

# Contents

<b>1</b>	<b>Information Sharing and Risk Management</b>	<b>1</b>
1.1	Introduction	1
1.1.1	The Benefits and Risks Resulting from IoT	1
1.1.2	Information Sharing and Information Security Investment	2
1.2	Literature Review	3
1.2.1	Just Considering Security Investment	3
1.2.2	Considering Both the Security Investment and Information Sharing	5
1.3	Model Setting	6
1.3.1	Previous Game in Traditional Environment	8
1.3.2	Our Game in the Environment of IoT	8
1.4	Non-cooperative Game	9
1.4.1	Firms' Strategies in the Non-cooperative Game	10
1.4.2	Parameters Analyses	11
1.4.3	Economical Analysis	13
1.4.4	Numerical Experiments	14
1.5	Totally Cooperative Game	18
1.5.1	Firms' Strategies in the Totally Cooperative Game	18
1.5.2	Parameters Analyses	19
1.5.3	Economical Analysis	22
1.5.4	Numerical Experiments	23
1.6	Optimum Analysis and Coordination Mechanism	27
1.6.1	Optimum Analysis	28
1.6.2	Coordination Mechanism	30
1.7	Conclusion and Future Research	32
1.7.1	Conclusion	32
1.7.2	Future Research	33

- 2 Optimal Allocation of Decision-Making Authority in IoT-Based Manufacturing Enterprises . . . . . 35**
  - 2.1 Introduction . . . . . 35
  - 2.2 Literature Review . . . . . 38
  - 2.3 Optimization Model for Decision Authority Distribution . . . . . 41
    - 2.3.1 The Multi-objective Optimization Model . . . . . 42
    - 2.3.2 Numerical Study . . . . . 47
  - 2.4 Sequential Game Model for Centralization Behavior . . . . . 53
    - 2.4.1 The Sequential Game Model . . . . . 53
    - 2.4.2 Numerical Study . . . . . 58
  - 2.5 Conclusion and Further Research . . . . . 60
    - 2.5.1 Conclusion . . . . . 60
    - 2.5.2 Future Research . . . . . 61
  
- 3 Dynamic Coordinated Supply Chain Scheduling in an IoT Environment . . . . . 63**
  - 3.1 Introduction . . . . . 63
  - 3.2 Literature Review . . . . . 64
    - 3.2.1 The Applications of the IoT in Industrial Manufacturing . . . . . 64
    - 3.2.2 The Development of Supply Chain Scheduling . . . . . 65
    - 3.2.3 The Development of Batch Scheduling . . . . . 65
    - 3.2.4 The Applications of the IoT in Supply Chain Scheduling . . . . . 67
  - 3.3 Problem Description . . . . . 67
  - 3.4 A Mixed Integer Programming Formulation . . . . . 68
  - 3.5 Heuristic for Batch Formation and Scheduling in Single Machine . . . . . 71
  - 3.6 Key Steps in SFLF-PR . . . . . 76
    - 3.6.1 Coding and Encoding . . . . . 76
    - 3.6.2 Basic Shuffled Frog Leaping Algorithm (SFLA) . . . . . 77
    - 3.6.3 Basic Path-Relinking Algorithm . . . . . 78
    - 3.6.4 SFLA-PR Algorithm . . . . . 78
  - 3.7 Computational Experiments . . . . . 87
  - 3.8 Conclusion and Future Research . . . . . 90
    - 3.8.1 Conclusion . . . . . 90
    - 3.8.2 Future Research . . . . . 90
  
- 4 Hybrid Manufacturing Distributed Inventory Management with Sharing Logistics . . . . . 91**
  - 4.1 Introduction . . . . . 91
    - 4.1.1 Background . . . . . 91
    - 4.1.2 Inventory Routing Problem in Hybrid Manufacturing . . . . . 93

- 4.2 Literature Review . . . . . 94
  - 4.2.1 Vehicle Routing Problem . . . . . 94
  - 4.2.2 Inventory Routing Problem . . . . . 95
  - 4.2.3 Crossing Field Literature . . . . . 96
  - 4.2.4 Our Contribution . . . . . 96
- 4.3 Model Descriptions . . . . . 97
  - 4.3.1 Model with One Retailer and Ignorance of Transportation . . . . . 98
  - 4.3.2 Model with Multiretailers and the Consideration of Transportation . . . . . 99
- 4.4 The Proposed Solution Method . . . . . 101
  - 4.4.1 The Main Structure of Algorithm . . . . . 102
  - 4.4.2 Improvement Neighborhood Structure . . . . . 103
  - 4.4.3 Perturbation Mechanism . . . . . 106
  - 4.4.4 Adaptive Selection Mechanism . . . . . 110
  - 4.4.5 Subproblem of Delivery and Pickup Plan . . . . . 110
  - 4.4.6 Acceptance and Termination Condition . . . . . 113
- 4.5 Computational Results . . . . . 113
  - 4.5.1 Construction of Instances . . . . . 113
  - 4.5.2 Algorithm Setting . . . . . 113
  - 4.5.3 Lower Bound . . . . . 115
  - 4.5.4 Upper Bound . . . . . 116
  - 4.5.5 Comparison with Upper Bound and Lower Bound . . . . . 116
  - 4.5.6 The Performance of Heuristic in the Subproblem of Delivery and Pickup Plan . . . . . 118
  - 4.5.7 The Effect of Novel Neighborhood Structures . . . . . 120
  - 4.5.8 The Sensitivity Analysis of Vehicle Capacity . . . . . 120
  - 4.5.9 Sensitivity Analysis of  $I_i$  and  $C$  . . . . . 122
- 4.6 Conclusion and Future Research . . . . . 124
  - 4.6.1 Conclusion . . . . . 124
  - 4.6.2 Future Research . . . . . 124
- 5 Cutting Stock Problem with the IoT . . . . . 127**
  - 5.1 Introduction . . . . . 127
    - 5.1.1 The Cutting Stock Problem . . . . . 127
    - 5.1.2 Notation of the Cutting Stock Problem . . . . . 128
    - 5.1.3 Cutting Stock in Manufacturing . . . . . 128
    - 5.1.4 The Cutting Stock Problem with the IoT . . . . . 128
  - 5.2 Literature Review . . . . . 129
    - 5.2.1 One-Dimensional Cutting Stock Problem . . . . . 130
    - 5.2.2 Two-Dimensional Cutting Stock Problem . . . . . 132
    - 5.2.3 Applications of the Cutting Stock Problem . . . . . 133

