

Index

• *Symbols and Numerics* •

5 Why's, 195–197
5S Method
 auditing results, 234
 communication boards, 215–219
 cons, 215
 daily inspection sheet, 233–234
 description of, 16, 213
 Lean Materials, 267
 pros, 214–215
 Rapid Improvement Event, 244, 249–250
 Shine phase, 228–230
 Sort phase, 219–222
 Standardize phase, 231–232
 Straighten phase, 223–227
 Sustain phase, 232–234
 Theory of Constraints, 335
80/20 rule, 14, 126, 282
100% Inspection, 54

• *A* •

absolute importance, 321
acceptable quality level (AQL), 53
acceptance number, 55
acceptance sampling by lots, 54
accreditation agencies, 31
accuracy
 in data-collection process, 114
 definition, 114
 importance of, 103
 in measuring processes, 113
AGI Institute (Web site), 350
Air Academy Associates (Web site), 292
American Engineering Standards
 Committee (AESC), 25
American National Standards Institute
 (ANSI), 25
American Society for Quality (ASQ), 292, 348
analysis of variance (ANOVA), 151–154
anecdotal evidence, 107, 108

ANSI (American National Standards
 Institute), 25
ANSI-ASQ National Accreditation Board, 32
approval for the process, securing, 66
AQL (acceptable quality level), 53
ASQ (American Society for Quality), 292, 348
Attractive Attributes, 85
attribute data
 control chart, 164, 165
 description of, 49
 in gauge R&R test, 115
 turning into variable data, 49
audit, 234
automation, in data collection, 122
average, 133

• *B* •

bar code, 259
baselining, process performance, 243–245
benchmarking
 industry standards, 96
 Lean processes, 181
 Quality Function Deployment, 317
 Total Quality Management, 280–281
best practices, 231–232
bias, 113, 181
bill of materials, 261
binary (coding scheme), 123
brainstorming, 43, 282
buffer
 minimizing with Lean Materials, 257–258
 in Theory of Constraints, 331–332
buyer, knowing your responsibilities,
 38–41

• *C* •

c chart, 165
capability index, 174–175
card, Kanban, 258–260
cause-and-effect diagrams, 43

- change, introducing
 - communication, 68–71
 - employee resistance, 63
 - employee training, 71–75
 - obstacles, 78–80
 - pilot project, 76–78
 - roadmap to quality, 64
 - sponsor, 64–68
- chart
 - benefits of using, 125
 - c, 165
 - control, 128–129, 159, 161–173
 - fishbone, 277–278, 283, 305–307
 - flowcharts, 159
 - np, 165
 - p, 165
 - Pareto, 126–127, 137–143, 159
 - R (Range), 129, 164–165, 168–169
 - run, 159, 160
 - in Statistical Process Control, 159, 161–173
 - u, 165
 - X-bar, 129, 164–168
- Chart Wizard button, Microsoft Excel, 166
- check sheets, 118–120, 283
- checkup, daily 5S, 233–234
- cleaning, in Shine phase of 5S method, 228–230
- clutter, managing. *See* 5S method
- CMMs. *See* coordinate measuring machines
- coding data, 123
- common areas, 229
- common-cause variation, 161, 171–172
- communication
 - importance of effective, 68
 - informational, 69
 - Lean processes, 182
 - mandatory, 69
 - marketing, 69
 - stakeholder reporting matrix, 70–71
 - types of information to communicate, 68–69
 - who communicates, 69–70
- communication boards
 - department status board, 216–219
 - description, 215–216
 - establishing facility, 216
 - floor plan, before, 217–219
 - spaghetti chart, before, 219, 220
- compare-and-review checks, 120
- competitors
 - borrowing from, 93
 - stealing customers, 84
- complaints, customer, 94
- confidence interval, 135
- confidence level, 135
- conflict resolution, 44
- conforming item, 47, 57
- consistency, in the inspection process, 52
- constraints. *See also* Theory of Constraints
 - bathub drain example, 331
 - buffer stabilization of, 332
 - checkout line example, 337
 - cleanup process, 335–336
 - description of, 18, 325
 - elevating, 337
 - identifying, 334–335
 - internal, 334
 - location, 334
 - market, 334
 - process speed and, 330–3631
 - subordinate processes, 332
 - supplier, 334, 335
- consultant, 66, 68
- Consumer Product Safety Commission (CPSC), 26
- consumer risk, 50
- container
 - reusable, 268
 - selecting, 267–268
- continuous data. *See* variable data
- continuous improvement, 286–288
- control chart
 - assumptions made by, 169
 - attribute data, 164, 165
 - building, 165–169
 - capability index calculation, 174–175
 - control limits, 129, 164, 173
 - description, 44, 128–129
 - mean, 162
 - patterns to look for, 170
 - population, 162
 - R (Range) chart, 129, 162, 164–165, 168–169
 - reading, 169–170
 - responding to variation detected by, 170–172
 - sample, 162
 - standard deviation, 162–163
 - in Statistical Process Control, 159, 161–173

