Ad-growth percentage, 45, 46	noise, pollution, and fuel
Ad-to-margin ratio, 45, 46	consumption, 106
Ad-to-sales ratio, 45, 46	obtained results, 110-112
Advertising	real input data, 110
expenditures, 39	road transportation, 103
impact on sales and profitability in	transportation fleet capacity versus
apparel industry, 37–54	number of trucks, 105
AMPL programming language, 104,	vehicle routing problem, 103-104
113	Boundary articulation, 131–132,
Analytical hierarchy process (AHP),	142-143
166	Breakeven analysis, 181
Analytic network process (ANP)	Business intelligence/business
approach	analytics (BI/BA), 155, 157,
for EOL product's collection	158, 175
centers, 72	
hierarchical structure for, 69	Capacitated VRP (CVRP), 103
Apparel industry	CCR model, 42–43
sales and profitability in,	Chinese drywall, 119–154
advertising impact on, 37–54	homeowners' problem, 121-136
Apple, 67	mess, 147–149, 153
Arms race, athletics, 4	problem structuring, 121
	US Customs and Border
Benchmarking, 22, 24, 25, 27, 29–30,	Protection problem, 136–147
34	Choice rule, 70
Big Data, 156–157	Cluster analysis, 7–8
Biobjective optimization of fleet size	College sports, 4
with environmental aspects,	Constant returns to scale (CRS), 45,
weighted-sum approach for,	46
101-113	Consumer durables, 82, 90, 97
algorithms and multi-objective	Context articulation, 132-133, 141,
approach, 104	144
central processor unit, 112	Corporación Cooperativa, 104
Eroski Group, 104	CPLEX solver, 103, 107, 113
future work, 112–113	Customer orders, 68
mathematical models, 107-110	Cynefin analysis, 134, 145
1.0	2

Data breach simulation, in Excel, 165	Pareto, 42
Data envelopment analysis (DEA)	technical, 24
of intercollegiate athletics	End-of-life (EOL) product's
efficiency, 3–17	collection centers, linear
productivity in	physical programming
telecommunications industry,	approach for, 65–77
58-60	analytic network process
REIT's performance, 23–27,	approach, 72
29-30, 33-34	literature review, 68–70
sales and profitability in apparel	nomenclature, 72–73
industry, advertising impact	numerical example, 74–77
on, 38, 40–47, 49, 50, 52–54	problem formulation, 73–74
Debt equity ratio, 59, 60	problem statement, 70–71
Debt ratio of capital, 59, 60	Enterprise warranty costs (EWC),
Decision-making, multicriteria, 68,	82–85, 89–92, 94–97
70, 71, 77	Enterprise warranty programs,
Decision-making units (DMUs), 5–8,	for two-dimensional policies
12, 14, 17, 25–27	with multiple objectives,
efficiency of, 58–60	81–98
Decision support capabilities, in	
Excel, 155–175	literature review, 83–85
analytical tools, 158-162,	model development, 85–92
180-181	results, 92–96
historical perspective, 156–158	Eroski Group, 104, 110, 113
simulation, 162-173, 181	Exact method, 103, 112, 117
Decision support system (DSS), 26,	Excel, decision support capabilities in, 155–175
157	analytical tools, 158–162,
Definitive stakeholders, 122	180–181
	historical perspective, 156–158
EBITDA (earnings before interest,	simulation, 162–173, 181
taxes, depreciation, and	Expectant stakeholders, 122
amortization) percentage	Expectant stakeholders, 122 Expected warranty costs, 88–89
margin, 25	Extended producer stewardship, 67
Economic manufacturing quantity	Extended producer stewardship, 67 Extended warranty, 83–85, 87, 97
(EMQ), 84	Extended warranty, 63–63, 67, 97
Economies of scale, 24	Force field diagram 122 122 144
Ecorica, 67	Force field diagram, 132, 133, 144
Efficiency	Fractional linear model, 59
analysis, intercollegiate athletics,	Free replacement, 83
3-17	Fuel consumption, 106
of decision-making units, 58–60	Fuji, 66
definition of, 25, 41	Fundamental objectives hierarchy,

