INDEX

Page references followed by fig indicate an illustrated figure; followed by t indicate a table; followed by e indicate an exhibit.

A
Abbott, 265
A-B-C approach, 274–276
Addams, H. L., 231
Additive model, 33
AEH/BBMC, 266
Altman, S. H., 206, 224, 230
American Association of Critical-Care Nurses (AACN), 179
American National Standards Institute (ANSI), 292
American Nurses Association, 179, 193
AmeriNet, 267
AmeriSource/Bergen Brunswig, 266
Anderson, T. D., 224
Answer Reports: example of Excel, 246fig; minimization problem, 252fig; for the staff scheduling problem, 256fig
Arrival patterns: emergency room, 371fig; Excel-based simulated, 406fig, 407fig; measures of, 372fig; Poisson arrival, 376–378; Poisson distribution of, 372fig, 399–400, 401t; Poisson probabilities for, 402t; probability distribution for, 400t; queuing system and, 369, 371–372. See also Patients; Queuing system; Waiting lines
Ashby, J. L., Jr., 230
Attributes: c-charts and p-charts for, 298, 299–304; control charts for, 298–304
Aventis Pharma, 265

B
B2B (business-to-business) commerce, 267
B2C (business-to-customer) commerce, 267
Baxter, 265
Becker, C., 273
Benchmarking: productivity, 208; for quality improvement, 315
Bendix, R., 201
Block scheduling, 197–198, 199e–200e
Bounded rationality phenomenon, 53–54
Bowling, G. S., 201
Bracci, L., 231
Brainstorming, 314
Breslawski, S., 201
Bristol-Myers Squibb, 265
Broadlane, 267
Burns, L. R., 265, 266, 267, 268
Byerly, G. E., 269

C
Cancer morality rate maps, 97–98fig
Capacity costs, 367
Capacity (queuing system), 382–384
Cardinal Health, 266
Cardinal Health/Bindley Western, 266
Carrying (or holding) costs, 271, 278–281
Case mix productivity adjustments, 218–219
Casey, K. L., 197
Cause-and-effect diagram, 317, 319fig
C-charts, 298, 299–300
Center-of-gravity method, 94fig–97, 94fig–95t
CEO (chief executive officer), 3
Ceris, F., 230
Champy, J., 122
Channel (or waiting line), 369
Chassin, M. R., 290, 291, 295
Check sheet, 315–316fig
Closeness rating chart (long-term care facility), 107fig
Computer-based layout programs: Excel template layout solution, 115fig; Excel templates and final layout for hospital, 115fig; overview of, 109–110
Computerized Relative Allocation of Facilities Technique (CRAFT), 110
Computerized scheduling systems, 194–195
CON (certificate of need), 82, 83
Considerations for Professional Nurse Staffing in Perinatal Units, 179
Consorta, 267
constraints, 238, 244fig, 255fig
Control charts: for attributes, 298–304fig; c-chart type of, 298, 299–300; mean and range charts, 298, 304–308; monitoring variation through, 297–298; p-chart type of, 298, 302–304
Control charts patterns: run-based, 309–312; sensitizing rules for detecting nonrandom, 312–313; zone tests, 312, 313 fig

COO (chief operating officer), 3
Cooper, W. W., 227
Corsi, L. A., 190
Cost information (inventory), 274
cost of labor, 214
Cost-profit-volume (CPV) analysis, 83–86 fig
Coverage factor, 176–178, 190
CPM (Critical Path Method), 334–338 fig
CPT (Common Procedure Terminology) coding, 210
CQI (continuous quality improvement): performance improved through, 3, 122; quality control through, 292, 293–295
CRAFT (Computerized Relative Allocation of Facilities Technique), 110
Crane, S., 206, 224
Critical activities: computing ES and EF times of, 337; computing LS and LF times of, 337; description and path sequences of, 336; Excel setup and solution example of, 338 fig; slack (time slippage) of, 337; start and finish times of, 336 fig
Crosby, P. B., 292
Cyclical scheduling, 191–193