- Total Quality Management, 278, 283
- variable data, 164–165
- variation detection, 161–162
- X-bar chart, 129, 164–168
- zones, 170
- control limits
 - capability index, 174
 - changing, 173
 - description of, 129
 - reasons to use, 164
 - setting, 164
- coordinate measuring machines (CMMs)
 - description of, 105
 - selecting correct, 106
 - when to use, 105–106
- COPDQ (cost of poor data quality), 121
- COPQ (cost of poor quality), 20–21
- correlation
 - calculating, 144–147
 - description of, 143–144
 - negative, 143
 - positive, 143
 - scatter diagram, 145–146
 - strength, 144
 - using results, 148
- correlation coefficient
 - calculating, 146–147
 - description of, 143
 - positive and negative, 143
 - strength, 144
- correlation matrix, House of Quality, 320
- cost
 - cutting, 26
 - of data collection, 121–122
 - of exceeding customer requirements, 21–22
 - inspection process, 51
 - labor, 244
 - of offering too little, 20–21
 - or rework, 59–60
 - of poor data quality, 121
 - of producing defective products, 48–49
 - reducing with Total Quality Management, 280
 - of risks, 79
 - savings with Rapid Improvement Event, 236–237
 - supplier involvement in controlling, 271
 - total cost of ownership, 83–84
 - unit cost of manufacture, 256
 - cost of poor data quality (COPDQ), 121
 - cost of poor quality (COPQ), 20–21
- CPSC (Consumer Product Safety Commission), 26
- CRM (customer relationship management) system, 92–93
- Curious Cat Management Improvement Library (Web site), 348
- current state map
 - creating, 202, 203–208
 - families, creating product, 206, 208
 - flow of materials and information, 204, 206
 - icons, 204, 205
 - sample, 207
 - software, 203
 - timeline, 206
- customer data
 - CRM (customer relationship management), 92–93
 - focus groups, 90–91
 - rules for collecting, 88–89
 - surveys, 89–90, 92
- customer demand, listening to, 192–193
- customer expectations
 - cost of, 83–84
 - exceeding, 180
 - perfection, 82–83
 - speed, 83
- customer relationship management (CRM) system, 92–93
- customer requirements
 - converting into design specifications, 317–318
 - data collection, 315–316
 - defining critical characteristics of, 342
 - demands and delighters, distinguishing between, 315
 - exceeding, 21–22
 - identifying, 314–316
 - measuring, 319
 - translating into measurements, 343
- customers
 - complaints, 94
 - CRM (customer relationship management), 92–93
 - data on, 87–94
 - desires of, 13
 - expectations of, 82–84

customers (*continued*)
 feedback from, 346
 focus groups, 90–91
 gauging desires with Kano Model, 84–87
 identifying critical-to-customer issues,
 82–84
 internal, 283
 listening to, 13–14
 observing, 94
 surveys, 89–90, 92
 voice of the customer (VOC), 13–14, 81
 customer/supplier mapping, 43

• D •

daily inspection sheet, 5S, 233–234
 data

attribute, 49, 115
 coding, 123
 cost of poor quality, 121
 customer, 87–94
 stratification of, 172
 variable, 49, 115
 warranty, 94

data analysis

coding data, 123
 control charts, 128–129
 histograms, 125–126
 Pareto charts, 126–127
 pivot tables, 123–124
 scatter diagrams, 127–128

data collection

analysis of data, 122–129
 anecdotal evidence, 107, 108
 automated, 122
 check sheets, 118–120
 coding data, 123
 compare-and-review checks, 120
 cost of poor data quality (COPDQ), 121
 costs of, 121–122
 design of experiments (DOE), 110–111
 elements of consistent collection
 process, 113–114
 gauge repeatability and reproducibility
 (gauge R&R), 113–117
 guidelines, 112
 knowing what you are looking for, 108–112
 one-change-at-a-time testing, 109–110
 pivot table use in, 123–124

