

Index

3D modeling, 118

3M

example, 213–214

feasibility stage, 47

focus on the job, 52

handspreads, 47

samples of new products, 47

7 principles. *See* seven principles.

7 wastes. *See* seven wastes.

14 points of Deming, 122–123

80/20 rule, 25–26

A

A3 reports, 157–158

acceptance tests, 150, 186. *See also* story tests.

accommodations, 233

accountability, 64–65

Aden, Jill, 195

adopting new technologies, 230–231

agile software development, tools for. *See* Rally.

Airline Information Management System, 119

airport check-in desk example, 110

airport delays, example, 136–137

Aisin fire, 208–209, 211

AJAX, 150

Alias, 55

alignment, 69

allegiance, 214–216

Allen, Charles, 234

American auto industry, 2–3

American System of Manufacture, 1

analyzing the situation, 169

andon, 139–140

annual performance rating. *See* performance evaluations.

applause, 210

Appleton, Brad, 202

approval process, 84, 103

architecture, software

definition, 20

divisible systems, 182

feedback and quality, 182

assemble-to-order, 34

assembly line. *See* mass production.

assessment, 188–189

asynchronous cadence, 109

Austin, Rob, 40

auto industry. *See also* specific industries.

America, 2–3

Japan, 4–7

used car sales, 41

Autodesk, 55

automating complexity, 72–73

automating routine tasks, 197–198, 227–228, 231–232

autonomation (Jidoka), 5–6

availability of processes, 98

B

BAA airport management, 217–218, 220–221

backlog items, 185–186

balanced scorecards, 144

barriers

eliminating, 210

interdepartmental, 122

batch and queue approach, 88

Beck, Kent, xx

Bell, Gordon, 165

bell curve, and individual performance, 130

Bell Laboratories, 121

Benneton, 67

Beyond the Goal, 230

big visible charts, 140

billing system example, 167–168

Black Belts, 229

blame, 143

Blanc, Honoré, 1–2

Blenko, Marcia, 57

BMI, 39

BMI call center, outsourcing, 215

Boehm, Barry, 33

- Boeing
 - 777 project, 117–120, 140, 230
 - 787 Dreamliner, 210
 - outsourcing, 216–217
- Bohnet, Ralph, 167
- bonuses as incentives, 145, 146
- books and publications
 - Beyond the Goal*, 230
 - Cheaper by the Dozen*, 37
 - “Collaboration Rules,” 208
 - Conquering Complexity in Your Business*, 67
 - “Do You Have Too Much IT?,” 69
 - Estimating and Planning*, 232–233
 - Fit for Developing Software*, 187
 - Hidden Value*, 146
 - The Instructor, the Man and the Job*, 234
 - The Knowledge-Creating Company*, 156
 - Lean Software Development: An Agile Toolkit*, xxiii
 - Lean Solutions*, 43
 - The Living Company*, 141, 225
 - The Machine That Changed the World*, 11
 - Managing the Unexpected*, 9
 - Product Development for the Lean Enterprise*, 15
 - Product Development Performance*, 13, 52
 - “Quality With a Name,” 20
 - Taxonomy of Problem Management Activities*, 20
 - Toyota Production System*, 5
 - The Toyota Way*, 14
 - The Ultimate Question*, 241
 - “When IT’s Customers Are External,” 62–63
 - Who has the D?*, 57
 - Working Effectively with Legacy Code*, 167
- bottleneck elimination, xix
- bottlenecks (Muri), xix
- boundaries, organizational
 - cascading queues, 113–114
 - cost of crossing, 39–40, 243
 - lean supply chains, 13
 - relational contracts, 221
 - teams, 214
 - value streams, 84
- boundaries, system, 201
- Brin, Sergey, 46
- building quality in, 25–29
- burn-down charts, 140
- business case, 240
- business intent, testing, 200
- business process, 17, 20, 181
- business success
 - constraints, 153
 - responsibility for, 13, 16, 53
 - rewards for, 145
- C
- cadence
 - asynchronous, example, 109
 - cycle time reduction, 108–109
 - establishing, 108–109
- Cagan, Martin, 53
- Canada, 231–232
- capable development process, 98
- capacity, limiting work to
 - cycle time reduction, 110–111
 - teams, 134
- cascading queues, 113–114
- cash stage, 49
- cause. *See* root causes.
- champions, 52–57, 133
- change
 - agents, 229
 - management, 25
 - scope bloat, 25
 - scope control, 25
 - tolerance, 182
 - waste, 25
- change for the better (Kaizen) events, 173–175
- change requests, 62
- chartering teams, 241
- charts, 140
- Cheaper by the Dozen*, 37
- chief architect, 133
- chief engineer, 53–55
- Christensen, Clayton, 226
- Chrysler
 - NS minivan, 56
 - QFD (quality function deployment) analysis, 56
 - shared leadership, 56
- churn
 - requirements, 24, 91
 - test-and-fix, 24
 - value streams, 91
 - waste, 24
- Clark, Kim B., 52
- Clark, Mike, 197
- ClearStream Consulting, 167–168
- Cleland-Huang, Jane, 182
- CMM, 124
- coaches, 133

- code
 - complexity, 69
 - source of waste, 74–75
 - technical debt, 150
 - undeployed, 75
 - undocumented, 75
 - unsynchronized, 74
 - untested, 74
- code reviews, 194–195
- coffee cup simulation, 10–11
- Cohn, Mike, 232
- collaboration. *See* partners; teams.
- “Collaboration Rules,” 208
- co-located teams, 211, 213
- commitment. *See also* Just-in-Time commitment.
 - to change, 151
 - deferring, principle of, 32–33
 - iterative development, 186
 - planning as, 33
- committees, 209–210
- companies
 - life expectancy, 225–227
 - organizational boundaries
 - cascading queues, 113–114
 - cost of crossing, 39–40, 243
 - lean supply chains, 13
 - relational contracts, 221
 - teams, 214
 - value streams, 84
 - purpose of, 123
 - types of, 141
- compensation
 - alternatives to money, 145–146
 - annual raises, 144
 - balanced scorecards, 144
 - bonuses, 145, 146
 - promotion systems, 143–144
 - reward basis, 144–145
 - span of influence *versus* span of control, 144–145
- competing on the basis of time, 34
- competitive advantage
 - complexity, 69
 - customer satisfaction, 241
 - development speed, 35
 - expert workforce, 37
 - feedback, 177
 - lean principles, 11
 - management innovation, 124
 - outsourcing, 215–216
 - Toyota, 224
 - user interface, 189
- complete teams, 57–60
- complexity
 - automating, 72–73
 - competitive advantage, 69
 - cost of, 69–70
 - limiting features and functions, 70–71
 - minimum useful feature sets, 71–72
 - pricing structure, example, 72–73
 - prioritizing features, 71–72
 - root cause of waste, 67
 - software code, 69
- concept stage, 46
- concurrent development, 182
- concurrent engineering, 16
- condensing knowledge, 157
- configuration management, 201–202
- conflict of interest, 215
- conquering complexity, 5
- Conquering Complexity in Your Business*, 67
- constraints, 230–233
- continuous improvement
 - cadence, 168
 - complexity reduction, 166
 - configuration management, 201
 - Deming’s 14 points, 122
 - development organization objectives, 239
 - at PatientKeeper, 98
 - principle of, 38
 - waste elimination, 166
- continuous integration, 202–203
- contractors, 218
- contracts
 - BAA airport management, 217–218, 220–221
 - fixed price, 125
 - Norwegian Computer Society, 218–219
 - NTNU (Norwegian University of Science and Technology), 218–219
 - PS 2000, 218–219
 - purpose of, 217
 - relational, 219–221
 - T5 Agreement, 217–218
 - time and materials, 218
- Cook, Scott, 51, 55
- costs
 - competing on the basis of time, 34
 - complexity, 24–25, 69–70
 - crossing organizational boundaries, 39–40, 243
 - economies of scale, 5
 - extra features, 24–25
 - joint ventures, 220
 - Keiretsu advantage, 12

