES: 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

QUALITY IN PRACTICE: Unique Online Furniture, Inc. 133

Review Questions 136

Discussion Questions 137

Problems 138

Projects, Etc. 141

CASES 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

Chapter 4 Workforce Focus 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 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 QUALITY IN PRACTICE: Improving Employee Retention Through Six Sigma Review Questions 194 Discussion Questions 195 Projects, Etc. 197 CASES The Dysfunctional Manager 197 Golden Plaza Hotel 198 The Hopeful Telecommuter 199 Nordam Europe, Ltd. 199 Notes 201

Chapter 5 Process Focus 205

QUALITY PROFILES: 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

iv

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

QUALITY IN PRACTICE: K&N Management, Inc. 236

QUALITY IN PRACTICE: Building Japanese Quality in North America 239

Review Questions 240

Discussion Questions 241

Problems 243

Projects, Etc. 244

CASES The State University Experience 245 Gold Star Chili: Process Management 246 IBM's Integrated Supply Chain 247

Notes 248

TOOLS AND TECHNIQUES FOR QUALITY 251 PART 2

Statistical Methods in Quality Management 253 Chapter 6

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

QUALITY IN PRACTICE: Improving Quality of a Wave Soldering Process

Through Design of Experiments 297

QUALITY IN PRACTICE: Applying Statistical Analysis in a Six Sigma Project at GE Fanue 299

Review Ouestions 301

Problems 302

Projects, Etc. 305

CASES Sizzlearill Burrito House 305

Berton Card Company 306

The Battery Experiment 307

Notes 308

Design for Quality and Product Excellence Chapter 7

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

QUALITY IN PRACTICE: Applying QFD in a Managed Care Organization 357

Review Questions 360

Problems 361

Projects, Etc. 365

CASES The Elevator Dilemma 366

Applying Quality Function Deployment to a University Support Service 366

Black Elk Medical Center 369

Notes 370

Chapter 8 Measuring and Controlling Quality 373

QUALITY PROFILES: MESA Products, Inc. and Operations Management International, Inc. 374

Measurement for Quality Control 375

Cost of Ouality Measurements 377 Cost of Ouality 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 \bar{x} - and R-Charts 409 Process Monitoring and Control 411 Estimating Process Capability 411 Case Study: La Ventana Window Company 41: \bar{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 np-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 Ouestions 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

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 561

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

CASES 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

QUALITY PROFILES: 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

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

APPENDICES

A Tables A-3

Notes 696

B Factors for Control Charts A-5

C Random Digits A-6

Bibliography B-1

Index I-1

Index

the state of the s	Ad Louis and an additional lines of feeth
	Advanced Circuits, 111
ABG. See Avis Budget Group Inc. (ABG) ABM. See activity-based management (ABM)	Advocate Good Samaritan Hospital (GSAM), 525, 653-655
ABM expert, 689	Aerospace Support (AS), 207
ABM master, 689	aesthetics, as dimension of quality, 103
Absolutes of Quality Management, 63	affinity diagram, 109, 110, 573-574
absorptive capacity, 640	after-action review, 222, 223
accelerated life testing, 355	agendas, 173
Accenture, 111	agility, 218–219
accessibility, 145, 586. See also data accessibility	aging population, 18
accountability, 526, 638	Airbus, 595
accreditation agency, 82	airlines industry
accuracy, 386, 500	customer requirements for, 140
vs. precision, 387	Alcoa, 656-658
Ackoff, Russell, 56	Al Hoover/PTA Health fund, 653
ACSI. See American Customer Satisfaction Index (ACSI)	aligned values, 157
ACSI model, 100	alignment
action	defined, 670
in Deming's points, 51, 54	organizational, 478, 528, 552
in Juran's breakthrough sequence, 62	plans at Park Place Lexus, 562
actionable information, 122, 129, 317, 375	strategic and process-level measurements, 607, 608, 67
actionable measurement, 375	at Xerox, 478
actionable results, 122	Alliance for Work-Life Progress, 157
action plans, 567, 568	alliances, 119
actively disengaged employees, 186	AlliedSignal, 687-689
activity-based costing, 384	alternative hypothesis, 283
activity-based management (ABM), 687	Amalgamated Clothing and Textile Workers, 31, 33
act stage, Act, PDCA cycle, 465	Amazon.com, 26, 120, 133
actual quality, 112	American business culture, 54
ADA. See Americans with Disabilities Act (ADA)	American Customer Satisfaction Index (ACSI), 99–100, 463
ADAC Laboratories, 523, 617	indexes produced by, 99
Adams, J. Stacy, 163	model, 100
daptive learning, 228	release of, 99
djourning phase, 174	results reported by, 99
doption, quality life cycle, 675	updating of, 99

American Express	measurement, improvement and, 81, 96
billing process at, 32	measurement system, 390
change management at, 667	Pareto, 384
DMAIC at, 468	p-chart, 425
"label and link" at, 164	portfolio, 642
organizational effectiveness measures at, 468	predictive, 192
American Honda Motor Co., 189-192	quality cost accounting and, 61
American National Standards Institute (ANSI), 8, 79	regression, 192, 270
American Nurses Association, 311	repeatability, 389
American Productivity and Quality Center (APQC),	reproducibility, 389
521, 618, 619–620	and review, 680
American Quality Foundation, 671, 672	situational, 642
American Red Cross, 685	staffing, 187
American Society for Quality (ASQ), 13, 17-18, 18, 79,	statistical, 29, 49, 153, 389
99, 476, 686	SWOT, 564, 588, 642
design guidelines, 352	technical, 172, 213
DFMEA in health care, 348	tools for, 61
Honorary Members of, 65	of variance. See analysis of variance (ANOVA)
MCO membership handbook, 359	analysis of variance (ANOVA), 288
quality principles, 18–19	analyze stage, Coast Guard, 467
RRC house of quality, 368	ANOVA. See analysis of variance (ANOVA)
RRC old layout, 367	ANSI. See American National Standards Institute
severity, likelihood, and detection rating scales, 349	(ANSI)
shift, probability, 440	Apple, 4, 105, 130
U.S. Postal Service and, 624	appraisal
American Supplier Institute, Inc., 317	conventional process, 181
Americans with Disabilities Act (ADA), 630	costs, 383
Ames Rubber Corporation, 21, 523, 612	performance, 182
customer satisfaction, 20	appraiser variation (AV), 389. See also reproducibility
product development at, 20	analysis
AMFC. See Association of Management Consulting	APQC. See American Productivity and Quality Center
Firms (AMCF)	(APQC)
AMR Research, Inc., 234	A3 report, Toyota, 480-481
Analog Devices, 599	Armstrong Building Products Operations, 606
analysis, 81, 610. See also specific types	Armstrong World Industries Building Products
break-even, 333, 334	Operations, 523
data, 78-79, 208, 270	arrow diagrams, 573, 577, 578
defined, 610	Artesyn Technologies. See Zytec Corporation
fact-based, 35	Arthur Andersen, 533
fault tree. See Fault tree analysis	AS. See Aerospace Support (AS)
Hewitt's, 192–193	Asahi Shimbum, 329
importance/performance, 129	aspects of care, 225

ASQ. See American Society for Quality (ASQ) assignable causes of variation, 72 assign responsibility, 225 Association of Management Consulting Firms (AMCF), 637 assurance, dimension of quality, 104. See also quality assurance AtlantiCare, 30, 525, 548-549 healthcare and, 548 AT&T, 167, 168, 317, 615, 666 customer supplier model, 109 customer-supplier model, 100-101 quality award, 15 value-creation processes, 209-210 AT&T Consumer Communication Services, 524 AT&T Network Systems (now Lucent Technologies, Inc. Optical Networking Group), 523 attribute measurement, 377 attributes, raw, 48 attributes data, 423-436 c-chart, 435 p-chart, 430 AT&T Transmission Systems, 354 AT&T Universal Card Services, 524 audio components, testing, 355-357 Audi's TT Coupe, 328 Aussieburgers, Ltd., 449 Australian Business Excellence Award, 540-541 Australian Quality Awards. See Australian Business Excellence Award AutoCM, Inc., 362 automotive manufacturers, 29 autonomy, 166 Autoprod, Inc., 364 average range calculations, 409 Avis Budget Group Inc. (ABG), 98, 521 award programs. See also Baldrige Award; European Quality Award; Malcolm Baldrige National Quality Award Federal Quality Prototype Award, 14 axiom, 317 axiomatic design, 316

В

back-and-forth process, 680 backward chaining, 215 Bain & Company, 130 balanced participation, 175 balanced scorecard, 598-601 at IBM Rochester, 600, 601 at Pearl River School District, 599-600 perspectives of, 599 at U.S. Postal Service (USPS), 622-624 Baldrige, Malcolm, 33 Baldrige assessment, 682 Baldrige Award, 14, 15, 29. See also Malcolm Baldrige National Quality Award operational and financial results, 29-30 quality awareness, 14 recipients, 29 Baldrige Criteria for Performance Excellence, 519, 526-538, 601-604 analysis, 527 core values and concepts, 532, 670 customer focus, 527 evolution of, 532-533 impact of, 536-537 ISO 9000 and, 543-547 knowledge management, 527 leadership, 526, 529-531 measurement, 527 and national culture, 542 operations focus, 528 organizational profile, 564-567 performance measurement in, 601-604 results, 528-529 Six Sigma and, 543-547 strategic planning, 527 values, 529 vision, 529 workforce focus, 527-528 Baldrige Organizational Profile, 564-567, 606 questions, 565-566 Baldrige principles, 374

MEDRAD, 48

Baldrige transition, 519	process, 233
Bandura, A., 163	reengineering and, 234
banking service product quality, 111	at Xerox, 32, 34
Bank of Montreal, 119	beneficial team behaviors, 175
Baptist Daily, 638	Berton Card Company (BCC), 306-307
Baptist Hospital, Inc. (BHI), 177, 524, 596-597,	Best Buy, 499
617, 638	Best-in-Boeing, Boeing A&T, 613
BAR (Budget Accountability Report), 597	Best-in-Industry, Boeing A&T, 613
CARE (Clinical Accountability Report of	best practices, 232-233, 671-673
Excellence), 597	Best Practices Knowledgebase, 620
FOCUS-PDCA, 597	Better Business Bureau, 134
Hospital Information System (HIS), 617	BHI. See Baptist Hospital, Inc.(BHI)
human resource changes, 571	BI, 524
teams at, 170	customer feedback at, 120-121
training at, 177	Relationship Customer Satisfaction Index at, 120
BAR. See Budget Accountability Report (BAR)	Strategic Business and Quality Plan (SBQP), 569
Basecamp, 167	workforce management at, 155
Basic Elements of Improvement, 63	bias, 106, 122, 123, 200, 270, 386, 563
Bass, Bernard M., 646	Big Hairy Audacious Goal, 563
Batter, Henry, 453	Big Q, 15
battery experiment, 307–308	Billing Study, 457
Baxter Healthcare International, 547–548	binomial distribution, 259
Baxter Quality Institute, 547	Bin Range, 276
BCC. See Berton Card Company (BCC)	Black Belt, 476, 688-689
Bean, L.L., 114	Black & Decker, 107
Beechmount Software Corp., 449	Black Elk Medical Center (BEMC), 369-370
behavior, and culture, 666	Blaine, Jeff, 457
behavioral frequency scale, 183	Blockbuster, 120
behavioral questions, 379	blogs, 107, 167
Bell System, 12, 253	BMW, 350
Bell Telephone Laboratories, 12, 404	Bodison, Glenn, 157
BEMC. See Black Elk Medical Center (BEMC)	Boeing Boeing
benchmarking	aerospace support, 207
approaches, 232	integrated product teams (IPTs), 170, 313
best practices and, 232-233	Boeing Aerospace Support (AS), 207, 209, 524
breakthrough improvement, 232	Boeing Airlift and Tanker (A&T), 170, 523, 603, 60
competitive, 233	606, 613, 667
customer satisfaction, 99	enterprise process model, 211
employee engagement study, 159-160	financial and market outcomes, 604
internal, 619–620	team development process, 174
measurement system, 37	workforce-focused outcomes, 604

Boeing C-17 Stuffed Tailcone team, 174

Index

Boise Cascade, 489-490 Bonsignore, Michael R., 688 Bossidy, Larry, 470 bottle plants, 590 Bowditch, James L., 163 Bowen, David E., 66 BP's deepwater horizon, 1 brainstorming, problem-solving procedure, 494 brainwriting, 315-316 Branch-Smith Printing Division (BSPD), 187, 254-255, 524, 550-552, 586-588, 617 design and delivery processes, 551 design and production processes, 552 hiring process, job, 187 performance, 551 Quality Improvement Database (QID), 551 recipient, Baldrige Award, 552 server uptime, protection, 617 strategic planning at, 586-588 systematic planning process, 551 breakthrough, defined, 462 breakthrough improvement, 232-234 breakthrough sequence, 62 Bridgestone Americas, Inc., 476 Bronson Methodist Hospital, 524 Bronze Award Level, 540 Brown, Mark Graham, 605 brush hardness variability, 482 Bryant Products and Elgin Metals, 286 BT Group, 119 Budget Accountability Report (BAR), 597 Buick Regal beat, 28 builder, 638 Bullwhip effect, 71 Buono, Anthony F., 163 burn-in, 22 Burns, James M., 646 business analytics technology, 612-613 business processes, 209, 210, 234, 248, 544 business results, quality and, 29-30 business-specific indicators, 603 business strategy, 571-572

business support functions, 26–27 finance/accounting, 26–27 legal services, 27 quality assurance, 27 business-to-business (B2B), 618 business-to-consumer (B2C), 618

c

cable and cable assembly flex, 356 CAD. See computer-aided design (CAD) Cadillac CTS, 7 Cadillac Motor Car Division, 523 CajaGigante, 364 calibration, 387-388 call centers, 51 Cal-Poly State University, 652 CAM. See computer-aided manufacturing (CAM) Camry, 4 Canada's National Quality Institute (NQI), 539-540 Canadian Awards for Business Excellence, 539-540 capability results La Ventana Window Company (LVWC), 416 CARE. See Clinical Accountability Report of Excellence (CARE) career development, 189 Cargill Corn Milling (CCM), 117, 523, 558 Cargill Kitchen Solutions (CKS), 164 carpal tunnel syndrome, 175 cartridge drop and scrape test, 356 catchball, negotiation process, 571 Caterpillar Financial Services Corporation (CFSC), 312, 462-463, 524, 561, 618, 652 "Caught Doing Good" program, 180 causal relationship, 600, 601 cause-and-effect diagrams, 492-493, 492-494 prediction, 59 rational management decision, 59 cause and effect tree analysis, 350 c-chart data and calculations, 434 for nonconformances, 431-432 quality rating system, 435

