

# Contents

<b>Acknowledgement</b> .....	II
<b>Abstract</b> .....	III
<b>Resumen</b> .....	V
<b>Resum</b> .....	VII
Contents .....	IX
List of Figures .....	XV
List of Tables .....	XVII
<b>Chapter 1</b> .....	19
1. Introduction .....	19
1.1 Planning in Supply Chain Management .....	20
1.2 Problem statement and motivation .....	22
1.2.1 Planning optimization .....	24
1.3 Research Questions and Objectives .....	26
1.4 Research Methodology .....	28
1.4.1 Observation .....	29
1.4.2 Theoretical construction .....	29
1.4.3 Experimentation .....	30
1.4.4 System Development .....	31
1.5 Research Outline .....	31
1.6 References .....	35
<b>Chapter 2</b> .....	38
2. An analysis of reviews of models and algorithms for the optimisation of supply chain replenishment, production and distribution plans. ....	38
2.1 Introduction .....	39
2.2 Perspectives from reviews. ....	40
2.3 Methodology .....	41

---

2.3.1 Collection .....	42
2.3.2 Descriptive analysis.....	45
2.3.3 Category selection .....	46
2.3.4 Validation .....	48
2.4 Results .....	48
2.4.1 Perspectives for the analysis.....	48
2.4.2 Supply chain processes .....	56
2.4.3 Modelling approaches.....	56
2.4.4 Solution methods .....	58
2.5 Discussion and future research opportunities.....	59
2.5.1 Supply chain under uncertainty.....	62
2.5.2 Closed loop supply chain .....	63
2.5.3 Green supply chain .....	64
2.5.4 Sustainable supply chain .....	65
2.5.5 Supply chain risk.....	66
2.5.6 Resilience in the supply chain.....	68
2.5.7 Supply chain management.....	68
2.6 Conclusions .....	71
2.7 References .....	72
<b>Chapter 3</b> .....	<b>76</b>
3. Models and algorithms for production planning, scheduling and sequencing problems: a holistic framework and a systematic review. ....	76
3.1 Introduction .....	77
3.2 Literature review methodology.....	79
3.2.1 Collecting material .....	80
3.2.2 Descriptive analysis.....	81
3.2.3 Category selection .....	82
3.2.4 Material evaluation.....	85

---

3.3 Results analysis .....	86
3.3.1 Decision level .....	86
3.3.2 Plan aggregation .....	87
3.3.3 Modelling approach and solution techniques .....	91
3.3.4 Mathematical model objectives .....	98
3.3.5 Applications area and enterprise integration level .....	104
3.3.6 Solution quality and problem scale .....	108
3.4 Discussion and perspectives .....	113
3.5 Conclusions and future research .....	115
3.6 References .....	116
<b>Chapter 4</b> .....	126
4. A decision-making tool for algorithm selection based on a fuzzy TOPSIS approach to solve replenishment, production and distribution planning problems. ....	126
4.1 Introduction .....	127
4.2 Algorithm selection problem literature review .....	131
4.3 Solution methodology .....	134
4.3.1 Fuzzy Set Theory and fuzzy numbers .....	136
4.3.2 The Fuzzy TOPSIS Method.....	138
4.4 The methodological approach for algorithm selection problem .....	139
4.4.1 Stage 1 - Define criteria and alternatives .....	140
4.4.2 Stage 2 - Problem statement .....	146
4.4.3 Stage 3 - Application of the Fuzzy TOPSIS Method .....	148
4.5 Sensitivity analysis .....	152
4.6 Conclusions .....	154
4.7 References .....	161
<b>Chapter 5</b> .....	172
5. An MILP model for the lot-sizing/scheduling of automotive plastic components with raw materials and packaging availability. ....	172

---

5.1 Introduction .....	173
5.2 Literature review.....	174
5.3 Problem description and formulation .....	176
5.4 Computational experiments .....	182
5.4.1 Generating datasets .....	182
5.4.2 Computational results.....	182
5.5 Conclusion.....	186
5.6 References .....	187
<b>Chapter 6</b> .....	<b>189</b>
6. A MILP model for reusable containers management in Automotive plastic components supply chain. ....	189
6.1 Introduction .....	190
6.2 Literature review.....	191
6.3 Problem definition.....	191
6.3.1 A MILP model for Reusable Containers Management.....	194
6.3.2 Numerical Experiment.....	197
6.4 Collaboration scheme .....	198
6.5 Conclusions.....	199
6.6 References .....	199
<b>Chapter 7</b> .....	<b>201</b>
7. Matheuristic Algorithm for Job-Shop Scheduling Problem Using a Disjunctive Mathematical Model.....	201
7.1 Introduction .....	202
7.2 Literature Review: Matheuristic Resolution Approaches.....	203
7.3 Job-Shop Scheduling Problem: Disjunctive Mathematical Formulation .....	209
7.4 Materials and Methods.....	211
7.4.1 Proposed Matheuristic Approach .....	211
7.4.2 Initial Population .....	213

---

7.4.3 Feasibility Tester .....	214
7.4.4 Fitness Function.....	216
7.4.5 Selection.....	217
7.4.6 Crossover Operator.....	217
7.4.7 Mutation Operator.....	218
7.5 Computational Experiments .....	218
7.6 Conclusions and Further Work.....	221
7.7 References .....	222
<b>Chapter 8.....</b>	<b>226</b>
8. A matheuristic approach to production and distribution planning.....	226
8.1 Introduction .....	227
8.2 Related works.....	230
8.3 Problem definition.....	232
8.3.1 Notation .....	233
8.4 Matheuristic solution method.....	235
8.4.1 Initial population.....	237
8.4.2 Evaluation function .....	237
8.4.3 Selection.....	238
8.4.4 Crossover.....	238
8.4.5 Mutation.....	238
8.4.6 The matheuristic approach procedure.....	239
8.5 Numerical experiments .....	239
8.5.1 Experimental results .....	240
8.6 Conclusion .....	245
8.7 References .....	246
<b>Chapter 9.....</b>	<b>250</b>
9. Conclusions.....	250
9.1 Main contributions.....	251

---

9.1.1 The replenishment, production and distribution planning holistic conceptual framework.....	251
9.1.2 Methodology for selecting algorithms to solve planning problems .....	252
9.1.3 Models and algorithms for replenishment, production and distribution planning.....	253
9.2 Future research lines .....	257
9.3 Reference .....	258
Funding Acknowledgement.....	259

---