

**TABLE OF CONTENTS**

<b>Abstract .....</b>	<b>4</b>
<b>Acknowledgements.....</b>	<b>5</b>
<b>Brief Contents .....</b>	<b>VII</b>
<b>Table of Contents .....</b>	<b>IX</b>
<b>List of Abbreviations.....</b>	<b>XV</b>
<b>List of Figures .....</b>	<b>XVIII</b>
<b>List of Tables .....</b>	<b>XXIV</b>
<b>1 Introduction .....</b>	<b>1</b>
1.1 Motivation and Research Context.....	1
1.2 Problem Statement .....	7
1.3 Research Questions .....	9
1.4 Design Science Research Methodology.....	10
1.5 Research Approach.....	14
1.5.1 Scientific Positioning .....	14
1.5.2 Scientific Investigation .....	15
1.6 Structure of the Thesis .....	15
<b>2 Research Foundations.....</b>	<b>19</b>
2.1 Preliminaries.....	19
2.2 Foundations of the Business Model Concept.....	19
2.2.1 Developments in Business Model Research .....	19
2.2.2 Business Model Definitions.....	21
2.2.3 Business Model Components.....	23
2.2.4 Delimitation of Business Models and Strategy .....	25
2.2.5 Delimitation of Business Models and Business Processes .....	29
2.2.5.1 Value Chains.....	29
2.2.5.2 Business Processes.....	30
2.2.5.3 Relationship between Business Models and Business Processes.....	34
2.3 Software Industry as Research Context.....	36
2.3.1 Characteristics of the Software Industry.....	36
2.3.2 Reference Models for Service Delivery in the Software Industry .....	39
2.3.2.1 IT Infrastructure Library .....	39
2.3.2.2 Software Lifecycle Processes of Systems and Software Engineering .....	41
2.3.2.3 Further Related Process Frameworks.....	42

2.4 Business Models in the Software Industry .....	44
2.4.1 Review of the State of the Art of Business Models in the Software Industry .....	44
2.4.1.1 Applied Methodology of the Literature Analysis.....	44
2.4.1.2 Software Business Models according to Bonaccorsi, Giannangeli and Rossi .	45
2.4.1.3 Software Business Models according to Kontio, Jokinen, Mäkala and Leino.	46
2.4.1.4 Software Business Models according to Rajala and Westerlund .....	47
2.4.1.5 Software Business Models according to Rönkkö and Valtakoski.....	48
2.4.1.6 Software Business Models according to Schief .....	49
2.4.2 Classification of the Literature Analysis Results of Software Business Models .....	50
2.4.2.1 Product and Strategy .....	51
2.4.2.2 Services and Implementation .....	54
2.4.2.3 Financials.....	57
2.4.2.4 Distribution .....	58
2.5 Concluding Remarks .....	59
<b>3 Requirements in the Domain of Software Business Models.....</b>	<b>61</b>
3.1 Preliminaries.....	61
3.2 Business Model Analysis and Transformation.....	61
3.2.1 Business Model Analysis .....	61
3.2.1.1 Business Model Analysis Approaches.....	64
3.2.1.2 Summary .....	67
3.2.2 Business Model Transformation .....	70
3.2.2.1 Business Model Transformation Approaches.....	71
3.2.2.2 Summary .....	75
3.3 Business Processes in the Software Industry .....	77
3.3.1 Applied Modeling Language.....	78
3.3.2 Value-Creating Activities in the Software Industry .....	80
3.3.2.1 Research Processes.....	81
3.3.2.2 Software Development Processes .....	82
3.3.2.3 Software Installation Processes .....	84
3.3.2.4 Software Operations Processes .....	85
3.3.2.5 Software Support Processes .....	87
3.3.2.6 Software Maintenance Processes.....	87
3.3.2.7 Software Replacement Processes.....	88
3.3.2.8 Marketing and Sales Processes.....	89
3.3.2.9 Financial Management .....	91