CCM. See Cargill CornMilling (CCM) Chase, Richard B., 220 CCP. See Cranford Consolidated Products (CCP) check sheets, 487-488, 503 CCR. See Client Concern Resolution (CCR) Chevron, 618 Cedar Foundation, 525-526 Chick-fil-A, 108 Cedar Rapids, IA., 664 China Center for Creative Leadership (CCL), 648 birth of quality assurance, 11 Centers for Medicare and Medicaid Services (CMS), 560 practices in, 36-37 Central Limit Theorem (CLT), 279 Quality Awards in, 541-542 CGISS. See Commercial, Government, and Industrial Six Sigma in, 36 Solutions Sector (CGISS) TQM in, 36 chain reaction, Deming, 50 China Association for Quality (CAQ), 541 chains of customers, 9 Chong, Alexander, 686 champions, 475 Chrysler Corporation, 4, 346 change. See also cultural change Chugach School District, 524 barriers to, 670 Chung Mong Koo, 635 organizational culture and, 665-669 CI. See confidence interval strategic versus process, 667 Cigna Corp., 584-585 Change Acceleration Process, 679 Cincinnati Fiberglass, 224 Change Action Process, 679 Citibank, 151 "change the-business," 614 The City of Coral Springs, 115, 188, 217, 222, 525, "changing nature of leadership" (CNL), 648 583-584, 664-665 charismatic leadership, 643 CK. See coefficient of kurtosis (CK) chart output box, 277 CKD. See Complete Knock Down (CKD) charts clarity, team goals, 175 c-chart Clark, Christina, 244 data and calculations, 434 Clarke American Checks, Inc., 606, 617, 618 for nonconformances, 431-432 clear communication, 175 quality rating system, 435 clearly defined roles, 175 control chart, 436-438 Client Concern Resolution (CCR), 97 data and calculations, 420 Client Satisfaction Index (CSI), 97 individual measurements, 421 Clifton Metal Works (CMW), 591-592 for individuals, 419-421 Clinical Accountability Report of Excellence moving range, 421, 423 (CARE), 597 for nonconformances, 431-432 CLT. See Central Limit Theorem (CLT) np-chart, 432 cluster sampling, 270 s-chart, 420 CMS. See Centers for Medicare and Medicaid u-chart Services (CMS) control chart construction, 437 coaching, 645 data and calculations, 436 Coca-Cola Company, 8 for nonconformances, 431-432 code of conduct, 651 quality rating system, 435 coefficient of determination, 290-296 x-chart. See x-charts coefficient of kurtosis (CK), 274

coefficient of skewness (CS), 273 Collins, Jim, 537 "command-and-control" attitude, 684 comment cards, 106 Commercial, Government, and Industrial Solutions Sector (CGISS), 5 commitment, 51, 65 organizational, 65 committee structure, 62 common causes of variation, 71, 76 communication, 158, 172 communicator, 637 communities of practice (CoPs), 625-626 Community Consolidated School District #15, Palatine, IL, 524 companywide quality control (CWQC), 16 comparative data, 613-614 compensation, 178-181 competitive advantage characteristics of, 27-28 quality and, 27-30 competitive benchmarking, 233 competitive performance survey, 126 competitive product analysis, 108 competitive products, 322, 324 competitive strategy, 544 competitor evaluation, 322 competitors, 14 complaint management, 116-118 accepting complaint, 118 acknowledging problem, 118 appealing for continued loyalty, 118 Cargill CornMilling (CCM), 117, 118 corrective action, 118 by Poudre Valley Health System, 118 complaints, 107 Complete Knock Down (CKD), 133 complexity, 385 component variability study, 394 comprehensive National Quality Program, 522 comprehensive Performance Evaluation Process, 231 computed tomography (CT) system, 314

computer-aided design (CAD), 629 computer-aided manufacturing (CAM), 629 Computer Associates of Islandia, 82 concept development DFSS, 314 and innovation, 315-316 concept of performance excellence, 521 Concordia Publishing House, 525 concurrent engineering, 313 conditional probability, 256 "Conditions of Collaboration," 157 confidence interval (CI), 281-283 Confidence Interval Template, 282, 283, 284 confidentiality and security, 617 conflict management, 172 conformance conformance to requirements, 63 as dimension of quality, 63, 103 problems, 474 to specifications, 15, 61 Consolidated District 15 school system, 187 "constancy of purpose," 670 constants in measurement system analysis, 390 consultants, 58 consumer awareness, 18 consumer focus groups, 108 Consumer Reports, 28 consumers, 9 contemporary leadership theories, 644-647 Continental Airlines, 119 continual reinforcement of knowledge, 177 - 178continuous improvement, 66, 227, 496 "continuous innovation," 680 continuous probability distributions normal distribution, 263-267 probability density function, 262 standard normal distribution, 263 continuous quality improvement (CQI), 33 control, process management, 209. See also Process control

control charts	correlation, 290
for attributes data, 423-436	correlation analysis, 270
construction, 436-438	cost(s), 3, 500. See also quality costs
cycles, 405-406	of corrective action, 383
development, 12	due to customer complaints and returns, 383
formulas, 437	of quality matrix, 384
hugging	Costco, 130
center line, 407–408	cost of quality (COQ), 382
control limits, 408-409	
patterns in, 404	courage, 638
process in control, 404–405	Covey, Stephen, 641
quality problem identification, 12	CPS. See creative problem-solving (CPS)
selection, 438	CPV. See customer perceived value (CPV)
single point outside control limits, 405	craftsmanship, age of, 11
sudden shift in the process average, 405	Cranford Consolidated Products (CCP), 456
trends, 406-407	Crayolas, 107
for variables data, 409-423	creative problem-solving (CPS), 467
control limits, 403	creativity, 315, 467, 638
hugging, 408-409	CRI. See Custom Research Incorporated (CRI)
location of, 440	Criteria for Performance Excellence. See Baldrige
s-chart, 418	Criteria for Performance Excellence
single point outside, 405	critical success factors, 572
conventional appraisal process, 181	strategic challenges, 566-567
Coolfoods, Ltd., 450	critical to quality (CTQ), 314, 319, 478
Cooper, William, 3	Crosby, Patricia, 656-657, 658
The Cooperative Plan," 171	Crosby, Philip, 28
Coors, Pete, 161	Crosby, Robert, 656-657, 658
Coors Brewery, 161, 168	Crosby philosophy, 63-64
CoPs. See communities of practice (CoPs)	Crosby's Absolutes of Quality Management, 63
COQ. See cost of quality (COQ)	Crosby's Basic Elements of Improvement, 64
ore competencies, 582–583	cross-cultural training, 172
ore processes, 209. See also value-creation processes	cross-functional, teams, 171
ore values and concepts, 532, 649-651, 670	cross-functional team-based organizational chart, 581
Corning Glass plant, 168	Crownover, Dale, 668
Corning Telecommunications Products Division, 523	Crowther, Samuel, 12
orporate citizenship, 650	CRP. See corporate responsibility process (CRP)
corporate culture, 64. See also culture	CRT. See Customer Relationship tracking (CRT)
orporate performance, 27	CS. See coefficient of skewness (CS)
orporate responsibility process (CRP), 651	CSI. See Client Satisfaction Index (CSI)
orporate social responsibility (CSR), 649, 652-653	CSN Stores, 133
orporation health, 37	CSR. See corporate social responsibility
orrective action, 63	CTO. See critical to quality (CTO)

CTQ tree, 485, 486 customer engagement, 98 cultural change, 54 customer errors, 220, 221 culture, 665-666. See also organizational culture during encounter, 221 American business, 54 in preparation include, 221 behavior and, 666 at resolution stage, 221 at Hillerich & Bradsby Co. (H&B), 54 customer feedback knowledge-enabled, 621 analyzing, 125-127 leadership and, 666 market evaluation, 212 Cummins Engine Company, 32 process requirements, 211 cumulative distribution function, 259 using, 125-127 customer(s) customer focus, 66, 527 commitment, 114 Australian Business Excellence Award, 541 contact, 114-115 Canadian Awards for Business Excellence, 540 contact requirements, 115 ISO 9000:2000, 544 customer-contact employees, 115-116 mastery description of, 183 customer-focused technology, 119-120 at Park Place Lexus, 97 data, analyzing voice of, 109-110 customer-focused organization, 113-118 expectations, 102-103 customer-focused outcomes, 602, 603 external, 101 customer-focused team-based organizational chart, feedback, 120, 125-128 · 580-581 focused organization, building, 113-118 customer-focused technology, 119-120 identifying, 100-102 Tsutaya Online (TOL), 120 interaction, 25, 114-115 customer importance survey, 125 internal, 100 customer interaction, 114-115 loyalty, 99, 117 customer loyalty, measurement, 129-130 measurement, 129-130 customer needs, 102-110. See also expected quality quality perceived by, 111 actual quality, 112 relationship management, 119-120 affinity diagram, 109, 110 requirements, 101-102, 105 collecting information about, 106 satisfaction survey, 121, 123 design, linking to, 111-113 segmentation, 101-102 on dimension of service quality, classifying, 105 customer and supplier communications, expectations, 101, 103 self-assessment, 681 expected quality, 112 customer benefit package, 7 at Frank Perdue, 103 customer commitment, 114 at Ideo, 102 customer contact, 114-115 internet banks, 111 customer-contact employees, 115-116, 188 Kano model of, 105-106 Fairmont Hotels, 116 "listening posts," 106 Procter & Gamble, 116 perceived quality, 112 Ritz-Carlton Hotel Company, 116 production, linking to, 111-113 St. Luke's Hospital, 115-116 quality dimensions, 103 customer contact requirements, 115 service delivery, linking to, 111-113

customer perceived value (CPV), 130

customer-driven quality, 9

CustomerPerfect!, 623 customer perspective, balanced scorecard, 599 customer relationship management (CRM), 120 customer relationships, 119-120 managing, 119-120 Customer Relationship tracking (CRT), 117 customer report card, 126 customer requirements described, 101-102 identification, 319 planning matrix, 318 process design, 211, 213 process mapping, 214 and technical requirements, 322, 323 customer satisfaction, 98-99, 500, 607, 667 benchmarking, 99 failure, reasons, 129 indicators of, 99 measuring, 32 at Ritz-Carlton Hotel Company, L.L.C., 98 satisfaction index, 99 customer satisfaction, measuring, 120-131 customer service quality, 111 customer-supplier partnerships, 119 Customer Value Analysis, 597 customization, 18, 23 Custom Research, Inc., 523 recognition and rewards, 180 Custom Research Incorporated (CRI), 210 CWQC. See companywide quality control (CWQC) cycle time, 208, 500 Cycle Time Task Force, 210 D

D. Power & Associates' Initial Quality Survey, 28
DADS. See Digitally Assisted Dispatch System (DADS)
DaimlerChrysler's Toluca Assembly Plant, 223
Dana Commercial Credit Corp., 524
Dana Corporation-Spicer Driveshaft Division, 310, 523
"dance cards," 497

"dangerous opportunity," 315

Dashboard Alert System, 610 dashboards, 376 data. See also comparative data; performance data raw data accounting, 27 analyses/analysis, 27, 58, 78, 253, 270 benchmark, 37 business decisions and, 16-17 confidentiality, 617 customer satisfaction surveys and, 20 historical, 270 matrix, 278 numerical, 275, 276 objective, 29 performance, 610 security, 617 sets, 271, 275 test, 354, 356 at Texas Nameplate Company, Inc. (TNC), 48 U-bolt, 277, 278 data accessibility information technology in, 617 at Pearl River School District, 616 Data Analysis ToolPak, 270, 274, 286 data collection, Juran Institute suggestion, 486 data mining, 612-613 data sheets, 487 Datsun, 7 Dean, James W., Jr., 66, 366 debrief (after-action review), 222 decision making, 172 decision process, 173 decline, quality life cycle, 675 Deere, John, 314-315 Deer Valley Ski Resort, 113 defective item check sheet, 488 defect location check sheet, 488, 489 defect rate, 385 defects, 28. See also Zero Defects defects per million opportunities (dpmo), 381 define, measure, analyze, design, and verify