for Quality Function Deployment (QFD),
 315–316

quality of, confirming, 117–121
 questions to ask about process, 108
 SIPOC map, 111–112
 standard samples, taking, 114–115
 testing data collectors, 115–117
 Total Quality Management (TQM), 282

data collectors, 88

data worksheets, 44

Datazinc (Web site), 292

DeCarlo, Neil (*Six Sigma For Dummies*), 289

decluttering. *See* 5S Method

defect

cost of producing, 48–49

definition of, 48

Total Quality Management, 278, 284

tracking, 56–60

waste of defective products, 191–192

Define, Measure, Analyze, Improve, and
 Control (DMAIC)

analyze, 298

control, 299

define, 295–296

improve, 298–299

measure, 296–298

delighters, 315

deliveries, 269–270

demand, listening to customer, 192–193

deming.org (Web site), 349

dependent variable, 128, 149

design of experiments (DOE), 110–111

design specification, converting customer
 requirements into, 317–318

desires, customer, 84–87

disaggregation, 172

discrete data. *See* attribute data

discrimination, in measuring processes, 113

disposal, 221–222

DMAIC. *See* Define, Measure, Analyze,
 Improve, and Control

DOE (design of experiments), 110–111

double sampling, 56

Dreyer, Dennis (consultant), 196, 197

drum, 18, 330–331

Drum-Buffer-Rope system

buffer, 331–332

drum, 330–331

rope, 332–333

• E •

80/20 rule, 14, 126, 282
 employee
 importance of empowered, 284–286
 role in Rapid Improvement Event (RIE),
 239–240
 suggestion program, 285
 training, 14, 72, 74–75
 tribal knowledge, 296
 underutilization of skilled, 186
 errors
 eliminating with Total Quality
 Management, 281
 error counts, 99
 sampling, 136
 evaluation matrix, 43
 Excel. *See* Microsoft Excel
 Exciters, 85
 executives, role in Total Quality
 Management, 283–284
 experiment design, 44
 experimentation, 172

• F •

F critical value, 154
 F ratio, 152, 154
 Failure Modes and Effects Analysis (FMEA)
 creating, 307–308, 309
 problem component, 308
 recommendation component, 310
 families, product, 206, 208
 feedback, 346
 field reports, 94
 fishbone chart/diagram, 277–278, 283,
 305–307
 5 Why's, 195–197
 5S Method
 auditing results, 234
 communication boards, 215–219
 cons, 215
 daily inspection sheet, 233–234
 description of, 16, 213
 Lean Materials, 267
 pros, 214–215
 Rapid Improvement Event, 244, 249–250
 Shine phase, 228–230

Sort phase, 219–222
 Standardize phase, 231–232
 Straighten phase, 223–227
 Sustain phase, 232–234
 Theory of Constraints, 335
 floor plan
 before, 217–219
 after, 225–227
 flowchart
 description of, 43
 in Statistical Process Control, 159
 Total Quality Management, 277
 Value Stream Mapping compared to, 201
 FMEA. *See* Failure Modes and Effects Analysis
 frequency distribution, 125
 future state map
 constructing, 209–210
 developing, 202
 example, 211
 implementing, 210
 value-added and non-value-added steps,
 208–209

• G •

gauge
 choosing correct, 102–103
 description of, 101–102
 setting up, 104
 types, 102
 gauge repeatability and reproducibility
 (gauge R&R)
 analyzing, 117
 elements of consistent collection
 process, 113–114
 form, 116
 Microsoft Excel, 115
 standard samples, taking, 114–115
 testing data collectors, 115–117
 when to perform, 113
 goal
 reviewing, 79
 Six Sigma, 290–291
 Theory of Constraints, 333
 Total Quality Management, 280–281
 Goldilocks (analogy), 19–20
 Goldratt, Dr. Eliyahu (*The Goal*), 325
 goldratt.com (Web site), 350
 go/no go measurement, 97–98, 100

graph, Kano, 86–87
 graphical analysis, 44
 guru, Lean, 182
 Gygi, Craig (*Six Sigma For Dummies*), 289