D
Dartmouth Atlas of Health Care, 97
Dartmouth Medical School, 97
Davies, D. C., 201
Davis, M. A., 222, 230
DEA (data envelopment analysis): description of, 225; example of DEA efficiency frontier formulation, 229 fig; linear programming expression of, 227–228; tips on using, 229
Decision analysis: description and issues related to, 68–70; dominance procedure for, 70–72; minimum attribute satisfaction procedure for, 72; most important attribute procedure for, 72
Decision making: analysis with nonmonetary values and multiple attributes, 68–72; decision tree approach to, 66–68; facility layout, 103–115 fig; health care manager and, 3; historical background/development of techniques for, 2–3; information technology (IT) role in, 3; performance-measure-based managerial, 407 fig; process of, 51–66; quantitative methods to aid in location, 83–98 fig; simulation to measure performance and managerial, 406–408. See also Forecasting; Health care management; Health care managers
Decision-making units (DMUs), 227, 229
Decision process: causes of poor decisions during, 53–54; decision level and milieu, 54; decision making under risk, 61–62; decision making under uncertainty, 54–55; expected opportunity loss (EOL) during, 63; expected value model (EMV) of, 62–63; expected value of perfect information (EVPI) during, 64; Hurwitz case during, 55, 57–58, 59; issues for consideration during, 52–53; Laplace case during, 55, 60; maximax case during, 55, 57 t; maximin case during, 55, 56, 57 t; minimax regret case during, 55, 58–60, 65–66; payoff table tool used during, 55 t–56; steps in the, 52; when payoffs are costs, 65–66
Decision tree: description of, 66; Excel illustration of payoff and, 68, 69 fig; illustration of, 67 fig; rollback procedure for using, 66–68 fig; rollback procedure using Excel template, 70 fig
Decision variables, 238
Delphi method, 13
Deming Prize, 292
Deming, W. E., 292
Deming wheel/Shewhart cycle, 294 fig
Denbor, R. W., 201
Dexter, F., 196, 197, 198, 201
Diabetes information booth: queuing system performance for expanded, 382 fig; queuing system probability summary for, 380 fig; summary analysis for M/M/S queue for, 385 t
Direct care hours: percentage of, 220; percentage of adjusted, 220–222; productivity measures using, 219–222
Distributors, 265–266
DMAIC sequence (Six Sigma), 295
DMUs (decision-making units), 227, 229
Dominance procedure: decision analysis using, 70–72; multi-attribute methods for location decisions, 91–92
Du Pont, 332
Dupuy, 265
Dynamic block scheduling, 198