(DMADV), 314

define, measure, analyze, improve, control (DMAIC)	funnel experiment, 72-78
process, 468-469	Red Bead experiment in, 72-76
analyze phase, 489-494	seminars in, 55
A3 report, Toyota, 480-481	statistical thinking and, 13
common six sigma tools in, 480	theory of knowledge, 58-59
control phase, 495	theory of knowledge in, 59-60
define phase, 482-485	variation and, 56-57
improvement phase, 494-495	Deming's 14 Points, 50-54, 168, 169, 176, 537-538
measure phase, 485-489	action in, 54
methodology for, 35	commitment in, 51
tools and techniques, 479-482	decision making in, 52
at Xerox, 34	driving out fear and, 53
define, measure, explore, design, implement (DMEDI)	education in, 54
approach, 312	exhortations in, 53-54
define, recognize, identify, verify, and evaluate	improvement in, 52–53
(DRIVE) process, 467	inspection in, 52
define opportunities, 312	leadership in, 53
delegating, 645	Management by Objective (MBO), 54
delineate scope of care, 225	philosophy in, 51
Dell, Michael, 227	pride in workmanship and, 54
Deming, W. Edwards, 205, 219, 226, 227, 329, 404,	quotas in, 54
537–538	self-improvement in, 54
Application prize, 49	statistical thinking and, 72-78
in Japan, 13, 49	teamwork in, 53
as "management guru," 49	training in, 53
philosophy and Baldrige criteria, 537-538	vision, 51
quality assurance, 12, 14	Deployment, 533
Deming Application Prize	Derr, Kenneth, 618
criteria for, 49	descriptive statistics, 268, 274-275
introduced in Japan, 13, 49	Descriptive Statistics tool, 274
Deming Chain Reaction, 50, 63	design. See also detailed design
Deming cycle	and environmental responsibility, 351-353
application of, 465-466	for manufacturability, 350-351
organizations and, 465	process management, 209. See also process design
as process improvement methodologies, 463-466,	for quality assurance, 352
467-468	reviews, 354
steps in, 466	verification, 353-355
Deming philosophy, 49-60	designed experiment, 290
chain reaction in, 50, 63	design failure mode and effects analysis (DFMEA), 346
comparisons of, 64	design for disassembly, 353
foundations of, 50, 63	design-for-environment (DFE), 353
14 points of, 50-54	design for excellence (DFX), 353

design for manufacturability (DFM), 351 DMEDI. See define, measure, explore, design, design for reliability, 334-344 implement (DMEDI) approach Dodge, Harold, 12 Design for Six Sigma (DFSS), 313-315 design optimization, 345-353 Domino's Pizza, 316 design failure mode, 345-347 Don Simon Homes, 690 effects analysis, 345-347 Dorothy Knight of Honeywell Aerospace, 235 Robust design, 345 do stage, PDCA cycle, 465 design optimization, DFSS, 314 Douglas Aircraft, 16 design verification downgrading costs, 383 design reviews, 354 Doylestown Hospital, 105 reliability testing, 354-355 dpmo (defects per million opportunities), 381 design verification, DFSS, 314 3.4 DPMO (defects per million opportunities), 471–474 detailed design Drew, Eileen, 686 axiom, 317 DRIVE(Define, Recognize, Identify, Verify, and axiomatic design, 316 Evaluate) process, 467 development and implement, 312 driving out fear, in Deming's 14 points, 53 DFSS, 314 DuPont, 82 DuPont's Delaware River plant, 169 independence axiom, 317 information axiom, 317 durability, as dimension of quality, 103 quality function deployment (QFD), DynMcDermott Petroleum Operations, 524 317-325 dysfunctional manager, 197-198 Taguchi loss function, 328-333 E for tolerance design, 333-334 target and tolerance design, 325-328 Eastman Chemical Co., 169, 523 TRIZ, 317 reviews designs, 354 determination, 64 eBay, 133 develop stage, Coast Guard, 467 EBL. See Evidence-Based Leadership (EBL) DFE. See design-for-environment (DFE) e-commerce, 26 DFM. See design for manufacturability (DFM) Economic Club of Chicago, 30 DFMEA. See design failure mode and effects analysis economic loss function, 329 (DFMEA) economics of quality, 63 DFSS. See Design for Six Sigma (DFSS) education diagnostic journey, 62 award recipients, 524 Digitally Assisted Dispatch System (DADS), 24 Baldrige criteria, 533, 535, 548 digital printing technology, 551 corporate, 650 direct customer contact, 107 customer-driven, 584 directing, 644 in Deming's 14 Points, 54 dissatisfiers, 105 encouraging, 54, 168 DMADV. See define, measure, analyze, design, and General, 628 verify (DMADV) leadership, 641 DMAIC. See define, measure, analyze, improve, control MCPS and, 665 (DMAIC) process nonprofit, 522

workforce, 152, 168, 184, 230 education and training, self-assessment, 681 Edwards, George, 12 Edwards, W., 673 effective knowledge management system, 619 effective leadership, 680 efficiency problems, 474 EFQM. See European Foundation for Quality Management (EFQM) electronic missile guidance system, 364 elevator dilemma, 366 EL Specialty Manufacturing Company, 448 emerging leadership theories, 644-647 emotional intelligence theory, 647 empathy, as of quality, 104 employee engagement, 159 employee involvement (EI), 161-162 employee participation, self-assessment, 681 Employee Quality Survey, Marlow Industries, 184-185 employees. See also human resource management; workforce actively disengaged, 186 at Alcoa, 656-658 at American Honda Motor Co., 189-192 at AtlantiCare, 548 at Bell Telephone Laboratories, 12 at Branch-Smith, Inc., 586-588 at Branch-Smith Printing Division (BSPD), 550-552 at Bridgestone Americas, Inc., 476 call center, 222 at Caterpillar Financial Services Corporation, 462-463 at Cigna Corp., 584-585 compensation and recognition of, 178-181 customer-contact, 24-25, 109, 115-116 at Deere & Company, 42-43 empowerment, 167-169

opportunities, 628

Six Sigma and, 18

post-World War II, 13

training and, 55, 156, 176, 551, 681

engaged, 186 engagement, 159-160 front-line, 18, 25, 66 at Graniterock Company, 254-255 at Heartland Health (HH), 525 at Hillerich & Bradsby Co. (H&B), 55 at Hilton Hotels Corp., 9 at Honeywell Federal Manufacturing & Technologies (FM&T), LLC, 207 at IBM Rochester, 611 interlinking and, 610-611 internal customers and, 9 involvement, 161-162 languages of, 61 marketing and sales, 20 at MEDRAD, 187-188 at MESA Products, Inc., 374-375 at MidwayUSA, 5 morale of, 24, 53 motivation, 162-164 at Motorola, Inc., 5 nonfarm, 23 not-engaged, 186 at Nucor Corporation, 179 at Park Place Lexus (PPL), 97 performance appraisal of, 181-184 and performance excellence, 669 personal quality and, 30 process benchmarking and, 233 at Procter & Gamble, 3 retention, 41, 192-194 at Ritz-Carlton Hotel Company, LLC, 25, 225-226, 647-648 at SAS Institute, Inc., 176 at Spicer Driveshaft, 310-311 at Studer Group, 636-637 systems thinking and, 55-56 teamwork and, 169-175 at Texas Nameplate Company, Inc. (TNC), 48 at U.S. Postal Service (USPS), 622-624 work design and, 165-167 at Xerox, 31-35, 32

Evidence-Based Leadership (EBL), 636 employee satisfaction Excel, 612 at FedEx, 25 analysis tools, 270 Poudre Valley Health System, 311 employee suggestion system, 161 ANOVA, 289 binomial probability calculations, 261 employee surveys COUNTIF, 272, 274 market, 49 data analysis, 278 of workers, 48 data and calculations, 422 at Xerox, 32 descriptive statistics tool, 274-275 empowered employees, 168 Descriptive Statistics tool, 274 empowerment, 25, 167-169 "enablers," 538 exponential probability, 268 ENBI Corporation, 231 Factorial Experiment, 296 frequency distribution and histogram, 278 energizing, quality life cycle, 675 histogram dialog, 276 engaged employees, 186 MEDIAN, 271 engagement, measurement, 184-186 MODE.MULT, 271 "engagement index," 186 engineering. See also overengineering; reengineering Normal Inverse Distribution Calculation Template, product design and, 20 normal probability calculations, 265 English, Larry P., 686 NORM.DIST, 265 "enriched" training, 167 Poisson probability calculations, 262 Enron, 533 statistical analysis with, 58 enterprise process model, 211 t-Test Dialog, 287 enterprise resource planning (ERP), 83, 607 voltmeter calibration data, 291 environment Excellence Award for Quality and Productivity, 14 ISO 14001:2004, standard, 80 exciters/delighters, 105 work, 81 execute stage, Coast Guard, 467 environmental assessment, 564 exhortations, 53-54 Environmental Protection Agency (EPA), 314 expected loss, calculation of, 332 environmental responsibility, and design, 351-353 EPA. See Environmental Protection Agency (EPA) expected quality, 112 expected value, calculation of, 332 epmo (errors per million opportunities), 382 experienced meaningfulness, 165 equipment variation (EV), 389. See also repeatability experienced responsibility, 165-166 equivalent parallel system, 343 experiment, statistical process, 255 ergonomics, 101 ERP. See enterprise resource planning (ERP) explicit knowledge, 618 errors per million opportunities (epmo), 382, 449 explore design concepts, 312 exponential distribution, 267 established ground rules, 175 Exponential Probability Distribution Template, 268 eTracker, 619 European Foundation for Quality Management external customers, 9, 101 needs of, 108-109 (EFQM), 538-539 external failure costs, 383-385 European Quality Award, 538-539 EyeClick, 97 events, probabilities of, 256

FAA. See Federal Aviation Agency (FAA) Fabulast, Inc., 302 Facebook, 107-108 factorial experiment, 293 FADE. See focus, analyze, develop, and execute (FADE) failure rate curve, 336 over time interval, 13 Fairmont Hotels, 116 Fall Prevention Task Force, 369 FarmaSuitica, Inc., 454 Fast Company, 313 Fault Tree Analysis (FTA), 350 FDA (Food and Drug Administration), 327 features, as dimension of quality, 103 Federal Aviation Agency (FAA), 458 Federal Express, 524 Federal Quality Prototype Award, 14 Federal Scandex, Inc., 454 FedEx, 119, 152, 170, 175, 177, 310, 380, 381 credo of, 25 guarantees of, 25 motto of, 25 "no layoff" philosophy, 25 FedEx Service Quality Indicator and Factors, 381 feedback customer. See customer feedback from job, 166 Feigenbaum, A. V., 16, 65, 686 Feigenbaum, Donald S., 686 Fidelity Investments, 102 field intelligence, 107 filling process, 243 finance/accounting, 26-27 financial outcomes, 604 financial perspective, balanced scorecard, 599 finished goods inspection and testing, 22 firewalls, 617 First National Bank of Chicago, 606 fishbone diagram, 492

Fisher, R. A., 290

Fleet Financial Group, 102 flexibility, 218 Florida Power and Light (FPL), 373-374 quality award, 15 Fluor Hanford, 377 FMEA. See also design failure mode and effects analysis (DFMEA) corrective actions or controls, 347 customer, effect of failure on, 346 detection rating, 346-347 failure modes, 346 Fault Tree Analysis (FTA), 350 in health care, 348 potential causes of failure, 347 risk priority number (RPN), 347 scoring rubric for, 347 Severity, Likelihood, and Detection Rating Scales, 346-347, 349 focus, analyze, develop, and execute (FADE), 467 focus groups, 106-107 focus on people, 56 focus stage, Coast Guard, 467 Food and Drug Administration, 83 Food and Drug Administration (FDA), 327 Ford, Henry, 12, 582 Ford F-150, 106 Ford Motor Company, 317 Japanese management practices and, 12 lean production, 495 formal surveys, 106 forming stage, 174 Fortune magazine, 117, 157, 159 The Foundation in Business Excellence Level, 540 14 points, Deming's. See Deming's 14 points FPL (Florida Power and Light), 373-374 Frankford Brake Systems, 450 Freadilunch Restaurant, 515 Fred Reichheld, 130 Freese and Nichols, Inc., 524, 559-560, 563 frequency distribution, 275, 278 Froedtert Memorial Lutheran Hospital, 501

5S (seiri, seiton, seiso, seiketsu, shitsuke), 496

front-line personnel, 18, 66 Frutayuda, Inc., 302 FTA. See Fault Tree Analysis (FTA) Fuji-Xerox, 612 Fujiyama Electronics, 453 full-scale production, 312 functional relationships, in manufacturing system, 19 fundamental concepts of excellence, 538-539 constancy of purpose, 539 continuous learning, 539 corporate social responsibility, 539 customer focus, 538 improvement opportunities, 539 innovation, 539 leadership, 539 management, processes and facts, 539 partnership development, 539 people development and involvement, 539 results orientation, 538 funnel experiment, 72-78 results of, 77 rules for adjusting, 77 future challenges, 17-19