• H •

histogram
 creating, 125–126
 description of, 125
 of normal process, 157
 Pareto chart, 126, 137
 in Statistical Process Control, 159
 House of Quality. *See also* Quality Function
 Deployment (QFD)
 basement, 321–323
 building, 313–323
 components of, 314
 description of, 18
 Quality Function Deployment (QFD)
 matrix, 312
 roof, 320–321
 Targets, 322–323
 housekeeping. *See* 5S Method

• I •

icons, Value Stream Map, 204, 205
 implementation. *See also* change, introducing
 future state map, 210
 of quality program, 64, 65
 improvement teams, 280, 285–286
 incorporation, of quality program, 64
 independent variable, 128, 149
 information security, 248
 inspection
 acceptable quality level (AQL), 53
 attribute data, 49
 challenges of implementation, 51–52
 conforming item, 12, 45, 57
 costs of, 51
 defect, definition of, 48
 defect, tracking, 56–60
 errors, categories of, 50
 human aspect of, 50–51
 importance of catching bad products, 48–49

lot sampling, 54–56
 nonconforming item, 12, 47, 48, 57
 100%, 54
 records, keeping careful, 57–59
 rectifying scheme, 56
 role of, 12
 selecting approach for, 52–54
 variable data, 49
 zero, 54
 internal constraints, 334
 internal customers, 283
 International Organization for
 Standardization (ISO) certification
 aim of process, 28
 audit, 31–32
 basics of, 27–28
 benefits of, 27, 28
 generic management system standards, 24
 name standardization, 25
 parts of ISO 9000 standards, 29
 preparing for ISO 9001 certification, 30–31
 registrars, 31–32
 requirements for ISO 9000, 29–30
 Web site, 347
 Internet survey, 90
 interval (coding scheme), 123
 interviews, 91, 94
 introducing quality control, 13
 inventory
 defined, 327
 shrinkage, 263
 waste of excess, 189–190
 Ishikawa's Fishbone chart, 305–307
 isixsigma.com (Web site), 349
 ISO. *See* International Organization for
 Standardization (ISO) certification
 ISO 9000
 as example of a quality standard, 23
 generic management system standards, 24
 importance of certification, 28
 parts of standard, 29
 requirements for, 29–30
 ISO 9000:2000, 29
 ISO 9001 certification, 30–31
 ISO 9001:2000, 29
 ISO 9004:2000, 29

• J •

Joint Commission on Accreditation of
Healthcare Organizations (JCAHO), 25–26
Juran Institute (Web site), 292, 349
Juran, Joseph (quality manager), 127
Just In Time item, 262

• K •

Kaizen event. *See also* Rapid Improvement
Event (RIE)
Lean processes and, 183
waste from unneeded processing steps, 189
Kaizen Institute (Web site), 349
Kanban, 17, 258–260, 261, 344
Kano Model
categories, 85
description of, 84
steps in using, 85–87
Kano, Noriaki (professor), 84
key performance indicators, 44
knowledge, tribal, 296

• L •

labeling items, 225
labels, standardizing, 231
labor, cost of, 244
Lean Aerospace Initiative (Web site), 348
Lean For Dummies (Williams and Sayer), 179
Lean Materials
buffers, 257–258
cons, 264
deliveries, 269–270
description of, 16–17, 256–257
Just In Time item, 262
Kanban, 258–260, 261
packing materials in containers, 267–268
pros, 263–264
Pull system, 260, 262–263
Push system, 260–262
recycling, 268
steps, 265–267
supermarkets, 267, 269
supplier involvement, 270–272

Lean processes
communication and training, 182
cons, 185
copying others, 182
cornerstones of, 180
customer demand, 192–193
description of, 15
5 Why's, 195–197
Lean guru, installing a, 182
process map, 183
pros, 184–185
smooth flow, 195
sustaining improvements, 184
Takt Time, 192–195
target areas, 181–182
tempo, 193–194
Theory of Constraints compared to, 328
value streams, concentration on, 182–183
waste elimination, 180, 183–184
waste identification, 186–192
Likert scale, 49–50
Linear Attributes, 85
linear regression, 148
linearity, in measuring processes, 113
lot sampling
description of, 54
double sampling, 56
lot sentencing, 55
sequential sampling, 56
single sampling, 55
lot sentencing, 55