- costs (*continued*):
 - lifecycle, 20, 70–71
 - refactoring, 166
 - of software maintenance, 20–21
 - standards, 193
 - support and warranty, 164
 - synergistic relationships, 221
 - target, 180, 218–219, 221
 - counterintuitive concepts
 - continuous integration, 202
 - Lean, 11
 - new paradigms, 11
 - object orientation, 195
 - set based development, 161
 - seven principles, 23
 - Crawford-Mason, Clare, 125
 - create knowledge, principle of, 29–32
 - Critical Chain, 232–233
 - cross-functional teams, 56, 64, 78, 122
 - Cunningham, Ward, 187
 - custom systems. *See* software development, custom systems.
 - customer-focused organizations
 - champions, 52–57
 - chief engineer, 53–55
 - complete teams, 57–60
 - decision making, 57
 - designing for manufacturability, 58–59
 - designing for operations, 58–59
 - development goal, 55
 - facilitating information flow, 52–60
 - leadership, 52–57
 - leadership teams, 55
 - Murphy's Law, 59–60
 - responsibility, 56–57
 - shared leadership, 56
 - What can go wrong, will go wrong, 59–60
 - customers
 - delighting, 49–52. *See also* Google.
 - focus on the job, 51–52
 - Kano model, 49–52
 - needs, 43
 - satisfaction, 49–52
 - satisfaction, as competitive advantage, 241
 - satisfaction, measurements, 241
 - service, example, 111–112
 - understanding, 50
 - cycle time
 - measurements, 238–240
 - PatientKeeper, 97–98
 - reducing
 - establishing a cadence, 108–109
 - evening out work arrival, 103–105
 - limiting work to capacity, 110–111
 - minimizing process elements, 105–107
 - minimizing process size, 107–108
 - pull scheduling, 112–114
 - speed, 98–99
 - utilization and, 102
- D**
- Darwin Information Typing Architecture (DITA), 131
 - dashboards, 136, 140–141
 - de Geus, Arie, 141, 225
 - decisions. *See also* commitment.
 - irreversible, 160
 - key, 162
 - making, 57
 - decomposition, optimizing by, 40–41
 - defects
 - discovering *versus* preventing, 27, 82. *See also* test-driven development.
 - inspecting for, 27, 82
 - as management problems, 29
 - queues, 25–26
 - rates, 27, 34, 81, 85
 - seven wastes, 81–82
 - tracking systems, 27
 - defer commitment, principle of, 32–33
 - delays
 - mapping in value streams, 91
 - seven wastes, 80–81
 - delighters, 65
 - delighting customers, 49–52
 - deliver fast, principle of, 34–35. *See also* speed.
 - Dell Computer, 11–13
 - Deming, W. Edwards
 - 14 points
 - overview, 122–123
 - point 12, 210
 - points 6 and 7, 210
 - causes of problems, 121, 123–124
 - choosing suppliers, 122, 123
 - Deming Cycle, 121
 - dependence on inspection, 122
 - fear, 122
 - inherent system variation, 121
 - interdepartmental barriers, 122
 - introduction, 120
 - leadership, 122
 - numerical quotas, 123
 - PDCA (plan, do, check, act), 121, 154–155
 - pride of workmanship, 123

- psychology, 122
 - purpose of a company, 123
 - scientific method, 121
 - slogans, exhortations, and targets, 123
 - synergy, 121
 - System of Profound Knowledge, 121
 - theory of knowledge, 121
 - training, 122, 123
 - Deming Cycle, 121
 - democracy principle, Google, 45
 - Denne, Mark, 182
 - dependencies, teams, 135
 - deployment
 - available to production, 87, 90
 - average time, 6, 86
 - concept-to-launch time, 99, 103
 - cycle time, 170, 238–239
 - delays, 91
 - incremental, 178–179
 - minimum useful feature sets, 71
 - obsolescence, 91
 - Polaris project, 178–179
 - QFD (quality function deployment) analysis, 56
 - undeployed code, 75
 - design
 - of code. *See* software development.
 - intent, testing, 200
 - for manufacturability, 58–59
 - for operations, 58–59
 - of products. *See* Toyota Product Development System; Toyota Production System.
 - Design for Six Sigma (DFSS), 229
 - design/build teams, 118, 123, 133
 - deskilling, 228
 - deterministic school, 21
 - detractor, 65, 241
 - Detroit, 2, 4, 117
 - developing software. *See* software development.
 - development teams
 - 3M, 56–60
 - capacity, 99
 - champions, 132
 - DFSS (Design for Six Sigma), 229
 - error prevention, 82
 - expertise, 129–130, 212
 - goal of, 240
 - incentives, 123
 - interaction designers, 189
 - joined at the hip, 55
 - maintenance duties, 79
 - measurements, 237
 - pride in workmanship, 210
 - process improvement, 31
 - pull scheduling, 112–114
 - rewards, 145
 - set-based concurrent engineering, 16
 - size, and technical debt, 153
 - DFSS (Design for Six Sigma), 229
 - differentiation, 50
 - discipline
 - automating routine tasks, 197–198
 - code reviews, 194–195
 - configuration management, 201–202
 - continuous integration, 202–203
 - five S's, 190–192
 - merging subsystems, 203–204
 - mistake-proofing, 196–198
 - nested synchronization, 203–204
 - Open Source reviews, 196
 - organizing a workspace, 190–192
 - pairing, 195–196
 - shine (seiso), 191–192
 - sort (seiri), 191–192
 - standardize (seiketsu), 191–192
 - standards for software development, 193–196
 - sustain (shitsuke), 191–192
 - systematize (seiton), 191–192
 - test-driven development, 198–201
 - dispatching, 137–138
 - DITA (Darwin Information Typing Architecture), 131
 - divisible systems architecture, 182
 - Do It Right the First Time, 165
 - do it right the first time, 29
 - “Do You Have Too Much IT?”, 69
 - doctor's appointments, example, 104–105
 - documentation, 74, 77
 - domain, 82, 180, 183
 - domain models, 185–186
 - Drucker, Peter, 12–13, 220–221
 - dual ladder, 143
 - dysfunctional measurements, 238
- ## E
- Easel Corporation, xvii
 - economic companies, 141
 - economies of scale, 4, 68
 - education. *See* training.
 - 80/20 rule, 25–26
 - eliminate waste, principle of, 23–25
 - eliminating barriers, 210
 - embedded software, 20, 163
 - empirical school, 21

employees. *See* partners; people; teams.
 engaged thinking people, 35, 37, 117, 237
 enterprise software, 20
 entrepreneurial leaders, 16, 37, 54
 ERP (Enterprise Resource Planning), 231
 estimates
 as commitments, 232
 granular level, 134
 implementation effort, 185
 stories, 183
 tasks, 97
Estimating and Planning, 232–233
 Evans, Eric, 186
 Evans, Phillip, 208
 Excel, 36
 excellence principle, Google, 45
 exchanging tests, 212
 exhortations, 123
 exhortations as incentives, 123
 expediting projects, 98
 experimentation, 171–172
 expert technical workforce, 37
 expertise, in teams, 129–131
 exploratory tests, 201
 extra features, as waste, 24–25, 75