3.3.2.10 Cross Processes: Partnerships .....	91
3.3.3 Business Process Monitoring and Analysis .....	91
3.3.3.1 KPIs and Measures.....	92
3.3.3.2 Service Level Agreements.....	93
3.3.3.3 Business Intelligence and Business Process Intelligence .....	94
3.3.3.4 Summary .....	100
3.4 Requirements Analysis for Process-driven Business Model Analysis.....	101
3.4.1 Qualitative Requirements Derivation .....	101
3.4.1.1 Design of the Study.....	102
3.4.1.2 Results of the Study .....	103
3.4.1.3 Summary .....	106
3.4.2 Requirements Consolidation.....	107
3.5 Evaluation of the State of the Art.....	109
3.5.1 Al-Debei and Avison (2010).....	109
3.5.2 Zott and Amit (2007 - 2010) .....	111
3.5.3 Brea-Solís et al. (2015) .....	112
3.5.4 Groesser (2015) and Groesser & Jovy (2016).....	113
3.5.5 Samavi, Tu and Topaloglou (2009) .....	114
3.5.6 Sellami, Gaaloul and Moalla (2012) .....	115
3.5.7 Filipowska, Kaczmarek and Stein (2009) .....	116
3.5.8 Rubin, Mitsyuk, Loazova, van der Aalst (2014) .....	118
3.5.9 Ternai, Török and Varga (2016).....	119
3.6 Concluding Remarks .....	119
<b>4 Conceptual Design of the Reference Model .....</b>	<b>123</b>
4.1 Preliminaries.....	123
4.2 Theoretical Foundations of the Reference Model .....	123
4.2.1 Corporate Landscape of Information and Application Systems .....	124
4.2.2 Terminological Foundations of Reference Models .....	126
4.3 Planning of the Reference Model.....	128
4.3.1 Classification Frame of the Reference Model .....	128
4.3.2 Applied Modeling Methods, Languages and Tools .....	130
4.3.3 Reference Model Design .....	132
4.4 Development of the Semantic Business Model Layer .....	133
4.4.1 Terminological Foundations of Ontologies .....	133
4.4.1.1 Types of Ontologies .....	133

4.4.1.2	Elements and Syntax of Ontologies .....	135
4.4.1.3	Ontology Engineering and Re-Using Ontologies.....	136
4.4.1.4	Delimitation from the Relational Database Scheme .....	137
4.4.2	Approach for the Development of the Semantic Business Model Layer .....	140
4.4.2.1	Technical and Semantic Design Considerations .....	140
4.4.2.2	Method for the Development of the Semantic Layer.....	141
4.4.3	State of the Art of Business Model Ontologies .....	142
4.4.3.1	REA Enterprise Ontology according to McCarthy .....	143
4.4.3.2	Business Model Ontology according to Osterwalder .....	144
4.4.3.3	E3-Value Ontology according to Gordijn and Akkermans .....	146
4.4.3.4	Delimitation of BMO and e3-Value.....	147
4.4.3.5	Business Webs according to Tapscott .....	149
4.4.3.6	Business Model Ontology according to Andersson et al. ....	149
4.4.3.7	SUPER Ontology Stack.....	151
4.4.3.8	TOVE Ontology.....	153
4.4.4	Evaluation of the State of the Art of Business Model Ontologies.....	154
<b>5</b>	<b>Reference Model for Process-Driven Business Model Analysis and Adaptation.....</b>	<b>161</b>
5.1	Preliminaries.....	161
5.2	Structure of the Reference Model.....	161
5.3	Representation of the Process Space .....	163
5.3.1	Semantic Modeling of Business Processes.....	164
5.3.2	Method for the Structuring of the Functional Design.....	166
5.4	Functional Design of the Strategy Dimension .....	167
5.4.1	Conceptual Frame of the Strategy Dimension .....	167
5.4.1.1	Value Proposition.....	168
5.4.1.2	Investment Horizon .....	171
5.4.1.3	Localization .....	171
5.4.2	Process Interface of the Strategy Dimension.....	172
5.4.2.1	VALUE PROPOSITION Process Interface .....	172
5.4.2.1.1	Value Offering Attribute ‘Quality’ .....	172
5.4.2.1.2	Value Offering Attribute ‘Intimate Customer Relationship’ .....	181
5.4.2.1.3	Price .....	185
5.4.2.1.4	Value Level.....	191
5.4.2.2	INVESTMENT HORIZON Process Interface .....	195
5.4.3	Data View of the Strategy Dimension .....	201

