

Contents

Part I Supply Chain Configuration Problem and Issues 1

1. Configuration 3

1.1 What is Configuration?..... 3

1.2 What is a Configurable System?..... 4

1.2.1 System and System Design Concepts..... 4

1.2.2 Sources of Configuration..... 7

1.2.3 Impact of Public Policies on Configuration..... 9

1.2.4 Configuration Problems..... 10

1.2.5 Configuration models 10

1.2.6 Configuration Solutions..... 11

1.3 Why is a Configurable System Needed? 11

1.4 Examples and Applications of Configuration..... 12

1.5 Key Issues in Configuration 13

1.5.1 Coordination and Synchronization 13

1.5.2 Conflicting Objectives 13

1.5.3 Complex Network 13

1.5.4 System Variation Over Time..... 14

1.5.5 Push-Pull Strategies..... 14

1.5.6 Direct-to-Consumer 14

1.5.7 Strategic Alliance 15

1.5.8 Mass Customization 15

1.5.9 Outsourcing and Procurement Strategies..... 15

1.5.10 Information Technology and Decision Support Systems 15

1.5.11 Customer Value 16

References 16

2. Scope of Supply Chain Configuration Problem 17

2.1 Introduction 17

2.2 Supply Chain and Supply Chain Management 17

2.2.1 A Systems Perspective on Supply Chains 18

2.2.2 The Supply Chain as a Configurable System 21

2.2.3 Supply Chain Management Process 22

2.3 Supply Chain Management Problem Domain 24

2.3.1 Overall Supply Chain Management Problems	27
2.3.2 Subset of Supply Chain Configuration Problems.....	31
2.3.3 Integration.....	32
2.4 Supply Chain Configuration Dimensions	33
2.4.1 Horizontal Extent.....	33
2.4.2 Vertical Extent.....	36
2.4.3 Objectives and Criteria	36
2.4.4 Decisions	38
2.4.5 Parameters	40
2.5 Aligning Objectives.....	41
2.6 Summary.....	43
References	43
3. Literature Review	47
3.1 Introduction	47
3.2 The Design of the Literature Survey.....	48
3.2.1 Classification Criteria.....	49
3.2.2 Complexity Criteria	50
3.3 Detailed Review	51
3.4 Focus Areas for Supply Chain Configuration.....	70
3.5 Summary.....	74
References	74
4. Reconfigurable Supply Chains: An Integrated Framework.....	81
4.1 Introduction	81
4.2 The Concept of Reconfigurable Supply Chains	82
4.2.1 Need.....	82
4.2.2 Definition.....	83
4.2.3 Advantages and Difficulties	85
4.2.4 Requirements	86
4.3 Configuration Problems and Methods	88
4.4 Integrated Frameworks	91
4.4.1 Existing Frameworks.....	92
4.4.2 Proposed Frameworks	93
4.5 Summary.....	96
References	97
5. Methodology for Supply Chain Configuration	101
5.1 Introduction	101
5.2 Background.....	102
5.3 Key Issues.....	104
5.4 Configuration Steps	105
5.5 Elaboration of Steps.....	109

5.5.1 Initialization of Configuration	109
5.5.2 Decision-Making Circumstances and Modeling Scope	110
5.5.3 Information Modeling	114
5.5.4 Preselection	118
5.5.5 Selection	120
5.5.6 Analysis of Output Data	122
5.5.7 Approbation of Results	122
5.6 Architecture of the Decision Support System	123
5.7 Summary	125
References	126

Part II Solutions..... 129

6. Knowledge Management as the Basis of Crosscutting Problem-Solving Approaches 131

6.1 Introduction	131
6.2 Crosscutting Approaches – Motivation, Focus, and Significance	133
6.2.1 Motivation and Focus	134
6.2.2 Problem Solving for Configurable Systems	134
6.2.3 Significance of This Approach	136
6.3 Taxonomy, Ontology, and System Integration	137
6.3.1 Taxonomy	138
6.3.2 Ontology	138
6.4 Knowledge Management System Development: A Proposed Framework	140
6.4.1 Taxonomy	141
6.5 Knowledge Management System Reference Model	144
6.6 Development of Components of Knowledge Management System	150
6.6.1 Capture	150
6.6.2 Assembly	151
6.6.3 Storage	155
6.6.4 Usage	155
6.7 Summary	156
References	156