• M •

maintenance issues, 230
management responsibility, ISO 9000
requirements for, 29–30
management system, generic standards, 24
managementhelp.org (Web site), 349
managers
role in Rapid Improvement Event, 241
role in Total Quality Management, 284
mapping
customer/supplier, 43
definition of, 200
process, 44, 183
relationships, 319–320

market constraints, 334
 Massachusetts Institute of Technology
 (Web site), 348
 materials
 cleaning, 229
 tidying, 223–224
 materials aggregator, 268
 matrix, Quality Function Deployment
 (QFD), 312
 mean, 133, 162
 measurement
 coordinate measuring machines (CMMs),
 105–106
 error counts, 99
 gauge, 101–104
 go/no go, 97–98, 100
 hand tools, 101
 metrics, 95–97
 selecting right process, 100
 against specifications, 98, 99
 measurement analysis and improvement,
 ISO 9000 requirements for, 30
 metrics
 characteristics of good, 96
 defined, 95–96
 industry standards used as, 96
 for Lean transition, 183
 measuring customer requirements, 319
 questions to ask concerning, 97
 in Value Stream Mapping (VSM), 201
 Microsoft Excel
 building control chart in, 165–169
 correlation coefficient calculation, 146–147
 gauge R&R test, 115
 pivot table creation in, 124
 regression analysis in, 149–150
 scatter diagrams, 145
 tracking risks with, 79
 mistake proofing, 247–248, 344
 movement, waste of unnecessary, 190–191
 Must-Haves, 85, 87

• N •

needs analysis, 64
 nominal (coding scheme), 123
 nonconforming item, 12, 47, 48, 57
 non-value-added steps, 208–209
 normal curve, 158

normal process, 157, 158
 Northwest Lean Networks (Web site), 348
 np chart, 165

• O •

Occupational Safety and Health
 Administration (OSHA), 26
 one-change-at-a-time testing, 109–110
 One-Dimensional Attributes, 85
 on-the-job training, 44
 operating expense, 327
 ordinal (coding scheme), 123
 overfeeding the process, 327–328
 overproduction, waste of, 186–187
 ownership, total cost of, 83–84

• P •

p chart, 165
 Pareto, Vilfredo (economist), 127
 Pareto analysis/chart
 benefits of, 137
 category selection, 138–139
 creating, 126–127, 137–140
 description of, 43, 126
 formation of, 139–140
 information gathering, 138–139
 interpreting, 140–143
 pattern recognition, 140–141
 pivot table use, 124
 problems, 142–143
 in Statistical Process Control, 159
 Total Quality Management, 278, 282
 using results of, 141–142
 Pareto Principle, 127, 137, 141
 parts, bad, 35
 pass/fail test, 98, 123
 PDCA. *See* Plan-Do-Check-Act (PDCA) cycle
 peer pressure, 229
 perfection, desire for, 82–83
 performance attributes, 85, 87
 personal items, putting away, 224–225
 pilot project, 13, 76–78
 pivot tables, 123–124
 Plan-Do-Check-Act (PDCA) cycle
 requirements of, 12
 stages, 41–43
 in Statistical Process Control, 172

- tools, 43–44
 - Total Quality Management, 287
 - population, definition of, 135, 162
 - precision, 114
 - process
 - bad, 36
 - mapping, 44, 183
 - standardization, 44
 - process capability
 - capability index, 174–175
 - description of, 173–174
 - identifying, 174–175
 - moving a process closer to customer specifications, 175–176
 - process flowchart, in Total Quality Management, 283
 - producer risk, 50
 - product development
 - customer requirement identification, 342
 - customer-feedback mechanism, creating, 346
 - improving the process, 345
 - Kanban planning, 344
 - leaning the process, 343–344
 - measuring customer requirements, 343
 - mistake proofing a process, 344
 - problem identification, 342
 - prototype process, establishing, 343
 - testing the process, 345
 - product realization, ISO 9000
 - requirements for, 30
 - prototype process, 343
 - Pull system, 260, 262–263
 - Push system, 260–262
- **Q** ●
- QCM (quality control manager), 65–66, 67
 - QFD. *See* Quality Function Deployment
 - QFD Institute (Web site), 350
 - quality
 - cost of poor quality (COPQ), 20–21
 - customer-based definition, 10
 - statistical definition, 11
 - quality assurance
 - bad processes, 36
 - bad products, 35–36
 - buyer responsibilities, 38–41
 - catching errors before they occur, 35–36
 - description of, 11, 33–34
 - nursery rhyme, 35
 - Plan-Do-Check-Act (PDCA) cycle, 12, 41–44
 - quality control compared to, 34–35
 - specifications, 44–46
 - supplier self-survey, 37–38, 39
 - suppliers, developing trusted, 36–41
 - quality control manager (QCM), 65–66, 67
 - Quality Function Deployment (QFD)
 - absolute importance, 321
 - cons, 312–313
 - customer requirements, identifying, 314–316
 - description of, 18, 311
 - House of Quality, 18, 313–323
 - mapping relationships, 319–320
 - matrix, 312
 - process, 313
 - pros, 312
 - relative importance, 321–322
 - targets, 322–323
 - technical difficulty, 323
 - voice of the engineer, 318
 - voice of the marketplace, 317
 - quality management standards. *See* quality standards
 - quality management system, ISO 9000
 - requirements for, 29
 - quality standards
 - American National Standards Institute (ANSI), 25
 - best practices, 231–232
 - certification, ISO, 27–32
 - communicating customers' requirements, 26
 - for cost cutting, 26
 - creating, 23–24
 - de facto standard, 23
 - defining, 22–23
 - governing bodies, 24–25
 - International Organization for Standardization (ISO), 24–25
 - Joint Commission on Accreditation of Healthcare Organizations (JCAHO), 25, 26
 - roles in commerce, 25–26
 - as rules of the road, 22
 - safety, 26
 - setting, 11

