

Paweł Hanczar
 Waldemar Grzechca
 Marek Karkula
 Krzysztof Jurczyk
 Mariusz Kostrzewski
 Ewa Kulińska
 Joanna
 Nowakowska-Grunt
 Katarzyna Majewska
 Jerzy Feliks
 Lech Bukowski
 Radim Lenort
 Pavel Wicher
 Jacek Żak
 Piotr Sawicki
 Hanna Sawicka

✓

QUANTITATIVE METHODS IN LOGISTICS MANAGEMENT



7 7 5 54
 16 6 4 2 56
 8 8 33 3
 11

13-436-346-363 -34-484638454 468434348 3 4 1 68
 146434464463463466363 436643 646 3 6 3 4
 36464364364643664663643664 6466346 6 6 3 636
 3464364643646436464 646643646436464 646643646436464
 3643664436664363465464336463 6564634 46364
 3546636364446 6432163463466 35136665 646636436643
 354663264665663636 6 464663663635 32136
 364666364366436663646436646 64663646364366443
 3466643663 64664663665 66467586790 436475
 30670436743063067036034306745217285473627 67 7634 3546765974 5
 330346, 340630463764574658797 8087367 476457 1545733 64 5 484066 452057
 36698573 1767 4874859763 35364 5 0 00506504 306400436 0 X 467430671 367034
 7609 4306 06743 3067 6034

60346303467340630463764574658797 80873604360346303467340630463764574658797 8
 3748569857363 634767 4874859763 3536485904363748569857363 634767 4874859763 3536



Contents

1. Advanced planning of product availability in the supply chain	7
1.1. Product availability in the supply chain	7
1.2. Operating procedure for supply chain planning	7
1.3. Production planning and inventory	8
1.4. Supply and inventory planning	9
1.5. Integrated production planning, delivery and inventory	14
1.6. Proposals of decision models in PIDP	16
1.7. Summary	20
References	21
2. Delays in assembly line balancing problem	24
2.1. Introduction	24
2.2. Two-sided assembly line balancing problem	25
2.3. Heuristic approach	27
2.3.1. Grouping tasks	27
2.3.2. Groups assignment	28
2.3.3. Final procedures	29
2.4. Quality measures of final performance	32
2.5. Conclusions	35
References	35
3. Simulation modeling of logistics processes – input data problems	37
3.1. Introduction	37
3.2. Input modeling for simulation – motivation	38
3.3. Simulation models of complex logistic processes	38
3.4. Input data classification	38
3.4.1. Main data issues	39
3.4.2. Sources for input data	41
3.5. Sample analysis of input data	44
3.6. Bootstrap sampling	50
3.7. Summary	51
References	51

4. Mathematical models of time computing in two-dimensional order-picking process in high-bay warehouses	55
4.1. Introduction	55
4.2. Mathematical models	58
4.2.1. The first mathematical model	59
4.2.2. The second mathematical model	60
4.3. Results and its examination	61
4.3.1. Study of example data set	62
4.4. Summary	67
References	68
5. The cost accounting in logistics processes	70
5.1. Introduction	70
5.2. The risk and the value added	71
5.3. Logistic processes and value creation	73
5.4. The methods of the measurement of the value added in logistic processes	74
5.5. The application of the characterization principle in the risk assessment in logistic processes	77
5.6. Conclusions	85
References	86
6. Dependability analysis of logistic systems – concept of modified FFMEA method	88
6.1. Introduction	88
6.2. The basic terminology of dependability	88
6.3. Dependability measures	90
6.3.1. Reliability performance measures	90
6.3.2. Maintainability performance measures	91
6.3.3. Availability performance measures	92
6.4. Chosen methods of reliability analysis	92
6.4.1. Reliability block diagram (RBD)	93
6.4.2. Fault tree analysis (FTA)	94
6.4.3. Event tree analysis (ETA)	96
6.4.4. Fault modes, effects and criticality analysis FMECA	97
6.5. Concept of modify FMEA	99
6.5.1. Fuzzy decision support system	100
6.6. Conclusions	104
References	105
7. Assessing and building the resilient supply chains	106
7.1. Characteristics of resilient supply chains	106
7.1.1. Definition of supply chain	106
7.1.2. Definition of resilience	107
7.1.3. Definition of resilient supply chain	108
7.2. Assessing the supply chain resilience	109
7.2.1. Preliminary analysis	109
7.2.2. Supply chain analysis	110
7.2.3. Business environment analysis	110

7.2.4.	Vulnerability analysis	111
7.2.5.	Resilience capabilities analysis	113
7.2.6.	Taxonomy development	114
7.2.7.	Evaluation	115
7.3.	Building the supply chain resilience	115
7.3.1.	Design of supply chain	117
7.3.2.	Design of processes	117
7.3.3.	Design of relationships	118
References	118
8.	Intelligent decision making in transportation and logistics systems	121
8.1.	Introduction	121
8.1.1.	The purpose of the chapter	121
8.1.2.	The role of intelligence in decision making	121
8.2.	Selected techniques for intelligent decision making	124
8.2.1.	Artificial Neural Networks	124
8.2.2.	Multiple Criteria Decision Making	124
8.2.3.	Fuzzy Logic	125
8.2.4.	Case-based reasoning	125
8.2.5.	Agent-based systems	126
8.2.6.	Metaheuristics and evolutionary computation	126
8.2.7.	Rough set theory	127
8.3.	Application of intelligent decision making techniques in transportation	130
8.3.1.	Optimisation of fleet composition problem using metaheuristics and evolutionary computation	130
8.3.1.1.	Problem definition	130
8.3.1.2.	Mathematical formulation	131
8.3.1.3.	Computer implementation	131
8.3.1.4.	Generated results	132
8.3.2.	Quality evaluation of transportation systems using dominance-based rough sets	134
8.3.2.1.	Problem definition	134
8.3.2.2.	Evaluation of a transportation system	135
8.4.	Conclusions	138
References	140