The handle https://hdl.handle.net/1887/3188575 holds various files of this Leiden University dissertation.

**Author:** Samaeemofrad, N.
**Title:** Business incubators: the impact of their support
**Issue Date:** 2021-06-17
Business Incubators: The Impact of Their Support

Negin Samaeemofrad
BUSINESS INCUBATORS:
THE IMPACT OF THEIR SUPPORT

PROEFSCHRIFT

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus prof.dr.ir. H. Bijl
volgens besluit van het college voor promoties
te verdedigen op donderdag 17 juni 2021
klokke 13:45 uur

door

Negin Samaeemofrad
geboren te Teheran, Iran
in 1986
The research reported in this thesis has been completed at the Leiden Centre of Data Science (LCDS) hosted at the Mathematical Institute (MI), previously hosted at Leiden Institute of Advanced Computer Science (LIACS) at the Faculty of Science, Leiden University, the Netherlands.

The research reported in this thesis has been founded by the Initial Training Networks (ITN) as part of the Marie Curie program. The research is part of the larger project: A Networked and IT-enabled Firm’s Perspective on Crisis, project number: FP7 PEOPLE-2012-ITN.

SIKS Dissertation Series No. 2021-14
The reported research in this thesis has been carried out under the auspices of SIKS, the Dutch Research School for Information and Knowledge Systems.

Cover design by Yasamin Samaeemofrad
ISBN 978-90-83-1496-7-7
© 2021 by Negin Samaeemofrad

An electronic version of this dissertation is available at http://openaccess.leidenuniv.nl/.
To my mother for her support

throughout my entire academic career
Preface

In my opinion, conducting a PhD thesis is a unique journey for each candidate. During such a journey all candidates experience different unique moments. I started my journey with participation in an EU project in 2014 as an external PhD candidate at the Centre of Technology and Innovation Management (CETIM) in the Leiden Institute of Advanced Computer Science (LIACS).

The project was in the context of crisis management. I studied a multidisciplinary topic, viz. the intersection of innovation, technology management, and crisis management. However, due to a variety of circumstances, I had to change this topic after only two years and moved to the field of entrepreneurship.

Meanwhile, I collaborated with business incubators as a startup trainer. In this new position, I was always curious to investigate the impacts of the different supports on the performance of the NTBFs. Hence, I saw and felt the void of a measurement tool for evaluating the incubator’s performance. Thus, the idea of my second PhD topic started from this gap and I have found it fascinating to address the incubators’ problem in my research scientifically.

During the first three years of my research project, I received support from the international graduate school on Networks, Information Technology & Innovation Management (NITIM). During the summer schools in Trondheim, Bergamo, Milan, Munster, Northern Island, and Leiden, the NITIM committee provided great feedback and support.

Negin Samaeemofrad, Leiden, June 17, 2021
# Table of Contents

Preface ......................................................................................................................... VII  
Table of Contents ......................................................................................................... IX  
List of Abbreviations .................................................................................................. XV  
List of Figures .............................................................................................................. XVII  
List of Tables ............................................................................................................... XVIII  
List of Definitions ....................................................................................................... XX  

1 Supporting New Technology-Based Firms ................................................................. 1  
1.1 The Idea of Business Incubator ........................................................................ 2  
1.2 Motivation ............................................................................................................. 3  
  1.2.1 My Starting Position ................................................................................... 3  
  1.2.2 Two Research Objectives .......................................................................... 5  
1.3 Essential Definitions ............................................................................................. 5  
1.4 Four Theoretical Perspectives – Four Characteristics ........................................ 7  
  A: Resource-Based View ......................................................................................... 8  
  B: Knowledge-Based View ..................................................................................... 8  
  C: Organizational-Learning Theory ....................................................................... 9  
  D: Social Capital Theory ....................................................................................... 9  
1.5 The Problem Statement and Research Questions .............................................. 9  
  1.5.1 Aiming at Three Contributions .................................................................. 10  
  1.5.2 The Problem Statement ............................................................................. 10  
  1.5.3 Three Research Questions .......................................................................... 10  
  1.5.4 What is the Most Appropriate Theoretical Perspective? ......................... 12  
1.6 Research Methodology ......................................................................................... 13  
  1.6.1 Identification of the Supportive Activities (SA) by UBIs ......................... 14  
  1.6.2 Operationalization of the SA Construct of the UBIs .................................. 14  
  1.6.3 Validation of the SA Construct of the UBIs .............................................. 14  
  1.6.4 Implementing the SA Construct of the UBIs ............................................ 15
## Structure of the Study

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.7</td>
<td>15</td>
</tr>
</tbody>
</table>

## Literature Review and Theoretical Embedding

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>19</td>
</tr>
</tbody>
</table>

