

List of Tables

Table 2-1: The Comparison of Various XML-Based B2B Standards (Liang, 2001)	8
Table 2-2: The Comparison Between Different Works in B2B and Ontology (This Research).....	32
Table 2-3: The Discussion Between Different B2B Research (This Research).....	34
Table 3-1: A Use Case Example (This Research)	39
Table 3-2: An Example of Business Document Information Provided by Standard	57
Table 3-3: The Correspondence Rules Of Merging Ontology (This Research).....	60
Table 4-1: The Prototype Platform Specification	65
Table 4-2: The Components Of Business Document (This Research)	91



List of Figures

Figure 1-1: Research Flow	5
Figure 2-1: A Simple B2B Integration Platform (This Research).....	7
Figure 2-2: A High Level Overview of The Interaction of Two Companies Conducting eBusiness Using ebXML	10
Figure 2-3: The Semantic Web Layer Cake (Tim Berners-Lee, 2000).....	16
Figure 2-4: The RDF Graph (W3C, 2004).....	17
Figure 2-5: The Multi-Layered Model for Content Integration.....	22
Figure 2-6: The Model for Data Transformation (Omelayenko and Fensel, 2001)....	23
Figure 2-7: RDFT Class Diagram (Omelayenko, Fensel, and Bussler, 2002)	24
Figure 2-8: B2B Integration Architecture (Bussler, 2001).....	25
Figure 2-9: SWWS Conceptual Architecture (Bussler, Fensel and Maesche, 2002)..	26
Figure 2-10: The DOME Architecture (Cui, Jones and O'Brien 2002)	28
Figure 2-11: Levels of Interoperability in B2B (Hofreiter and Hurmer, 2002)	29
Figure 2-12: Language Binding Between Ontology and E-Business Vocabulary	30
Figure 2-13: Deploying a PIP In a Given Context (Trastour, Preist, and Coleman, 2003)	31
Figure 3-1: The Structure of Ontology-Based B2B Integration Method	36
(This Research)	36
Figure 3-2: A Use Case Diagram Example (This Research).....	39
Figure 3-3: A Sequence Diagram Example of Purchase Order (This Research)	40
Figure 3-4: An Activity Diagram Example of Purchase Order (This Research)	41
Figure 3-5: A Class Diagram Example of Purchase Order (This Research).....	42
Figure 3-6: A Use Case Diagram Example	43
Figure 3-7: A Sequence Diagram to Describe The Purchase Process From Standard.	44
Figure 3-8: An Activity Diagram to Describe The Purchase Process from Standard..	45
Figure 3-9: The B2B Interaction (This Research)	46
Figure 3-10: The B2B Basic Classes (This Research)	48
Figure 3-11: The Properties Of B2B Process (This Research)	48
Figure 3-12: The Properties Of B2B Partner (This Research).....	49
Figure 3-13: The Properties Of B2B Document (This Research).....	49
Figure 3-14: The Properties Of B2B Activity (This Research)	49
Figure 3-15: The Properties Of B2B Action (This Research).....	50
Figure 3-16: An Example of Basic Data Entities (This Research)	52

Figure 3-17: An Example of Descriptive and Composite Entities (This Research)	53
Figure 3-18: To Build The Business Document Ontology (This Research)	55
Figure 3-19: An Example of The Sequence of Processes (This Research).....	58
Figure 3-20: Ontology Evolution Process (Stojanovic et al., 2002)	63
Figure 3-21: A B2B Integration Ontology Evolvement Cycle (This Research)	64
Figure 4-1: Prototype Architecture (This Research)	66
Figure 4-2: Prototype Function (This Research)	67
Figure 4-3: The B2B DTD Plug-in	68
Figure 4-4: The B2B DTD Importer	68
Figure 4-5: The Format Of Information File	69
Figure 4-6: The Basic Classes Of Process Ontology Template	70
Figure 4-7: The Basic Properties Of Process Ontology Template	70
Figure 4-8: Create Restriction for Ontology.	71
Figure 4-9 Merge The Ontologies.....	72
Figure 4-10 The Ontology Test.....	72
Figure 4-11 Browse The Ontology Class.....	73
Figure 4-12: The Use Case Diagram, Sequence Diagram and Activity Diagram of Current Order Process.....	76
Figure 4-13: The Use Case Diagram, Sequence Diagram and Activity Diagram of RosettaNet PIP3A4	78
Figure 4-14: Create The Instances Of Ontology	79
Figure 4-15: Another Example To Create An Instance Of Ontology.....	80
Figure 4-16: The Current Process Ontology	81
Figure 4-17: The Generated Classes And Properties (Partial)	82
Figure 4-18: The Instance Of PIP3A4	83
Figure 4-19: The Basic Data Entities From PIP 3A4.....	84
Figure 4-20: The Composite Data Entities From PIP 3A4	84
Figure 4-21: The Business Entities From PIP 3A4.....	85
Figure 4-22: The Mapping Between Two Ontologies (Partial)	86
Figure 4-23: Example Of Equivalent Class	86
Figure 4-24: Example Of Equivalent Properties.....	87
Figure 4-25: View The Ontology Through Internet Browser	88

Table of Contents

List of Tables.....	III
List of Figures.....	IV
Chapter 1 Introduction	1
1.1 Research Motivation	1
1.2 Research Issue.....	2
1.3 Research Objective	3
1.4 Research Flow.....	3
1.5 Organization of the Thesis	4
Chapter 2 Literature Review	6
2.1 B2B Integration.....	6
2.1.1 Introduction.....	6
2.1.2 ebXML.....	8
2.1.3 RosettaNet.....	12
2.1.4 Open Issues	14
2.2 Semantic Web and Ontology.....	15
2.2.1 Introduction.....	15
2.2.2 Ontology Languages	17
2.3 Ontology Application in e-Commerce	20
2.3.1 Ontology and e-Commerce	20
2.3.2 Semantic B2B Integration	25
2.3.3 Semantic Web enabled Web Service (SWWS)	26
2.3.4 Domain Ontology Management Environment (DOME)	27
2.3.5 Ontology with ebXML and RosettaNet	28
2.3.6 Discussion	32
Chapter 3 Research Method.....	36
3.1 A Ontology-Based Method	36
3.2 Business Process Modeling – UML-based	37
3.2.1 UML.....	37
3.3 Ontology Modeling Heuristics.....	45
3.5 The Merge, Representation and Testing of Ontologies	59
3.6 Discussion	62
Chapter 4 Research Prototype and Implementation.....	65
4.1 Prototype Platform and Architecture	65

4.2 Prototype Design and Functions	66
4.2.1 DTD Importer	67
4.2.2 Ontology Editor	69
4.2.3 Ontology Display	73
4.3 Research Implementation: Case Study – RosettaNet.....	73
4.4 Research Implementation: Case Study – ebXML.....	88
4.5 Discussion	91
 Chapter 5 Research Discussions and Limitations.....	92
5.1 Research Implications	92
5.2 Research Limitations	94
 Chapter 6 Conclusions and Future Research	95
6.1 Summary	95
6.2 Future Research Directions.....	95
 References.....	97
Appendix A: XML DTD Example	100
Appendix B: Business Process Specification Schema Example.....	105
Appendix C: Process Ontology Template.....	107