

Index

- Algorithm(s)
 - in evaluation of alternatives in decision making, 37-42
 - model solving and, 19
 - simplex, in solving complex linear programming problems, 59-60
- Analysis phase, in library problem solving, 5-6
- Analysis of variance process, stochastic models and, 106
- Automation, library problem solving by, 133-134
- Bayes' law
 - in decision theory applied to library problems, 46-48
 - stochastic processes and, 106
- Bibliometrics, 110
- Binomial distribution function, 105
- Bradford's law, journal productivity and, 115-116
- Bradford-Zipf distribution, journal productivity and, 116-117
- Branch viability, as library problem, decision table for, 43
- Central Limit Theorem, stochastic models and, 107
- Collection size, mathematical model for determining library, 13-14
- Constraints
 - nonnegativity, of linear programming, 55
 - in resource allocation, 53
- Correlation coefficient, 106
- Cost-benefit analysis, in allocation resource decisions, 68-69
- Cost(s)
 - direct library, data collection for management information systems and, 142-143
 - indirect library, data collection for management information systems and, 143
- Critical Path Method, in library operations scheduling, 77-80
- Data processing subsystem. *See* Management information systems
- Decision alternatives
 - algebraic variables to test, 53-54
 - objective function in measuring, 53-54
- Decision parameters, in resource allocation problems, 52-53
- Decision support system. *See* Management information systems
- Decision table, in management information systems, 139-141
- Decision theory, 30-50. *See also* Library decision(s)
 - applied to library problems, 42-48
 - branch viability as model in library, 42-44
 - document retrieval as model in library, 44-45
 - probability measurements in, 38-41
 - summary, 50
- Design phase, in library problem solving, 6-7
- Discrete event simulation, modeling and, 126
- Document retrieval, as model in library decision theory, 44-45
- Evaluation phase, in library problem solving, 7-8
- First-in-first-out method, queuing situation and, 88, 90
- Flowchart(s)
 - as data collection technique for management information systems, 139

- Flowchart program
 - calculating average of library exam using, 140
 - in management information systems, 139
- Flowchart system in management information systems, 139
- Game theory, library decisions and, 48-49
- Gamma distribution function, 105
- Graph(s)
 - binary tree, 74
 - defined, 73
 - finite, defined, 73
 - information structures and, 75-76
 - nodes, defined, 73
 - project, library operations represented by, 78-80
 - tree, defined, 74
 - unidirected, 73
 - vertices, defined, 73
- Graph theory
 - definitions involving, 73-74
 - library networks and, 72-84
 - model, example of, 75-76
- Heap, binary tree, defined, 75
- Hypergeometric distribution function, 105
- Implementation phase, in library problem solving, 8-9
- Information storage system, model of, 5
- Integer programming problem, in resource allocation, decisions, 68-69
- Joint probability distribution factor, stochastic processes and, 106
- Journal productivity, as example of stochastic process and library model, 110-118
- Journal selection
 - decision table of, 141
 - as example for management information system, 137-138
- Journal worth, in journal selection decision, 137-138
- Kendall notation, queuing situations and, 89-90
- Last-in-first-out method, queuing situation and, 88, 90
- Law of large numbers, stochastic models and, 107
- Law of total probability, 106
- Library(ies)
 - collection size, mathematical model for determining, 13-14
 - costs, management information systems and, 142-143
 - files, sorting and searching of, graph theory applied to, 75-76
 - as information system, 3-4
 - management, simulation modeling in, 125-135
 - problem, modeling and simulation to solve practical, 131-135
 - queuing theory in, 100-101
 - shelving, modeling and simulation to solve problem of, 131-132
 - subsystems of, 3-4
 - as system, 3-4
 - waiting lines in, dynamics of. *See* Queuing theory
- Library check-out desk, behavior of, simulation modeling of, 127-128
- Library decision(s)
 - alternatives in, 32-33
 - certainty as factor in evaluating, 38
 - elements of, 31-32
 - evaluations in, 34-35
 - evaluation of alternatives in, 37-42
 - examples of, 30-31
 - linear programming model of, graphic analysis of, 58. *See also* Linear programming models, decision theory approach and, 42-48
 - outcomes in, 33-34
 - outcomes of, cardinal scale as measure of, 36
 - nominal scale as measure of, 35
 - ordinal scale as measure of, 35
 - ratio scale as measure of, 36
 - probability measurements in, 38-41
 - risk as factor in evaluating, 38-39
 - scales of measurement in, 35-37
 - states of nature in, 33
 - table, 34
 - theory, 30-50. *See also* Library decision(s) uncertainty as factor in evaluating, 40-42
- Library management information systems. *See* Management information systems
- Library models, stochastic processes and, 103-122. *See also* Stochastic processes and library models
- Library network(s)
 - design, variables associated with, 82-83
 - graph theory applied to, 81-84