quality steering committee, 284
 questionnaire
 in Kanon Model, 86
 supplier self-survey, 37–38, 39–40

• R •

R (Range) chart, 129, 164–165, 168–169
 random sampling, 136
 range, 133, 162
 Rapid Improvement Event (RIE)
 baselining process performance, 243–245
 cleaning work area, 249
 cons, 237
 description of, 16, 235–236
 documenting current process, 241–245
 documenting tests and research, 252
 fifth day, 253–254
 first day, 245–249
 5S process, 244, 249–250
 following workers through process, 243
 fourth day, 251–252
 improvement plan, drafting, 250–251
 information security, 248
 leader, 240
 management report, 253
 managers, 241
 mapping process flow, 241–242
 mistake proofing, 247–248
 one week later, 254
 presentations, 246–248
 problematic process, identifying, 238
 pros, 236–237
 scorecard, 244, 252
 second day, 249–250
 selecting a process victim, 237–239
 staffing an improvement team, 239–241
 team building, 246–247
 testing improved process, 251–252
 third day, 250–251
 training the team, 245–249
 Value Stream Map, 241–242, 248–249
 work instructions, 242–243
 workers, 239–240
 ratio (coding scheme), 123
 records, of inspection process, 57–59
 rectifying scheme, 56
 recycling, 268
 registrars, 31–32

regression analysis
 description of, 148
 linear regression, 148
 in Microsoft Excel, 149–150
 performing, 149–150
 using results of, 151
 relative importance, 321–322
 Replenishment Technology Group, Inc.
 (Web site), 349
 reporting matrix, stakeholder, 70–71
 resource management, ISO 9000
 requirements for, 30
 returning items, 221
 rework, 59–60
 RIE. *See* Rapid Improvement Event
 risk
 consumer, 50
 identifying, 78–79
 monitoring and managing, 79
 planning for, 79
 producer, 50
 quantifying, 79
 tracking with Microsoft Excel, 79
 Risk Priority Number (RPN), 308
 roadmap, quality, 64
 root-cause analysis of failures, 52
 rope, in Theory of Constraints, 332–333
 rulers, three-dimensional electronic, 105
 Rumsey, Deborah (*Statistics For Dummies*),
 131
 run charts
 in Statistical Process Control, 159, 160
 Total Quality Management, 283

• S •

safety, quality standards, 26
 sample fudge factor, 163
 sample size, 135–136, 162
 sampling
 double, 56
 lot, 54–56
 random, 136
 reasons to use in quality control, 134–135
 sample size, 135–136, 162
 sequential, 56
 single, 55
 standard samples, 114–115
 sampling error, 136

