

SOFTWARE ENCLOSURE  
Book not returnable if software  
has been removed.  
PRENTICE-HALL, INC.

# Quality

SECOND EDITION

Suranaree University of Technology



31051000579710

Donna C. S. Summers

# Contents

<b>I</b>	<b>SETTING THE STAGE</b>	<b>1</b>
1	Quality Basics	2
	Identifying Quality 4 / Ingredients for Success 5 / The Evolution of Quality 10 / Beyond Total Quality Management 15 / Summary 17 / Lessons Learned 18 / Chapter Problems 18 / Case Study 20	
2	Quality Advocates and Quality Management	26
	Quality Advocates 28 / Continuous Improvement 39 / Summary 49 / Lessons Learned 49 / Chapter Problems 50 / Case Studies 52	
3	Quality Improvement: Problem Solving	64
	Problem Solving 66 / Steps in Process Improvement 66 / Plan 68 / Do 90 / Study 94 / Act 95 / Summary 96 / Lessons Learned 97 / Chapter Problems 98 / Case Studies 104	
<b>II</b>	<b>CONTROL CHARTS FOR VARIABLES</b>	<b>113</b>
4	Statistics	114
	Statistics 116 / Use of Statistics in Quality Assurance 118 / Populations versus Samples 118 / Data Collection 121 / Measurements: Accuracy, Precision, and Measurement Error 124 / Data Analysis: Graphical 127 / Data Analysis: Analytical 146 / Normal Frequency Distribution 161 / Summary 170 / Lessons Learned 170 / Chapter Problems 171 / Case Studies 182	
5	Variable Control Charts	192
	Control-Chart Functions 195 / Variation 196 / Control Charts 199 / Control Charts for Variables 199 / Summary 243 / Lessons Learned 243 / Formulas 244 / Chapter Problems 246 / Case Studies 253	
6	Process Capability	280
	Individual Values Compared with Averages 282 / Estimation of Population $\sigma$ from Sample Data 283 / Control Limits and Specification Limits 286 / The $6\sigma$ Spread versus Specification Limits 289 / Calculating Process Capability Indices 292 / Summary 302 / Lessons Learned 302 / Formulas 303 / Chapter Problems 303 / Case Studies 305	

<b>7</b>	<b>Other Variable Control Charts</b>	<b>316</b>
	Individuals and Moving-Range Charts 318 / Moving-Average and Moving-Range Charts 323 / A Chart Plotting All Individual Values 327 / Median and Range Charts 328 / Run Charts 334 / A Chart for Variable Subgroup Size 336 / Precontrol Charts 338 / Short-Run Charts 344 / Summary 348 / Lessons Learned 348 / Formulas 351 / Chapter Problems 352 / Case Studies 360	
<b>III</b>	<b>CONTROL CHARTS FOR ATTRIBUTES</b>	<b>367</b>
<b>8</b>	<b>Probability</b>	<b>368</b>
	Probability Theorems 370 / Permutations and Combinations 378 / Discrete Probability Distributions 381 / Continuous Probability Distribution 387 / Distribution Interrelationships and Approximations 389 / Summary 391 / Lessons Learned 392 / Formulas 392 / Chapter Problems 394 / Case Studies 399	
<b>9</b>	<b>Quality Control Charts for Attributes</b>	<b>404</b>
	Attributes 406 / Charts for Nonconforming Units 406 / Charts for Counts of Nonconformities 430 / Summary 445 / Lessons Learned 447 / Formulas 447 / Chapter Problems 449 / Case Studies 465	
<b>IV</b>	<b>EXPANDING THE SCOPE OF QUALITY</b>	<b>477</b>
<b>10</b>	<b>Reliability</b>	<b>478</b>
	Reliability 480 / Product Life Cycle Curve 481 / Measures of Reliability 482 / Reliability Programs 491 / Reliability Engineers 494 / Summary 495 / Lessons Learned 495 / Formulas 496 / Chapter Problems 496 / Case Studies 500	
<b>11</b>	<b>Quality Costs</b>	<b>504</b>
	What Are Quality Costs? 506 / Defining Quality Costs 506 / Types of Quality Costs 510 / Quality-Cost Measurement System 513 / Utilizing Quality Costs for Decision Making 514 / Summary 514 / Lessons Learned 515 / Chapter Problems 515 / Case Studies 518	
<b>12</b>	<b>Product Liability</b>	<b>530</b>
	The Evolution of Product Liability 532 / Warranties 533 / Product Liability Suits 533 / Liability Loss Control Programs 535 / Future Considerations 540 / Summary 540 / Lessons Learned 541 / Chapter Problems 541 / Case Study 544	

<b>13</b>	<b>Quality Systems: ISO 9000, Supplier Certification Requirements, and the Malcolm Baldrige Award</b>	<b>548</b>
	Quality Systems 550 / ISO 9000 550 / Supplier Certification Requirements: QS 9000 557 / ISO 14000 558 / Malcolm Baldrige National Quality Award 559 / Summary 562 / Lessons Learned 563 / Chapter Problems 564 / Case Study 565	
<b>14</b>	<b>Benchmarking and Auditing</b>	<b>572</b>
	Benchmarking 574 / Auditing 580 / Summary 585 / Lessons Learned 585 / Chapter Problems 586 / Case Study 588	
	<b>Appendix 1 Normal Curve Areas (<math>Z \leq Z_0</math>)</b>	<b>595</b>
	<b>Appendix 2 Factors for Computing Central Lines and <math>3\sigma</math> Control Limits for <math>\bar{X}</math>, <math>s</math>, and <math>R</math> Charts</b>	<b>597</b>
	<b>Appendix 3 Cumulative Binomial Probability Distribution</b>	<b>598</b>
	<b>Appendix 4 The Poisson Distribution</b>	<b>609</b>
	<b>Appendix 5 About PQ Systems</b>	<b>613</b>
	<b>Appendix 6 SQCpack Student Version Software</b>	<b>615</b>
	<b>Glossary</b>	<b>622</b>
	<b>Answers to Selected Problems</b>	<b>634</b>
	<b>Bibliography</b>	<b>637</b>
	<b>Index</b>	<b>642</b>