E
Easham, A., 201
e-Auction, 267
e-Catalog, 267
Economic efficiency, 226–227
Economic order size, 272
EDI (electronic data interchange), 265–266
e-distributors, 264, 267
Eli Lilly, 265
Emergency room: arrival patterns in, 371 fig; service time for patients in, 373 fig
Employees. See Health care workers
EMQ (expected value model), 62–63 t
EOQ (economic order quantity) model: depletion or demand rate of, 277; Excel solution for, 281–282, 283 t; holding and ordering costs identified in,
278–281; inventory order cycle for basic, 276ff, 280–281; overview of, 276–281; ROP (reorder point) identified using, 282–284
e-Request for Proposal (eRFP), 267
e-Specials, 267
EVPI (expected value of perfect information), 64
Excel: Answer Report, 246ff, 252ff; Answer Report for the staff scheduling problem, 256ff; critical activity setup and solution on, 338ff; EOQ (economic order quantity) model solution using, 281–284; identifying constraints and integer values, 255ff; identifying constraints and solution cells, 244ff; integer programming: setup for the staff scheduling problem, 255ff; Limits Report, 248ff; minimization problem Limits Report, 253ff; M/M/1 queue set-up and solution in, 379ff–380; M/M/3 queuing system performance summary, 383ff; probabilistic radiation oncology project setup and solution, 345ff; queuing system capacity analysis using, 385ff; random numbers generated by, 401ff; selection of Solution Reports, 245ff; Sensitivity Report, 247ff–249ff, 252ff; setup for the insurance company problem, 243ff; setup for the minimization problem, 251ff; simplex method embedded in, 242–249; simulated arrivals using, 406ff, 407ff; solution the staff scheduling problem, 256ff; solution to the minimization problem, 251ff; solution to the syringe reorder problem, 282ff; solver, 244ff
Excel templates: final observation schedule, 150ff; process layout, 115ff; rollback procedure, 70ff; stabilized dates and times, 148ff; valid dates and times, 149ff; work sampling random observation schedule, 145–147ff
Expected opportunity loss (EOL), 63t
Expected value of perfect information (EVPI), 64
Expenditures. See Health care expenditures
Exponential service time, 376–378
F
Facility layout decisions: for fixed-position layout, 110; issues related to planning, 103–104; process layout and, 105–115ff; product layout and, 104–105; total cost of layout and, 113t
Facility location: complex factors of decisions related to, 81–82; quantitative methods to decide, 83–98ff. See also Hospitals
Facility location methods: center-of-gravity, 94ff–97; cost-profit-volume (CPV) analysis, 83–86ff; factor rating, 86–91; geographic information systems (GIS) in health care, 97ff–98ff; multi-attribute, 91t–93t
Factor rating method, 86–91
FC/FS (first come/first served) scheduling, 197
FDA (Food and Drug Administration), 273
Findlay, J., 194
First-come, first-served provided service, 374
Fishbone (or Ishikawa) chart, 317, 319ff
Fitzsimmons, J. A., 7
Fitzsimmons, M. J., 7
5W2H approach, 314
Fixed-position layout, 110
Flexible scheduling, 193–194
Flow chart, 153, 154ff, 317, 318ff
Flow process charts: commonly used symbols for, 153ff; emergency room specimen processing, 152ff, 154ff; overview of using, 152
Flu inoculation queuing, 368ff
Focus groups, 315
Forecasting: approaches of, 13–44; description and importance of, 11–12; process of, 12–13. See also Decision making
Forecasting approaches: judgmental forecasts, 13–14; seasonal, cycle, and random variations, 15ff; techniques for averaging, 14–44ff; time-series, 14
Forecasting averaging techniques: accuracy of forecasts, 40–43ff; determining reasonable number of periods for moving average, 18–19; forecast control, 42–44ff; moving averages (MA), 16–18; naïve method, 14, 16; for seasonality, 33–40; SES (single exponential smoothing), 20–22; for trends, 22–33; WMA (weighted moving average), 19–20ff
Forecasting seasonality: daily indexes technique, 38t; description of, 33–34; employing seasonal indexes, 38–40; error calculations on, 41t; Heal- Me Hospital average daily patient days, 35t–36t; MAD (mean absolute deviation) and, 41; MAPE (mean absolute percent error), 41; monthly and daily adjusted forecasts, 39–40t; monthly indexes technique, 34, 37t; quarterly indexes technique, 34, 37t
