MASTER

Private financial infrastructure in Brainport Eindhoven Region
a systems-level approach

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Private Financial Infrastructure in Brainport Eindhoven Region: A systems-level approach

by
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In partial fulfilment of the requirements for the degree of

Master of Science
in Innovation Management

Supervisors:
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dr. J.I. Höffken, TU/e
TUE - School of Industrial Engineering.

Series Master Theses Innovation Management

**Subject headings:** Regional Planning, Noord Brabant, Innovation, Sociotechnical Systems, Small Firms; Financing.
ABSTRACT

New Technology-Based Firms (NTBF) are the main drivers of innovation, its commercialization and the economic growth and job creation that come with it, which is why, the creation and rapid growth of these firms is a key priority to regional stakeholders. However, highly uncertain outcomes and notably inconstant returns force Venture Capitalists to increasingly move towards latter phases of a firm’s life cycle for investment purposes; and likewise, the lack of collaterals cause banks to deprive NTBF of access to debt. This lack of private incentives to invest in NTBF can not only decelerate their growth in a significant way, but it can also lead to the bankruptcy of many young ventures who would otherwise have been successful. The aim of this Master Thesis is to design an analytical tool for studying this issue in Brainport Eindhoven Region and to create knowledge about the private financing of young high-tech firms. In this way an investigation will be pursued in order to evaluate how the current interventions of Brainport Development can be improved.
Preface & Acknowledgements

This Master of Science (MSc) thesis report, is the culmination of my TU/e journey in the Netherlands. Driven by my interest on Innovation and its power to bring wellbeing and prosperity to regions, I decided to pursue a Master of Science degree on Innovation Management.

The particular cause of my curiosity is the way in which different agents get together and agree on a common vision that allows them execute a collective, societal effort towards the same goals. In relation with this, I decided to study Brainport Eindhoven Region as a regional innovation system. So I want to thank Dr. Sadowski for helping me to go through with this subject, and for supporting me, with among others, by introducing me ways in which to approach a very broad and complex problem through focusing, his valuable guidance, advice and suggestions; without it, this would have been an even bumpier journey. Thank you very much! I would also like to use this opportunity to express my gratitude to Dr. Höffken. I appreciate a lot the time you spent reviewing my work in order to give me quite detailed feedback. I am confident that the quality of my paper improved significantly thanks to it. My gratitude! I also want to show appreciation to all the interviewees from Brainport Development and its projects. Without your input, I could not have gathered the essential empirical data. I hope you find my analysis somewhat useful. Thank you all!

I have met a lot of great people along this international master’s experience, few of which I am grateful to call buddies. Thank you all for your support, and of course, the mutual sharing of knowledge, jokes and adventures. I’ve had some epic times!

Also, I want to thank my parents, Freth and Zoila, for their unconditional support and affection. And my final and special thanks to Donata. Without your love and awesomeness, the last months working on my thesis would have felt long! You gave me the motivation needed during this exciting journey.

Vilnius, Lithuania

January, 2014
Management Summary

A large number of New Technology-Based Firms (NTBF) in the Brainport Eindhoven Region do not manage to develop into independent and fast growing companies after the first few years of being started, and contrary to this, they either remain small or do not manage to survive at all. Brainport Development - a Regional Innovation Agency (RIA) - and its partners have identified as main reasons for this the fact that entrepreneurs confront two crucial disadvantages throughout the initial and most critical phases of their ventures: lack of access to private capital, as well as a lack of managerial, financial and marketing expertise.

Even though it is the role of the government to support innovative ventures in their initial funding phases, a complementary private investment – mainly in the form of Venture Capital and business angels – is also necessary. This due to the fact that entrepreneurs need not only capital in order to reach success, but also smart managerial, financial and marketing advice, coupled with access to a greater social network from which links with potential customers and suppliers can be made. However, Brainport Development and its partner organizations have taken notice that Venture Capitalists, the organizations capable of offering the funding and advice, are increasingly moving towards latter phases of a firm’s life cycle for investment purposes due to a need of lower risks. This has consequently created a hole in the market for NTBF entrepreneurs in the need of pre-seed and seed capital, which is worsened by the fact that subsidies are disappearing and banks are less and less willing to provide capital to entrepreneurs.

With €300 billion in the Netherlands as private capital (mkb-fonds.nl/mkb_obligaties, 2013), and a region abundant in highly educated people, Brainport Development and its institutional partners have determined that the main roots appear to be, first, a lack of connections among entrepreneurs and private financial sources, and second, a lack of “credit-worthy” start-ups in the region – which means that investors do not find most business propositions compelling enough.

