On inter-organizational trust engineering in networked collaborations: modeling and management of rational trust

Msanjila, S.S.

Citation for published version (APA):
Contents

1. Introduction and research problem analysis .............................................. 1
   1.1 Introduction .............................................................................................. 1
   1.2 Collaborative networked organizations and breeding environments .......... 3
       1.2.1 Virtual organizations Breeding Environment - VBE......................... 5
       1.2.2 Addressed challenges and gained advantages for organizations joining
            VBEs ................................................................................................ 6
       1.2.3 Readiness for joining VBEs ............................................................ 8
       1.2.4 VBE management and the need for trust ......................................... 9
   1.3 Background on definition of trust and its emerging base concepts .......... 14
       1.3.1 Diversities among definitions of trust ............................................ 14
       1.3.2 Base concepts of trust ................................................................. 17
   1.4 Research motivation and problem area description ............................... 17
   1.5 Research questions, objectives, and scope of the thesis ....................... 20
   1.6 Research methodology ......................................................................... 23
   1.7 The ECOLEAD project and related scientific publications .................. 24
       1.7.1 The ECOLEAD project ................................................................. 24
       1.7.2 Scientific publications related to the dissertation ........................... 29
   1.8 Thesis structure ...................................................................................... 30
   1.9 Chapter discussion and conclusion ....................................................... 31

2. Aspects and characterization of trust ....................................................... 33
   2.1 Introduction .............................................................................................. 33
   2.2 Traditional practices on trust .................................................................. 34
       2.2.1 Inter-personal versus inter-organizational trust ............................... 34
       2.2.2 Trust among individuals ............................................................... 35
       2.2.3 Trust in different disciplines ......................................................... 36
   2.3 Trust among organizations in VBEs ...................................................... 38
       2.3.1 Importance of creating trust between organizations in VBEs ........... 38
       2.3.2 Antecedents of trust between organizations in VBEs .................... 38
       2.3.3 Main related challenges in trust studies for VBEs ............................ 40
       2.3.4 Boundary characteristics of rational and subjective trust ............... 40
       2.3.5 Main concepts related to inter-organizational trust ....................... 42
       2.3.6 Different aspects of trust in organizations - applied to the proposed
            approach ......................................................................................... 47
   2.4 Characterization of trust related data for organizations in VBEs .......... 50

2.5 Trust management and its role in VBEs .................................................. 50
2.6 The ECOLEAD project and related scientific publications .................. 24
   2.6.1 The ECOLEAD project ................................................................. 24
   2.6.2 Scientific publications related to the dissertation ........................... 29
2.7 Thesis structure ...................................................................................... 30
2.8 Chapter discussion and conclusion ....................................................... 31
2.9 Aspects and characterization of trust ..................................................... 33
   2.9.1 Introduction ...................................................................................... 33
   2.9.2 Traditional practices on trust .......................................................... 34
       2.9.2.1 Inter-personal versus inter-organizational trust .......................... 34
       2.9.2.2 Trust among individuals .......................................................... 35
       2.9.2.3 Trust in different disciplines ..................................................... 36
   2.9.3 Trust among organizations in VBEs ............................................... 38
       2.9.3.1 Importance of creating trust between organizations in VBEs ....... 38
       2.9.3.2 Antecedents of trust between organizations in VBEs ............... 38
       2.9.3.3 Main related challenges in trust studies for VBEs .................... 40
       2.9.3.4 Boundary characteristics of rational and subjective trust .......... 40
       2.9.3.5 Main concepts related to inter-organizational trust ................. 42
       2.9.3.6 Different aspects of trust in organizations - applied to the proposed
            approach ......................................................................................... 47
   2.9.4 Characterization of trust related data for organizations in VBEs ....... 50

3. Trust management and its role in VBEs .................................................. 50
   3.1 Introduction ............................................................................................ 50
   3.2 Traditional practices on trust ................................................................. 50
       3.2.1 Inter-personal versus inter-organizational trust ............................. 50
       3.2.2 Trust among individuals ............................................................... 50
       3.2.3 Trust in different disciplines ......................................................... 50
   3.3 Trust among organizations in VBEs ...................................................... 50
       3.3.1 Importance of creating trust between organizations in VBEs ........... 50
       3.3.2 Antecedents of trust between organizations in VBEs .................... 50
       3.3.3 Main related challenges in trust studies for VBEs ............................ 50
       3.3.4 Boundary characteristics of rational and subjective trust ............... 50
       3.3.5 Main concepts related to inter-organizational trust ....................... 50
       3.3.6 Different aspects of trust in organizations - applied to the proposed
            approach ......................................................................................... 50
   3.4 Characterization of trust related data for organizations in VBEs .......... 50

4. Conclusion .................................................................................................. 51
   4.1 Introduction ............................................................................................ 51
   4.2 Traditional practices on trust ................................................................. 51
       4.2.1 Inter-personal versus inter-organizational trust ............................. 51
       4.2.2 Trust among individuals ............................................................... 51
       4.2.3 Trust in different disciplines ......................................................... 51
   4.3 Trust among organizations in VBEs ...................................................... 51
       4.3.1 Importance of creating trust between organizations in VBEs ........... 51
       4.3.2 Antecedents of trust between organizations in VBEs .................... 51
       4.3.3 Main related challenges in trust studies for VBEs ............................ 51
       4.3.4 Boundary characteristics of rational and subjective trust ............... 51
       4.3.5 Main concepts related to inter-organizational trust ....................... 51
       4.3.6 Different aspects of trust in organizations - applied to the proposed
            approach ......................................................................................... 51
   4.4 Characterization of trust related data for organizations in VBEs .......... 51
### Contents