Index 185

Game-theoretic approach to service contracts, 84	Jamaica, 4
Geographical Information Systems (GIS), 166–173	Lagrangian heuristic approach, 69 Latent stakeholders, 122
Green vehicle routing problems (G-VRPs), 102, 103, 105, 107,	Leveraging, 24 Linear physical programming (LPP)
110–112 Gross margin ratio, 38	approach, for EOL product's collection centers, 65–77
Growth of the firm, 38	analytic network process approach, 72
Heterogeneous fleet, 102, 105, 107, 111, 113 Holding cost, 84	literature review, 68–70 nomenclature, 72–73 numerical example, 74–77
Homeowners' problem, 121-136	problem formulation, 73-74
how perspective analysis, 134–135	problem statement, 70–71
what perspective analysis,	Linear programming, 41, 43
127-129	Liquidity, 22
when perspective analysis, 135–136	L-shaped warranty, 84
where perspective analysis,	Market price, 59, 60
131–133	Market share function, 87–88
who perspective analysis, 122–126	Means-ends network, 128–129, 140
why perspective analysis, 130–131	Mechanism selection, 134, 145
Homogeneous fleet, 111	Mercedes-Benz, 102
How perspective analysis	Mixed-integer programming, 107, 112
homeowners' problem, 134–135	Monte-Carlo simulation, 162
US CBP problem, 145–146	Motivation/feedback analysis, 130, 141–142
Inspection cost, 84	Multi-attribute utility methods, 166
Intercollegiate athletics efficiency, DEA analysis of, 3–17	Multicriteria decision-making, 68, 70, 71, 77
cluster analysis and sample size	Multidepot vehicle routing problem
requirements, 7–8	with pick-up and delivery and
data collection, 7	time windows
efficiency scores, 10–13	(MDVRPPDTW), 104
input and output inefficiencies,	Multidepot VRP (MDVRP), 103
12–16	Multi-objective approach, 104
model inputs, 8–9	Multi-objective land allocation
model outputs, 10	(MOLA), 166–173
sample size and missing data, 7	
Intervention timing, 135, 146	National Association of Collegiate
Inventory control, 68	Directors of Athletics
Isocost warranty, 84	(NACDA), 7, 10

National Collegiate Athletic Association (NCAA)	Quality function deployment (QFD).
Division I Football Bowl Subdivision (FBS), 4, 7, 17	Real estate investment trusts (REITs
Federal Graduation Rate (FGR)	performance, empirical analysis of, 21–34
database, 7, 10	data and methodology, 25–27
Noise, 103, 106 Nonrenewing warranty, 83	empirical analysis, 27–33 model, 24–25
Objectives articulation, 127, 140	previous studies, 23-24
Office of Postsecondary Education	Rectangular warranty, 84
(OPE)	Recycling, 66, 67
Equity in Athletics Disclosure Act	Regression analysis, 179
(EADA) database, 7, 10	Reinvestment rate, 38
One-dimensional policies, for	Remanufacturing, 66-70, 72, 73, 77
enterprise warranty, 83	Repair of products, 85
One-way data table, 158–162, 180	Reprocessing, 66
Open vehicle routing problem	Return on assets (ROA), 23, 38, 39,
(OVRP), 103	45–48, 50
Operational planning, 70	Return on equity (ROE), 23, 38,
Original equipment manufacturers	45-48, 50, 59, 60
(OEMs), 66, 67	Return on investment (ROI), 38,
	45-48, 58
Output-oriented (O-O) model, 6	Reverse supply chain (RSC), 67, 68,
Pareto efficiency, 42	70, 73, 77
Performed sensitivity analysis on	Rework cost, 85 Ricoh, 66
discount rate, 84	Risk-adjusted performance, 23
Periodic maintenance, before and	Road transportation, 102, 103
after warranty, 85	Road transportation, 102, 103
Poisson process, 87	Sales and profitability in apparel
Pollution, 106	industry, advertising impact
Pollution routing problem (PRP), 104	on, 37–54
Portfolio diversification, 23	data and methodology, 45–46
Production planning, 68	data envelopment analysis, 38,
Productivity, definition of, 25	40-47, 49, 50, 52-54
Productivity, in telecommunications	empirical analysis, 46–53
industry, 57–61	literature review, 39–40
data envelopment analysis,	Sales growth rate, 39, 40, 45–48, 50
58-60	Sales to profit, 59, 60
Product price, 83, 87, 90–94, 97	Scroll bar, in Excel, 158–162,
Profit margin, 38, 45, 47	177–180
Pro rata warranty, 83, 84	Setup cost, 84
• · · · · · · · · · · · · · · · · · · ·	- :

Index 187

Usage rate, 84
US Customs and Border Protection
(CBP) problem, 136–147
how perspective analysis, 145–146
what perspective analysis,
140-141
when perspective analysis,
146-147
where perspective analysis,
142-145
who perspective analysis, 136-140
why perspective analysis,
141-142
Variable returns to scale (VRS), 45,
46
Vehicle routing problem (VRP),
103-104
green, 102, 103, 105, 107, 110-112
Volvo, 102
VRP with time windows (VRPTW),
103
Warranty costs, 85
expected, 88–89
Weighted-sum approach, for
biobjective optimization of
fleet size with environmental
aspects, 101-113
algorithms and multi-objective
approach, 104
central processor unit, 112
Eroski Group, 104
future work, 112–113
mathematical models, 107-110
noise, pollution, and fuel
consumption, 106
obtained results, 110–112
real input data, 110
road transportation, 103
road transportation, 103
transportation fleet capacity versus

What perspective analysis homeowners' problem, 127–129 US CBP problem, 140–141 When perspective analysis homeowners' problem, 135–136 US CBP problem, 146–147 Where perspective analysis homeowners' problem, 131–133 US CBP problem, 142–145 Who perspective analysis homeowners' problem, 122–126 US CBP problem, 136–140 Why perspective analysis homeowners' problem, 130–131 US CBP problem, 141–142

Zimbabwe, 4