F

FAA (Federal Aviation Administration), 119
 face-to-face discussion, 78
 fail fast, 118–119
 fast delivery. *See* deliver fast; speed.
 fear as incentive, 122
 feasibility stage, 46–47
 Feathers, Michael, 167
 features
 limiting, 70–71, 165
 minimum useful sets, 71–72
 prioritizing, 71–72
 wastes, 24–25, 75
 YAGNI (You Aren't Going to Need It), 165
 FedEx, 34
 feedback, and quality
 architecture, 182
 competitive advantage, 177
 iterative development, 183–190
 Polaris program, 177–182
 release planning, 179–181
 financial results. *See* return on investment.
 fire, Aisin plant, 208–209, 211
 FIT (Framework for Integrated Tests), 75, 150, 187
Fit for Developing Software, 187

Fitness, 150
 five S's, 190–192
 fixed price contracts, 125
 fixtures, 187
 focus on the job, 51–52
 Ford, Henry, 2–3
 Ford Motor Company, 2–3
 14 points of Deming, 122–123
 Fowler, Martin, 167
 framework for integrated tests. *See* FIT (Framework for Integrated Tests).
 France, 1–2
 Francis, Charles A., 3
 frequent integration, 212
 Fujimoto, Takahiro, 52
 Fujitsu, 39
 funding profiles, 61
 future blindness, 226

G

games, 17, 48, 181
 Gap, 68
 Gates, Bill, 36
 GE Workout, 173–175
 genchi-genbutsu (go, see, confirm), 54
 General Motors, 2–3
 George, Michael, 67
 Gilbreth, Frank, 37–38
 Gilbreth, Lillian, 37–38
 global networks, 210–214
 global teams, 212
 global work groups, 212
 goal setting, 223
 Goldratt, Eliyahu, 230, 232
 Google
 corporate philosophy, 44
 customer satisfaction, 50
 democracy principle, 45
 excellence principle, 45
 history of, 43–44
 Keyhole, 45
 maps, 45
 page rank system, 48
 product development principles, 44–45
 product development timeline
 cash stage, 49
 concept stage, 46
 feasibility stage, 46–47
 pilot stage, 48
 systems design stage, 47
 queuing theory, 101–102
 speed principle, 45

- startup, 46–47
- value principle, 44
- workforce utilization, 101–102
- Google Earth, 45
- Google Local, 45
- Green Book, 6

H

- hack-a-thon, 152
- hacking *versus* speed, 35
- Hamel, Gary, 117, 124–125
- handoffs, 77–78
- hangers, theft of, 125
- hardening software, 150–151
- haste makes waste, 35
- Heathrow, 217
- help desk, BMI, 39
- help each other, 35, 127, 129, 183
- Hidden Value*, 146
- history of lean software development
 - See Just-in-Time
 - See mass production
 - See Toyota Product Development System
 - See Toyota Production System
- H&M, 67
- Honda, xxiii, 55
- Honeywell, 119–120
- HTTPUnit, 150
- hypothesis development, 171, 234–241

I

- IBM AT cables, 196–198
- incentives
 - applause, 210
 - blame, 143
 - individual performance, 142
 - performance evaluations, 141–143
 - rankings, 142–143
- incremental development, dangers of, 164
- incremental funding, 61
- Inditex, 67, 69
- individual performance as incentives, 142
- industrial model, 2, 5, 11
- infrastructure, outsourcing, 214–215
- innovation
 - management, 124, 218
 - start of, 46
 - Web inspired, 233
- inspections
 - dependence on, 122

- discovering defects, 27, 82. *See also* test-driven development.
- preventing defects, 27, 82. *See also* test-driven development.
- purpose of, 27
- types of, 27
- The Instructor, the Man and the Job*, 234
- integration
 - continuous, 202–203
 - frequent, 212
- interaction designers, 55, 130, 189
- interchangeable parts, 1–2
- interchangeable people, 2–3
- interdepartmental barriers, 122
- Internet age, and knowledge creation, 159
- intrinsic rewards, 146
- Intuit
 - complete teams, 57–58
 - founding of, 51
 - leadership teams, 55
 - limiting complexity, 70
 - QuickBooks, 70
 - Quicken
 - introduction of, 51
 - leadership teams, 55
 - Quicken Rental Property Management, 57–58
- inventory. *See also* Just-in-Time.
 - coffee cup simulation, 10–11
 - pull system, 10–11
 - rocks-and-stream metaphor, 7–8
 - as waste, 24
- irreversible decisions, 160
- ISO 9000, 124–125
- IT departments
 - accountability, 64–65
 - business collaboration, 62–65
 - cost, 68
 - external customers, 62–63
 - fixing, 64
 - guide to the use of technology, 69
 - versus* software companies, 62–65
 - we-they model, 63
 - workload example, 103–104
- iterative development
 - assessment, 188–189
 - commitment, 186
 - example, 184
 - feedback and quality, 183–190
 - FIT (Framework for Integrated Tests), 187
 - implementation, 186–188
 - introduction, 183–184

iterative development (*continued*):

- overview, 183
- planning, 186
- preparation, 185–186
- stories, 183–186
- story-test driven development, 186
- user interface variation, 189–190

J

- Japan. *See also* Toyota; Toyota Product Development System; Toyota Production System.
 - auto industry, 4–7
 - textile industry, 3–4
- Java, five S's, 192
- Jefferson, Thomas, 1
- Jensen, Bent, 80
- Jidoka (autonomation), 5–6
- JIFFIE, 151
- job grades, 143–144
- Job Instruction (JI) module, 235–236
- Job Methods (JM) module, 235–236
- Job Relations (JR) module, 235–236
- Johnson, Jim, 24
- joined at the hip, 55
- joint ventures, 220–221
- Jones, Daniel, 43
- journey
 - accommodations, 233
 - adopting new technologies, 230–231
 - automating routine tasks, 227–228, 231–232
 - centering on people, 227–228
 - corporate life expectancy, 225–227
 - Critical Chain, 232–233
 - developing a hypothesis, 234–241
 - ERP (Enterprise Resource Planning), 231
 - future blindness, 226
 - goal setting, 223
 - measurement, 237–241
 - push *versus* pull systems, 236–237
 - right to think, 237
 - road map, 242
 - schedules, 228
 - Six Sigma, 229–230
 - Theory of Constraints, 230–233
 - thinking, 236–237
 - tools *versus* results, 229–230
 - training, 234–236
 - the use of technology, 227–228
- JR (Job Relations) module, 235–236
- Jula, John, 54
- junior people, 130–131, 144

JUnit, 150

Juran, J. M., 26

Just-in-Time. *See also* inventory.