Gaebler, T., 597-598 gainsharing, 179 Gallup Organization, 152 Galvin, Robert, 30, 469 Gantt, Henry, 154 Gap, 106 gap model, 112 "garbage in, garbage out," 615 Garvin, David A., 103 GE Fanuc, 299-301 Geisler, David, 169 Gellerman, Saul W., 162 General Electric (GE), 109, 470, 666, 678-679 design for Six Sigma (DFSS), adopter of, 314 employee certification, 476 management techniques training, 109 plastics division, 353

product lines, 15 quality management, 15, 65 quality standards, 639 Six Sigma, Fanuc manufacturing plant, 299-301 Southwest Airlines and, 109 task force studies at, 15 thermoplastics, use of, 353 virtuous teaching cycle (VTC) and, 680 General Electric's plastics division, 353 General Foods, 167 General Motors, 4, 59, 182 General Systems Company, 65 general systems theory, 228 General Telephone and Electronics Corporation. See Verizon Genjeteye, Inc., 303 GenLab, Ltd., 449 Georgio's Giant Gyros, 361 Gilbreth, Lillian, 154 global food supply chains, 244 globalization, 18 global markets, 17 global responsibility, 18 Globe Metallurgical, Inc., 523 goals Boeing Aerospace Support, 207 business, 32 design processes, 222 Honeywell Federal Manufacturing & Technologies (FM&T), 207 learning cycle, 228 at Motorola, 20-21 SPC, 438 stretch goals force, 232 at Xerox, 31-32 Godfrey, Blanton, 129, 241 The Gold Award Level, 541 Golden Plaza Hotel, 198 Gold Star Chili Inc., 246-247 goods, quality dimensions of, 103 Good Samaritan Leadership System (GSLS), 654

governance, 651 governance outcomes, 604 government safety regulations and recalls, 14 Graniterock Company, 123, 170, 176, 184, 254-255, 523 customer importance survey, 125 customer report card, 126 "Great man" model, 643 Great Places to Work (GPTW) survey, 159 Great Press Printing Company, 449 Green Belt, 476, 674, 688 green indicator, 610 green lawn parable, 694-695 green zone, pre-control lines, 401, 402 group process, awareness of, 175 Grout, John, 245 GSLS. See Good Samaritan Leadership System (GSLS) GTE Directories, Inc. See Verizon Information Services (GTE Directories, Inc.) Guest Incident Action forms, 118 guiding principles, 563 Freese and Nichols, Inc., 563 н HACCP. See Hazard Analysis and Critical Control Points (HACCP) Hackman, Richard, 165, 166 Hackman and Oldham Work Design Model, 165 Hamel, Gary, 582 Hammond, Joshua, 671

HACCP. See Hazard Analysis and Critical Control
Points (HACCP)

Hackman, Richard, 165, 166

Hackman and Oldham Work Design Model, 165

Hamel, Gary, 582

Hammond, Joshua, 671

Harley, William S., 131

Harley-Davidson, Inc., 131–133

competitive advantage, 132

Complete Knock Down (CKD), 133

creativity model, 133

general merchandise, 132

Harley Owners Group, 133

heavy weight motorcycles, customer segments, 132

licensed products, 132

multicultural customer, 132

museum, 132

other services, 132

parts & accessories, 131

Harley Owners Group, 133 Harrington, H. James, 1, 618, 672 Harvard Business Review, 599 Hawkeye Magnetronics, 451 Hazard Analysis and Critical Control Points (HACCP), 244 hazard function, 338 healthcare AtlantiCare and, 548 Cigna Corp. and, 584-585 costs for, 18 delivery, 549 employee, 584 fall rate at, 369 innovations in, 654 integrated delivery, 582-583 Mercy Health System (MHS) and, 582-583 Premier Inc. and, 560 for retirees, 176 Saint Luke's Hospital and, 187 Skilled Care Pharmacy and, 41 standards for, 81 health care industry Baldrige Award, addition of, 15 challenges, 585 key personnel, shortages of, 188, 566 quality evaluation, 224-225 Studer Group and, 636-637 Health Care Organizations, 224-225 Heartland Health (HH), 525-526 Hendricks, Kevin, 29 Hennes & Mauritz (H&M), 218 Henry Ford Health System, 525 Hershey, Milton, 20 Hershey Foods Corporation, 20 Herzberg, Frederick, 163 Herzberg's theory, 163. See also Two-Factor theory Hewitt Associates, 192-194 analysis of, 192-193 Hewlett-Packard, 13, 107, 317, 354

hidden factory, 65

high performance work culture, 155, 157-158 technical requirements in, 321 high-performance work systems voice of customer, 320 compensation and recognition, 178-181 HQV. See Honeywell Quality Value (HQV) program Huawei Technologies, 36-37 designing, 164-184 empowerment, 167-169 human resource management (HRM), 154 job design, 165-167 traditional vs. strategic, 155-156 performance management, 181-184 human resource plans, 571-572 sustaining, 187-189 humbling, 683 teamwork, 169-175 humility, 638 work design, 165-167 "100-mile" rule, 173 workforce capability, 187-189 hypothesis testing, 283-289 workforce capacity, 187-189 alternative hypothesis, 283 workplace environment, 175-176 level of significance, 284 Hillerich, Jack, 54-55, 55 nonrejection region, 285 Hillerich & Bradsby Co. (H&B), 54-55 null hypothesis, 283 Hilton Hotel Guest Survey, 124 rejection region, 285 Hilton Hotels Corp., 9 Hyundai Motor Co., 635 HIS. See Hospital Information System (HIS) histogram, 275 Excel template, 278 IBM, 167, 247-248, 317 frequency distribution, 275 IBM Credit Corporation, 234 tools, 274 IBM Rochester, 523, 605-606, 611 holding gains, 62 balanced scorecard, 600, 601 Honda, 234 Icy Rider sled, 108 Honda Accord, 28 idea generation, 311 Honda Civic, 7 Ideo, 102 Honeywell, Inc., 536, 687-689 Imai, M., 569 Honeywell Federal Manufacturing & Technologies Immelt, Jeffrey, 649, 679 (FM&T), 207, 547 implementation, 641 Honeywell Quality Value (HQV) program, 687-689 of Crosby's Basic Elements of Improvement, hoshin kanri, 569-571 hoshin planning. See hoshin kanri improvement, 81 Hospital Information System (HIS), 617 process management, 209 House, Robert J., 163 improvement plan, 175 house of quality, 318, 319 Ina Tile Company, 345 customer voice in, 319, 320 independent, probability, 258 for managed care organization (MCO) membership indexes handbook, 359 American Customer Satisfaction, 99 Research Resources Center (RRC), 368 Client Satisfaction, 97 for screwdriver, 365 customer satisfaction, 99 process capability, 397-401 six basic steps in building, 318-325 symbol, 322 process performance, 401

1-19

indicators, 375 International Quality Study (IQS), 672 of quality, 225 International Telephone and Telegraph (ITT), 63 of shifts, 406 Internet, 107-108, 618 individual implemented improvements, 162 bank service, 111 individuals (x) chart, 424 customer requirements, 322 industrial engineers and process design, 22 technical requirements, 322 Industrial Quality Control, 13 Internet service provider (ISP), 454 Industrial Revolution, 11 interrelationship digraph, 573, 574-575 infant mortality period, 336 intraorganizational, teams, 171 The Information Management Advisory Committee, 607 Investor Protection Act of 2002, 651 information resources management, 615-617 IPT. See integrated product teams (IPT) information systems costs, 383 IQS. See International Quality Study (IQS) Initial Quality Survey, 28 IQS Best Practices Report, 673 innovation, 19, 105, 315-316, 563 Iredell-Statesville Schools (I-SS), 30, 462-463, 524, 682 balanced scorecard, 599 ISC. See integrated supply chain (ISC) technology and, 315 Ishikawa, Kaoru, 65-66 input range, excel histogram dialog, 276 Ishikawa diagram, 492 inspection ISO 9000, 543-547, 681 in Deming's 14 points, 52 principal benefits of, 82 mass, 12, 13 Sears' quality management system, 85-86 inspection rate, 386 statistical methods, 438 installation and service, 22 supplier certification processes, 236 instrument maintenance costs, 383 ISO 9000:2000 integrated product teams (IPT), 170, 313 process management, 208 integrated supply chain (ISC), 247-248 ISO 9000:2005, 80 integration, 533, 670 ISO 9001:2008, 81 integrity, 563, 638 basic quality assurance, 81 Intel Corporation, 234 major areas of, 81 intellectual capital (IC), 599, 621 ISO 9004:2009, 81 interaction, 294 ISO 9001 certification, 671 interlinking models, 610-612 ISO 9000 family of standards, 79-83 internal audits, 79 advisory in nature, 82 internal benchmarking, 619-620 businesses, apply to, 81 internal best-practice learning process, 620 DuPont, 82 internal customers, 9, 100 implementing, 82 understanding needs of, 109 International Organization for Standardization internal failure costs, 383 (IOS), 79 internal perspective, balanced scorecard, 599 ISO 9000:2000, 80 International Consortium for Executive Development ISO 9000:2005, 80 Research, 640 ISO 9001:2008, 81 International Organization for Standardization ISO 9004:2009, 81

ISO 9000:1994 series standards, 80

(ISO), 79

joint probabilities, calculation of, 258 ISO 9000 family of standards (continued) Jones, Mark, 547 Michigan-based Delcor Homes, 83 Jostens, 119 principal benefits, 82 registration audit, 82 Juanita, 413 judgmental perspective, 6 Sun Microsystems' Milpitas plant, 82 judgment sampling, 270 three documents of, 80-81 Juran, Joseph, 1, 60-65, 67, 83, 158, 168, 205, 219, 254, Toronto Plastics, Ltd, 83 306, 482 ISO 26000:2010 - Guidance on social responsibility, background of, 60 649 breakthrough sequence, 62 ISO 9000:1994 series standards, 80 objectives of, 80 in Japan, 60 as "management guru," 47 ISP. See Internet service provider (ISP) quality assurance term, 12 ITT. See International Telephone and Telegraph (ITT) statistical quality control techniques, 13 Juran Center for Leadership, 636 Juran Institute, 62 J. D. Power's Initial Quality metrics, 336 Juran philosophy J. McWilliams Swim Club, 451 breakthrough sequence, 62 Janson Medical Clinic, 514-515 comparisons of, 64 Japan. See also Union of Japanese Scientists and in Japan, 60-62 Engineers Quality Trilogy in, 61 Deming in, 13 Juran's breakthrough, 62, 462 Juran in, 13 JUSE. See Union of Japanese Scientists and Engineers quality in, 12 Japanese-made television components (JUSE) just-in-time (JIT), 230, 495, 496 versus U.S.-Made television, 329 JCAHO. See Joint Commission on Accreditation of Healthcare Organizations (JCAHO) kaizen, 13, 230, 231, 232, 239 JCI. See Johnson Controls, Inc. (JCI) kaizen blitz, 232 J.D. Power awards, 369 kanban, 496 Jefferson, Thomas, 11 Kano, Noriaki, 105-106, 373, 374 Jenks Public Schools, 524 Kaoru Ishikawa, 171, 488, 492 JetBlue Airways, 110 Kaplan, Robert, 598-600, 606 Jiro, Kawakita, 109 job design, 165-167 KARLEE, 84-85, 523 job enlargement, 167 continual improvement, 84 customer focus, 84 job enrichment, 167 factual approach to decision making, 84 John Deere Power Systems, 314 involvement of people, 84 Johnson, Samuel, 14 Johnson Controls, Inc. (JCI), 98, 610-611 leadership, 84 mutually beneficial supplier relationships, 84-85 Joiner, Brian, 70 Joint Commission on Accreditation of Healthcare process approach, 84 system approach to management, 84 Organizations (JCAHO), 346, 369, 454

Kearns, David, 14, 17, 31, 33 case data, 412 Kelleher, Herb, 158 excel template, 414 Kendall, Kay, 157 production data, 417 Keough, Donald R., 8 R-chart, 414 key guest requirements (KGR), 97 with additional data, 417 key selling points, 322 revised, 415 key workforce-focused practices, for Quality, statistical control, 413 x-chart, 415 Kiwi Oil, 303 revised, 416 KI method, 109 leadership, 641 K&N Management, 97, 236-238, 524 accountability, 638 K&N Management Leadership Performance Excellence at Advocate Good Samaritan Hospital (GSAM), Model, 531 653-655 K&N Management Senior Leadership Support of at Alcoa, 656-658 Values, 531 Australian Business Excellence Award, 541 knowledge Baldrige framework and, 636 assets, 618 builder, 638 culture and, 621 Canadian Awards for Business Excellence, 540 explicit, 618 CEOs, 2011 survey, 636 intellectual capital (IC) and, 621 classification of theories, 643 of results, 166 coaching, style, 645 RKT, 621-622 communicator, 637 tacit, 618 competencies and practices, 637-639 transfer, 619-622 contemporary and emerging theories, 644-647 knowledge management, 617-622, 618 contingency theories, 644 for performance excellence, 595-632 continual learning, 636 at Sprint Nextel, 625-626 corporate citizenship, 650 Korea, 17 corporate social responsibility (CSR), 649, 652-653 kurtosis, 274 courage, 638 creativity, 638 L culture and, 666 L. L. Bean, 233 delegating, style, 645 "label and link" approach, 164 Deming's 14 points, 53, 636 labor unions, 33 directing, style, 644 lagging indicators, 600 emotional intelligence theory, 647 lagging measures, 599-600 global business landscape, 636 Lamborghini, 6 governance and, 651-652 Langford, Rob, 457 Human Development and Leadership Division, latent defects, 354 637-638 Laurent, Carly, 663 humility, 638 La Ventana Window Company (LVWC), 411 integrity, 638 capability results, 416 lack of, 53