7. Information Modeling Approaches..... 161

7.1 Introduction	161
7.2 Information Modeling for Supply Chain Configuration	162
7.2.1 Purpose	162
7.2.2 Interactions with Information Systems Development	163
7.2.3 Overview of Modeling Techniques	165
7.3 Process Modeling	168

7.4 Data Modeling	174
7.4.1 General Data Model	175
7.4.2 Modeling Technique Specific Data Model.....	176
7.4.3 Data Mapping	177
7.5 Generic Supply Chain Configuration Data Model	177
7.6 Summary.....	180
References	180
8. Mathematical Programming Approaches	183
8.1 Introduction	183
8.2 Fundamentals.....	184
8.3 Mixed-Integer Programming Models	185
8.3.1 Generic Formulation.....	186
8.3.2. Modifications.....	188
8.3.3 Computational Issues.....	191
8.4. Other Mathematical Programming Models	195
8.4.1 Multi-Objective Programming Models	195
8.4.2 Stochastic Programming Models.....	197
8.4.3 Non-Linear Programming Models.....	198
8.5 Sample Application	198
8.6 Model Integration	201
8.7 Summary.....	204
References	204
9. Simulation Modeling Approaches	207
9.1 Introduction	207
9.2 Background.....	208
9.3. Overview of Existing Simulation Models	210
9.4 Development of Supply Chain Configuration Simulation Models	214
9.4.1 Approach	215
9.4.2 Representation of Supply Chain Entities.....	216
9.4.3 Model Generation.....	217
9.4.4 Sample Simulation Results	221
9.5 Summary.....	222
References	222
10. Hybrid Approaches	225
10.1 Introduction	225
10.2 Background.....	225
10.3 Hybrid Modeling For Supply Chain Configuration.....	227
10.3.1 General Approach.....	228
10.3.2 Types of Hybrid Models.....	228

10.4 Sample Hybrid Models	230
10.4.1 Sequential Hybrid Modeling	230
10.4.2 Simultaneous Hybrid Modeling.....	232
10.4.3 Meta-Model Based Feedback	235
10.5 Summary.....	242
References	243
11. Information Technology Support for Configuration Problem Solving.....	245
11.1 Introduction	245
11.2 Information Technology for Supply Chain Configuration	246
11.3 Analytical Systems	249
11.3.1 Standalone Packages.....	249
11.3.2 Data Warehouses	251
11.3.3 Advanced Planning Systems	252
11.3.4 Integrated Decision-Making Environments.....	252
11.4 Supply Chain Management Information Systems	253
11.4.1 Usage	253
11.4.2 Architecture	254
11.4.3 Integration Technologies	257
11.5 Prototype of a Decision-Modeling System.....	258
11.6 Summary.....	261
References	262
Part III Applications.....	265
12. Review of Applied Studies.....	267
12.1 Introduction	267
12.2 Review of Extended Studies	268
12.3 Review of Other Applied Studies	273
12.4 Summary.....	278
References	279
13. Applications in Automotive Industry.....	281
13.1 Introduction	281
13.2 Review of Problem Area	281
13.2.1 Automotive Supply Chain: Trends, Issues and Opportunities	281
13.2.2 Literature Review	284
13.3 Information Modeling Case.....	286
13.3.1 Case Description.....	286
13.3.2 Data Models.....	287
13.3.3 Generated Simulation Model.....	290

13.4 Stochastic Optimization Case	291
13.4.1 Business Objectives	291
13.4.2 System	291
13.4.3 Model.....	292
13.4.4 Results	295
13.5 Summary.....	298
References	299
Appendix	300
 14. Application in Retail: Locating a Distribution Center	303
14.1 Introduction	303
14.2 Retail Supply Chain	304
14.3 Supply Chain Reconfiguration and Facility Location	308
14.3.1 Facility Location Techniques	309
14.4 Supply Chain Simulators	314
14.4.1 Overview	315
14.4.2 Modeling Process	316
14.4.3 Supply Chain Simulation Tool LORD	317
14.5 Case Study: Locating a Distribution Center	319
14.5.1 Current Supply Chain	319
14.5.2 Problem Definition	320
14.5.3 Evaluation of Alternatives	321
14.6. Summary.....	331
References	331
 15. Future Research Directions in Supply Chain Configuration	
Problem.....	335
15.1 Introduction	335
15.2 Trends and Opportunities in Supply Chain Configuration	335
15.3 An Agenda for Future Research in Supply Chain	
Configuration.....	337
References	340
 Index	341