- autonomation (Jidoka), 5–6
- definition, 4
- Green Book, 6
- Just-in-Time flow, 5
- maximizing local efficiencies, 8
- mistake-proof systems, 6–7
- nonstock production, 6
- rocks-and-stream metaphor, 7–8
- stop-the-line culture, 5–6
- zero inspection, 6–7

Just-in-Time commitment. *See also* commitment.

- dangers of incremental development, 164
- Do It Right the First Time, 165
- example, 167–168
- examples

- medical device interface, 162
- pluggable interfaces, 163
- red-eye reduction, 162–163

introduction, 159–160

irreversible decisions, 160

key decisions, 162

legacy systems, 166–168

refactoring, 164–168

and scientific method, 154

set-based design, 160–164

and waste, 164

YAGNI (You Aren't Going to Need It), 165

Just-in-Time manufacturing, 4–7

K

Kaizen (change for the better) events, 173–175

Kanban, 10–11, 136, 138–139

kanban cards, 10–11

Kano, Noriaki, 49–52

Kano model, 49–52

Keiretsu, 12–13

Kennedy, Michael, 15

key decisions, 162

Keyhole, 45

knowledge

creation

A3 reports, 157–158

condensing knowledge, 157

in the Internet age, 159

keeping notebooks, 156–157

lost knowledge, 155–159

principle of, 29–32

problem definition, 152–153

at Rally Software Development, 149–152

technical debt, 150
 tracking knowledge, 155–159
 theory of, 121
 knowledge-based engineering, 15
The Knowledge-Creating Company, 156

L

large group improvement, 173–175
 large-batch software development, 71, 102
 last responsible moment, 32, 161, 185
 lava lamp, 140, 198
 leadership
 customer-focused organizations, 52–57
 Deming's points, 122
 entrepreneurial, 16, 37, 54
 Honda, 55
 Intuit, 55
 Open Source, 209–210
 process, 132–133
 Strong Project Leader, 54
 teams, 55, 132–133
 technical, 132–133
 traveling team leaders, 213

lean

definition, xxiii
 initiatives
 first step, 153
 initiating. *See* journey.
 reasons for failure, 153
 manufacturing
 versus development, 14
 overview, 11–12
 principles, competitive advantage, 11. *See*
 also seven principles.
 production
 See also lean, software development
 See also mass production
 See also Toyota Product Development
 System
 See also Toyota Production System
 Dell Computer, 11–13
 flowchart, 12
 Keiretsu, 12–13
 knowledge-based engineering, 15
 manufacturing, 11–12
 manufacturing *versus* development, 14
 operations, 11–12
 product development, 13–15
 Southwest Airlines, 11–12
 supply chain, 12–13
 Toyota *versus* other vehicle manufacturers,
 13

software development
 history of
 See lean, production
 See mass production
 See Toyota Product Development
 System
 See Toyota Production System
 overview, 17

Lean Solutions, 43
 learn-by-doing, 19
 learning. *See* training.
 legacy systems, 166–168
 Lexus, 13
 lifecycle costs, 20, 70–71
 Liker, Jeffrey, 14
 limiting work to capacity, 110–111, 134
 Linux security breach, example, 207–208, 211
 Little's Law, 100–101
The Living Company, 141, 225
 L.L. Bean, 34
 local efficiencies, 8
 looms, automated, 3–4
 lost knowledge, 155–159

M

MacCormack, Alan, 30
 MacGibbon, Simon, 62
The Machine That Changed the World, 11
 maintenance
 cost of, 20–21
 staffing for, 79–80
 management
 functional, 133
 innovation as competitive advantage, 124
 people. *See* people, managing.
 project, 133. *See also* project managers.
Managing the Unexpected, 9
 manufacturing. *See also* Toyota Product
 Development System; Toyota Production
 System.
 versus development, 14
 Just-in-Time, 4–7
 lean, 14
 lean production, 11–12
 mass production, 12–13
 video cassettes, 59
 mapping value streams. *See* value streams.
 maps, Google, 45
 Marick, Brian, 166, 199
 market research, 56, 62–63
 market share, 61, 241
 Martens, Ryan, 149

mass production

- See also* lean, production
- See also* Toyota Product Development System
- See also* Toyota Production System
- American auto industry, 2–3
- American System of Manufacture, 1
- Ford Motor Company, 2–3
- General Motors, 2–3
- interchangeable parts, 1–2
- interchangeable people, 2–3
- Japanese auto industry, 4–7
- Japanese textiles, 3–4
- Just-in-Time manufacturing, 4–7
 - and lean manufacturing, 12–13
- maximizing local efficiencies, 8
- McAfee, Andrew, 69
- McCabe Cyclomatic Complexity Index, 194–195
- Measure UP, 40–41
- measurements
 - customer satisfaction, 241
 - cycle time, 238–240
 - decreasing number of, 40–41
 - dysfunctional, 238
 - improving the wrong ones, 237
 - Measure UP, 40–41
 - net promoter score, 241
 - optimize by decomposition, 40–41
 - raising levels, 40–41
 - reducing the number of, 238
 - ROI (return on investment), 240–241
 - Sloan, Alfred P., 40–41
 - Sloan's metrics, 40–41
 - statistical process control, 120–122
- medical device interface example, 162
- Meszaros, Gerard, 167
- MetaScrum meeting, xvii
- metrics. *See* measurements.
- Microsoft, respect for people, 36
- Miller, Lynn, 55, 189
- mindfulness, 9
- mind-meld, 50
- minimum useful feature sets, 71–72
- Minoura, Teruyuki, 236
- mistake-proofing, 6–7, 196–198
- money, as incentive, 145–146
- Muda (waste), xix
- Mugridge, Rick, 187
- Mulally, Alan, 118, 123, 140
- multitasking, causing waste, 78–80
- Mura (stress), xix
- Muri (bottlenecks), xix

Murphy's Law, 59–60

myths

- finishing the code, 79
- haste makes waste, 35
- one best way, 37–38
- optimize by decomposition, 40–41
- planning is commitment, 33
- predictable outcomes, 31–32
- specifications reduce waste, 24–25
- testing to find defects, 28–29

N

- National Center for Manufacturing Sciences (NCMS), 13
- nested synchronization, 203–204
- net promoter score, 241
- New United Motor Manufacturing Incorporated (NUMMI), 226
- newspaper, online subscription, 50
- no partial credit, 188
- no secrets, 118
- Nonaka, Ikujiro, 156
- nonfunctional requirements, testing, 201
- nonstock production, 6
- non-value-added waste, 23, 83
- Norwegian Computer Society, 218–219
- Norwegian University of Science and Technology (NTNU), 218–219
- notebooks, keeping, 156–157
- NS minivan, 56
- numerical quotas, 123