## Three Definitions from Three Generations of Business Incubators

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1</td>
<td>19</td>
</tr>
<tr>
<td>2.1.2</td>
<td>21</td>
</tr>
<tr>
<td>2.1.3</td>
<td>22</td>
</tr>
<tr>
<td>2.1.4</td>
<td>23</td>
</tr>
</tbody>
</table>

## Four Theoretical Perspectives

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.1</td>
<td>24</td>
</tr>
<tr>
<td>2.2.2</td>
<td>27</td>
</tr>
<tr>
<td>2.2.3</td>
<td>27</td>
</tr>
<tr>
<td>2.2.4</td>
<td>28</td>
</tr>
<tr>
<td>2.2.5</td>
<td>31</td>
</tr>
</tbody>
</table>

## Chapter Conclusion

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
</tr>
</tbody>
</table>

## Supports by the Business Incubators

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>37</td>
</tr>
</tbody>
</table>

## Why BIs are Created?

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
</tr>
</tbody>
</table>

## Research Approach

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
</tr>
</tbody>
</table>

## Research Methodology

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
</tr>
</tbody>
</table>

## Field Work

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4.1</td>
<td>41</td>
</tr>
<tr>
<td>3.4.2</td>
<td>42</td>
</tr>
<tr>
<td>Activity 1</td>
<td>42</td>
</tr>
<tr>
<td>Activity 2</td>
<td>43</td>
</tr>
<tr>
<td>Activity 3</td>
<td>44</td>
</tr>
<tr>
<td>Activity 4</td>
<td>45</td>
</tr>
<tr>
<td>Activity 5</td>
<td>46</td>
</tr>
<tr>
<td>3.4.3</td>
<td>47</td>
</tr>
</tbody>
</table>

## The Answer to RQ1

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
</tr>
</tbody>
</table>
4 Operationalization of the Supportive Activities Construct ........................................ 51
4.1 The Importance of RBV .......................................................................................... 53
4.2 Model Development ............................................................................................... 54
  4.2.1 Innovation Strategy .......................................................................................... 54
  4.2.2 Supportive Activities by UBIs .......................................................................... 57
  4.2.3 Supportive Activities and Innovation Strategy .................................................. 59
  4.2.4 Capabilities of the NTBFs ............................................................................... 60
4.3 Summarizing the Model .......................................................................................... 63
4.4 Operationalization of the Measurement Scales ..................................................... 63
  4.4.1 Innovation Strategy .......................................................................................... 64
  4.4.2 Knowledge Development and Dissemination ..................................................... 65
  4.4.3 Finance Mobilization ........................................................................................ 68
  4.4.4 Absorptive Capacity ........................................................................................ 69
    A: The development of the Absorptive Capacity model .......................................... 70
    B: A New Measurement Scale of AC Issues With R&D and Non-R&D-Related Issues .................................................................................................................. 70
    C: A New Model Using Pi’s (2021) Division ............................................................. 71
  4.4.5 Financial Capability ......................................................................................... 74
  4.4.6 Performance of the NTBF ............................................................................... 75
4.5 A Partial Answer to RQ2 ...................................................................................... 77

5 Validation of the Supportive Activities Construct ...................................................... 79
5.1 Characteristics of the Employed Data Set .................................................................. 80
  5.1.1 Sampling Design .............................................................................................. 80
  5.1.2 Data Collection ................................................................................................ 82
  5.1.3 Identification of the Target Population ............................................................. 84
5.2 Method of Analysis ................................................................................................. 86
5.3 Construct Validity .................................................................................................... 87
  5.3.1 Evaluating the Appropriateness of the Data ...................................................... 88
    A: Correlation Matrix ............................................................................................ 88
    B: The Kaiser–Meyer–Olkin (KMO) Criterion ......................................................... 90
    C: Bartlett’s Test of Sphericity .............................................................................. 90
5.3.2 Extract the Factors / Components .................................................................91
   A: Principal Component Analysis (PCA) or Principal Factor Analysis .......... 91
   B: Component Extraction ....................................................................................92

5.3.3 Determine the Number of Factors / Components .......................................92
   A: Kaiser’s Criterion ............................................................................................93
   B: Scree Plot .........................................................................................................95
   C: Parallel Analysis ..............................................................................................97

5.3.4 Interpret the Factor Solution (Component Rotation) ................................99
   A: Promax Rotation Method on the Independent Variables ......................... 101
   B: Varimax Rotation Method on the Moderators ..............................................104

5.4 Construct Reliability ........................................................................................106
   5.4.1 Cronbach’s Alpha .......................................................................................106
   5.4.2 Composite Reliability ................................................................................107