The Aim of this Study

The aim of this research project is to find an answer to the main research question: How is Brainport Development addressing the problem of lack of access to seed capital that NTBF in the region face? In specific, the objective of this study is to design an analytical tool for studying this issue in the Brainport Eindhoven Region and to create knowledge about the private financing of young high-tech firms. In this way an investigation can be pursued in order to evaluate how the current interventions of Brainport Development could be improved.

Analytical Tool

The merging of evolutionary economics with the perspective of firms as ‘learning organizations’ (Arnold, 2004), has resulted in Innovation been regarded for at least 30 years now as a phenomenon of dynamic and systemic nature. I.e. besides the internal factors of an enterprise, successful innovation occurring in firms has been linked to their systemic interactions and exchanges with external institutions and agencies, supply and value chains, competitors, governmental policies and cultural and social practices characteristic of a territory. Therefore, for effectively supporting NTBF in the region, Brainport Development needs to consider not only the lagging internal aspects of these young ventures, but also the capabilities of their supporting and complementary organizations (e.g. research institutes, universities, innovation brokers, banks, venture capital, business angels, etc.), the links NTBF have with these other organizations, and the laws and cultural features inherent to the region.
This systemic approach to innovation has inspired many scholars to try and develop a heuristic model that facilitates the visualization of the ecosystem in which firms are immersed: Innovation Systems. From an approach to the subject from a territorial perspective, justified in the fact that Brainport is an Innovation System that comprehends the Southeast Netherlands, the Regional Innovation System model has been chosen as the fittest tool for studying the ‘Brainport’ Innovation System. Among other academics, Doloreux & Parto (2005) indicate that there is no generally accepted definition for what a RIS is; however, based in a suggestion from these two authors, an attempt to capture this concept has been developed:

A RIS is a set of interacting private and public interests, formal institutions and other organizations located in a common territory, which function according to organizational and institutional arrangements and relationships conducive to the generation, use, and dissemination of knowledge and new technologies.

Analysis of Regional Innovation Systems

Probably the greatest impact of recognizing the dynamic and systemic nature of Innovation is that it has changed the justification of innovation policy intervention beyond markets failures, to System Failures, and quite recently, to Transformational System Failures (Weber & Rohracher, 2012).

In line with this systemic perspective on Innovation, a comprehensive framework is needed by RIAs – like Brainport Development - in order to assess the performance of a region on a systemic level, additionally to the neoclassical approach of supporting the individual components of the system. This provides a better perception of the coordination and alignment of the different components of the system. Therefore, a general framework has been developed to allow a structured and ordered evaluation, from a systems-level point of view, of the estate of a Regional Innovation System at any given moment for a total of 15 different groups of processes.

Market Failures in the Innovation System context

<table>
<thead>
<tr>
<th>Type of Failure</th>
<th>Failure Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Asymmetries</td>
<td>Uncertainty about outcomes and short time horizon of private investors lead to undersupply of funding for R&amp;D.</td>
</tr>
<tr>
<td>Knowledge spillover</td>
<td>Public good character of knowledge and leakage of knowledge lead to socially sub-optimal investment in (basic) research and development</td>
</tr>
<tr>
<td>Externalization of costs</td>
<td>The possibility to externalize costs leads to innovations that can damage the environment or other social agents.</td>
</tr>
<tr>
<td>Over-exploitation of Commons</td>
<td>Public resources are over-used in the absence of institutional rules that limit their exploitation (tragedy of the commons).</td>
</tr>
</tbody>
</table>


Structural System Failures in the Innovation System context

The analytical tool for Structural System Failures suggests examining each identified function through the lens of each of the four structural components identified in Table 2.1. This joint structure ensures that the analysis being executed has not left any aspect out of scope. Table 2.3 below shows an example of this framework using the function that includes the problem statement: ‘Financing of Innovation Processes’.
### Table 2.1: Structural Dimensions of a Regional Innovation System and Subcategories (Wieczorek & Hekkert, 2012; and Kuhlmann & Arnold, 2001).