O

- Ohno, Taiichi
 - introduction, 5–6
 - planning, 33
 - value streams, 83
 - waste, 23–25, 75
- on the job training, 234–236
- one best way, 2, 37–38
- one click build, 198
- Oobeya, 213
- Open Source
 - chief engineer approach, 54
 - leadership, 54
 - reviews, 196
 - software example, 209–210
 - Strong Project Leader, 54
- operations, lean, 11–12
- optimize by decomposition, 40–41
- optimize the whole, principle of, 38–41

options-based development, 135
 ordinary employees, 117, 227
 O'Reilly, Charles, 146
 organizational boundaries. *See* boundaries,
 organizational.
 organizing a workspace, 190–192
 organizing work, 138–139
 outsourcing
 basic principles, 216–217
 BMI call center, 215
 Boeing, 216–217
 competitive advantage, 215–216
 conflict of interest, 215
 development, 216–217
 infrastructure, 214–215
 introduction, 214
 Procter & Gamble, 216–217
 Toyota, 216–217
 transactions, 215
 overproduction, 25, 75
 overtime, 110–111

P

Page, Larry, 46
 page rank system, Google, 48
 pairing, 195–196
 Pareto analysis, 26
 partially done work, 74–75
 partners. *See also* teams.
 committers, 209–210
 contracts
 BAA airport management, 217–218, 220–
 221
 Norwegian Computer Society, 218–219
 NTNU (Norwegian University of Science
 and Technology), 218–219
 PS 2000, 218–219
 purpose of, 217
 relational, 219–221
 T5 Agreement, 217–218
 Deming point 12, 210
 eliminating barriers, 210
 equality of, 213
 examples
 3M, 213–214
 Boeing 787 Dreamliner, 210
 Linux security breach, 207–208, 211
 Open Source software, 209–210
 Procter & Gamble, 210
 exchanging tests, 212
 frequent integration, 212
 global networks, 210–214

global teams, 212
 global work groups, 212
 joint ventures, 220–221
 leaders, 209–210
 Oobeya, 213
 outsourcing
 basic principles, 216–217
 BMI call center, 215
 Boeing, 216–217
 development, 216–217
 infrastructure, 214–215
 introduction, 214
 Procter & Gamble, 216–217
 Toyota, 216–217
 transactions, 215
 proxies, 213
 rotating people, 212
 synergy, 207–217
 traveling team leaders, 213
 war room, 213
 PatientKeeper
 cycle time, 97–98
 delivery speed, 95–98
 development teams, 97
 introduction of Scrum, xvii
 limiting complexity, 71
 limiting work to capacity, 134
 product managers, 97
 release schedules, 97
 PBS documentary, 119
 PDCA (plan, do, check, act), 121, 154–155
 people, managing
 andon, 139–140
 under the bell curve, 130
 Boeing 777 project, 117–120, 140
 causes of low quality and productivity, 121
 centering on people, 227–228
 choosing suppliers, 122
 compensation
 alternatives to money, 145–146
 annual raises, 144
 balanced scorecards, 144
 bonuses, 145, 146
 promotion systems, 143–144
 reward basis, 144–145
 span of influence *versus* span of control,
 144–145
 dashboards, 136, 140–141
 Deming Cycle, 121
 Deming on, 120–123
 dependence on inspection, 122
 fear, 122

- people, managing (*continued*):
- incentives
 - individual performance, 142
 - performance evaluations, 141–143
 - rankings, 142–143
 - inherent system variation, 121
 - interdepartmental barriers, 122
 - job grades, 143–144
 - junior people, 130–131, 144
 - kanban, 136, 138–139
 - leadership, 122
 - numerical quotas, 123
 - ordinary employees, 117, 227
 - organizing work, 138–139
 - PBS documentary, 119
 - PDCA (plan, do, check, act), 121, 154–155
 - pride of workmanship, 123
 - projects *versus* products, 62
 - psychology, 122
 - rotating assignments, 212
 - scientific method, 121
 - self-directing work, 137–141
 - sharing early and often, 118
 - slogans, exhortations, and targets, 123
 - stop-the-line culture, 139–140
 - synergy, 121
 - System of Profound Knowledge, 121
 - testing early, failing fast, 118–119
 - theory of knowledge, 121
 - training, 122, 123, 129
 - trust, 125
 - visible signals, 139–140
 - visual workspace, 136–141
 - wall charts, 140
 - why programs fail, 124–125
 - Working Together program, 118–120
- performance evaluations as incentives, 141–143
- personnel. *See* partners; people; teams.
- PERT (Program Evaluation and Review Technique), 179
- Pfeffer, Jeffrey, 146
- pilot stage, 48
- P&L (profit and loss) model, 240
- plan, do, check, act (PDCA), 121, 154–155
- plan-driven methods, 33
- planning
 - as commitment, 33
 - iterative development, 186
 - Taiichi Ohno on, 33
- pluggable interfaces example, 163
- Polaris program, 177–182
- policies. *See* practices; principles.
- Post-it Notes, 139
- practices. *See also* principles.
 - definition, 19
 - for successful software development, 30
- predictable outcomes, 31–32
- Price, Jerry, 125
- pricing structure, complexity example, 72–73
- pride of workmanship, 123
- principles. *See also* practices.
 - continuous improvement, 38
 - definition, 19
 - Google
 - democracy principle, 45
 - excellence principle, 45
 - product development principles, 44–45
 - speed principle, 45
 - value principle, 44
 - lean software development. *See* seven principles.
 - learn-by-doing, 19
 - of outsourcing, 216–217
 - software development, 20–21
 - understand-before-doing, 19
- prioritizing features, 71–72
- Prius, 21
- problem solving
 - analyzing the situation, 169
 - defining the problem, 152–153, 169
 - disciplined approach, 169–172
 - experimentation, 171–172
 - first rule, 168
 - follow up, 172
 - hypothesis generation, 171
 - introduction, 168
 - Kaizen (change for the better) events, 173–175
 - large group improvement, 173–175
 - scientific method, 154, 169–172
 - standardization, 172
 - verifying results, 172
- process cycle efficiency, 85–86, 90–92, 108
- process leadership, 132–133
- processes
 - availability, 98
 - average time, calculating, 100–101
 - capable, 98
 - minimizing elements, 105–107
 - minimizing size, 107–108
 - quality measurement, 99
 - robust, 177
 - too big, 107–108
 - too many things, 105–107