eadership (continued)	leading indicators, 600
learner, 638	leading measures, 599-600
mentor, 637	lean enterprise, 497. See also lean production
motivator, 638	Lean Expert, 689
navigator, 637	Lean Master, 689
organization and, 650-651	lean production, 495-497
for performance excellence, 635-660	proponents of, benefits, 496
perseverance, 638	tools used in, 496-497
personal leadership characteristics, 638	Lean Six Sigma, 33, 34, 498-499, 679
practice of, perspectives, 648	services, 499–501
practices for, 638-639	learner, 637
self-assessment, 681	learning, 533
skills, changes, 648	learning cycle, 228
societal responsibilities, 652-653	learning organization. See organizational learning
strategy and, 639-640	learning perspective, balanced scorecard,
substitutes for, 647	599
supporting, style, 645	Le Blanc, Honoré, 11
systems, 641-642	legal services, 27
theory and practice, 643-648	level of confidence, 281
through quality, 31-33	Levi Strauss, 108
well-being, 638	Lewis, Clarence Irving, 58
eadership category, 526, 529-531	Lexus, 6, 350
governance and societal responsibilities, 529	liability, 14, 27
K&N Management and, 530-531	life testing, 355
legal and ethical behavior, 529	Likert scale, 123
senior leadership, 529	limitation, quality life cycle, 675
sustainable organization, 530	Lincoln Electric and Procter & Gamble, 230
vision and values, 529	"listening posts," 106
Leadership Development Program, 188	Little q, 15
eadership outcomes, 604	Livelong, Inc., 363
eadership skills, 172	Locke, Edward, 163
eadership systems, 641-642	long-term sustainability, 664
eadership theories, 644-647	Los Alamos National Bank, 523
applied in Ritz-Carlton Hotel Company, L.L.C.,	loss function, 329
647-648	nominal, 330
classification, 644	Louisville Slugger, 55
emerging, 644	Lowell, Francis, 233
emotional intelligence, 647	lower control limit (LCL), 403
situational, 644-645	loyal customers, 98, 117
substitutes for, 647	loyalty, measurement, 129-130
transactional, 645-646	LT, Inc., 510-513
transformational, 646	Luthans, Fred, 644
Leadership Through Quality, 14, 31-33	LVWC. See La Ventana Window Company (LVWC)

machining process, 205 Macy's Department, 101 Magnivision, 232 Maguire, Miles, 687 main effect, 294 maintenance factors, 163 Major defect, 380 Malcolm Baldrige Award, 522 recipients, 523-525 Malcolm Baldrige Criteria, 457 Malcolm Baldrige National Quality Award (MBNQA), 33 Malcolm Baldrige National Quality Improvement Act (Public Law 100-107), 522 managed care organization (MCO), 357-360 applying QDF in, 357-360 House of Quality for, 359 management by facts, 539 key process-focused practices, 206 K&N management, Inc., 236-238 language of, 62 at Mazda, 605 MESA Products, Inc., 374-375 mistakes, 72 by planning, 569 process, 208-209 quality, environmental, health, and safety (QEHS) system, 690 responsibility, 83 statistical methods, 253-308 systems thinking and, 55-56 total quality management commitment of, 37 management by objective (MBO), 54 management by planning. See hoshin kanri management failures, 16 management involvement, self-assessment, 681 management leadership path, 189 Management of Information, Knowledge, and Information Technology, 527 management responsibility, 81

management teams, 170, 171 Managerial Grid model, 643 managers, 27 impatient, 673 self-assessment and, 682-683 manufacturers, 11 costs, 14, 56 manufacturing and assembly, 21 manufacturing execution systems (MES), 83 manufacturing perspective, 8 manufacturing systems, 19-22 assembly in, 27 finance/accounting, 26-27 finished goods inspection and testing, 22 functional relationships in, 19 industrial engineers and process design in, 22 installation and service, 22 key relationships in, 19 manufacturing and assembly in, 21 marketing/sales in, 20 packaging, shipping, and warehousing, 22 product design/engineering in, 20 production planning and scheduling in, 21 purchasing/receiving in, 21 tool engineering function in, 22 Manuplex, Inc., 364 market evaluation, 312 marketing/sales, 20 "market in" perspective, 66 market introduction and evaluation, 312 market outcomes, 604 "market out" perspective, 66 marketplace performance indicators, 604 market research, 15, 61 market share, 23, 29, 30 Marlow, Raymond, 639 Marlow Industries, 184-185, 523, 639 Marriott International, See Ritz-Carlton Hotel Company Mary Kay Cosmetics, 233 Maslow, Abraham, 163 Massachusetts Institute of Technology (MIT),

228

mass customization, 218-219	measures and indicators, 375
mass inspection, 13	part variation (PV), 390
Master Black Belt, 475-476, 689	for performance excellence, 595-632
mastery descriptions, 183	precision, 386, 387
mathematics of reliability, 335-340	process capability, 393-401
matrices I I we will be the little with the li	quality measurements, 377-382
cost of quality, 384	reference, 388
data analysis, 573, 575-577	R&R study, 389
diagram, 573, 575	SMART (simple, measurable, actionable, related and
diagrams, 577	timely), 375
fixed pricing, 111	SSM Health Care, 212-213
House of Quality relationship, 361-362	system evaluation, 385-393
prioritization, 548	and working-level standards, 388
project selection, 478-479	Measurement, Analysis and Improvement of
scoring, 316	Organizational Performance, 544
maturation, quality life cycle, 675	measurement-managed organizations, 598
Mayer, Raymond, 441	measurements
Mayor's Cup Quality Award, 542	frequency distribution, 398
Mazda, 317, 605	histogram, 398
MBNA, 606	for quality control, 375-385
MBNQA. See Malcolm Baldrige National Quality	U-Bolt, 276, 277
Award (MBNQA)	"measurement summits," 617
McClelland, David, 163	measurement system
McCombs, Tom, 656, 657-658	auditing, 609-610
McDonnel-Douglas Corporation, 16	evaluation, 385-393
McGregor, Douglas, 163	measuring instruments, 385
MCI, 613	Medical Administration Process, 215
MCO. See managed care organization (MCO)	Medical Center of the Rockies (MCR),
mean square, 288	310, 311
mean time between failures (MTBF), 335, 339	Medical College of Wisconsin, 501
mean time to failure (MTTF), 335, 339	Medical Information Data Access System, 617
measurement, 81. See also performance measurement	MEDRAD, 48, 159, 177, 178, 523, 568, 651
systems	benchmarking, 48
accuracy, 386, 387	a Code of Conduct, 651
antiquated, 617	competencies at, 188
as Baldrige Criteria for Performance Excellence,	Customer Complaint Process in, 48
529-601	decision making, 48
calibration, 387-388	employee competencies at, 187–188
constants used, 390	. human resources department, 187
cost of quality measures, 382-385	Net Promoter (NP) scores, 29, 48
dashboards, 376	pay range, market pricing, 178
Fluor Hanford, 377	Mehne, Patrick, 98
indicator, 375	mentor, 637

Mercedes-Benz, 350 of Pearl River School District (PRSD), 600, 616 Mercy Health System (MHS), 464, 524, 582-583, 607, of Procter & Gamble, 228 608, 610, 614 mistake-proofing processes, 219-221 comparative data at, 614 designing potential defects, 219 Culture of Excellence Four Pillars, 582 factors, 219 Dashboard Alert System, 610 identifying potential defects, 219 healthcare and, 582-583 poka-yoke concept, 219 Mercy Hospital in Janesville, 613-614 preventing mistakes, 219 Merrill Lynch Credit Corp., 524 Zero Quality Control, 219 MESA Products, Inc., 374-375, 524 MIT. See Massachusetts Institute of Technology (MIT) Mesa Products, Inc., 671 Mitsubishi's Kobe shipyard site, 317 Metro Health Hospital, 498 mixing process, 205 MMC. See Morelia Mortgage Company (MMC) metrology, 386-387 Miami Valley Aircraft Service Co., 449 modern quality technology, 65 Michigan-based Delcor Homes, 83 moment of truth, 114 MicroKeeb Co., 363 Money, 29 microphone drop test, 356 Montgomery County Public Schools (MCPS), 524, Microsoft Excel. See Excel 664-665 MicroTech, 573-577 Montvalley Short-Haul Lines, Inc. (MSL), 456 Middle East Quality Association, 17 Morelia Mortgage Company (MMC), 455-456 middle managers, 669 motivation, 162-164 Midland Builders, 690 defined, 162 MidwayUSA, 524 motivational factors, 163 "100-mile" rule, 172, 173 motivation theories, 163 Miller, Jim, 116 classification of, 163 Milliken & Co., 523, 616 motivator, 638 Mind and the World (Lewis), 58 Motorola, Inc., 168, 317, 523, 617 mission Commercial/Government/ Industrial Solutions of Black Elk Medical Center (BEMC), 369-370 Sector, 102 of Branch-Smith Printing Division, 551 field failure data analyzis, 472 of Cadillac Motor Car Company, 523 financial personnel, 27 of Cedar Foundation, 525-526 goals of, 20-21 of Clifton Metal Works, 591 Six Sigma, 232, 469-470 of Coyote Community College, 628-631 suggestions for improving, 119 of a firm, 563 MSL (Montvalley Short-Haul Lines, Inc.), 456 of Gold Star Chili, 246-247 Mt. Edgecumbe High School (Sitka, Alaska), 2 of Jenks Public Schools, 524 MTBF (mean time between failures), 335, 339 of Joint Commission on Accreditation of Healthcare MTTF (mean time to failure), 335, 339, 363 Mulcahy, Anne, 168 Organizations, 369 of Mercy Hospital, 614 multiplication rule of probability, 256 of National Committee for Quality Assurance mutually exclusive, 256

My Life and Work (Ford), 12

(NCQA), 2

NASA, 14

Nashua Corporation, 49

National Cash Register Company (NCR), 228

National Committee for Quality Assurance (NCQA), 2

National Database of Nursing Quality Indicators

(NDNQI), 311

National Highway Traffic Safety Administration, 325

National Institute of Standards and Technology

(NIST), 315, 386-388

National Nuclear Security Administration, 207

National Performance Assessment (NPA) system, 623

National Quality Month, 14

natural work teams, 170, 171

Naval Air Systems Command, 16

navigator, 637

NCQA. See National Committee for Quality Assurance

(NCQA)

NCR. See National Cash Register Company (NCR)

NDNQI. See National Database of Nursing Quality

Indicators (NDNQI)

negotiation, 172

Nelson, Ronald L., 521

Nestlé Purina PetCare Co. (NPPC), 29, 108, 523

Netflix, 120

net present value of the customer (NPVC), 102

net promoter score (NPS), 29, 130

Newfonia, Inc., 361

New philosophy, learning, 51

Newsweek, 16

Newvis Pharmaceutical Company, 304

NGT. See nominal group technique (NGT)

Ni-Au boards, 301

Nissan Motor Company Ltd., 7, 22, 28

NIST. See National Institute of Standards and

Technology (NIST)

No Child Left Behind Act, 682

nominal dimensions, 325

loss function, 330

nominal group technique (NGT), 173

nominal specifications, 8

nonconformances

c-chart for, 431-432, 433

charts for, 431-432

np-chart for, 432

u-chart for, 431-432, 433

nonconformances per unit (NPU), 379, 449

nonloyal customers, 117

nonprofits, 684-686

TQ principles, 685

Nordam Europe, Ltd., 199-201

Nordstrom's customer service, 30

normal distribution, 56, 263-267

Normal Inverse Distribution Calculation Template,

266

Normal Probability Calculations, 265

norming stage, 174

North Mississippi Medical Center (NMMC), 188, 524,

566, 612

Norton, David, 598-600, 600, 606

not-engaged employees, 186

not-for-profits, 15, 310, 525, 535, 685

NPA. See National Performance Assessment (NPA)

system

np-charts, 428-430

data and calculations, 431

for nonconformances, 432

NPS. See net promoter score (NPS)

NPVC. See Net present value of the customer (NPVC)

Nucor Corporation, 164, 179

null hypothesis, 283

number of nonconforming units, 428

0

observed significance level, 285

Occupational Safety and Health Administration

(OSHA), 623, 624, 630

Ohio State Studies, 643

okyakusama, 95

Oldham, Greg R., 165, 166

OMI. See Operations Management International, Inc.

(OMI)

On-Demand Supply Chain system, 248

"one-entry system,", 210

online systems quality, 111

operating profit, 607 operational definitions, 486 operations focus, 528 Operations Management International, Inc. (OMI), 374-375, 524 order fulfillment process, process improvement tools, 503-505 organizational culture, 665-670. See also culture barriers to change, 670 changing, 666-669 leadership, 668, 669 strategic vs. process change, 667 organizational effectiveness measures, 17 organizational governance, 651-652 organizational learning, 51, 678-681 organizational performance indicators, 155 organizational performance measure, 607 Organizational Profile. See Baldrige Organizational Profile organizational structure, 578 organizational sustainability, 533 organizational transformation strategies, 677 organizations apparent structure of, 579 availability of personnel, 579 for breakthrough, 62 characteristics, Baldrige Award achievement in results, 534 agility, 534 entrepreneurism, 534 governance and leadership metrics, 534 innovation, 534 work systems and work processes, 534-535 customer influences, 579 Deming cycle and, 465 diversity and complexity of product line, 579 financial stability, 579 line and staff, 580 management style, 579 matrix-type, 580 measurement and, 598 "one-size-fits-all" quality, 582 operational and organizational guidelines, 579

self-managed teams (SMTs), 173 Six Sigma projects, 476-477 size of, 579 stability of the product line, 579 Osborn, Alex, 467 Osborne, D., 597-598 OSHA. See Occupational Safety and Health Administration OTC. See over-the-counter (OTC) outcome of experiment, 255 output box, histogram, 277 outsourcing, 583 overall mean calculations, 409 overengineering, 20 over-the-counter (OTC), 228 ownership, 15 defined, 669

P

packaging, shipping, and warehousing, 22 packing slips, 434, 444 Palma State Bank, 450 Pal's Sudden Service, 524 "Caught Doing Good" program, 180 Malcolm Baldrige Award Recipients, 524 Quality Engines, 672 value-creation processes, 211, 212 parallel subsystem, 342 Pareto, Vilfredo, 482 Pareto analysis, 384, 482, 444 Pareto diagram, 482-483, 504 of customer calls, 483 for progressive analysis, 484 Pareto distribution, 482 Pareto principle, 482 Park Place Lexus (PPL), 97, 524 alignment plans at, 562 Client Satisfaction Index (CSI) at, 97 leadership at, 639 Parnes, Sidney, 467 participation, 33 part variation (PV), 390 passion for performance, 563