2.4.1 Classification of data for creation of trust among organizations .......... 50  
2.4.2 Types of validity evidence for trust related data................................. 51  
2.5 Characterization of trust relationships among organizations in VBEs........ 52  
2.6 Chapter discussion and conclusion.......................................................... 53  

3. Identification of trust elements for organizations................................. 55  
3.1 Introduction............................................................................................... 55  
3.2 HICI: An approach for identifying trust elements for organizations........... 56  
3.2.1 First Stage: Hierarchical Analysis......................................................... 57  
3.2.2 Second Stage: Impact Analysis.............................................................. 59  
3.2.3 Third Stage: Causal Influence Analysis.................................................. 62  
3.3 Trust elements related to organizations in VBEs..................................... 64  
3.3.1 Trust elements for creation of trust between organizations............... 65  
3.3.2 Trust elements for creation of trust from members towards the VBE administration................................................................. 73  
3.3.3 Trust elements for creation of trust from external stakeholders towards the VBE................................................................. 75  
3.4 Chapter discussion and conclusion.......................................................... 77  

4. Conceptual modeling of trust elements.................................................... 79  
4.1 Introduction............................................................................................... 79  
4.2 Related trust models in research and development................................. 79  
4.3 Modeling of trust relationships between organizations - The proposed approach................................................................. 88  
4.3.1 Main trust parameters for modeling trust relationships between organizations................................................................. 89  
4.3.2 Object-based conceptual modeling formalism....................................... 90  
4.3.3 Record-based conceptual modeling formalism.................................... 91  
4.3.4 Ontology-based conceptual modeling formalism................................ 94  
4.4 Chapter discussion and conclusion.......................................................... 95  

5. Mechanisms for assessing trust level of an organization........................ 97  
5.1 Introduction............................................................................................... 97  
5.2 Traditional approaches addressing assessment of trust in organizations....... 97  
5.3 Concepts related to assessment of trust....................................................... 100  
5.4 Measuring and assessing organization’s trust level.................................. 100  
5.4.1 Need for trust measurement in VBEs ...................................................... 100  
5.4.2 Proposed trust assessment mechanisms................................................. 103  
5.4.3 Developing mechanisms for assessing trust level of organizations.......... 104  
5.4.4 Corrective measures for assessing trust level........................................ 107  
5.4.5 Setting up and customization of organizations trust assessment system for VBEs ................................................................. 107  
5.5 Analysis of causal influences among trust criteria.................................. 115  
5.5.1 Social perspective.................................................................................... 116
5.5.2 Economical perspective ................................................................. 116
5.5.3 Technological perspective .............................................................. 118
5.5.4 Managerial perspective ................................................................. 120
5.6 Chapter discussion and conclusion ..................................................... 122

6. Development of trust management system for VBEs ......................... 123
   6.1 Introduction .................................................................................... 123
   6.2 VBE management system .............................................................. 124
       6.2.1 VMS base concepts and motivation ........................................... 124
       6.2.2 VMS subsystems .................................................................... 125
   6.3 Trust management system ............................................................... 128
       6.3.1 Mechanisms for assessing trust level of organizations ................. 128
       6.3.2 Approach for developing the TrustMan system ........................... 129
   6.4 Analysis and specification of the TrustMan system ............................ 131
       6.4.1 Specification of system users and user requirements .................. 131
       6.4.2 Specification of functionalities and services ............................. 133
   6.5 Designing the TrustMan system ....................................................... 135
       6.5.1 Interoperability architecture of the TrustMan system .................. 135
       6.5.2 The four-layer componential architecture of the TrustMan system ........................................................................ 137
       6.5.3 Design of user interfaces of the TrustMan system ...................... 140
       6.5.4 Design of database schema for the TrustMan system ................. 141
   6.6 Implementation and operation of the TrustMan system ...................... 142
       6.6.1 Implementation of the TrustMan system .................................. 144
       6.6.2 Take-ups of the TrustMan at running industrial VBE networks ....... 149
   6.7 Chapter discussion and conclusion .................................................. 157

7. Conclusion, validation, lessons learned and future work ....................... 159
   7.1 Introduction .................................................................................... 159
   7.2 Reflection on research findings ....................................................... 159
       7.2.1 Reflection on responses to the research questions ...................... 159
       7.2.2 Reflection on achievement of research objectives ...................... 160
   7.3 Evaluation and validation of research results .................................... 161
       7.3.1 General evaluation approaches ................................................. 161
       7.3.2 Validation of our achieved results .......................................... 162
       7.3.3 Empirical validation – Achievements in relation to VBE requirements .......................................................... 163
       7.3.4 Self validation – With standard indicators and against other systems ........................................................................ 165
       7.3.5 Peer reviewed validation – Within scientific community .......... 167
   7.4 Lessons learned and future work ..................................................... 168
       7.4.1 Inter-organizational trust: lessons learned .................................. 168
       7.4.2 Inter-organizational trust: future work ...................................... 170
## Contents

A. **List of author’s publications** ................................................................. 173

B. **TrustMan validation with standard indicators and against related systems** ........................................................................................................... 177
   B.1 **Applied standard indicators** .................................................................................................................. 177
   B.2 **Related trust management systems** ........................................................................................................ 181
   B.3 **Evaluation of TrustMan system with standard indicators** ........................................................................ 182

C. **Empirical evaluation – questionnaire** .................................................... 183
   C.1 **VBE networks involved in evaluation** .................................................................................................... 183
   C.2 **Description of the questionnaire** .......................................................................................................... 184

**Bibliography** ................................................................................................................... 185

**Summary** .............................................................................................................................. 191

**Samenvatting** ...................................................................................................................... 193

**Acknowledgements** ............................................................................................................. 195