- Procter & Gamble, 51, 210, 216–217
 - product development, lean, 13–15
 - Product Development for the Lean Enterprise*, 15
 - Product Development Performance*, 13, 52
 - product managers, 133
 - product owners, 133
 - productivity, 28
 - products
 - concept stage, 46
 - development. *See* software development; Toyota Product Development System; Toyota Production System.
 - versus* projects, 60–63
 - specifications
 - basis for acceptance tests, 150
 - waste reduction, 24–25
 - profit, definition, 152
 - profit and loss (P&L) model, 240
 - profitability, 61, 122, 241–242
 - Program Evaluation and Review Technique (PERT), 179
 - programmer tests. *See* unit tests.
 - programmers. *See* partners; people; teams.
 - project managers, 42, 127, 133, 237. *See also* management.
 - projects
 - average process time, calculating, 100–101
 - average speed, 99–100
 - cycle time, 98–99
 - dividing work into stories, 99
 - expediting, 98
 - measuring, 99
 - PatientKeeper delivery cycle, 95–98
 - process availability, 98
 - process capability, 98
 - versus* products, 60–63
 - red flags, 98
 - setting upper limits, 99
 - setting upper size limits, 99
 - time delays, 98–99
 - promotion systems as incentives, 143–144
 - property tests, 201
 - Proulx, Tom, 55
 - proxies, 213
 - PS 2000 contract, 218–219
 - psychology, 122
 - pull scheduling, example, 112–113
 - pull systems, 10–11, 236–237
 - push systems, 236–237
- Q**
- QA (Quality Assurance), 89, 96
 - QFD (quality function deployment) analysis, 56
 - quality
 - building in, principle of, 25–29
 - change tolerance, 182
 - discipline
 - automating routine tasks, 197–198
 - code reviews, 194–195
 - configuration management, 201–202
 - continuous integration, 202–203
 - five S's, 190–192
 - merging subsystems, 203–204
 - mistake-proofing, 196–198
 - nested synchronization, 203–204
 - Open Source reviews, 196
 - organizing a workspace, 190–192
 - pairing, 195–196
 - shine (seiso), 191–192
 - sort (seiri), 191–192
 - standardize (seiketsu), 191–192
 - standards for software development, 193–196
 - sustain (shitsuke), 191–192
 - systematize (seiton), 191–192
 - test-driven development, 198–201
 - divisible systems architecture, 182
 - iterative development
 - assessment, 188–189
 - commitment, 186
 - example, 184
 - FIT (Framework for Integrated Tests), 187
 - implementation, 186–188
 - introduction, 183–184
 - overview, 183
 - planning, 186
 - preparation, 185–186
 - stories, 183–186
 - story-test driven development, 186
 - user interface variation, 189–190
 - robust development processes, 177
 - role of feedback
 - architecture, 182
 - iterative development, 183–190
 - Polaris program, 177–182
 - release planning, 179–181
 - Quality Assurance (QA), 89, 96
 - quality function deployment (QFD) analysis, 56
 - “Quality With a Name,” 20
 - queuing theory. *See also* speed.
 - average process time, calculating, 100–101
 - cascading queues, 113–114

queuing theory (*continued*):

- cycle time reduction
 - establishing a cadence, 108–109
 - evening out work arrival, 103–105
 - limiting work to capacity, 110–111
 - minimizing process elements, 105–107
 - minimizing process size, 107–108
 - pull scheduling, 112–114
- examples
 - airport check-in desk, 110
 - asynchronous cadence, 109
 - customer service, 111–112
 - doctor's appointments, 104–105
 - IT workload, 103–104
 - pull scheduling, 112–113
 - release cycles, 107–108
 - a seven year list, 106–107
 - thrashing, 111–112
- Google, 101–102
- Little's Law, 100–101
- system stability, 101–102
- utilization, 101–102
- variation, 101–102
- QuickBooks, 70
- Quicken Rental Property Management, 57–58

R

- raises as incentives, 144
- Rally Software Development, 149–152
- ranking people, 128, 142–143
- Raymond, Eric, 54
- red-eye reduction example, 162–163
- refactoring, 164–168
- Reichheld, Fred, 241
- relational contracts, 219–221
- relearning, 76
- release cycles, example, 107–108
- release planning, 179–181
- remote teams, 212–213
- repeatable reliable cycle time, 238
- requirements
 - churn, 24, 91
 - nonfunctional, 182, 201
 - overloading, 25
 - SRS (Software Requirements Specifications), 75
 - stale, 74
 - test specs, 82
 - timing assumptions, 233
 - too early, 24, 91
- respect for people, 3, 36–38
- response time
 - by category, 84

- at peak capacity, 101
- queue length, 172
- reliability, 98
- testing, 201
- responsibility, 56–57
- responsibility-based planning and control, 133–135
- retrospectives, 236
- return on investment (ROI), 41, 240–241
- reversible decisions, 32
- rewards. *See also* compensation; incentives.
 - basis for, 144–145
 - intrinsic, 146
- right to think, 237
- risk
 - contracting away, 218
 - custom software development, 181
 - partially done work, 24
 - refactoring, 164
- river companies, 141
- robust development processes, 177
- rocks-and-stream metaphor, 7–8
- Rogers, Paul, 57
- root causes
 - failure of lean initiatives, 153
 - group improvement failure, 174
 - low quality and productivity, 121, 123–124
 - of problems, 121, 123–124
 - technical debt, 150
 - waste, 67
- rotating people, 212

S

- safety considerations, stop-the-line culture, 9
- sales, engineering, development (SED) system, 55
- Sapolsky, Harvey, 179
- satisfaction, customer, 49–52, 241
- schedules
 - inventory. *See* Just-in-Time.
 - Kanban, 10–11
 - PatientKeeper releases, 97
 - philosophy of, 228
 - slipping dates, 133–134
 - and teams, 134, 135
- Schnaith, Kent, 192
- Schwaber, Ken, xvii
- scientific method
 - Deming Cycle, 121
 - Just-in-Time commitment, 154
 - managing people, 121
 - problem solving, 154, 169–172
 - steps of, 154

- stop-the-line culture, 154
 - Toyoda, Kiichiro, 154
 - Toyoda, Sakichi, 154
 - Toyota Production System, 154
- scope bloat, 25
- scope control, 25
- Scrum
 - bottleneck elimination, xix
 - creation of, xvii–xviii
 - definition, 28
 - quality improvement, 28
 - stress avoidance, xix
 - Type A, xvii
 - Type B, xvii
 - Type C, xvii
 - waste elimination, xix
 - winning companies, xvii
 - winning product portfolio, xvii
 - winning teams, xvii
- Scrum Product Owners, 133
- ScrumMasters, 133
- Sears, 34
- SED (sales, engineering, development) system, 55
- seiketsu (standardize), 191–192
- seiri (sort), 191–192
- seiso (shine), 191–192
- seiton (systematize), 191–192
- self-directing work, 137–141
- self-organization, 17, 19, 97
- set-based design, 160–164
- seven principles
 - building quality in, 25–29
 - create knowledge, 29–32
 - defer commitment, 32–33
 - deliver fast, 34–35
 - eliminate waste, 23–25
 - myths
 - haste makes waste, 35
 - one best way, 37–38
 - optimize by decomposition, 40–41
 - planning is commitment, 33
 - predictable outcomes, 31–32
 - specifications reduce waste, 24–25
 - testing to find defects, 28–29
 - optimize the whole, 38–41
 - respect people, 36–38
- seven wastes. *See also* waste.
 - defects, 81–82
 - delays, 80–81
 - extra features, 75
 - handoffs, 77–78
 - partially done work, 74–75
 - relearning, 76
 - task switching, 78–80
- seven year list, example, 106–107
- shared leadership, 56
- sharing early and often, 118
- Shewhart Cycle, 121
- Shimmings, Ian, 41
- shine (seiso), 191–192
- Shingo, Shigeo
 - introduction, 6–7
 - purpose of inspections, 82
 - seven wastes, 73
 - types of inspections, 27
- ship builders, training, 234–236
- shitsuke (sustain), 191–192
- Shook, Jim, 35
- Shore, Jim, 20
- Sienna minivan, 53–55
- Silicon Valley Product Group, 53
- silos, 40, 131
- simulation, kanban cards, 10
- single point of responsibility, 65
- Six Sigma, 124, 229–230
- slack, 15, 88, 102, 112, 134
- slipping dates, 133–134
- Sloan, Alfred P., 2, 40–41
- slogans as incentives, 123
- small batches, 15, 74, 101–102, 196
- Smalley, Art, 153
- Smith, Levering, 178
- Sobek, Durwood, 53
- software
 - cost of maintenance, 20–21
 - development timeline, 20
 - difficult to change. *See* legacy systems.
 - embedded, definition, 20
 - enterprise, definition, 20
 - legacy, 166–168
 - structure of. *See* architecture, software.
- software companies *versus* internal IT, 62–65
- software development
 - capable processes, 98
 - concurrent, 182
 - defect queues, 25–26
 - detailed design, 29–30
 - deterministic school, 21
 - empirical school, 21
 - handling changes. *See* change, management.
 - large-batch approach, 71, 102
 - outsourcing, 216–217
 - plan-driven methods, 33

