

TABLE OF CONTENT

LIST OF TABLES.....	V
LIST OF FIGURES	VIII
LIST OF ABBREVIATIONS	XI
1 INTRODUCTION	1
1.1 Conceptual background and research motivations.....	1
1.2 Research goals and scope to develop the ontology of innovation networks	6
1.2.1 Defining the main research questions of this work	6
1.2.2 Why an ontology for analyzing innovation networks.....	8
1.2.3 Expected contributions of this work	11
1.3 The knowledge lens for building the ontology of innovation networks	11
1.4 Methodology and structure of this work.....	15
1.4.1 Selecting the methodology for building the ontological approach of innovation networks.....	15
1.4.2 Method mix supporting the research activities.....	20
1.5 Research outline of this work	21
2 THEORETICAL CONSIDERATIONS TO UNDERSTAND INNOVATION NETWORKS.....	25
2.1 The juxtaposition of innovation and cooperation	25
2.1.1 Innovation, knowledge and its link to cooperation	25
2.1.2 Characteristics of innovation influencing cooperation.....	28
2.1.2.1 Innovation outcomes.....	28
2.1.2.2 Types of innovation and their degree of newness	29
2.1.2.3 The scope of innovation.....	33
2.1.2.4 Uncertainty in innovation	35
2.1.3 Towards a collaborative innovation process	36
2.1.3.1 Characterizing the innovation process.....	38
2.1.3.2 Main constructs within the innovation process	43
2.2 Characteristics of networks	45
2.2.1 Definition of network in the business context.....	45
2.2.2 Complexity of a network and its implication for innovation networks.....	46
3 KNOWLEDGE OF THE PROBLEM DOMAIN ‘INNOVATION NETWORKS’	49
3.1 Description of the systematic literature review process.....	51

3.2	Current state of scientific research in innovation networks	53
3.2.1	General inferences from the literature analysis	54
3.2.2	Defining innovation networks	60
3.2.3	Components and elements of innovation networks	64
3.2.3.1	Nodes or agents of innovation networks.....	65
3.2.3.2	Ties or links in innovation networks	67
3.2.3.3	Types of knowledge and their considerations in collaborative- networked innovation.....	70
3.2.3.4	Classification of agents based on their role as source of knowledge.....	73
3.2.4	Typology of innovation networks	74
3.2.4.1	Main approaches characterizing innovation networks	74
3.2.4.2	Categorizing innovation networks according to the purpose of the network	78
3.2.5	Frameworks for managing innovation networks	81
3.2.6	Evaluation measures assessing innovation networks	85
3.2.6.1	Collaboration and cooperation in innovation networks	85
3.2.6.2	Efficiency and Performance in innovation networks	88
3.2.7	The quest of an ontological approach.....	99
4	BUILDING THE ONTOLOGY OF INNOVATION NETWORKS	105
4.1	Main constructs describing the ontology of innovation networks..	106
4.1.1	Identifying the building blocks of the ontology considering the performance approach.....	108
4.1.2	Characteristics intrinsic to the organization and its capacity to absorb knowledge.....	112
4.1.3	Closeness to new knowledge and the structure given to collaboration	114
4.1.4	Characteristics inherent to innovation and determinants of network dynamics.....	115
4.2	Characterizing the organization's perspective.....	118
4.2.1	Literature review and data description to analyze cooperation from the organization's perspective	119
4.2.1.1	Cooperation and factors: concept disambiguation.....	119
4.2.1.2	Identifying and selecting the main empirical studies.....	120
4.2.1.3	Factors influencing the participation of organizations in innovation networks	124
4.2.1.4	Preparing the aggregated factors to carry out the meta-analysis.....	127
4.2.1.5	Data limitations and recommendations for future studies on cooperation	131
4.2.2	Defining the method to conduct the meta-analysis	134
4.2.2.1	Evaluating meta-analysis approaches and selecting the method.....	134
4.2.2.2	Describing the process followed to apply the Z-score method	136

4.2.3	Conducting meta-analysis to identify main cooperation factors.....	137
4.2.3.1	Main results of the meta-analysis	137
4.2.3.2	Recommendations for further research based on the central results of the meta-analysis	139
4.3	Describing innovation network structures	146
4.3.1	Considerations to define the network structure	147
4.3.2	Topologies of innovation networks and characteristics defining their physical structure.....	150
4.3.3	Characteristics defining the structure of exploration and exploitation networks	154
4.3.4	Network structure and its relation to network behavior	157
4.3.4.1	Direct and indirect ties	158
4.3.4.2	Coordination and the implication of the position of the organization within the network	159
4.3.4.3	The central position and accessibility of the network.....	160
4.3.4.4	The importance of distances between organizations.....	162
4.4	The network dynamics.....	166
4.4.1	General considerations framing the dynamics of innovation networks .	166
4.4.2	Characterizing absorptive capacity's influence on network behavior ...	169
4.4.2.1	Describing the concept of absorptive capacity	171
4.4.2.2	Preconditions of organizations willing to participate in innovation networks	172
4.4.2.3	The process of absorptive capacity framing the dynamics of innovation networks	175
4.4.2.4	The absorptive capacity process and its significance for innovation networks	182
4.4.3	Innovation process in innovation networks	186
5	EMPIRICAL EVALUATION OF THE ONTOLOGY OF INNOVATION NETWORKS.....	190
5.1	Description of the data and generation of subsequent variables ...	191
5.1.1	Gathering and description of the main data.....	194
5.1.2	Consideration and limitations of the data.....	198
5.1.3	Constituted criteria	199
5.1.3.1	Network complexity (NetComplex)	199
5.1.3.2	Network innovativeness (InF)	199
5.1.3.3	Innovation complexity (InnoComplex).....	200
5.1.3.4	Potential absorptive capacity (PACAP)	201
5.1.3.5	Realized absorptive capacity – Performance of the innovation network (P_n).....	202
5.1.4	Exploring the characteristics of the dataset	204
5.2	Empirical evidence of the structural configuration of innovation network (Network Structure).....	207
5.2.1	Main characteristics of innovation networks topologies.....	210
5.2.2	Descriptive statistics of innovation network topologies.....	211

5.3 Innovation networks behavior – Absorptive capacity	213
5.3.1 Potential absorptive capacity	214
5.3.1.1 Model building and development of hypotheses.....	214
5.3.1.2 Analysis and main results	218
5.3.2 Realized absorptive capacity (Performance)	221
5.3.2.1 Model building to measure performance of innovation networks: Main Hypotheses.....	221
5.3.2.2 Model development to measure performance of innovation networks	226
5.3.3 Final remarks regarding potential absorptive capacity and the performance of innovation networks.....	228
5.3.3.1 Potential absorptive capacity	229
5.3.3.2 Realized absorptive capacity – Performance of innovation networks	231
6 MAIN FINDINGS AND FURTHER RESEARCH	233
6.1 Main findings	233
6.1.1 Main findings regarding the ontological approach	233
6.1.2 Main findings from the evaluation phase	237
6.1.3 Implications for management.....	238
6.1.4 Implications for policy.....	240
6.2 Main constraints and general limitations influencing the results of this work	242
6.3 Further research	243
BIBLIOGRAPHY	246
APPENDIXES.....	XIX