- Satisfiers, 85, 87
- Sayer, Natalie (*Lean For Dummies*), 179
- scatter diagram
- creating, 128
 - plotting data on, 145–146
 - in Statistical Process Control, 159
 - in Total Quality Management, 282
 - uses for, 127–128
- sequential sampling, 56
- shadow boards, 223
- Shewhart, Walter (statistician), 41, 156
- Shine phase, 5S Method
- cleaning as you go, 229–230
 - common areas, 229
 - description of, 228
 - equipment for, 228–229
 - fixing problems at the source, 230
 - maintenance issues, 230
- shrinkage, inventory, 263
- sigma, 163, 290, 301–303
- signage, standardizing, 231
- single sampling, 55
- SIPOC map, 111–112
- SIPOC (Standard Input and Output Chart), 304–305
- Six Sigma
- cons, 293
 - description of, 17–18, 289–290
 - DMAIC (Define, Measure, Analyze, Improve, and Control), 295–299
 - expertise levels, 291–292
 - Failure Modes and Effects Analysis (FMEA), 307–310
 - foundation of, 290
 - goal, 290–291
 - implementation, 293–299
 - Ishikawa's Fishbone chart, 305–307
 - Lean improvements compared to, 18
 - process-review tools, 304–310
 - project selection, 293–299
 - pros, 292–293
 - Rolled Throughput Yield (RTY), 300–301
 - sigma measure, 301–303
 - Standard Input and Output Chart (SIPOC), 304–305
 - Theory of Constraints compared to, 329
 - variation measurement, 303–304
- Six Sigma For Dummies* (Gygi, DeCarlo, and Williams), 289
- Six Sigma Qualtec (Web site), 292
- small-group leadership skills training, 44
- Some Economic Factors in Modern Life* (Stamp), 122
- Sort phase, 5S Method
- description of, 219–220
 - disposal of items, 221–222
 - preparing to sort, 221–222
 - steps to sorting, 222
- spaghetti chart
- after, 237
 - before, 219, 220
 - Rapid Improvement Event, 243
- SPC. *See* Statistical Process Control
- special-cause variation, 162, 171
- specifications
- attributes of good, 45–46
 - avoiding extras in, 46
 - creating clear, 45–46
 - measurement against, 98, 99
 - need for, 44
 - required ingredients, 44–45
- sponsor
- approval for process, securing, 66
 - deciding on, 65
 - description of, 64–65
 - quality control manager, appointment of, 65–66
 - roles of, 65–68
- spreadsheet. *See* Microsoft Excel
- stability, in measuring processes, 113
- stakeholder reporting matrix, 70–71
- Stamp, Sir Josiah (*Some Economic Factors in Modern Life*), 122
- standard deviation
- capability index and, 174
 - control limits, 164
 - description of, 134
 - in Statistical Process Control, 162–163
- Standard Input and Output Chart (SIPOC), 304–305
- standard measurement, 115
- Standardize phase, 5S Method, 231–232
- standards. *See* quality standards
- Statistical Process Control (SPC)
- control chart use, 159, 161–173
 - data, attribute and variable, 164–165
 - description of, 15, 155–156
 - development of, 41

- Statistical Process Control (SPC) (*continued*)
- PDCA cycle, 172
 - process capability, calculating, 173–176
 - pros and cons, 159–161
 - responding to variation, 170–172
 - steps in, 156
 - tools, 158–159
 - variable (or continuous) data, 57
 - variation detection, 161–162
 - variation in normal processes, 157–158
- statistics
- confidence interval, 135
 - confidence level, 135
 - correlation, 143–148
 - mean, 133
 - Pareto analysis, 137–143
 - purposes served by, 14
 - range, 133
 - regression analysis, 148–151
 - sampling, 134–136
 - sampling error, 136
 - standard deviation, 134
 - suspicion concerning, 132–133
 - terminology, 133–134
 - variance, 133, 151–154
- Statistics For Dummies* (Rumsey), 131
- status board, department, 216–219
- storage, 224
- Straighten phase, 5S Method
- description of, 223
 - floor plan, after, 225–227
 - labeling items, 225
 - personal items, putting away, 224–225
 - spaghetti chart, after, 227
 - tools and materials, 223–224
- stratification, common-cause variation, 172
- stream, 200
- subordinate processes, 332, 336, 338
- suggestion program, 285
- supermarkets, 267, 269
- supplier
- buyer, relationship with, 38–41
 - deliveries from, 269
 - developing trusted, 36–41
 - involvement to control costs, 271
 - self-survey, 37–38, 39–40
 - small lots, shipments in, 272
- supplier certification program, 270
- supplier constraints, 334, 335
- survey
- customer, 89–90
 - Internet, 90
 - supplier self-survey, 37–38, 39–40
- Sustain phase, 5S Method
- auditing, 234
 - daily checkup, 233–234
 - description of, 232
 - guidelines, 233
 - permanence of, 232–233
- system constraint, 334. *See also* constraint
- T ●
- table, pivot, 123–124
- Takt Time, 192–195, 330
- Targets, House of Quality, 322–323
- tempo, process, 193–194
- Theory of Constraints (TOC)
- checkout line example, 337
 - cleanup process, 335–336
 - cons, 329–330
 - description of, 18, 325–326
 - Drum-Buffer-Rope system, 330–333
 - elevating the constraint, 337
 - goals, 333
 - identifying a constraint, 334–335
 - Lean compared to, 328
 - overfeeding the process, 327–328
 - principles of, 326
 - pros, 328–329
 - Six Sigma compared to, 329
 - subordinate processes, 332, 336, 338
 - throughput, concentration on, 326–327, 338
- Threshold Attributes, 85
- throughput, 327
- timeline, Value Stream Map, 206
- TOC. *See* Theory of Constraints
- tools
- acting, 44
 - checking, 44
 - cleaning, 228
 - coordinate measuring machines (CMMs), 105–106
 - doing, 43–44
 - gauge, 101–104
 - hand, 101