5.5 Results of the Construct Validity and Reliability ...........................................108

5.6 Answer to RQ2 .................................................................................................109

6 Implementing the SA Construct ..........................................................................111
   6.1 The Supports by UBIs and the Capabilities of the NTBFs ......................... 112
       6.1.1 The Outcome of the Incubation Is A Challenge ..................................... 112
       6.1.2 Our Point of View ...................................................................................113
       6.1.3 Two Research Gaps ...............................................................................114

   6.2 Research Participants’ Information ...............................................................114

   6.3 The Development of Hypotheses ..................................................................115
       6.3.1 Knowledge Development and Dissemination and the Performance of the NTBFs .................................................................116
       6.3.2 Finance Mobilization Supportive Activity and the Performance of the NTBFs .................................................................117
       6.3.3 Innovation Strategy and the Performance of the NTBFs .................... 117
       6.3.4 Supportive Activities by UBIs, Innovation Strategy and the Performance of NTBFs .................................................................118
       6.3.5 Amplifying the Impact of Knowledge Development and Dissemination 119

   6.4 Research Design ............................................................................................119
       6.4.1 Measures ................................................................................................120
           A: Dependent Variable ..............................................................................120
-XIV-

References .......................................................................................................................... 155
Appendices ........................................................................................................................ 172
Summary ............................................................................................................................ 201
Samenvatting ..................................................................................................................... 205
Curriculum Vitae ............................................................................................................... 209
List of Publications ......................................................................................................... 211
Acknowledgment ............................................................................................................. 213
SIKS Dissertation Series .................................................................................................. 215
## List of Abbreviations

The list below contains the abbreviations that are used in this thesis. Normal lexical abbreviations, such as, ‘e.g.’ and ‘i.e.’, are not listed. The same applies for the names of corporations, such as SAP.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Absorptive Capacity</td>
</tr>
<tr>
<td>AI</td>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>BI</td>
<td>Business Incubator</td>
</tr>
<tr>
<td>BIC</td>
<td>Business Innovation Centre</td>
</tr>
<tr>
<td>CBI</td>
<td>Corporate Business Incubator</td>
</tr>
<tr>
<td>CV</td>
<td>Control Variable</td>
</tr>
<tr>
<td>FTE</td>
<td>Full-Time Equivalent</td>
</tr>
<tr>
<td>IBI</td>
<td>Independent Business Incubator</td>
</tr>
<tr>
<td>KBV</td>
<td>Knowledge-Based View</td>
</tr>
<tr>
<td>KMO</td>
<td>Kaiser-Meyer-Olkin</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
</tr>
<tr>
<td>NTBF</td>
<td>New Technology-Based Firm</td>
</tr>
<tr>
<td>NITIM</td>
<td>Network of IT and Innovation Management</td>
</tr>
<tr>
<td>LT</td>
<td>Log Transformation</td>
</tr>
<tr>
<td>OLT</td>
<td>Organizational Learning Theory</td>
</tr>
<tr>
<td>PCA</td>
<td>Principal Component Analysis</td>
</tr>
<tr>
<td>PFA</td>
<td>Principal Factor Analysis</td>
</tr>
<tr>
<td>PS</td>
<td>Problem Statement</td>
</tr>
<tr>
<td>RBV</td>
<td>Resource-Based View</td>
</tr>
<tr>
<td>R &amp; D</td>
<td>Research and Development</td>
</tr>
<tr>
<td>RQ</td>
<td>Research Question</td>
</tr>
<tr>
<td>SA</td>
<td>Supportive Activity</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>SCT</td>
<td>Social Capital Theory</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Science</td>
</tr>
<tr>
<td>UBI</td>
<td>University Business Incubator</td>
</tr>
<tr>
<td>VC</td>
<td>Venture Capitalist</td>
</tr>
<tr>
<td>VRIN</td>
<td>Valuable, Rare, Inimitable, and Non-substitutable</td>
</tr>
<tr>
<td>VIF</td>
<td>Variance Inflation Factor</td>
</tr>
</tbody>
</table>
List of Figures

Figure 1-1: Thesis Structure ........................................................................................................ 18

Figure 4-1: Innovation Strategy and Performance of the NTBFs ................................. 56
Figure 4-2: Supportive Activities by UBIs and the Performance of the NTBF ....... 57
Figure 4-3: Support by UBIs, Innovation Strategy, and NTBF’s Performance ..... 59
Figure 4-4: The Moderating Role of the NTBFs’ Capability ................................. 60
Figure 4-5: Theoretical Model .............................................................................................. 63

Figure 5-1: Scree Plots associated with Independent Variables ............................... 96
Figure 5-2: Scree Plots associated with Moderators ...................................................... 96