Forecasting trends: based on linear regression, 23–28ff; linear regression as trend line, 29–30ff; overview of, 22–23; SEST (single exponential smoothing with trend), 31–33ff; trend-adjusted exponential smoothing, 32–34ff
FTEs (full time equivalents): coverage factor and, 176–178; determination for nurse staffing, 175–176; reallocation through daily adjustments, 178–179; staffing levels and utilization of, 171–175; staff scheduling allocating budgeted, 187
G
Gantt chart, 330–332
Gantt, H., 2
General Electric, 295
Geographic information systems (GIS), 97ff–98ff
GHX, 267
Gilbreth, F., 2, 125
Gilbreth, L., 2, 125
GlaxoSmithKline, 265
Goldberger, S., 206, 224
Goldman, H., 201
Goodman, D. C., 97
GPOs (group purchasing organizations), 264, 266–267
GRASP system, 166
Gross, M., 230
Guidelines of Perinatal Care, 179
Gulf South/Gateway, 266
Healy, B. A., 197
Hamilton, D., 201
Hammer, M., 122
Harris, F. W., 2
HCA/Health Trust, 267
Heal-Me Hospital: alternative forecasting methods/accuracy measured by MAD/MAPE, 41–42/fig; average daily patient days, 35r–36r; daily indexes for, 38r; error calculations on forecasting for, 41r; linear trend with tracking signal for patient visit forecast, 43/fig; monthly and daily adjusted forecasts for, 39–40r; monthly indexes for, 37r; quarterly indexes for, 37r; seasonality removed trend data for patient demand of, 38–39/fig; tracking signal for patient visit forecast, 44/fig
Health care expenditures: carrying (or holding) costs, 271, 278–281; cost of labor, 214; as GDP percentage for 30 OECD countries, 4r; inventory cost information, 274; queuing system capacity analysis and costs, 382–384; waiting costs as, 367
Health care management: information technology (IT) role in, 3; medical inventory, 268–270; project management component of, 327–363r; resource allocation and, 237–258; simulation for measuring decisions of, 406–407/fig. See also Decision making
Health care managers: bounded rationality phenomenon and, 53–54; decision making by, 3; project, 327–328; staff scheduling by, 187–202; workload management by, 162–182. See also Decision making
Health care services: capacity and costs of, 367/fig; distinctive characteristics of, 6–7; first-come, first-served provided, 374; management of, 6; by occupation (2006), 7r; scope and recent trends of, 4–6. See also Queuing system; Waiting lines
Health care services components: intangible nature of health care outputs, 8; judgment requirements/heterogeneous nature of health care as, 8; patient participation as, 7; perishable capacity as, 8; simultaneous production and consumption as, 7–8
Health care supply chain: distributors, wholesalers, and EDI role in, 265–266; e-distributors role in, 264, 267; flow of materials in, 267; GPOs (group purchasing organizations) role in, 266–267, 267; manufacturers/suppliers role in, 265; overview of the, 263–264/fig; providers issues related to, 267–268. See also Medical inventory management
Health care workers: distribution of, 5r; labor costs related to, 214–216; staff scheduling of, 187–202; workload management and, 162–182. See also Nursing units
Health Industry Business Communications Council (HIBCC), 273
Henry Schein, 266
Histogram, 317
HMOs (health maintenance organizations): enrollment growth of, 5; waiting lines at, 365
Hoffmann-La Roche, 265
Holding (or carrying) costs, 271, 278–281
Hospitals: emergency room arrival/service times, 371/fig, 373/fig; productivity and quality relationship in, 222–224; radiation oncology clinic in, 331r, 334/fig–335r, 341t, 342t, 345/fig; staffing decisions in, 161–182, 187; summary of productivity-related dilemmas in, 224; surgical suite resource scheduling in, 196–201. See also Facility location; Nursing units; Patients; Public clinics
HPPD (hours per patient day), 167, 207, 209, 210–212
HSCA, 267
Human resources management, 123
Hurwitz strategy, 55, 57–58, 59