<table>
<thead>
<tr>
<th>Structural Dimensions</th>
<th>Subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actors</strong></td>
<td>Knowledge-exploiting Subsystem: NTBF, SMEs, large firms, MNCs.</td>
</tr>
<tr>
<td></td>
<td>Education &amp; Research Subsystem: Universities, Technology &amp; Research Institutes.</td>
</tr>
<tr>
<td></td>
<td>Political Subsystem: National, Regional and city government organizations, economic development agencies.</td>
</tr>
<tr>
<td></td>
<td>Innovation support actors: Regional Innovation Agencies, Venture Capital &amp; Banking, pure Innovation Brokers, etc.</td>
</tr>
<tr>
<td></td>
<td>Demand: final consumers and producers.</td>
</tr>
<tr>
<td><strong>Institutions</strong></td>
<td>Hard: rules, laws, regulations, instructions.</td>
</tr>
<tr>
<td></td>
<td>Soft: norms, customs, common habits, routines, expectations, established practices, traditions, ways of conduct.</td>
</tr>
<tr>
<td><strong>Interactions</strong></td>
<td>At level of networks.</td>
</tr>
<tr>
<td></td>
<td>At level of individual contacts.</td>
</tr>
<tr>
<td><strong>Infrastructure</strong></td>
<td>Physical: roads, bridges, harbors, broadband networks, laboratories, incubation facilities, artefacts, instruments, machines, etc.</td>
</tr>
<tr>
<td></td>
<td>Knowledge: knowledge, expertise, know-how, strategic information.</td>
</tr>
<tr>
<td></td>
<td>Financial: private capital, subsidies, loans, financial programs, grants, etc.</td>
</tr>
</tbody>
</table>

From a total of 15 functions, Table 2.3 below shows an example of this framework using the function that includes the problem statement: ‘Financing of Innovation Processes’.

### Table 2.3: Joint function-structure framework (based on Table 2.2 and Wieczorek & Hekkert, 2012).

<table>
<thead>
<tr>
<th>System Functions</th>
<th>Structural Dimensions</th>
<th>Subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financing of Innovation Processes</strong>... and other activities that lead to the commercialization of knowledge and its adoption.</td>
<td><strong>Actors</strong></td>
<td>Knowledge-exploiting Subsystem</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education &amp; Research Subsystem</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Political Subsystem</td>
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<tr>
<td></td>
<td></td>
<td>Innovation support actors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Demand</td>
</tr>
<tr>
<td></td>
<td><strong>Institutions</strong></td>
<td>Hard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soft</td>
</tr>
<tr>
<td></td>
<td><strong>Interactions</strong></td>
<td>At level of networks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>At level of individual contacts</td>
</tr>
<tr>
<td></td>
<td><strong>Infrastructure</strong></td>
<td>Physical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial</td>
</tr>
</tbody>
</table>

Continue with all 15 Functions of the Regional Innovation System.

Overview of Transformational System Failures

Similarly, the analysis of Transformation System Failures is executed by taking one function at the time, and studying its completeness according to the key points indicated in the table below.
<table>
<thead>
<tr>
<th>Type of Failure</th>
<th>Failure Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Directionality</strong> Failure</td>
<td>Lack of shared vision regarding the goal and direction of the transformation process; Inability of collective coordination of distributed agents involved in shaping systemic change; Insufficient regulation or standards to guide and consolidate the direction of change; Lack of targeted funding for research, development and demonstration projects and infrastructures to establish corridors of acceptable development paths.</td>
</tr>
<tr>
<td><strong>Demand Articulation</strong> Failure</td>
<td>Insufficient spaces for anticipating and learning about user needs to enable the uptake of innovations by users. Absence of orienting and stimulating signals from public demand. Lack of demand-articulating competencies.</td>
</tr>
<tr>
<td><strong>Policy Coordination</strong> Failure</td>
<td>Lack of multi-level policy coordination across different systemic levels (e.g. regional–national–European or between technological and sectorial systems; Lack of horizontal coordination between research, technology and innovation policies on the one hand and sectorial policies (e.g. transport, energy, agriculture) on the other; Lack of vertical coordination between ministries and implementing agencies leads to a deviation between strategic intentions and operational implementation of policies; No coherence between public policies and private sector institutions; No temporal coordination resulting in mismatches related to the timing of interventions by different actors.</td>
</tr>
<tr>
<td><strong>Reflexivity</strong> Failure</td>
<td>Insufficient ability of the system to monitor, anticipate and involve actors in processes of self-governance; Lack of distributed reflexive arrangements to connect different discursive spheres, provide spaces for experimentation and learning; No adaptive policy portfolios to keep options open and deal with uncertainty.</td>
</tr>
</tbody>
</table>


Insights and Implications for Brainport Development

Using this general analytical framework for the ‘Financing of Innovation Processes’ function resulted on 20 propositions based on a literature review on Venture Capital and other sources of private capital. These propositions were later verified/falsified by confronting them against the actual projects and activities of Brainport Development.