Figure 6-1: The Hypothesized Model Relationships ..................................................... 115
Figure 6-2: Interaction of Knowledge Development and Absorptive Capacity ... 135
List of Tables

Table 1-1: Research Stages ............................................................................................................17

Table 2-1: The Evolution of the Value added by BIs to the NTBFs ........................................20
Table 2-2: Definitions of Business Incubators ...........................................................................21
Table 2-3: Overview of the Reviewed Literature of BIs ..........................................................32

Table 3-1: General Characteristics of the NTBFs under Study .............................................41
Table 3-2: The Portfolio of Supportive Activities by UBIs ....................................................48

Table 4-1: Innovation Strategy ..................................................................................................55
Table 4-2: Innovation Strategy Measurement Scale .................................................................65
Table 4-3: Knowledge Development and Dissemination Measurement Scale .....................68
Table 4-4: Finance Mobilization Measurement Scale .............................................................69
Table 4-5: Absorptive Capacity Measurement Scale ...............................................................72
Table 4-6: The Modified Absorptive Capacity Measurement Scale .......................................73
Table 4-7: Financial Capability Measurement Scale ...............................................................75
Table 4-8: The Performance of NTBFs Measurement Scale ...................................................76

Table 5-1: List of the Accelerators/Incubators/Innovation Centers ....................................83
Table 5-2: List of Experts to Validate the Survey .................................................................86
Table 5-3: List of the Six Types of Questions Related to the Construct .................................87
Table 5-4: Correlation Matrix of the Expected Variables .......................................................89
Table 5-5: The Results of KMO Index .....................................................................................90
Table 5-6: The Results of Bartlett's Test ................................................................................91
Table 5-7: Eigenvalues for Independent Variables ...................................................................94
Table 5-8: Eigenvalues Moderators .......................................................................................94
Table 5-9: The Result of Parallel Analysis ...............................................................................98
Table 5-10: Component Correlation Matrix Associated with All Variables .....................100
Table 5-11: First Pattern Matrix on Independent Variables ................................................102
Table 5-12: Final Parallel Matrix Rotation Solution on Independent Variables .103
Table 5-13: First Rotation on the Moderators .............................................................105
Table 5-14: Final Rotation Matrix on the Moderators ..............................................105
Table 5-15: Construct Reliability ................................................................................108

Table 6-1: The Results of the Skewness Analysis ......................................................127
Table 6-2: Breusch-Pagan and Koenker Tests .........................................................129
Table 6-3: Descriptive Statistics and Correlation Analysis........................................131
Table 6-4: Regression Results ....................................................................................133
Table 6-5: The Results of the Hypotheses Testing ....................................................134
List of Definitions

Definition 1.1: Business Incubator .................................................................5
Definition 1.2: Supportive Activities............................................................6
Definition 1.3: University Business Incubator .............................................6
Definition 1.4: New Technology-Based Firm ................................................7
Definition 1.5: Construct .............................................................................11

Definition 4.1: Innovation Strategy ..............................................................55
Definition 4.2: Performance of the NTBFs ..................................................56
Definition 4.3: Knowledge Development and Dissemination .......................58
Definition 4.4: Finance Mobilization ...........................................................58
Definition 4.5: Capability ...........................................................................60
Definition 4.6: Absorptive Capacity ............................................................62
Definition 4.7: Financial Capability .............................................................62

Definition 5.1: Characteristics ....................................................................80
Definition 5.2: Snowball Sampling Technique ..............................................81
Definition 5.3: The Convenience Sampling Technique ................................85
Definition 5.4: Variable Reduction Techniques ..........................................88
Definition 5.5: Correlation Matrix ...............................................................88
Definition 5.6: Kaiser–Meyer–Olkin ............................................................90
Definition 5.7: Bartlett’s Test of Sphericity ..................................................90
Definition 5.8: Principal Component Analysis ...........................................92
Definition 5.9: Eigenvalue .........................................................................92
Definition 5.10: Kaiser’s Criterion ..............................................................93
Definition 5.11: Scree Plot .........................................................................95
Definition 5.12: Parallel Analysis .................................................................97
Definition 5.13: Component Rotation ..........................................................99
Definition 5.14: Oblique Rotation .................................................................99
Definition 5.15: Promax Rotation .................................................................100
Definition 5.16: Varimax Rotation.................................................................100
Definition 5.17: Cronbach’s Alpha...............................................................106
Definition 5.18: Composite Reliability.........................................................107

Definition 6.1: Harman's One-Factor Analysis ...........................................125
Definition 6.2: Skewness Analysis.................................................................126
Definition 6.3: Residual.............................................................................127
Definition 6.4: Heteroscedasticity.................................................................128
Definition 6.5: Multicollinearity.................................................................129
Definition 6.6: Variance Inflation Factor .................................................129