IDS (integrated delivery systems): health care adoption of, 3; restructuring required to create, 6
Independent path duration times, 340
Infinite-source models: formulations, 375–382/fig; typical, 375
Information technology (IT): health care decision making role of, 3; health care management role of, 3; management information systems (MIS) reshaped by, 3
Institute of Medicine (IOM), 289
Integer linear programming, 250, 253–258
Integer programming: nurse scheduling with, 257r; overview of, 250, 253–258
International Organization for Standardization (ISO), 292
Interviewing, 314–315
Inventory: cost information on, 274; definition of, 271; holding or carrying costs of, 271, 278–281
Inventory cycle, 276/fig, 280–281
Inventory management: accounting systems used in, 272; classification system used in, 274–276; cost information issue of, 274; EOQ (economic order quantity) model of, 276 fig. –284; lead time and, 273; requirements for effective, 272; ROP (reorder point) calculations for, 282–284; traditional approach to, 271; UPCs (universal product codes) used in, 273. See also Medical inventory management

Ishikawa (or fishbone) chart, 317, 319 fig.

ISO 9000 standards, 292

J

Janssen, 265
JCAHO (Joint Commission on Accreditation of Healthcare Organizations), 293
JIT (just-in-time) delivery: advantages and disadvantages of, 269–270; flow of materials and, 267; single versus multiple vendors and, 270; stockless inventories and, 269
Job design: behavioral approach to, 126; management principles guiding, 125; socio-technical approach to, 126–127 fig.
Johnson & Johnson, 265
Joint probability of completion, 340
Judgmental forecasts, 13–14
Juran, J. M., 292

K

“Kaizen Teams,” 315
Kelley, M. G., 201
Kerzner, H., 327
Ketcham, J. S., 201
Kinney, M., 193
Kirk, R., 163, 171, 179, 206
Klastorin, T., 327
Knappenberger, H. A., 201
Kowalski, J. C., 270
Krumrey, N. A., 269
Kubic, F. T., 201