5.4.3.1	VALUE PROPOSITION Data View.....	202
5.4.3.1.1	Value Offering Attributes.....	202
5.4.3.1.2	Price Properties.....	207
5.4.3.1.3	Value Level Properties .....	209
5.4.3.2	INVESTMENT HORIZON Data View .....	211
5.5	Functional Design of the Value Offering Dimension .....	213
5.5.1	Conceptual Frame of the Value Offering Dimension .....	213
5.5.1.1	Software Product .....	213
5.5.1.2	Service Model .....	216
5.5.1.3	Maintenance Model.....	218
5.5.1.4	Financial Dimension.....	219
5.5.1.4.1	License Model.....	220
5.5.1.4.2	Revenue Model.....	221
5.5.1.4.3	Pricing Assessment Base.....	222
5.5.1.4.4	Key Cost Drivers .....	223
5.5.2	Process Interface of the Value Offering Dimension .....	225
5.5.2.1	SOFTWARE PRODUCT Process Interface.....	225
5.5.2.2	MAINTENANCE MODEL Process Interface .....	229
5.5.2.3	SERVICE MODEL Process Interface .....	236
5.5.3	Data View of the Value Offering Dimension .....	243
5.5.3.1	SOFTWARE PRODUCT Data View .....	243
5.5.3.2	SERVICE MODEL Data View.....	246
5.5.3.3	MAINTENANCE MODEL Data View .....	249
5.6	Functional Design of the Customer and Business Environment Dimension .....	252
5.6.1	Conceptual Frame of the Customer and Business Environment Dimension .....	252
5.6.1.1	Target Customer .....	252
5.6.1.2	Distribution Channel .....	254
5.6.1.3	Partnerships .....	254
5.6.1.4	Market.....	256
5.6.2	Process Interface of the Customer and Business Environment Dimension.....	259
5.6.2.1	TARGET CUSTOMERS Process Interface .....	259
5.6.2.1.1	Customer Equity ‘Acquisition’ Process Interface .....	260
5.6.2.1.2	Customer Equity ‘Retention’ Process Interface .....	262
5.6.2.1.3	Customer Equity ‘Add-On Selling’ Process Interface .....	265
5.6.2.2	DISTRIBUTION CHANNEL Process Interface.....	267

5.6.2.3 PARTNERSHIPS Process Interface .....	268
5.6.3 Data View of the Customer and Business Environment Dimension .....	272
5.6.3.1 TARGET CUSTOMER and DISTRIBUTION CHANNEL Data View .....	272
5.6.3.2 PARTNERSHIPS Data View.....	275
5.7 Reference Model Evaluation .....	276
<b>6 Use Case Scenario and Model Implementation .....</b>	<b>279</b>
6.1 Preliminaries.....	279
6.2 Use Case Scenario.....	279
6.2.1 Applied Approach for the Proof of Concept.....	279
6.2.2 Identification of Model Requirements.....	280
6.2.3 Modeling Method, Design and Development.....	284
6.2.3.1 Modeling Method .....	284
6.2.3.2 Model Design and Development .....	286
6.3 Model Implementation and Evaluation.....	291
6.3.1 System Components .....	291
6.3.2 Implementation of the Semantic Business Model Layer .....	293
6.3.3 User Interface of the BMMS.....	296
6.4 Concluding Remarks .....	302
<b>7 Conclusions .....</b>	<b>305</b>
7.1 Contribution to Research Objectives.....	305
7.2 Implications for Research and Practice .....	307
7.3 Limitations .....	310
7.4 Future Research.....	311
<b>A. Analysis Results .....</b>	<b>313</b>
<b>B. Implementation of the SW-BMO .....</b>	<b>359</b>
<b>C. Terminology .....</b>	<b>377</b>
<b>D. Business Processes in the Software Industry.....</b>	<b>381</b>
<b>E. Amendment of the State of the Art.....</b>	<b>385</b>
<b>F. Dissemination of Research Results .....</b>	<b>387</b>
<b>Bibliography.....</b>	<b>389</b>