- software development (*continued*):
 - principles of. *See* principles; seven principles.
 - process quality measurement, 99
 - speed, competitive advantage, 35
 - speed *versus* hacking, 35
 - systematic learning, 31
 - waterfall model, 22, 29–30
 - software development, custom systems
 - accountability, 64–65
 - beginning/end criteria, 62
 - change requests, 62
 - funding profiles, 61
 - IT departments
 - accountability, 64–65
 - fixing, 64
 - versus* software companies, 62–65
 - we-they model, 63
 - IT—business collaboration, 62–65
 - products *versus* projects, 60–63
 - software companies *versus* internal IT, 62–65
 - staffing, 62
 - we-they model, 63
 - Software Requirements Specifications (SRS), 75
 - sort (seiri), 191–192
 - Southwest Airlines, 11–12
 - span of influence *versus* span of control, 144–145
 - specialists in teams, 130–131
 - specification-by-example, 200
 - specifications, 24–25, 150
 - speed. *See also* deliver fast; queuing theory.
 - average projects, 99
 - cycle time, 98–99
 - dividing work into stories, 99
 - expediting, 98
 - versus* hacking, 35
 - measuring, 99
 - PatientKeeper delivery cycle, 95–98
 - principle of, 45
 - process availability, 98
 - process capability, 98
 - red flags, 98
 - setting upper limits, 99
 - time delays, 98–99
 - unique projects, 100
 - Spolsky, Joel, 36
 - Spring, 150
 - Sprints, at PatientKeeper, xvii
 - SRS (Software Requirements Specifications), 75
 - staffing. *See* partners; people; teams.
 - Stalk, George, 5, 35
 - standardization, problem solving, 172
 - standardize (seiketsu), 191–192
 - standards for software development, 193–196
 - statistical process control, 120–122
 - stealing hangers, 125
 - stop-the-line culture
 - andon, 139–140
 - definition, 5–6
 - safety considerations, 9
 - and scientific method, 154
 - stories
 - dividing work into, 99
 - iterative development, 183–186
 - no partial credit, 188
 - story tests, 200. *See also* acceptance tests.
 - story-test driven development, 186
 - strangling legacy code, 167
 - stress (Mura), xix
 - stress avoidance, xix
 - Strong Project Leader, 54
 - suggestion systems, 236
 - supervisors. *See* people, managing.
 - suppliers, choosing, 122, 123
 - supply chain, lean, 12–13
 - sustain (shitsuke), 191–192
 - Sutcliffe, Kathleen M., 9
 - Sutherland, Jeff, 71, 96
 - synchronization, nested, 203–204
 - synergy, 121, 207–217
 - System of Profound Knowledge, 121
 - system stability and queuing theory, 101–102
 - system variation, 121
 - systematic learning, 31
 - systematize (seiton), 191–192
 - systems design stage, 47
- ## T
- T5 Agreement, 217–218
 - tacit knowledge, 14, 31, 77–78, 156–157
 - Takeuchi, Hirotaka, 156
 - target costs, 180, 218–219, 221
 - targets as incentives, 123
 - task switching, 78–80
 - Taxonomy of Problem Management Activities*, 20
 - Taylor, Frederick Winslow, 2, 37, 227
 - TDD (test-driven development). *See* test-driven development.
 - teachers. *See* training.
 - teams. *See also* partners.
 - barriers to, 128
 - champions, 133
 - characteristics of, 126–127

- chartering, 241
- coaches, 133
- co-located, 211, 213
- complete, 57–60
- cross-functional, 56, 64, 78, 122
- dependencies, 135
- design/build, 118, 123, 133
- development
 - 3M, 56–60
 - capacity, 99
 - champions, 132
 - DFSS (Design for Six Sigma), 229
 - error prevention, 82
 - expertise, 129–130, 212
 - goal of, 240
 - incentives, 123
 - interaction designers, 189
 - joined at the hip, 55
 - maintenance duties, 79
 - measurements, 237
 - pride in workmanship, 210
 - process improvement, 31
 - pull scheduling, 112–114
 - rewards, 145
 - set-based concurrent engineering, 16
 - size, and technical debt, 153
- expertise, 129–131
- global, 212
- Honda, 55
- versus* individual efforts, 126
- Intuit, 55, 57–58
- leadership, 55, 132–133
- limiting work to capacity, 134
- organizational boundaries, 214
- product managers, 133
- Quicken, 55
- ranking systems, 128
- remote, 212–213
- responsibility-based planning and control, 133–135
- schedules, 134, 135
- Scrum Product Owners, 133
- ScrumMasters, 133
- silos, 131
- slipping dates, 133–134
- specialists, 130–131
- variation, 135
- winning, xvii
- work breakdown structure, 135
- versus* workgroups, 126–127, 212
- Teamwork is the key..., 56–57
- technical debt, 150
- technical leadership, 132–133
- technical success, 145
- technical writers, 75, 130–131
- test early, fail fast, 118–119
- test harness
 - acceptance tests, 202
 - benefits of, 82
 - legacy systems, 166–167
 - schedule, 27
 - unit tests, 200
 - usability tests, 201
 - user interface, 151
- test-and-fix churn, 24
- test-driven development (TDD)
 - exploratory tests, 201
 - productivity, 28
 - property tests, 201
 - purpose of, 199
 - story tests, 200
 - types of tests, 199
 - unit tests, 200
 - usability tests, 201
- testing
 - 3D modeling, 118
 - automating, 82
 - Boeing 777, 118–120
 - business intent, 200
 - design intent, 200
 - to find defects, 28–29. *See also* test-driven development.
 - nonfunctional requirements, 201
 - testing early, failing fast, 118–119
 - too late, 88, 91
 - user interface, 150–151, 201
 - verification, role of, 29
- testing early, failing fast, 118–119
- tests
 - acceptance, 150, 186
 - acceptance-test-driven development, 186
 - exchanging, 212
 - programmer. *See* unit tests.
 - story-test driven development, 186
 - unit, 200
 - usability, 21
- textile industry, Japan, 3–4
- Theory of Constraints, 230–233
- theory of knowledge, 121
- thinking, 236–237
- thinking tools, 21–22, 195
- thrashing, example, 111–112
- time, competing on the basis of, 34
- timebox, 32, 181