L

Labor costs: productivity measure of, 214; standardized, 214–216
Lamkin, L. R., 179
Laplace strategy, 55, 60 t
Layouts. See Facility layout decisions
LCF (longest case first) scheduling, 198
Lead time, 273
Leahy, T. M., 264
Lee, K., 228, 229
Limits Report, 248 fig.
Linear programming (LP): description of, 237–239; integer, 250, 253–258; maximization models of, 239–249 fig.; minimization models of, 249–250 fig., 251 fig.–253 fig.; structure of, 238–239
Long-term care facility: closeness rating chart for, 107 fig.; layout solution for, 108 fig.
Lynch, J. R., 229

M

MAD (mean absolute deviation), 41
Magerlein, J. M., 196, 198, 201
Managed care programs: growth of prepaid, 5; HMOs (health maintenance organizations), 5, 365
Management information systems (MIS), 3
Management. See Health care management
Managerial decisions. See Decision making
Manufacturers/suppliers, 265
MAPE (mean absolute percent error), 41
Martin, J. B., 196, 198, 201
Maximax strategy, 55, 57 t
Maximin strategy, 55, 56, 57 t
Maximization models, 239–249 fig.
McCue, Y. A., 228
McDougall, M. D., 170, 171, 172, 174, 181, 182
McFadden, C. D., 264
McKesson, 266
Mean charts, 298, 304–308
MedAssets, 267
Medical inventory management: advantages/disadvantages of JIT and stockless inventory, 269–270; contemporary issues in, 268–270; JIT (just-in-time) and stockless inventories, 269; single versus multiple vendors in, 270. See also Health care supply chain; Inventory management
Medicare Prospective Payment System (PPS), 205, 206
Medicus Systems Corporation, 166, 167, 194
Medline, 266
Medtronic, 265
Merck, 265
Merwin, E., 228, 229
Meyer, D., 166
MGMA (Medical group Management Association), 283
Minimax regret strategy, 55, 58–60, 65–66 t
Minimization models, 249–250 fig., 251 fig.–252 fig.
Minimization Problem Answer Report, 252 fig.
Minimization Problem Limits Report, 253 fig.
Minimization Problem Sensitivity Report, 252 fig.
Minimum attribute satisfaction procedure: decision analysis using, 72; location decision using, 92, 93 t
Misutilization, 291
M/M/1 queuing model, 376–381
M/M/2 queuing model, 375
M/M/3 queuing model, 374, 381–382 fig., 383 fig.
M/M/5/15 queuing model, 374
M/M/s>1 queuing model, 381, 385 t
Monte Carlo simulation method: description of, 398; empirical distribution of, 399; process of, 398–399; for public health clinic, 399; random number look-up, 400, 402–406; theoretical distribution of, 399–400
Monthly and daily adjusted forecasts, 40–42
Monthly indexes technique, 34, 37
Morrissey, J. P., 228, 229
Most important attribute procedure: decision analysis using, 72; location decision using, 92, 93
Motorola, 295
Moving averages (MA): applications of, 16; determining reasonable number of periods for, 18–19; equation of, 16; example of, 16–17; WMA (weighted moving average), 19–20
Multi-attribute method: description of, 91; dominance procedure, 91–92; minimum attribute satisfaction procedure, 92, 93; most important attribute procedure, 92, 93
Multi-factor productivity, 208–210
Multiple-line queuing system, 369, 370
Multiple room system, 201
Multiplicative model, 33, 34
Muther, R., 105, 106

N
Naïve method, 14, 16
Narasimhan, S. L., 197
National Cancer Institute, 97
Neoforma, 267
Networks. See Project networks
Newstorm, J.W., 188, 195
Nominal group technique, 314
Nonrandom variation, 296, 299–300
Novation, 266–267
NPAQ system, 166–170, 194
Nurses Association of the American College of Obstetrics and Gynecology, 179
Nursing Management (journal), 190
Nursing units: abridged patient care tasks in, 136; Average Census for medical/surgical floor, 169; Daily Census for medical/surgical floor, 168; data collection form for, 137; GRASP system defining NCU (nursing care unit), 166; HPPD (hours per patient day), 167; NPAQ system for managing resources in, 166–167, 170, 194; observed/normal time calculations for, 134; observed times/performance ratings for nursing units, 133; partial work distribution chart for, 151. See also Health care workers; Hospitals