5.3	Variable Cross-Sectional Cutting Stock Problem . . . . .	134
5.3.1	Background and Model of the Problem . . . . .	135
5.3.2	The Improved Algorithm for Solving Circular Truncated Cone Cutting Stock Problem . . . . .	139
5.4	CSP in the Internet of Things . . . . .	148
5.4.1	Product Cutting Status and Position Monitoring . . . . .	148
5.4.2	The Model of CSP in Internet of Things . . . . .	149
5.4.3	Improved SHP Algorithm . . . . .	153
5.4.4	Simulation and Analysis . . . . .	157
5.5	Conclusion and Future Research . . . . .	159
5.5.1	Conclusion . . . . .	159
5.5.2	Future Research . . . . .	160
<b>6</b>	<b>Total Quality Management of the Product Life Cycle in an IoT Environment . . . . .</b>	<b>163</b>
6.1	Introduction . . . . .	163
6.1.1	Total Quality Management . . . . .	163
6.1.2	Product Life Cycle Quality Management . . . . .	164
6.1.3	Quality of Service (QoS) in a Cloud Manufacturing Environment . . . . .	164
6.2	Literature Review . . . . .	165
6.2.1	The Application of TQM to Realize Continuous Quality Improvements . . . . .	165
6.2.2	The TQM Approach . . . . .	166
6.2.3	Meeting Customer Requirements with Cloud Manufacturing . . . . .	167
6.3	Entire Life Cycle Quality Management . . . . .	169
6.3.1	Difference of Quality Management Under Internet and Big Data . . . . .	169
6.3.2	Entire Life Cycle Quality Management Concepts System . . . . .	170
6.3.3	Life Cycle Quality Assurance System and Methods for Its Implementation . . . . .	177
6.3.4	Life Cycle Quality Management System . . . . .	182
6.4	A Quality Management Model Considering Service Level . . . . .	195
6.4.1	Model Description . . . . .	195
6.4.2	Equilibrium Analysis . . . . .	197
6.5	Conclusion and Future Research . . . . .	208
6.5.1	Conclusion . . . . .	208
6.5.2	Future Research . . . . .	208
<b>7</b>	<b>Life Cycle Assessment in an IoT Environment . . . . .</b>	<b>209</b>
7.1	Introduction . . . . .	209
7.1.1	Life Cycle Assessment . . . . .	209
7.1.2	LCA in an IoT Environment . . . . .	210

- 7.2 Literature Review . . . . . 211
  - 7.2.1 Inventory Analysis and Impact Assessment . . . . . 212
  - 7.2.2 Life Cycle Cost . . . . . 214
  - 7.2.3 Social Life Cycle Assessment . . . . . 215
  - 7.2.4 LCA Methods . . . . . 215
- 7.3 Life Cycle Assessment of Mobile Phone from Environmental Dimension . . . . . 216
  - 7.3.1 Summary of Life Cycle of Mobile Phone . . . . . 217
  - 7.3.2 Construction of LCA System Model . . . . . 218
- 7.4 Inventory Analysis . . . . . 221
  - 7.4.1 Production Capacity of iPhone4S . . . . . 221
  - 7.4.2 Components Inventory of iPhone4S . . . . . 222
  - 7.4.3 Energy Consumption and Emissions of Material Production and Mobile Phone Manufacturing for iPhone4S . . . . . 223
  - 7.4.4 Inventory in the Transportation Phase . . . . . 230
  - 7.4.5 Inventory in the Use Phase . . . . . 231
  - 7.4.6 Inventory in the Recycling Phase . . . . . 232
  - 7.4.7 Inventory in the Whole Life Cycle . . . . . 232
- 7.5 Impact Assessment and Improvement Analysis . . . . . 233
  - 7.5.1 Impact Assessment . . . . . 233
  - 7.5.2 Improvement Analysis . . . . . 235
- 7.6 Social Life Cycle Assessment to iPhone 4S . . . . . 236
  - 7.6.1 Construction of S-LCA Structure . . . . . 236
  - 7.6.2 Brief Introduction of Yang’s ER Approach . . . . . 237
  - 7.6.3 Assignment of Belief Degrees and Attribute Weights . . . . . 240
  - 7.6.4 Generating the Overall Belief Degrees . . . . . 241
- 7.7 Conclusion and Future Research . . . . . 244
  - 7.7.1 Conclusion . . . . . 244
  - 7.7.2 Future Research . . . . . 245
- Appendix: Materials of the Main Components of iPhone4S . . . . . 247**
- References . . . . . 251**



<http://www.springer.com/978-3-319-64567-4>

Optimization and Management in Manufacturing  
Engineering

Resource Collaborative Optimization and Management  
through the Internet of Things

Liu, X.; Pei, J.; Liu, L.; Cheng, H.; Zhou, M.; Pardalos, P.M.

2017, XVIII, 264 p. 14 illus., 6 illus. in color., Hardcover

ISBN: 978-3-319-64567-4