- timelines. *See* value streams.
- too many things in processes, 105–107
- too much work. *See* limiting work to capacity.
- tools *versus* results, 229–230
- towering technical competence...., 129
- Toyoda, Eiji, 5, 226
- Toyoda, Kiichiro
- incentives, 141
 - introduction, 4
 - scientific method, 154
 - tracking knowledge, 155
- Toyoda, Sakichi
- evolutionary thinking, 226–227
 - incentives, 141
 - introduction, 3
 - scientific method, 154
 - tracking knowledge, 155
- Toyota
- chief engineer, 53–55
 - competitive advantage, 224
 - fire at Aisin plant, 208–209, 211
 - genchi-genbutsu (go, see, confirm), 54
 - versus* other vehicle manufacturers, 13
 - outsourcing, 216–217
 - problem definition, 152–153
 - product delivery deadlines, 161
 - profits, xxiii
 - responsibility, 56–57
 - responsibility-based planning and control, 133–135
 - set-based design, 161
 - Sienna minivan, 53–55
 - Smart Car initiative, 224–225
 - Teamwork is the key..., 56–57
 - towering technical competence...., 129
 - training new engineers, 129
- Toyota Product Development System
- See also* Just-in-Time manufacturing
 - See also* mass production
 - See also* Toyota Production System
 - cornerstone elements, 16
 - entrepreneurial leadership, 16
 - expert engineering workforce, 16
 - respect for people, 36–37
 - responsibility-based planning and control, 16
 - set-based concurrent engineering, 16
 - software development philosophy, 21
 - study of, 15
- Toyota Production System
- See also* Just-in-Time manufacturing
 - See also* mass production
 - See also* Toyota Product Development System
 - automated looms, 3
 - autonomation (Jidoka), 5–6
 - detecting abnormalities. *See* autonomation (Jidoka); stop-the-line culture.
 - goals, 152–153
 - Japanese auto industry, 4–7
 - Just-in-Time flow, 4–5
 - overview, 4–7
 - push *versus* pull systems, 236–237
 - scientific method, 154
 - versus* Six Sigma, 229–230
 - thinking, 236–237
 - value streams, 83
- Toyota Production System*, 5
- The Toyota Way*, 14
- traceability, 75, 199
- tracking knowledge, 155–159
- tradeoffs, 41, 158, 241
- training
- Allen's steps, 234–236
 - Deming's points, 122, 123
 - on the job, 234–236
 - Job Instruction (JI) module, 235–236
 - Job Methods (JM) module, 235–236
 - Job Relations (JR) module, 235–236
 - new engineers, 129
 - ship builders, 234–236
 - TWI (Training Within Industry), 235–236
 - vocational education, 234–236
- Training Within Industry (TWI), 235–236
- transactions, outsourcing, 215
- traveling team leaders, 213
- trust, 125
- Turner, Richard, 33
- Type A Scrum, xvii
- Type B Scrum, xvii
- Type C Scrum, xvii
- U**
- The Ultimate Question*, 241
- uncoded documentation, waste, 74
- undeployed code, waste, 75
- understand-before-doing, 19
- undocumented code, waste, 75
- unit tests, 200
- United Airlines, 117–118
- United Kingdom, 41, 193, 217
- United States
- 3M tour, 213
 - Deming and, 121
 - doctor's appointments, 104
 - invention of interchangeable parts, 1–3

- liens registry, 231
- Toyota manufacturing, 216, 226
- Toyota moves to, 12
- unsynchronized code, waste, 74
- untested code, waste, 74
- unused documentation, waste, 77
- US War Production Board, 235
- usability tests, 201
- used car sales, 41
- user interface
 - competitive advantage, 189
 - iterative design, 189–190
 - testing, 150–151, 201
 - variation, 189–190
- utilization
 - and cycle time, 102, 244
 - full, 88
 - Google workforce, 101–102
 - and queuing theory, 101–102
 - and variation, 101–114

V

value

- customer-focused organizations
 - champions, 52–57
 - chief engineer, 53–55
 - complete teams, 57–60
 - decision making, 57
 - designing for manufacturability, 58–59
 - designing for operations, 58–59
 - development goal, 55
 - facilitating information flow, 52–60
 - leadership, 52–57
 - leadership teams, 55
 - Murphy's Law, 59–60
 - responsibility, 56–57
 - shared leadership, 56
 - What can go wrong, will go wrong, 59–60
- customers
 - delighting, 49–52. *See also* Google.
 - focus on the job, 51–52
 - Kano model, 49–52
 - needs, 43
 - satisfaction, 49–52
 - understanding, 50
- value principle, 44
- value streams
 - churn, 91
 - delays, 91
 - examples, 85–91
 - for future processes, 92
 - keeping it simple, 85

- mapping, 83–84
- owner identification, 84–85
- preparation, 83–84
- start/stop points, 84
- waste diagnosis, 91
- Van Schooenderwoert, Nancy, 27
- variation
 - inherent in the system, 121
 - and queuing theory, 101–102
 - and utilization, 101–114
- variation in teams, 135
- verification, and long release cycles, 107–108
- verifying results of problem solving, 172
- video cassettes, manufacturing, 59
- visible signals, 139–140
- vision, 16
- visual workspace, 136–141
- “vital few and trivial many” rule, 26
- vocational education, 234–236
- voice of the customer, 53, 229
- volunteers, 54, 208–210

W

- waiting. *See* delays.
- Wake, Bill, 165
- wall charts, 140
- war room, 213
- waste. *See also* seven wastes.
 - 80/20 rule, 25–26
 - anticipating, 76
 - biggest source of, 24–25
 - churn, 24
 - complexity and, 67, 69–73
 - diagnosing. *See* value streams.
 - elimination
 - principle of, 23–25
 - reducing by specification, 24–25
 - Taiichi Ohno on, 23–25
 - extra features, 24–25
 - inventory as, 24
 - Just-in-Time commitment, 164
 - lost knowledge, 76
 - Muda, xix
 - multitasking, 78–80
 - non-value-added, 23, 83
 - partially done software, 24
 - recognizing, 23. *See also* value streams.
 - requirements churn, 24
 - root cause, 67
 - test-and-fix churn, 24
 - uncoded documentation, 74
 - undeployed code, 75

waste (*continued*):

- undocumented code, 75
 - unsynchronized code, 74
 - untested code, 74
 - unused documentation, 77
 - “vital few and trivial many” rule, 26
- waste (Muda), xix
- waterfall development model, 22, 29–30
- Weick, Karl E., 9
- Welch, Jack, 173
- we-they model, 63
- What can go wrong, will go wrong, 59–60
- “When IT’s Customers Are External,” 62–63
- Whitney, Eli, 1
- Who has the D?*, 57
- Wild, Werner, 159
- winning companies, xvii
- winning product portfolio, xvii
- winning teams, xvii

- Wolf, Bob, 208
- Womack, James, 43
- work breakdown structure, 135
- workers. *See* partners; people; teams.
- workgroups, 126–127, 212
- Working Effectively With Legacy Code*, 167
- Working Together program, 118–120
- Workout, 173–175
- write less code, 29, 67–73

Y

- YAGNI (You Aren’t Going to Need It), 165
- Yamada, Kosaku, 13
- Yokoya, Yuji, 53–55

Z

- Zara, 67–68
- zero inspection, 6–7