Patterson, John, 228 small organizations and nonprofits, challenges in, pay-for-performance approach, 624 684-686 PBM. See process-based management (PBM) strategies, 558-592, 671-674 p-chart performance indicators, 614 attributes data, 430 performance management, 181-184 fraction nonconforming, 424-425 performance measurement with variable sample size, 425-428 auditing, 609-610 PDCA. See plan-do-check-act (PDCA) cycle the balanced scorecard, 598-601 PDPC. See process decision program chart (PDPC) Baldrige criteria, 601–604 peak performance study, 394 cost of quality and, 63 Pearl River School District, 524 customer-focused outcomes, 602, 603 data accessibility at, 616 designing, 604-610 Pearl River School District balanced scorecard, designing effective, 604-610 599-600 "doing it right the first time," 63 Peer Review Grievance Process, 159 financial outcomes, 604 perceived quality, 99, 111, 112 governance outcomes, 604 Perdue, Frank, 103 guidelines for, 605 performance, as dimension of quality, 103 leadership outcomes, 604 performance appraisals, 181, 182 linking measures to strategy, 606-607 performance data market outcomes, 604 analyzing, 610-615 process outcomes, 602-603 comparative data, role of, 613-614 product outcomes, 601 performance review, 614-615 purpose of, 604-605 performance excellence selecting performance measures, 605-606 Australian Business Excellence Award, 540-541 strategic and process-level measurements, aligning, Baldrige Roadmap to, 676 607-609 best practices, 671-673 value and scope of, 597-604 Canadian Awards for Business Excellence, 539-540 workforce-focused outcomes, 602, 603-604 criteria for, 526-538 performance review, 614-615 culture of, 668 performing stage, 174 employees and, 669 perseverance, 638 European Quality Award, 538-539 personal digital assistant (PDA), 97 implementation, principles for, 673-674 personal initiative, 30 international quality and, 538-542 personal quality checklist, 39 journey toward, 675-686 personal values, quality and, 30 knowledge management for, 595-632 perspectives, quality leadership for, 635-660 customer, 8-9, 10 organizational design for, 578-582 integrating, 9-10 organizational learning, 678-681 manufacturing, 8, 10 process, 34, 35 product, 6-7 Quality Awards in China, 541-542 user, 7 quality life cycle, 675-678 value, 7-8 self-assessment, 681-683 perspiration test, 356

Peters, Tom, 161	policy deployment, 569-571
Peterson, Donald, 605	hoshin kanri, 569-571
pharmaceutical product manufacturing, 444-447	Seven Management and Planning Tools, 573-578
Philip Crosby Associates, 63	population Page 18 Pag
philosophy of quality management, 47-93. See also	aging, 18
Deming philosophy; Juran philosophy; total	defined, 271
quality (TQ)	degree of kurtosis, 274
comparisons of, 64	mean, 279, 281, 282, 283
Crosby, 63-64	parameters, 279, 281
Deming, 49-60	standard deviation for, 272
implementing, 78–83	uninsured, 549, 655
Juran, 60-62	variance of, 271
other quality, 64-66	population, collection of objects, 271
practices for, 67	positive quality culture, 668
principles of, 66-67	positive referrals, 612
techniques in, 67-70	post-World War II, 13
variation and statistical thinking in, 70-78	Poudre Valley Health System (PVHS), 30, 118, 157,
various types, 64-66	310–311, 524
picking activity, histogram, 504	CARE, 118
PIMS Associates, Inc., 27	power shift, 169
plan, design, measure, assess, and improve, 361	practices. See also best practices
plan-do-check-act (PDCA) cycle, 464, 465, 671, 680,	in China, 36–37
682. See also Deming cycle	Prahalad, C. K., 582
planning, 641	precision, 386
bottom-up, 66	vs. accuracy, 387
enterprise resource, 83, 607	pre-control lines, 401, 402
function, 12	pre-control process, 401-403
for improvement, 540	preliminary concept development, 311
production, 21	Premier, Inc., 115, 182, 524, 559-560, 563, 619
quality, 61	core values, 563
strategic business, 61	and healthcare, 560
succession, 152, 187, 188, 530, 651	recognition and rewards, 181
planning for improvement	Premier performance management process, 182-183
Canadian Awards for Business Excellence, 540	President's Management Agenda (PMA), 624
plan stage, PDCA cycle, 465	Pressler, Paul, 106
platform-team approach, 171	prevention costs, 383
Plato, Charlie, 453	pricing, value, 8
PMA. See President's Management Agenda (PMA)	"pride and joy" in work, 47
PMBOK. See The Project Management Body of	pride in workmanship, in Deming's 14 points, 47
Knowledge	Principles of Corporate Governance, 652
Poisson distribution, 260	Printed Circuit Assembly-Encoder (PCA-Encoder), 29
poka-voke approach, 219-220, 245	prioritization matrix, 548

probability	production types, 205
complement, 256	quality management, 206
concepts, 255-259	requirements, 211-213
conditional probability, 256	simulation, 56
continuous probability distributions, 262-268	support processes, 210-211
event, 256	value-creation processes, 209-210
experiment, 255	variables data, monitoring and control, 411
independent, 258	vs. function, 206
joint probabilities, calculation of, 258	process-based management (PBM), 209
multiplication rule of, 256	process benchmarking, 233
mutually exclusive, 256	process capability
of nonconforming product, 395	pre-control, 401-403
outcome, 255	variables data, 411
rolled throughput yield, 259	process capability indexes
sample space, 255	formula, 399
tree diagram and, 257	specifications and natural variation, 397
probability distributions, 259-262, 279	U-bolt data, 399
binomial distribution, 259-261	process capability measurement
cumulative distribution function, 259	calculations, 395
"probe and learn" process, 680	component variability study, 394
problem(s)	and control, 397
aging population and, 18	peak performance study, 394
benchmarks for, 37	process capability indexes, 397-401
conformance, 474	process characterization study, 394
defined, 474	process performance indexes, 401
efficiency, 474	spreadsheet, 400
manufacturing, 37	study design, 393
process design, 475	process capability spreadsheet template, 392
product design, 475	process capability study, 393
service, 104	process characterization study, 394
unstructured performance, 474-475	process control, 221-226
problem solving	costs, 383
defined, 467	daily management, 221
Juran philosophy, 61	elements, 222
teamwork, 171	long-term improvements, 221
theory of inventive, 316	in manufacturing, 223-224
tools, 62	plan, 224
problem-solving activities, 170	vs. improvement, 221-222
problem-solving teams, 171	process decision program chart (PDPC), 573, 577, 576
process, 205	process design
identifying and requirements, 209-212	for agility, 218–219
key practices, 206	goal of, 213
pre-control, 401-403	mapping, 214-216

Medical Administration Process, 215 Process Task Force, 210 mistake-proofing processes, 219-221 process variation histograms and specifications, 396 problems, 475 Procter, William Cooper, 3 purpose, 213 Procter & Gamble, 3, 8, 115, 228, 230, 317 quality and performance, 213 and consumer relations, 116 requirements, 213 defined, 16 for services, 216-218 Deming philosophy, 49 and technology, 213 over-the-counter (OTC), 228 process failures, 383 value pricing, 8 process flowchart, 214. See also process mapping voice of the company, 116 process improvement, 231 product(s) Juran's breakthrough cycle, 62 as dimension of quality, 103 process improvement, lean tools for, 495-501 liability, 14 process improvement methodologies quality, 15-16 creative problem-solving (CPS), 467 product and process design, self-assessment, 681 custom improvement methodologies, 467-468 product control, self-assessment, 681 Deming cycle, 463-466, 467-468 product design, 20, 319 DMAIC, 468-469 and engineering, 20, 22 process management, 208-209 and manufacturing, 652 control, 208 problems, 475 cycle time, 208 and production/delivery processes, 209 design, 208 and reliability, 481 Gold Star Chili Inc., 246-247 at Xerox, 33 improvement, 208 product designers, 20 ISO 9000:2000, 208 product development process phases, 209 concurrent engineering, 313 principles, 208-209 design for six sigma (DFSS), 313-314 techniques of, 208 full-scale production, 312 value-creation processes, 209-210 idea generation, 311 process management, improvement and innovation market evaluation, 312 Australian Business Excellence Award, 541 market introduction, 312 process map, 228-229 preliminary concept development, 311 process mapping, 214-216, 483 product/process development, 311 process measurement and control costs, 383 structured product development process, 312 process optimization product excellence, 6 Canadian Awards for Business Excellence, 540 production. See also lean production process-outcome linkages, 612 manufacturing systems and, 11 process outcomes, 602-603 at Toyota Motor, 17 process owners, 208 variation and, 11 process performance indexes, 401 production/delivery processes, 209 process requirements, technology, 211 production line data, 607 process standard deviations, 401 production planning and scheduling, 21

production types, 205 productivity, 3 product liability costs, 383 product-liability judgments, 14 product life characteristics curve, 336 product perspective, 6-7 product realization, 81 product recall costs, 383 profitability, 27 Profound Knowledge, 55-60 project(s) identification, 62 selection matrix, 479 top-down in, 569 project charter, 485 The Project Management Body of Knowledge (PMBOK), 475 project ranking metric, 478, 479 project scoping, 482 project teams, 171 proof of need, 62 proportion, 272 proportion nonconforming, 379 PRO-TEC Coating Company, 29, 153-154, 524, 614-615 Prudential Insurance Company, 617 The Public Company Accounting Reform, 651 Public Company Accounting Reform and Investor Protection Act (2002), 651 public responsibility, 649 pull production, 496 purchasing/receiving, 21 Purnell, Pete, 456 purpose, constancy of, 539 p-value, 285 PVHS. See Poudre Valley Health System (PVHS) Pyzdek, Thomas, 480 0

Q12, Gallup Organization, 186

QBR. See Quarterly Business Reviews (QBR)

QEHS. See quality, environmental, health and safety

(QEHS) system

QFD. See quality function deployment (QFD) QID. See Quality Information Database (QID) QMI. See Quarterly Management Interaction Qualcomm, Inc., 2 quality, 686-687 actual, 112 age of craftsmanship and, 11 Boeing Aerospace Support, 207 Branch-Smith Printing Division, 254-255 building Japanese quality, 239-240 business results and, 29-30 in business support functions, 26-27 Caterpillar, 312 characteristics, 24, 57 in China, 36-37 City of Coral Springs, 217 competitive advantage, 27-30 current and future challenges, 17-19 customer perceptions of, 104 Custom Research Incorporated (CRI), 210 defined, 6-10 dimensions, 103, 111 Domino's Pizza, 316 early twentieth century, 12-13 engineering, 20 expected, 112 finance/accounting, 26-27 Fluor Hanford, 377 GE Fanuc, 299-301 Graniterock company, 254-255 history of, 10-19 Honeywell Federal Manufacturing & Technologies, 207 integrating perspectives on, 9-10 ISO 9000 family of standards, 79-83 John Deere Power Systems, 314-315 K&N Management, Inc., 236-238 leadership, 31-33, 65 managed care organization (MCO), 357-360 management practices, 67, 68-70 management principles, 66-67, 68

management techniques, 67

Quality Awards in China, 541-542 manual, 60, 79 quality circles, 171 in manufacturing, 19-22 quality control, 61 in marketing and sales, 20 MESA Products, Inc., 374-375 Quality Control: Principles, Practice, and Administramodern technology, 65 tion (Feigenbaum), 65 Quality Control for Foremen, 66 Operations Management International, Inc., 374-375 Quality Control Handbook (Juran), 60 perceived, 112 quality costs Crosby philosophy, 63 perceived by customer, 111 Feigenbaum's philosophy, 65 performance measurements, 63 personal, 30 performance measurements and, 63 and personal values, 30 prevention costs, 383 return on quality (ROQ), 477 Pharmaceutical Product Manufacturing, 444-447 service and manufacturing organizations, 385 policy, 78 Poudre Valley Health System, 310-311 Quality Digest, 1, 16 "quality engine," 671, 672 in practice, 31-37 quality frameworks Printed Circuit Assembly-Encoder (PCA-Encoder), at Veridian Homes, 690-691 problems, 63 quality function deployment (QFD), 317-325 managed care organization (MCO), 357-360 Procter & Gamble, 228 research resources center (RRC), 366-368 product design, 20 Tennessee Technological University, 366 profiles, 5 profitability and, 27 University support service, 366-368 Quality Gamebox software, 279 quality management system (QMS), 78-83 revolution, 13-14 quality gate, 239 quality improvement, 61 Rich Products Corporation, 292-293 Ritz-Carlton Hotel Company, 225-226 self-assessment, 681 in services, 23-27 team, 231 quality information, self-assessment, 681 Shure, Inc., 355-357 Quality Information Database (QID), 255 in Six Sigma, 17 Spicer Driveshaft, 310-311 Quality is Free (Crosby), 28 quality leadership, 65 statistical analysis, 29 quality life cycle, 675-678 strategies for, 671-674 quality management, 15-16 three steps to, 65 Toyota Georgetown, 230 challenges of, 17-19 craftsmanship, age of, 11 twenty-first century, 18-19 in early twentieth century, 12-13 Xerox, 31-35 failures in, 16 quality, environmental, health and safety (QEHS) history of, 10-19 system, 690 performance excellence in, 16-17 quality assurance defined, 27 in post-World War II, 13 from product quality to total, 15-16 design guidelines for, 352

pioneers of, 12

six sigma tools in, 17

quality management (continued) successes in, 14-15 in United States, 13-14 quality management processes, 208 quality management system (QMS), 78-83, building effective, 83 core of, 78 enterprise resource planning (ERP), 83 at Honeywell, 687-689 internal audits, 79 ISO 9000 family of standards, 79-83 life-sciences industry, 83 manufacturing execution systems (MES), 83 objectives of, 78 quality manual, 79 quality policy, 78 quality manual, 79 quality measurements attribute measurement, 377 cost of quality measures, 382-385 defect, unit of work, 377 defects per million opportunities (dpmo), 381 errors per million opportunities (epmo), 382 FedEx Service Quality Indicator and Factors, 381 nonconformance, 377 nonconformances per unit, 379 nonconforming unit of work, 377 proportion nonconforming, 379 rolled throughput yield (RTY), 381 service organizations, 377-378 service quality indicator (SQI), 380 throughput yield (TY), 380 unit of work, 377 variable measurement, 377 quality network, 231 quality notice, 221 quality organization, 11 quality planning, 61 quality planning costs, 383 quality policy, 78 Quality Progress, 687 quality revolution, in U.S., 13-14