- Library operation(s) scheduling
 - Critical Path Method in, 77-80
 - graph theory applied to, 76-81
 - Project Evaluation and Review Technique in, 80-81
- Library system
 - effectiveness as, 27
 - goals of, operations research and, 25-28
 - operations research and, 25-28
 - resource allocation in, 27
 - performance measures of, amount of resources and, 27
- Library systems analysis, accounting and budgeting techniques in, 143
- Linear programming
 - advanced concepts in, 60-62
 - applied to realistic resource allocation problem, 62-66
 - example of, in solving resource allocation problem, 55-60
 - graphic analysis of, 58
 - model of library decision, drawbacks to using, 65-66
 - problem, important features of, 57-59
 - solving complex, 59-60
 - in resource allocation methodology, nine-step planning process using, 63-66
 - in solving resource allocation problems, 54-66
- Literature growth, epidemic theory approach to, 113
 - model to predict, 113
- Little's law, in queuing situation, 94
- Lognormal distribution function, 105
- Lotka's law, journal productivity and, 117-118
- Management information systems, 136-146
 - accounting techniques as data for, 143
 - analysis of data for, 145
 - basic concept of, 136-137
 - budgeting techniques as data for, 143
 - cost data for, 142-143
 - data collection for, 138-142
 - flowcharting as technique of, 139
 - data required for, 138-142
 - decision table as data in identification technique for, 139-141
 - example of, 137-138
 - information reporting for, 145-146
 - library operations key to, 144
 - as library subsystem, 4
 - library use as data for, 144
 - library user numbers as data for, 144
 - ongoing data collection activities for, 142-144
 - question/answer format in, 145-146
 - time study, data for,
 - work sampling as time study technique in, 141
- Markovian analysis, in stochastic processes and library models, 119-122
- Markovian model of obsolescence, literature growth and, 114
- Markov chains, stochastic models and, 107-110
- Model building, in operations research, 15-19
 - principles of, 18
- Model(s)
 - defined, 123
 - library serial selection, comparison of, 16-17
 - in operations research, 12-19
 - descriptive, 13-15
 - mathematical, 13-15
 - physical, 12-13
 - prescriptive, 15
 - single-service queue, example of, 124-125
 - sources of error in, 130-131
 - validation, 129-131
 - verification, 128-129
- Modeling and models, in operations research, 12-19
- Modeling and simulation, 123-135
 - cycle, 129
 - defined, 123
 - goal of, 130
 - in operations research, 12-19
 - practical problem involving, 131-134
 - sources of error in, 130-131
- Monte Carlo* technique, simulation modeling and, 126
- Negative binomial distribution function, 105
- Negative exponential distribution function, 105
- Nonlinear programming, in solving-resource allocation problem, 66-67
- Normal distribution function, 105
- Objective function(s)
 - multiple, in resource allocation problems, 69-70
 - in resource allocation problems, 53-54
- Operations research
 - algorithms in, 19

