

## List of Contents

<b>List of Figures</b> .....	<b>XV</b>
<b>List of Tables</b> .....	<b>XVII</b>
<b>List of Appendices</b> .....	<b>XIX</b>
<b>List of Abbreviations</b> .....	<b>XXI</b>
<b>1 The growth of service-driven businesses of industry 4.0</b> .....	<b>1</b>
1.1 Motivation and problem statement .....	2
1.2 Structure of the thesis .....	3
1.3 The raise of industry 4.0 .....	4
<b>2 Analysis of the initial understanding on how to develop services in supply chains for industry 4.0</b> .....	<b>7</b>
2.1 Illustration of identified characteristics of industry 4.0, SCM, and services ..	8
2.1.1 Definitions .....	10
2.1.2 Requirements.....	18
2.1.3 Approaches .....	31
2.2 Discussion on how industry 4.0 impacts SCM and services.....	40
2.2.1 How does industry 4.0 influence SCM?.....	41
2.2.2 How does industry 4.0 influence services? .....	43
2.2.3 What is services supply chain management? .....	45
2.3 Intermediate result: Discussion of the research gap for developing services in supply chains for industry 4.0.....	48
2.3.1 Definition of research propositions .....	53
<b>3 Analysis on how practice develops services in supply chains for industry 4.0</b> .....	<b>61</b>
3.1 Blockchain technology as industry 4.0 technology for services in supply chains .....	64
3.1.1 Invention of the blockchain technology.....	65
3.1.2 Technical characteristics of the blockchain technology .....	65
3.1.3 Benefits and challenges of the blockchain technology .....	67
3.1.4 Future investigations of the blockchain technology .....	69

3.2	Case studies' research: Blockchain technology usage for services in supply chains .....	72
3.2.1	Case Study I: How do companies apply the blockchain technology to develop services in supply chains? .....	72
3.2.2	Case Study II: How do companies engage with the blockchain technology based on secondary research publications? .....	88
3.2.3	Case Study III: How do companies experience the progress of the blockchain technology for their services in supply chains?.....	94
3.3	Intermediate result: Discussion of practical findings for developing services in supply chains for industry 4.0.....	102
3.3.1	Redefinition of research propositions .....	104
<b>4</b>	<b>Strategies for the Service oriented Supply Chain Management for industry 4.0.....</b>	<b>113</b>
4.1	Validation of the research propositions .....	115
4.2	Development of the Service oriented Supply Chain Management framework for industry 4.0 .....	120
4.2.1	Value Chain Network Participants .....	121
4.2.2	Value Chain Network for Services.....	125
4.2.3	Transfer for Services .....	129
4.2.4	Decision-Makings for Services .....	134
4.2.5	Value Creation for Services.....	136
4.2.6	Interrelations of domain fields and principles .....	139
4.2.7	Dependencies of domain fields .....	143
4.3	The SoSCM framework for industry 4.0 .....	150
4.3.1	Service oriented Value Chain Network Models .....	155
4.3.2	Phases of the Service oriented Value Creation Process and the Service Continuity Process.....	159
4.4	Managerial guidelines to apply the SoSCM framework .....	165
4.4.1	Identification of the service idea .....	166
4.4.2	Collaboration of service provider and service operator .....	168
4.4.3	Careful selection of supply chains and VCNPs to build the VCN ..	170
4.4.4	Validation of the created service solution .....	173
<b>5</b>	<b>Conclusion.....</b>	<b>175</b>

5.1	Limitations .....	178
5.1.1	Limitations of theoretical and practical findings .....	178
5.1.2	Limitations of the SoSCM framework for industry 4.0.....	180
5.2	Future research .....	181
<b>Appendix .....</b>		<b>XXIII</b>
<b>Bibliography.....</b>		<b>CCIII</b>
<b>Affidavit .....</b>		<b>CCXLI</b>