Quality Trilogy, 61

Quarterly Business Reviews (QBR), 639

Quarterly Management Interaction (QMI), 639

Quarterly Performance Audit, 599

quest for excellence conference, 619

QuEST Forum, 36–37

quincunx, 56–57

quotas, 54

R

Rabbitfoot Community Bank, 304 radical redesign, 234 "ramp-in" schedule, 164 random variable, 259 Raphael Transformers, 363 rapid knowledge transfer (RKT), 621-622 Rath & Strong, 30 rational-legal leadership, 643 rational subgroups, sampling, 439 raw data, 487 Raytheon, 621, 682 R-charts, 409-411 Reagan, Ronald, 14 recognition and rewards, 178-181 Custom Research, Inc., 180 Premier, Inc., 181 Ritz-Carlton Hotel Company, 180 Wells Fargo Bank, 180 recruitment Baptist Hospital's strategy, 571 Nordam Europe, Ltd., 200 Red Bead experiment, 72-76 description, 72-73 first day's production, 73 fourth day's cumulative results, 75 lessons from, 75-76 run chart of fraction, 76 second day's cumulative results, 74 third day's cumulative results, 74 Red dashboard, 610 redesign, 309 REDRESS. See Resolve Employment Disputes Reach Equitable Solutions Swiftly (REDRESS)

red zones, pre-control lines, 401, 402

reengineering	Ritz, Caesar, 47
approaches, 232, 234	Ritz-Carlton Hotel Company, 6, 8, 25-26, 154, 168, 17
and benchmarking, 232	214, 225-226, 313, 524, 603, 604, 613, 647-648
defined, 234	customer satisfaction, 98
regeneration, quality life cycle, 675	customers ranked by, 102
registration audit, 82	Guest Incident Action forms by, 118
regression analysis, 270, 289-290	mechanisms, 231
regression tool dialog, 291	quality control at, 47
Relationship Customer Satisfaction Index, 120	recognition and rewards, 180
reliability	for satisfying customer, 118
achieved reliability, 335	River Bottom Fire Department, 450, 451
definition, 334	Rivers, Diane, 687
design for, 334-344	RKT. See rapid knowledge transfer (RKT)
as dimension of quality, 103, 104	RMB prize, 542
exponential reliability calculations, 339	Robert W. Monfort College of Business, 524
function, calculation, 338	Robert Wood Johnson University Hospital Hamilton
hazard function, 338	3, 524
inherent reliability, 335	robust design, 345
mathematics of, 335-340	Rockstone tires, 514
system reliability, 340-344	Rolex watches, 6
testing, 354–355	rolled throughput yield (RTY), 259, 381, 449
reliability function, R(T), 337	Romanoff, Edward M., 688
reliability rankings, 28	root cause analysis, 492
remedial action, 62	root causes
remedial journey, 62	in China, 11
Repack Solutions, Inc., 449	continuous improvement, 496
repeatability analysis, 389-393	problem solving, 491
repeatability and reproducibility (R&R) study, 389	process variation, 71
repetitive stress injuries, 175	scientific approach, 175
reproducibility analysis, 389–393	ROQ. See return on quality (ROQ)
research and development (R&D) processes, 315	Royal Bank of Canada (RBC), 102
research resources center (RRC), 366-368	Royal Order of the Sacred Treasure, 49
Resolve Employment Disputes Reach Equitable	RRC. See research resources center (RRC)
Solutions Swiftly (REDRESS), 624	R&R study. See repeatability and reproducibility (R&I
resource management, 81	study
responsiveness, dimension of quality, 104	RTY. See rolled throughput yield (RTY)
return on quality (ROQ), 477	Rubbermaid, 108
principles, 477	run chart, 396, 398, 488
review, 641	of red beads produced, 76
reward systems, 669	"run-the-business" measure, 606, 614
Richland College, 524	Runyon, Marvin, 623
Rich Products Corporation, 292–293	RWJ Hamilton. See Robert Wood Johnson Universit

Hospital Hamilton

Right Management, 159

The state of the s
safety, 14
Saint Luke's Hospital (SLH), 115, 159, 187, 524, 636–637
customer-contact employees, 115–116
employee satisfaction results, 186
healthcare and, 187
quality journey of, 677–678
sample, subset of objects, 271
sample size
p-charts, 425-428
statistical process, 439
sample space, 255
sampling sampling
basis for, 439
Custom Research Incorporated (CRI), 210
distributions, 279–281
frequency, 439-440
statistical methodology, 270
tables, 13
U.S. military, 13
sampling error, 271
Santa Cruz Guitar Company (SCGC), 90-91
Santayana, George, 10
Sarbanes-Oxley Act, 651
SAS Institute, Inc., 176
satisfaction, measurement, 184-186
satisfaction surveys, designing, 121-125
Graniterock Company, 123, 125
Hilton Hotels, 123, 124
instrument, 122
telephone interviews, 122
written surveys, 122
satisfiers, 105
Satmetrix, 130
SBQP. See Strategic Business and Quality Plan (SBQP
scatter diagrams, 494
s-charts, 418–419, 420
Schneck Medical Center, 525
Schneiderman, Art, 599
Scholtes, Peter, 59, 175
Schulze Horst 647

scientific approach, 175 scrap and rework costs, 383 Scribner, Cynthia, 547 Sears Holdings Corp., 85 Sears' quality management system, 85-86 segmentations, of markets, 101-102 seiri, seiton, seiso, seiketsu, shitsuke (5S), 496 self-assessment, 681-683 customer and supplier communications, 681 employee participation, 681 management involvement, 681 managers and, 682-683 product and process design, 681 product control, 681 quality improvement, 681 quality information, 681 self-determination, concept of, 169 self-directed work teams, 170 self-managed teams (SMT), 170, 173 Semco S/A, 579 Senge, Peter, 228 senior leadership path, 189 series-parallel system, 343 server errors, 220 service(s) labor intensive, 24 manufacturing versus, 23-24 quality dimensions of, 103, 104 quality in, 23-27 serviceability, dimension of quality, 103, 104 service design, 319 service organizations, 23-26 components of, 24-26 vs. manufacturing, 23-24 service process Deming philosophy, 50 performance excellence, 16-17 product realization, 81 Ritz-Carlton's, 214 service quality, 607 components of, 24-26 service quality improvement training American Honda Motor Co., 189-192

service quality indicator (SQI), 380 Cigna Corp., 584-585 service recovery, 117-118 committed leadership, top management, 674 service sector. continuous reinforcement and rewards, 674 changing personnel in, 23 critical to quality (CTQ) characteristics, 544 CAUCH STORY IS growth of, 23 defined, 469 service system quality, 24-26 design phase, 209 Seven Habits of Highly Effective People (Covey), 641 DFSS, 313-315 Seven Management and Planning Tools, 573-578 disciplined customer gathering, 674 affinity diagram, 573-574 3.4 DPMO (defects per million opportunities), arrow diagrams, 573, 577, 578 471-474 interrelationship digraph, 573, 574-575 evolution of, 17, 469-470 matrix data analysis, 573, 575-577 General Electric, 470 matrix diagram, 573, 575 Green Belt certification, 254 process decision program chart, 573, 577, 578 Hewitt Associates, 192-194 tree diagram, 573, 575 implementation, 474-479 seven QC (quality control) tools, 480 principles for, 673-674 Severity, Likelihood, and Detection Rating Scales, improving employee retention through, 192-194 349 integration, 674 Sewell, Carl, 98 ISO 9000 and, 543-547 Sharp HealthCare, 524 leadership, in trenches, 674 Shewhart, Walter, 12, 404, 463 lean production and, 495-497, 499 Shingo, Shigeo, 219 market intelligence gathering, 674 Shure, Inc., 355-357 in Motorola, 469-470, 474 testing audio components, 355-357 principles of, 471 The Silver Award Level, 540 process thinking, 674 simple random sampling, 270 project management and organization, 475-476 simplification, 679 projects Singhal, Vinod, 29 categorization, 545 single minute exchange of dies (SMED), 496 selection, 476-479 SIPOC diagram, 483, 485 statistical analysis, 299-300 situational leadership, 644-647 statistics, 254 controversy and contributions of, 645 strategic planning, Cigna Corp., 584-585 Six Sigma teams, 475-476 advantages of, 546 theoretical basis for, 471-472 in Allied Signal, 470 training, 674 ANOVA, 300 training, employees, 470 application of, medical errors reduction, 501-502 vs. TQM, 471 Baldrige criteria and, 543-547 Six Sigma Black Belt training curriculum, 481-482 based on, concepts, 471 Six Sigma Excellent Organization Award, 542 benefits of, 612 Six Sigma Plus, 687-689 Bridgestone Americas, Inc., 476 Skandia, 618

skewness, 273

in China, 36

stakeholder value, 641

standard deviation, 272 Skilled Care Pharmacy standard error, 275 healthcare and, 41 of the mean, 279 skill variety, 166 standard normal distribution, 263, 264 Skinner, B. F., 163 standing problem-solving team, 231 Skyhigh Airlines, 458 standing system-wide committee, 614 small organizations, 684-686 command-and-control attitude in, 684 Stark, Ray, 688 TQ principles, implementation of, 684 state-of-the-art online computer network, 617 SMED. See single minute exchange of dies Stateside Metrology Repairs, Inc., 449 statistical analysis Smith, Bill, 469 with Microsoft Excel, 275-278 SMT. See self-managed teams (SMT) R&R study, 389 social media monitoring, 107-108 societal responsibilities. See corporate social statistical control, 395 statistical inference, 269, 278-281 responsibility (CSR) statistical limits of variation, 75 Society for Human Resource Management, 155 "soft skills," 172 statistical methodology "cookbook" approach, 58 software statistical methods, 253 Microsoft Excel and Access, 612 ANOVA (analysis of variance), 288 soikufu, 467 correlation, 290 Solar Turbines, Inc., 523, 561, 603, 652 Solectron Corp., 523 descriptive statistics, 268, 271-274 elements of, 268-269 Sony televisions, 329 ISO 9000, 438 Southcentral Foundation, 525 predictive statistics, 270 Southwest Airlines, 109, 114-115, 158 and General Electric (GE), 109 for quality, 269 Southwestern Vista Homes (SVH), 411 regression analysis, 289-290 SPC. See statistical process control (SPC) sampling, 270-271 statistical inference, 269 special causes, 60, 72 statistical process control (SPC), 403-409 in profound knowledge, 59-60 conditions, 438 specifications, 8 conformance to, 8 control chart, 403, 404 control limits, 403 nominal, 8 elements, 438-439 product, 9 goals, definition of, 438 Spicer Driveshaft, 310-311 implementing, 438-441 Splaun, Donald, 299 Sprint Nextel, 625-626 lower control limit (LCL), 403 pharmaceutical product manufacturing, 444-447 SQC. See statistical quality control (SQC) practical guidelines, 440-441 SQI. See service quality indicator (SQI) sample size, 439 SSM Health Care, 120, 211, 524, 651 sampling, 439 process requirements and measures, 212-213 sampling frequency, 439-440 Stacey, Rulon, 157 stagnation, quality life cycle, 675 upper control limit (UCL), 403

statistical quality control (SQC), 12

statistical sampling, 13 statistical thinking defined, 70 Deming philosophy and, 13, 72-78 MIL-STD, for military standard, 13 variation, 70-78 statistics and technology, 253-254 Steve Jobs, 105 Stewart, Douglas M., 220 STMicroelectronics, 523; 601 stockholders, 55 Stoner, Inc., 177, 523 Stoner Business Excellence System, 641, 642 storming stage, 174, 175 Strategic Business and Quality Plan (SBQP), 569 strategic challenges, 566 strategic human resource management, 155 strategic leadership, 639-640 characteristics of, 640 defined, 640 strategic objectives, 567, 572 strategic partnerships, 119 strategic planning, 527, 558 at Branch-Smith, Inc., 586-588 at Cargill Corn Milling, 558 at Caterpillar Financial Services Corporation, 561 at Cigna Corp., 584-585 at Eastman Chemical Company, 561, 562 hoshin kanri, 569 human resource plans, 571-572 at Park Place Lexus, 561, 562 scope of, 560-572 Seven Management and Planning Tools, 573-578 Strategic Planning Institute, 27 strategic quality planning, 231, 532 strategic work system design core competencies and, 582-583 strategies, 567 deployment, 567-569 developing, 567 strategies deployment, 567-569

