

Contents

- 1 Background and Introduction.** 1
 - 1.1 Globalized Business Environment 1
 - 1.1.1 Increasing Customer Requirements and Preferences 4
 - 1.1.2 Cost Reduction Pressure 5
 - 1.1.3 Productivity Improvement Pressure 6
 - 1.1.4 Consolidation: M&A 6
 - 1.2 Competitive Business Strategy 7
 - 1.3 Operational Business Capability 13
 - 1.4 Business Needs of Technology Integration 15
 - 1.5 Summary 21
 - 1.6 Exercises 21
 - References 22

- 2 Technology Integration State, Issues, Benefits, and Obstacles.** 23
 - 2.1 Current State of Supply Chain Interoperability 24
 - 2.1.1 No Communication Standard for Product Life Cycle Management. 24
 - 2.1.2 Proprietary Solutions and Tools 26
 - 2.1.3 OEM-Driven Relationship 27
 - 2.1.4 Disconnected Business Processes 27
 - 2.2 Issues of Supply Chain Interoperability 28
 - 2.2.1 Private Business Information Disclosure 29
 - 2.2.2 Hard-to-Reachable Common Business Process Ontology Development 30
 - 2.2.3 Heavy Development Time and Efforts of Interoperability Tool 30
 - 2.2.4 Workload Unbalance Between OEMs and Suppliers 31
 - 2.3 Benefits of Supply Chain Interoperability 31
 - 2.3.1 Burden Relief on Information Infrastructure Establishment 32

2.3.2	Easier Version Control of Industry Standards	33
2.3.3	Savings on New Technology Adoption Time and Effort	34
2.3.4	Quicker New Partner Connectivity	34
2.3.5	Semantic Message Processing.	34
2.3.6	Interoperability Value Proposition Efforts	34
2.4	Obstacles of Supply Chain Interoperability	35
2.4.1	Loosened Vertical Integration and Split Business Ownership	35
2.4.2	Heterogeneous Business Processes, Systems, Data Structures	37
2.4.3	Enlarged Footprint of Business Partners.	38
2.4.4	Long Distance Logistics Networks	40
2.4.5	Diversified Acquisition and Procurement Channels	41
2.4.6	Third Party Involvement	42
2.4.7	Elevated Security and Stricter Customs Regulations	43
2.4.8	Information Security Danger	44
2.5	Interoperability Research in Europe	45
2.6	Interoperability Research Agenda in the U.S.	46
2.6.1	Vision for Interoperability Standards Within and Across Supply Chain.	47
2.6.2	Current State of Interoperability Standards Within and Across Supply Chain.	47
2.6.3	Solutions for Interoperability Standards Issues Within and Across Supply Chain.	51
2.7	Supply Chain Interoperability in Product Development Process	59
2.7.1	Product Development Process.	60
2.7.2	Linkage Between Product Development Process and Supply Chain Management	61
2.7.3	Interoperability Needs	64
2.8	Summary	65
2.9	Exercises	65
	References	66
3	Understanding New and Emerging Business Technologies	67
3.1	Introduction	67
3.2	Technology Forecasting Techniques.	70
3.2.1	Growth Curve Matching	70
3.2.2	Delphi Technique	71
3.2.3	Scenarios and Relevance Trees.	71
3.2.4	System Dynamics	72
3.2.5	Patent Analysis.	73
3.2.6	Bibliometric Analysis	74

3.3	Case Studies for Technology Forecasting	74
3.3.1	RFID Technology	74
3.3.2	Web Service Technology	77
3.3.3	Discussion	90
3.4	Summary	93
3.5	Exercises	94
	References	95
4	Technology Integration Needs for Manufacturing, Logistics, and Supply Chain Management	97
4.1	Business-Driven Technology Needs	98
4.1.1	Business Process Interruption and Modification	99
4.1.2	Non-standard Technology Adoption	99
4.1.3	Stand-Alone Solution.	99
4.1.4	Conflict with Existing Infrastructure	100
4.2	Manufacturing Needs	100
4.2.1	Importance of Standardization	101
4.2.2	Environment of Technology Implemented	101
4.2.3	Recent Example Technology Needs for Manufacturing	102
4.3	Logistics Needs	103
4.3.1	Expanded Transportation Origin–Destination Pairs	103
4.3.2	Increasing Transportation Routes and Modes	104
4.3.3	Longer Transportation Distance	106
4.3.4	Recent Example Technology Needs for Logistics	106
4.4	Supply Chain Management Needs	108
4.4.1	Difference Between Logistics and Supply Chain Management	109
4.4.2	Supply Chain Integration	110
4.4.3	Supply Chain Management Systems	111
4.4.4	Recent Example Technology Needs for Supply Chain Management	112
4.5	Motivating Technology Integration Need Example	113
4.5.1	Definition of Interoperability Levels	113
4.5.2	Virtual Interoperability Versus Physical Interoperability	117
4.5.3	Public Versus Private Interoperability Space	117
4.5.4	Motivating Example	118
4.6	Summary	130
4.7	Exercises	130
	References	131