- Operations research (*continued*)
- descriptive models of, 13-15
 - implementation problems in, 24-25
 - library
 - first benchmark of, 22
 - goals and performance measures in, 25-28
 - history of, 21-24
 - second benchmark of, 23
 - third benchmark of, 24
 - mathematical model of, 13-15
 - model building, 15-19
 - models and modeling in, 12-19
 - normative model of, 15-18
 - overview of library, 11-28
 - physical model of, 12-13
 - prescriptive model of, 15
 - summary of, 28
- Operations research, technique(s)
- decision theory as, 19-20
 - graph theory as, 20
 - inventory of, 19-21
 - list of areas for study using library, 21
 - queuing theory, 20
- Planning performance budget system, in management information systems, 143
- Poisson distribution function, 105
- Probability(ies), measurements, decision theory and, 38-41
- Probability distribution function(s), 104-106
- Problem solving, rational, systematic, objective approaches to, 1-10. *See also* System(s) approach, to problem solving
- systems approach to, defining, 5-10. *See also* System(s) approach, to problem solving
- Productivity, journal, general model of, 110-118
- Productivity and usage, journal, library model for, 118-119
- Project Evaluation and Review Technique, in library operations scheduling, 80-81
- Queue(s)
- D/D/1, 92
 - defined, 86
 - deterministic, 92
 - M/G/1, 98
 - M/M/1, 92-96
 - multiple server, 97-98
 - networks of, 99
- Queuing
- arrival pattern as aspect of, 86-88
 - defined, 86
 - discipline
 - in queuing situation, 88-89
 - various values for, 90
 - network(s) 99
 - notation, and queuing situation organization, 89-90
 - situation(s)
 - arrival pattern as parameter of, 86-88
 - example of, 87
 - interarrival time specification in, 87-88
 - multiple service channels in, 96-98
 - operating characteristics of, 91
 - queuing discipline in, 88-89
 - queuing notation and, 89-90
 - reneging as parameter of, 87
 - service mechanism as aspect of, 89
 - steady state in, 91-92
 - traffic intensity defined in, 93
 - unusual, 98
- Queuing system
- librarian control of parameters of, 95-96
 - operating characteristics of, 91
- Queuing theory, 85-102
- in libraries, 100-101
 - and nondeterministic processes, 85
 - in operations research technique, 20
- Regression process, 106
- Resource allocation(s), 52-70
- decision, integer programming problem in, 68-69
 - decision theory related to, 20
 - problems
 - advanced linear programming concepts in solving, 60-62
 - cost-benefit analysis in, 68-69
 - decision parameters in, 53
 - decision variables in, 52-53
 - linear programming in solving, 54-66. *See also* Linear programming
 - multiple objective function in, 69-70
 - nonlinear programming in solving, 66-67
 - objective functions and constraints in, 53
 - summary of, 70
 - steps in building level, 66
- Retrieval document, as model in library decision, 44-45
- Retrieval problem, *a priori* probabilities for, 48
- Retrieval problem, *a posteriori* probabilities for, 48

- Retrieval system, model of, 5
- Robot(s), library problems solved by, 133-134
- Serial selection, models, comparison of, 16-17
- Shelving problem of, modeling and simulation to solve, 131-132
- Simulation
 - defined, 123
 - for management game, 131
- Simulation modeling, 125-135
 - as management tool, 125-126
 - validation of, 129-131
 - verification of, 128-129
- Simulator development, library problem solving and, 134
- Standard deviation, defined, 105
- Stochastic processes and library models, 103-122
 - journal productivity as example of, 110-118
 - Markov chains in, 107-110
 - Markovian analysis in, 119-122
 - terminology associated with, 104-107
- Stochastic programming, defined, 85
- System(s)
 - defined, 2
 - information storage, model of, 5
 - library as, 3-4
 - library information, major elements of, 3-5
 - retrieval, model of, 5
- System(s) analysis
 - mathematical model in, 13-15
 - models and modeling in, 12-19
 - physical model in, 12-13
- System(s) approach, to problem solving
 - analysis phase in, 5-6
 - defining, 5-10
 - design phase in, 6-7
 - evaluation phase in, 7-8
 - library as, 3-10
 - implementation phase in, 8-9
 - summary of, 10
- Statistics, Bayesian, application to library decisions, 46-48
- Time study in management information systems, 141
- Uniform distribution function, 105
- Variable(s) types of, stochastic processes and, 104-107
- Work sampling as time study technique in management information systems, 141