strategy development, 561-564 characterization of, 561 at Solar Turbines, Inc., 561 stratified sampling, 270 streamlining process, 231 strengths, weaknesses, opportunities, and threats (SWOT) analysis, 564 stretch goals. See breakthrough improvement structured product development process, 312 Studer Group, 524, 636-637 health care industry and, 636-637 study stage, PDCA cycle, 465 suboptimization, 56, 620 substitutes for leadership theory, 647 success and sustainability Australian Business Excellence Award, 541 Suh, Nam, 316 summary statistics, 275 Sung, Tina, 687 Sun Microsystems' Milpitas plant, 82 Sunny Fresh Foods, Inc., 523 Sunset Manufacturing, Inc., 497 "SuperTracker," 26 supplier certification process, 235-236 ISO 9000, 236 supplier focus Canadian Awards for Business Excellence, 540 suppliers, 235 Suppliers-Inputs-Process-Outputs-Customers (SIPOC), 483 supply chain management (SCM), 52, 83 supply chain manager, 247 supply chain processes, 235-236 supporting, 645 support processes, 210-211 surveys. See also employee surveys comment cards and formal surveys, 106 designing satisfaction surveys, 121-125 Wall Street Journal, 25 survival learning, 228 SVH. See Southwestern Vista Homes (SVH)

strategy, characterization of, 557-558

team-based system improvements, 162

team management, 172

team process effectiveness, 184

team's life cycle, stages of, 174

Team Members, 476

Swaim, Jack, 547 teamwork, 66, 67, 169-175 SWOT analysis, 564, 588 achieving process excellence teams, 313 symbol, houses of quality, 322 beneficial team behaviors, 175 continual improvement, 84 systematic error, 271 systematic sampling, 270 continuous improvement, 496 System of Profound Knowledge, 55, 60 Deming philosophy, 537 designing high-performance work systems, 169-175 system reliability equivalent parallel system, 343 factual approach to decision making, 84 optimize the efforts of, 53 parallel subsystem, 342 parallel system, 341 Six Sigma, 481 product design phase, 344 Technical Assistance Research Programs, Inc. See redundancy, 341 TARP series-parallel system, 343 technical competence, 647 series system, 340 technical requirements systems, manufacturing, 19-22 and customer requirements, 322, 323 systems thinking and targets, 325 Australian Business Excellence Award, technology 541 banks and, 111 business analytics, 612 competitive markets, 5 tacit knowledge, 618 as component of service quality, 24 Taco Bell, 234 computer, 618, 647 Taguchi, Genichi, 296, 329 consumer Awareness and, 18 CRM and, 120 Taguchi loss function, 328-334 customer-focused, 119-120 takt time, 491 tangible errors, 221 digital printing, 551 tangibles, dimension of quality, 104 increasing rate of change, 18 targets, 8 information, 25-26, 234, 527, 617 completed House of Quality, 326 innovation and, 315, 573 and tolerance design, 325-328 inspection, 78 TARP, 116-117 internal benchmarking and, 620 task errors, 220 manufacturing categories, 385-386 task identity, 166 modern quality, 65 task significance, 166 process design and, 213 Taylor, Frederick, 12, 154, 668 process requirements, 211 team, 169. See also teamwork statistics and, 253-254 team-based pay, 179 training programs for, 53

Telecommunications Products Division (TPD), 209 telecommunication terminal equipment, 79–80 telephone interviews, 122

virtual teams and, 171

workforce development, 177

10-Step Monitoring and Evaluation Process, 224 total quality (TQ) Termination Identification Process System (TIPS), 617 core principles, 66 defined, 15 test and inspection costs, 383 evolution of, 12, 15 Texas Instruments, 535, 620, 621 key elements of, 66 quality management, 17 in Korea, 17 Raytheon, 205, 535 philosophy, 66, 80 Texas Instruments Defense Systems & Electronics (DS&E), 523, 682 principles, 684-685 Texas Nameplate Company, Inc. (TNC), 48, 168, 235, at Procter & Gamble, 16 scope of, 15-16 523, 524, 604, 668, 684-685 Tovoda, Akio, 4 learning environment, 48 Toyota Camry, 28 philosophy of, 48 text analytics, 110 Toyota Georgetown, 230 Toyota Motor, 4, 234 text mining, 110 Theory of Inventive Problem Solving, 316 lean production, 495 theory of knowledge, 55, 58-59 Toyota Production System, 673 The Quality Calibration Handbook, 387 TPD. See Telecommunications Products Division (TPD) TPM. See total productive maintenance (TPM) 360-degree feedback, 182 TPM Expert, 689 3M Dental Products Division, 523 thresholds for evaluation (TFEs), 455 TPM Master, 689 throughput yield (TY), 380, 449 TOM. See total quality management (TQM) TIPS. See Termination Identification Process System Trader Joe, 130 "traditional" intelligence, 647 Tokyo University of Science, 105 TOL. See Tsutava Online (TOL) training and development, 200-201 tolerance design, 327 Taguchi loss function, 333-334 and employee, 53 Employee Quality Survey, 185 and target, 325-328 tolerances, necessity for, 15 and general management costs, 383 tool engineering, 22 at Honda, 189-192 Toronto Plastics, Ltd, 83 institute training, 53, 538 Marlow Industries, 185 Torque Traction Technologies, Inc. See Dana Six Sigma Black Belt, 482 Corporation-Spicer Driveshaft Division Toshiba, 230 Transactional Customer Satisfaction Index, 120 transactional leadership theory, 645-646 total productive maintenance (TPM), 496, 689 transcendent perspective, 6 total quality control (TQC), 16, 65 transformational leadership theory, 646 aspects of, 65 coining of, 16, 65 treatment errors, 220 performance excellence, 16-17 Treaty on European Union, 80 total quality management (TQM), 471 tree diagram, 573, 575 and probabilities, 257 in China, 36 development of, 15-16 Trident Precision Manufacturing, Inc., 523 TRIZ, 316 failures, 16

Tsutaya Online (TOL), 120 t-Test Dialog, 287 Turkuman Rug Company, 302 Twitter, 108 Two-Factor theory, 163 Type I error, 285 TY (throughput yield), 380, 449

U

UAW, See United Auto Workers (UAW) U-bolt, 275, 276 data, 276, 277 histogram, 277 u-chart control chart construction, 437 data and calculations, 436 for nonconformances, 431-432 packing slip errors, 443 quality rating system, 435 receiving process, 441-444 UCL. See upper control limit (UCL) Ultimate Service program, 9 Union of Japanese Scientists and Engineers (JUSE), 13, 65, 66, 171 Unique Online Furniture, Inc., 133-136 Better Business Bureau and, 134 Christmas gift certificate by, 134 client experience checklist, 134-136 competition, 133 customer requirements, identified by, 133-134 multiple communication mechanisms by, 134 websites and, 134 "You Totally Rock" certificate by, 134 United Auto Workers (UAW), 4 United States, quality revolution in, 13-14 United Way of America, 685 unit of work, 377 universal theory of management, 60 University of Michigan Business School, 99 University of Minnesota, 636 University of Tokyo, 105, 171 University of Washington, 144 University of Wisconsin-Stout, 524

unstructured performance problems, 474–475
upper control limit (UCL), 403
U.S. Army Armament Research, Development and
Engineering Center, 525
U.S. Postal Service (USPS), 622–624
user perspective, 7

V

VA Cooperative Studies Program Clinical Research Pharmacy Coordinating Center, 525 VACSP, See Veterans Affairs Cooperative Studies Program (VACSP) value(s) Baldrige Criteria for Performance Excellence, 529 leadership, 529 performance measurement, 597-604 personal, quality and, 30 perspective, 7-8 stakeholder, 641 value chain, 9-10 value chain, 10-19 integrating perspectives on, 9-10 value-creation processes, 209-210 requirements, 211, 212 Value Innovation Program (VIP) Center, 351 value perspective, 7-8 value pricing, 8 value stream map, 489 variable measurement, 377 variables data La Ventana Window Company (LVWC), 411 process capability, 411 process monitoring and control, 411 x-chart and R-charts, constructing, 409-411 variance, 271 calculation of, 332 variation, 56-57 assignable causes of, 72 "bullwhip" effect, 71 causes, 71-72 common causes of, 71 complex interactions of, 71

Deming philosophy and, 49

excessive, 56 lessons from, 71-72 operational problems by, 71 production and, 11 quincunx and, 56-57 reducing sources of, 62 statistical method and, 57 and statistical thinking, 70-78 understanding, 70-72 Veridian Homes, 690-691 Verizon, 109 Verizon Information Services (GTE Directories, Inc.), 524 Verizon Wireless advertises, 354 vertical integration, 583 Veterans Affairs Cooperative Studies Program (VACSP), 153-154, 547 VIP. See Value Innovation Program (VIP) Center virtual teams, 170-171 virtuous teaching cycle (VTC), 680 vision, 563 Baldrige Criteria for Performance Excellence, 529 in Deming's 14 Points, 51 and demonstrate commitment, 51 leadership, 529 organization's view, 563 visionary leaders, 676 visual controls, 496 "vital few," 102 VOC. See Voice of the Customer (VOC) Voice of the Customer (VOC), 106, 111-112, 310 gathering, 106-109 at U.S. Postal Service, 623 Voice of the Employee, 623 Voltmeter calibration data, 291, 292 Vonderhaar, Alan, 328 Vroom, Victor H., 163 VTC. See virtuous teaching cycle (VTC)

W

Wainwright Industries cultural change at, 669–670 empowerment in, 168

information practices, 596-597 quality improvement at, 596-597 suggestion system at, 161-162 workforce, 161-162 Wainwright Industries, Inc., 523 Walker, Darren, 91 Walker Auto Sales and Service (WASS), 91 Wallace Co., Inc., 523 Wall Street Journal, 25, 99 Walmart, 109, 117 War Production Board, 13 Washington Elementary School, 663-664 WASS. See Walker Auto Sales and Service (WASS) waste elimination, 6 wave soldering process, 297-299 data corresponding to first experiment, 298 defects after experimental design optimization, 298 DOE and, 297-299 factors/levels of experimentation, 297 at Hewlett-Packard India, Ltd., 297 Wayback Cleaning Co., 303 Weber, Max, 643 Welch, Jack, 470, 678-679 well-being, 59 well-defined decision procedures, 175 Wells Fargo Bank, 180 recognition and rewards, 180 Western Electric Company, 12 Westinghouse, 14, 669 Westinghouse Commercial Nuclear Fuel Division, 523 Weston, Tex, 413, 458 Wherehousing, Inc., 303 Whirlpool, 106, 108, 353 Whitney, Eli, 11 Widetred, Inc., 363 wikis, 167 Wilford, Sandra, 198 Willard, Daniel, 171 Wilson Sporting Goods Company, 71 The Wizard of Oz, 695 work design, 165-167

Work Environment, 81

workforce. See also employees basic quality system and, 152 capability and capacity, 187-189 at Caterpillar Financial Services Corporation, 462-463 compensation and recognition, 178-181 defined, 151, 152 development, 176-178 effectiveness, 184-186 engagement, 158-160, 184-186 at Graniterock Company, 254-255 at Heartland Health (HH), 525-526 at Hewitt Associates, 192-194 ISO 9000:2000, 152 learning and development, 176-178 management, 154-155 measuring engagement of, 186 at MEDRAD, 159 motivation, 162-164 at Motorola, Inc., 5 at Park Place Lexus (PPL), 97 at PRO-TEC Coating Company, 153-154 at Ritz-Carlton Hotel Company, LLC, 25-26 at SAS Institute, Inc., 176 satisfaction, 152, 184-186 at Studer Group, 636-637 at Wainwright Industries, Inc., 596-597 work systems and, 582 workforce focus, 527-528, 546 ISO 9000:2000, 545 workforce-focused outcomes, 602, 603-604 "Workforce Planning and Assessment Tool," 187 work measurement, 50 work-outs, 679 workplace environment, 175-176 work processes, 221-222 work systems, 583 at Baptist Hospital, 170 compensation, 178-179 designing, 164-184 empowerment and, 167-169 job design, 165-167

quality circles, 171–172
recognition; 178–181
rewards, 180–181
self-determination vs. empowerment, 169
sustaining, 187–189
work design, 165–167
at Xerox, 168
world class, Boeing A&T, 613
WorldCom, 533
World War II, 13
Wright, Ann, 623
Wriston, Walter, 151
written surveys, 122
Wyatt Company, 665–666

X

x-charts, 418-419, 421 with additional data, 419 advantages of, 423 control limits, 410, 411, 447 for individual measurements, 421 La Ventana Window Company (LVWC), and R-charts, constructing, 409-411 revised, 416 used for, 409 Xerox, 14, 31-35, 168, 177, 184, 317, 667 alignment at, 478 behaviors, 34 "Black Belt," 33 core values, 33-34 crisis, 33-35 customer satisfaction, 32 employees at, 32 evolution of quality at, 31 leaderhip, 34 Leadership Through Quality, 31-33 Lean Six Sigma, 33, 34 market trends, 34 quality imperative within, 32 Quality Policy, 31 quality renewal, 33-35 restrengthening quality within, 34

\$93/4/14 ·

reward and recognition systems, 33
satisfaction survey, 121
suppliers and, 33
training at, 33
workforce plans, 155
Xerox Business Services, 524
Xerox Corp. Business Products and Systems, 523
Xerox Quality Policy, 31

Y

Yamada Electric plant, 220 yellow brick road to quality, 695 yellow zones, pre-control lines, 401, 402 7

ZD. See Zero Defects (ZD)
Zero Defects Day, 73, 74
Zero Defects (ZD), 63, 73
Zero Quality Control (ZQC), 219
Zhou Dynasty, 11
ZQC. See Zero Quality Control (ZQC)
Zytec Corporation, 54, 523