planning, 43
 tidying, 223–224
 Total Quality Management, 282–283
 total cost of ownership, 83–84
 Total Quality Management (TQM)
 continuous improvement, 286–288
 customer satisfaction, 286
 data collection, 282
 defect deletion, 281
 description of, 17, 275
 executives, role of, 283–284
 improvement teams, 280, 285–286
 middle managers, duties of, 284
 obstacles, overcoming, 288
 Plan-Do-Check-Act cycle, 287
 principles, 276–277
 pros and cons, 279
 steps, 277–278
 techniques, 280–281
 tools, 282–283
 training workers, 284–285
 Toyota Production System (TPS), 186
 TQM. *See* Total Quality Management
 tracking defects, 56–60
 training
 cooperative, 75
 experimentation, 75
 formal, 72–74
 help with, 74
 importance of, 71
 informal, 72, 74–75
 Lean processes, 182
 Rapid Improvement Event team, 245–249
 self-motivated, 75
 Six Sigma, 291–292
 steps in, 73
 workers on Total Quality Management,
 284–285
 transportation waste, 188–189
 tribal knowledge, 296

• U •

u chart, 165
 unit cost of manufacture, 256
 unnecessary motion, waste of, 190–191

• V •

value, definition of, 200
 Value Stream Map (VSM)
 advantages of, 202–203
 attributes, 201
 creation, steps in, 201–202
 current state map, 202, 203–208
 description of, 15, 200
 families, creating product, 206, 208
 flow of materials and information, 204,
 206
 flowcharting compared to, 201
 future state map, 202, 208–212
 icons, 204, 205
 purpose of, 199–200
 in Rapid Improvement Event, 241–242,
 248–249
 value-added and non-value-added steps,
 208–209
 value streams, leaning, 182–183
 value-added steps, 208–209
 variable data
 control chart, 164–165
 description of, 49
 in gauge R&R test, 115
 Statistical Process Control, 57
 turning attribute data into, 49
 variables, 128, 149
 variance
 analysis of variance (ANOVA), 151–154
 calculating and using, 152–154
 description of, 133
 identifying variance issue, 151–152
 variation
 common-cause, 161, 171–172
 measuring in Six Sigma, 303–304
 normal, 157–158
 special-course, 162, 171
 voice of the customer (VOC)
 benefits of, 81
 House of Quality, 313
 methods to seek information, 93–94
 survey, sample, 92
 ways to hear, 13–14
 voice of the engineer, 318

voice of the marketplace, 317
VSM. *See* Value Stream Map

• *W* •

waiting, waste of, 187–188
warranty data, 94
waste
 defective products, 191–192
 defined, 15
 excess inventory, 189–190
 focus on elimination of, 180, 183–184
 of overproduction, 186–187
 Theory of Constraints, definition of, 327
 transportation, 188–189

 underutilization of skilled employees, 186
 of unnecessary motion, 190–191
 from unneeded processing steps, 189
 of waiting, 187–188
Web sites, 347–350
Wikipedia (Web site), 347
Williams, Bruce
 Lean For Dummies, 179
 Six Sigma For Dummies, 289
work instructions, process, 242

• *X* •

X-bar chart, 129, 164–165