This exercise revealed that the program ‘Bright Move’ and the Brainport Networking Financials (BNF) program are indeed addressing most market, system and transformational failures on an active way; however assessing their efficacy over the RIS is still not possible due to the fact that these activities were all initiated only a year ago, additional to the absence of a sound monitoring tool and time-lag issues. Additionally, it has been revealed that there is still plenty of room for expanding previous successes across other Spearhead Sectors of the region. The latter is to be expected given the short time period for which these projects have been active.

Among the most pressing issues we can find the lack of a long-term plan for the development of one or several mechanisms that allow systemic exit routes, which can lead to a more efficient re-investment of private funds within the clusters operating in the region. Furthermore, more attention must be put to the development of capabilities of VC firms, given that having too few high quality organizations of this kind will limit the supply of the very much needed complementary expertise that entrepreneurs seek. Also, efforts could increase towards linking business angel networks with public technological incubation organizations and public research spin-offs. And lastly, the most urgent need of this function right now is the development of a sound monitoring tool that would help direct funds, actions and policy towards empirically verified needs of the region.
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List of Abbreviations

AAL: Ambient Assisted Living
BNF: Brainport Networking Financials
BOM: Brabantse Ontwikkelings Maatschappij – Brabant Development Company
DPI: Dutch Polymer Institute
ECFG: Eindhoven Corporate Finance Group
ESI: Embedded Systems Institute
FTE: Full-Time Equivalent
ICT: Information and Communications Technology
IPO: Initial Public Offering
IS: Innovation System
MNC: Multinational Corporations
M&As: Mergers and Acquisitions
NIS: National Innovation System
NTBF: New Technology-Based Firms
OECD: Organization for Economic Co-operation and Development
OEM: Original Equipment Manufacturer
POC: Proof of Concept
RIA: Regional Innovation Agency
RIS: Regional Innovation System
ROI: Return on Investment
R&D: Research and Development
SIS: Sectorial Innovation System
SME: Small and Medium sized Firm
SRE: Samenwerkingsverband Regio Eindhoven – Grouping of Eindhoven Region
SVCF: Stimulus Venture Capital Fund
S&T: Science and Technology
TIS: Technological Innovation System
TU/e: Technical University of Eindhoven
VC: Venture Capital
Chapter 1: Introduction

Entrepreneurial activity is central to the health and development of the knowledge-based economy. Both, economic development and the living standards of a region depend drastically on entrepreneurs, whose role is turning the potential of new knowledge, new technologies, markets and networks into substantial actions that produce or take advantage of new business opportunities.

Given that they are the main propellers of innovation, its commercialization and the economic growth and job creation that come with it, the creation and rapid growth of New Technology-Based Firms (NTBF) is a key priority to regional stakeholders. However, highly uncertain outcomes and notably inconstant returns force Venture Capitalists to increasingly move towards latter phases of a firm’s life cycle for investment purposes; and likewise, the lack of collaterals cause banks to deprive NTBF of access to debt. This lack of private incentives to invest in NTBF can not only decelerate their growth in a significant way, but it can also lead to the bankruptcy of many young ventures who would otherwise have been successful.

In general, technology-based start-ups and spin-offs are increasingly dealing with a gap in their financial resources in the first few years of their operations, causing many innovative technologies and knowledge to be underexploited by regions. Therefore, it is essential for regional managers to carry out studies on the private financing of NTBF, and to design mechanisms that help filling this gap. The next section will present these regional managers as problem owners in the research project, after which the context in which this master thesis takes place will be introduced.

1.1 Brainport Development

With representatives of government, industry and knowledge institutions on its governing board, Brainport Development is a hybrid agency that works in support of the knowledge-based economy of the Brainport Eindhoven Region, located in the Southeast Netherlands. Brainport Development fits the OECD’s definition of a Regional Innovation Agency (RIA) proposed in their report “Reviews of Regional Innovation: Regions and Innovation Policy” (2011) given that it fulfills the following four criteria:

1. “Public mission: the organization’s mission is complementary to private services, responding to market or systems failures.
2. Geographically bounded at sub-national level: the organization’s mission targets a given region, defined along administrative boundaries.
3. Permanent: these organizations are not projects but structures with an indefinite lifetime.
4. Promotes innovation in a broad sense: supporting innovation activities in the region is one of the goals, or the only goal, of the structure. The mission encompasses a wide range of innovation aspects, and not just a single instrument or target group.”
The center of the Triple-Helix (see Figure 1.1) considers all of those aspects which simultaneously concern all agents, and can thus be the platform for the formation of new hybrid institutions and organizations. These hybrid institutions refer also to new organizational formats that have the purpose of fostering innovation and are themselves a synthesis of elements of the Triple Helix (Etzkowitz, 2003) such as business incubators, business support organizations, science parks, and of course, Regional Innovation Agencies.