O
Objective function, 238
OECD health care expenditures, 4
OmniCell, 267
Oncology Nursing Society (ONS), 179
Ordering costs (inventory), 274
Ortho Biotech, 265
OSHA (Occupational Safety and Health Administration), 124
Outcome Standards for Cancer Nursing Practice, 179
Overfelt, F., 231
Overutilization, 291
Owens & Minor, 266
Ozcan, H., 228
Ozcan, Y. A., 201, 228, 229

P
PACU (post-anesthesia care unit), 196
Palmer, J., 191
Parameters, 238–239
Pareto diagram, 319
Pareto principle, 122
Patient acuity systems: GRASP system applied to, 166; NPAQ system applied to, 166–167, 170; staffing decisions related to, 163–166
Patients: balking at queue and waiting times, 374; overutilization, underutilization, or misutilization by, 291; reneging and leaving the queue, 374; service time for ER, 363. See also Arrival patterns; Hospitals; Quality of care; Queuing system; Waiting lines
Payoff table: decision making using, 55–56; for EMV, 63; Excel illustration of decision tree and, 68, 69
P-charts, 298, 299, 302
PDSA cycle, 294
Performance: CQI (continuous quality improvement) to improve, 3, 122; measures of queuing system, 375; reengineering to improve, 121; simulation to measure managerial decisions and, 406–407; TQM (total quality management) to improve, 3, 122. See also Quality control (QC)
Performance-measure-based managerial decision making, 407
Periodic system, 272
Perpetual system, 272
PERT (Program Evaluation and Review Technique), 332–333
Pexton, C., 295, 296
Pfizer, 265
Phillips, K. T., 201
Piedmont Medical Center (Atlanta), 81
Pierce, J. L., 188, 195
Poisson arrival, 376–377
Poisson distribution: M/M/1 queuing model, 376–378,
Project management: case of dominant critical path, 328–329
Project life cycle, 328–329
Project management tools: CPM (Critical Path Method) for, 332–333; Gantt charts, 330–332;
PERT (Program Evaluation and Review Technique) for, 332–333
Project managers: roles and responsibilities of, 329–330; team management/relationships by, 329–330
Project networks: case of dominant critical path for, 345–346; conventions used for activities, 333 fig–334; CPM (Critical Path Method) for activities on, 334–338/fig; description of, 333; independent path duration times for, 340; joint probability of timely completion, 340; probabilistic approach to, 338–345/fig; probabilistic time estimates for, 341t; for radiation oncology, 334/fig
Projects: life cycle and phases of, 328–329; managing teams and relationship on, 329–330; network diagram of activities of, 333/fig–334/fig; planning and scheduling, 330
Premier, 266, 267
The Principles of Scientific Management (Taylor), 2
Process layout: computer-based layout programs for, 109–110; Excel template solutions for, 115/fig;
fixed-position layout, 110; issues related to, 105; method of minimizing distances and costs, 109;
tools for designing, 105–108/fig
Process variability: capability of, 297/fig; control charts used to monitor, 297–298; quality and random vs. nonrandom, 296–297
Productivity adjustments: case mix, 218–219; cost of labor, 214; direct care hours and, 219–222; for inputs, 212–216; for output measures, 216–224; service mix, 216–218; skill mix, 212–214; standardized cost of labor, 214–216
Productivity measurements: adjustments for inputs, 212–216; CPT (Common Procedure Terminology) coding, 210; data envelopment analysis used for, 227–229; DEA (data envelopment analysis) method for, 225, 227–229; using direct care hours, 219–222; economic efficiency method for, 226–227; HPPD (hours per patient day), 167, 207, 204, 210–212; new methods of, 225–227; technical efficiency method for, 225–226/fig
“The Productivity Paradox” (Skinner), 229
Product layout decisions, 104–105
Project compression: probabilities for, 346r; project duration and costs of, 346/fig–348/fig; three iterations of, 349–353; total cost of, 353/fig; trade-offs between reduced project time and cost, 346–353
Project life cycle, 328–329
Project management: case of dominant critical path, 345–346; of compressed projects, 346–353/fig; issues related to, 327–328; probabilistic approach to, 338–345, 346r; tools used for, 330–333
Project management tools: CPM (Critical Path Method) for, 332–338/fig; Gantt charts, 330–332;
Quality of care: IOM’s definition of health care, 289–290; measuring, 290–291; productivity relationship to, 222–224; “quality gaps” in, 291–292. See also Patients
Quarterly indexes technique, 34, 37
Queue discipline, 374
Queue phenomenon, 366
Queuing analysis, 366
Queuing model notation, 376
Queuing models: classification of, 374; formulations of, 375–376; M/M/1, 376–381; M/M/2, 381; M/M/3, 374, 381, 383; M/M/5/15, 374; M/M/s>1, 381, 385; typical infinite-source, 375–382
Queuing system: capacity analysis and costs of, 382–385; diabetes information booth, 382; number of servers and, 369; patient ballooning at, 373–374; patient reneging, 373–374; performance measures of, 375; population source characteristic of, 368; queue characteristics of, 373–374; service patterns and, 373; single-line and multi-line, 369; steady state assumption of, 375. See also Arrival patterns; Health care services; Patients; Servers; Waiting lines
Queuing theory, 365, 399