5	Technology Integration Preparation	133
5.1	Business Process Analysis	135
5.2	Team Formation	139
5.3	Technology Assessment	141
5.3.1	Proprietary Standard Versus Open Standard	142
5.3.2	Centralized Warehouse Versus Stand-alone Point-to-Point Application	142
5.3.3	Automotive Industry as an Early RFID Adopter	143
5.3.4	RFID-Related Extended Standards	143
5.3.5	Technology Assessment Tips	144
5.4	Technology Vendor Selection	149
5.5	Stakeholder Identification	152
5.6	Business Case Development	155
5.7	Solution Architecture Development	160
5.8	Analytical Modeling	162
5.9	Pre-validation of Business Case	164
5.10	Summary	165
5.11	Exercises	165
	References	167
6	Technology Integration Project Planning and Execution	169
6.1	Technology Integration Project Management Characteristics	169
6.2	Technology Integration Project Management Challenges	173
6.3	Technology Integration Project Management Failure Causes	175
6.4	Project Management Life Cycle	176
6.5	Project Initiation	177
6.5.1	Tasks During Pre-initiation	179
6.5.2	Processes During Initiation	186
6.6	Project Planning	189
6.6.1	Integration Management	192
6.6.2	Scope Management	192
6.6.3	Time Management	195
6.6.4	Cost Management	198
6.6.5	Quality Management	199
6.6.6	Human Resource Management	201
6.6.7	Communications Management	202
6.6.8	Risk Management	204
6.6.9	Procurement Management	209
6.7	Project Execution	211
6.7.1	Integration Management	211
6.7.2	Quality Management	214
6.7.3	Human Resource Management	215
6.7.4	Communications Management	221
6.7.5	Procurement Management	222

6.8	Project Monitoring and Control	223
6.8.1	Integration Management	224
6.8.2	Scope Management	225
6.8.3	Time Management	227
6.8.4	Cost Management	228
6.8.5	Quality Management	229
6.8.6	Communications Management	230
6.8.7	Risk Management	231
6.8.8	Procurement Management	232
6.9	Project Close.	233
6.9.1	Integration Management	233
6.9.2	Procurement Management	233
6.10	Solution Roll-Out	234
6.11	Summary	235
6.12	Exercises	235
	References	236
7	Case Study: Radio Frequency Identification	237
7.1	RFID and Wireless Technology General.	237
7.2	Business Environment Description.	239
7.3	Business Case	241
7.3.1	Content of Business Case.	242
7.3.2	Business Case of RFID Project.	242
7.4	Solution Approach.	256
7.5	RFID-Enabled Decision-Making Framework.	258
7.6	Analytical Models	260
7.6.1	Deployment Decision	260
7.6.2	Shipment Decision	261
7.7	Test and Evaluation	261
7.7.1	Simulated Test and Evaluation	261
7.7.2	Proof-of-Concept Test and Evaluation	262
7.8	Managerial Implications.	263
7.9	Impact on Other Supply Chain Members	264
7.10	Summary	267
7.11	Exercises	267
	References	268
8	Case Study: Interoperability in Business Supply Chain	269
8.1	Business Problem Description.	269
8.2	Web Service and Service-Oriented Architecture	272
8.3	Logic Programming-Based Interoperability Architecture.	274
8.4	Semantic Rules for Interoperability	277
8.4.1	sameAs 1:1 Translation	278
8.4.2	joinTo n:1 Translation	278

8.4.3	MultiplyTo n:1 Translation	278
8.4.4	Mapping Rules	279
8.5	Test and Business Implications	279
8.5.1	Illustrative Example	280
8.5.2	Business Implications	282
8.6	Web Service Composition	283
8.7	Summary	286
8.8	Exercises	287
	References	288
9	Case Study: Business Service Composition for Sustainable Supply Chain	289
9.1	Business Problem Description	289
9.2	Semantic Web Service for Business Composition	292
9.3	Direct and Indirect GHG Emissions in Supply Chain.	294
9.3.1	Standards for Scope 3 Measurement—Organizational Footprint	296
9.3.2	Standards for Scope 3 Measurement—Production or Service Footprint	297
9.4	Performance Metrics of Sustainable Supply Chain.	298
9.5	SWS-based Business Composition Method	302
9.6	Test and Business Implications	304
9.6.1	Specification Phase	306
9.6.2	Matchmaking and Negotiation Phase with CO ₂ Footprint and Environment Impact Considerations	306
9.6.3	Composite Service Generation Phase.	308
9.6.4	Business Implications	309
9.7	Summary	312
9.8	Exercises	313
	Glossary	317
	Index	323