R
Radiation oncology clinic: AON network diagram for, 334; calculation of expected time/standard deviations on each path of, 342; Excel CPM version of setup and solution to, 338; Excel setup and solution to probabilistic, 345; Gaunt chart for launching new, 331; path lengths for, 335; probabilistic time estimates for, 341
Random numbers: generated using Excel, 401; Monte Carlo simulation and look-up, 400, 402; Poisson probabilities for arrivals and corresponding, 402
Random variation, 296–297
Range charts, 298, 304–309
Rasmussen, S. R., 193
Redinius, D. L., 295
Reengineering: human resources management role in, 123; improving performance by, 121–123; work design and, 124; worker compensation issue and, 153, 155; work measurement using time standards for, 127–135; work measurement using work sampling for, 135–147; work simplification for, 147–153; 154
Remington Rand Corporation, 332
Resource allocation: integer linear programming, 250, 253–258; linear programming (LP) used for, 237–258; maximization models of, 239–249; minimization models of, 249–250; 251–252. See also Staff scheduling
Richmond Metropolitan Area blood banks: interaction with selected hospitals, 96; locations of, 97
Richmond Metropolitan Area Hospitals: list of selected, 95; map of, 94; selected hospitals and their blood bank interaction, 96
Risk (or uncertainty): decision making strategies under, 54–55; decision making under, 61–62; description of, 54; Type I error, 298; Type II error, 298
ROP (reorder point), 282–284
Rose, M. B., 201
Run-based pattern tests, 309–312
S
Safety stock, 284
Sanders, T., 269
Scatter diagram, 317
Scheduling. See Staff scheduling
Schering-Plough, 265
Schultz, B., 295, 296
Seasonal variations, 33
Seiford, L. M., 227
selection of Solution Reports, 245
Sensitivity Reports: example of Excel, 247; graphic explanation of sensitivity analysis, 249; minimization problem, 252
Sensitizing rules for control charts, 312–313
Servers: definition of, 366; queuing systems and number of, 369. See also Queuing system
Service mix productivity adjustments, 216–218
Service patterns, 373
SES (single exponential smoothing), 20–22
SEST (single exponential smoothing with trend), 31–33
Sharon, A. T., 201
Sheehan, P. E., 270
Shewhart, W., 2
Shortage costs (inventory), 274
Shukla, R. K., 165, 179, 212, 214, 216
Simplex method, 242
Sinclair, V. G., 230
Single-line health care systems, 369
Six Sigma program, 293, 295–296
Skill mix productivity adjustments, 212–214
Skinner, W., 229, 230
SKUs (stock keeping units), 267, 271
Sleven, M., 179
SLP (systematic layout planning), 105
Socio-technical school approach, 127
Stack, R. T., 81, 82
Staffing decisions: challenges related to, 162–163; FTEs (full time equivalents) component of, 171–179, 187; three components of any, 164; workload management and, 162–182; workload standards and their influence on staffing levels, 163–164
Staff scheduling: assessment of scheduling alternatives, 201; comparing eight- and ten-hour shifts, 189; computerized scheduling systems for, 194–195; cyclical, 191–193; estimation of procedure times for, 201–202; flexible, 193–194; implementation of new work system for, 195–196; overview of, 187–189; pattern of alternating eight- and twelve-hour shifts, 190; studies of shift patterns, 189–191; surgical suite resource, 196–201. See also Resource allocation
Staff utilization, 163
Stahl, R., 295, 296
Standardized cost of labor, 214–216
Standards for Nursing Care of the Critically Ill, 179
Standards for Obstetric, Gynecological, and Neonatal Nursing, 179
Steady state assumption, 375
Stockless inventory: advantages and disadvantages of, 269–270; JIT (just-in-time) delivery and, 269
Stopwatch time studies, 128
Sub-optimization phenomenon, 54
Suppliers/manufacturers, 265
Supply chain. See Health care supply chain
Surgical suite resource scheduling: assessing of different alternatives to, 201; block approach to, 197–198, 199e–200e; dynamic block approach to, 198; FC/FS (first come/first served) approach to, 197; goals of, 197; issues related to, 196; LCF (longest case first) approach to, 198; multiple room system of, 201; SCF (shortest case first) approach to, 198; top down/bottom up approach to, 198
Taylor, F. W., 2, 125
Technical efficiency, 225–226
Technology. See Information technology (IT)
Templates. See Excel templates
3M, 265
Time-series approach, 14
Tone, K., 227
Top down/bottom up scheduling, 198, 201
TQM (total quality management): improving performance through, 3, 122; quality control through, 292, 293–294
Traub, R. D., 196, 197, 201
Type I error, 298
Type II error, 298
Uncertainty (or risk): decision making strategies under, 54–55; decision making under, 61–62; description of, 54; Type I error, 299; Type II error, 298
Underutilization, 291
Uniform Code Council (UCC), 273
UPC (Universal Product Code), 273
U.S. Department of Labor, 4, 6, U.S. Food and Drug Administration (FDA), 273
Variables: detecting anomalies among, 304–309; using mean and range charts for, 304–309
Velianoff, G., 190
Virginia Atlas of Community Health, 82
Waiting costs, 367
Waiting lines: number and capacity of servers at, 369; patient balking at, 374; patient reneging queue or, 374; queue phenomenon and analysis of, 366; queuing conceptualization of flu inoculation, 368; queuing theory on, 365. See also Arrival patterns; Patients; Queuing systems
Walker, E. K., 164
Warner, M. D., 194
Wheeler, J., 106
Wholesalers, 265–266
WMA (weighted moving average), 19–20
Work design: description of, 124; job design component of, 125–127; socio-technical school approach to, 127; systems perspective on, 124
Worker compensation, 153, 155
Workload management: Average Census for medical/surgical floor, 169; Daily Census for medical/surgical floor, 168; development of internal workload standards, 170–179; establishing workload standards, 163–164; external work standards and their adjustments for, 179–181; GRASP system for, 166; illustrated process of, 162–163; NPAQ system for, 166–167, 170; patient acuity systems and, 163–166; productivity and, 181–182; three components of, 162
Workload stability index (WSI), 179
Workload standards: adjustments of external, 179–181; coverage factor for, 176–178, 190;
Workload standards: adjustments of external determination of FTEs for nurse staffing, 175–176; development of internal, 170–179; examples of, 164; influence on staffing levels, 163–167, 170; reallocation through daily adjustments for, 178–179; tolerance ranges of, 180

Work measurement using time standards: allowance percentages for varying working conditions, 131r; determination of number of cycles (sample size), 128–132; observed/normal time calculations for nursing units, 134; observed times/performance ratings for nursing units, 133; overview of, 127–128; standard elemental times and predetermined standards, 132–135; stopwatch time studies, 128

Work measurement using work sampling: abridged patient care tasks in nursing unit, 136r; data collection form for nursing unit, 137r; determination of sample size, 138–139, 140; development of random observation schedule, 140–144r; overview of, 135–136, 138; random number generator formula used for, 141r; random observation schedule using Excel, 145–147r; training observers, 138

Work simplification: flow process chart, 152r, 153r; overview of, 147–148; work distribution chart, 148–152r

Wyeth, 265

Zimmer, 265

Zone tests, 312, 313r