As Etzkowitz (2003) remarks, what brings economic and social relevance to the formation of the Triple Helix model is the new developments in innovation strategies and practices that emerge from the increment of interactions among industry, university and government. The main purpose of these hybrid organizations is acting on the overlapping areas of interest (Table 1.2) towards the creation and maintenance of network relations between and within industries, universities, and state-owned organizations (Etzkowitz & Leydesdorff, 1998). Collaborations within the Triple Helix can allow the identification of solutions that enable all actors to achieve their own goals without jeopardizing those of the other parties, and in addition, the creation of synergetic dynamics that accelerate results.

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<td>Government</td>
<td>Funding, Direction of Research, Expertise.</td>
<td>Innovative capacity of people and knowledge generation.</td>
</tr>
<tr>
<td>Knowledge Institutes</td>
<td>Funding for top level education, Legislation, and fundamental research.</td>
<td>Core of the Triple-Helix: Promotion of the Region, Coordination of Network Activities, Entrepreneurship Stimulation, Knowledge Creation, Knowledge Exchange and Knowledge Valorization.</td>
</tr>
</tbody>
</table>

Table 1.1. Triple-Helix interactions.

The Triple Helix model highlights the vitality of a joint effort of government, industry and knowledge institutes to develop and maintain an ecosystem that promotes and rewards innovation. I.e. the Triple Helix model stresses the organizational capacity of a region’s most important agents as a prerequisite to success.

In a nutshell, Brainport Development stimulates the creation of supportive structures in the domains of labor market and entrepreneurship, technology, innovation and business development, and the region’s living climate. For this, Brainport Development promotes the Brainport Eindhoven Region both in the Netherlands and abroad, and assists the regional industry with initiatives such as corporate advice and funding, starter provisions, corporate housing, incubation facilities and business centers.

And in addition, what is relevant for the current thesis project is that this RIA also introduces corporate investors to a variety of Dutch networks and business suppliers, to government authorities at national and regional levels, to academic and private sector consultants, and to others involved in the investment process. The following section describes thoroughly the context in which Brainport Development operates: the Brainport Eindhoven Region.
1.2 Context description: Brainport Eindhoven Region

Eindhoven has been an upbringing place for technological creativity for over a hundred years. Having grown around the development of the Dutch multinational Philips Electronics, the city is now proud of world-wide known inventions such as the MRI scanner, the LED lamp or the compact disc. However, things weren’t always great for the region: around 25 years ago the city was languishing and deeply affected by social and economic declines due to de-industrialization processes. Because of this reason, the city, in connection with its surroundings, was forced to reinvent itself from an industrial town into the major technology heart of the Netherlands, and a Design focal point.

Now, the Southeast Netherlands adds significantly to the rest of the country, generating 17% of the Gross National Product, and with 35% of all Dutch exports coming from this region. The Regional Innovation Scoreboard (Hollanders et al., 2012), which measures the innovation index in European regions once a year, has consecutively placed the province of North Brabant as the best innovation performer of all regions within the Netherlands. Despite of considering the country as an Innovation Follower, North Brabant is perceived as a Leader-medium Innovator. This categorization reflects that even though the province’s general innovation performance is high in relation to the majority of regions in Europe, it still has weak aspects, with the principal one being low Public R&D Expenditures.

Together with the main ports of Amsterdam and Rotterdam, the Southeast Netherlands is a pillar of the Dutch economy. Eindhoven’s knowledge-based development ‘miracle’ has been recognized by the Dutch planning authorities who named it as the national ‘Brainport’ in 2004. And in 2011 Brainport Eindhoven Region was voted ‘Intelligent Community of the Year 2011’ by the Intelligent Community Forum, an award that acknowledges the region’s strong international position.

Maldonado & Romein (2010) explain that something capital at explaining Brainport Eindhoven Region’s economic success is the triple-helix concept: a unique cooperation structure among industry, research and government. Regional stakeholders have been working as partners in the elaboration and commitment of a shared vision and its strategy for the future development of the region for over 10 years now. Companies in the region cooperate with each other and with knowledge institutes by sharing and multiplying knowledge in an open innovation environment before launching their products to market (brainport.nl, 2013).

The following two subsections explain in detail the technological and innovation capabilities of the region, as well as its strong knowledge base. The purpose of this is to introduce to the reader the great potential for commercialization of innovation that the region has, and which is not being properly exploited at the moment.

1.2.1 Technology & Innovative Capacity of the Region

The technological strength of the Southeast Netherlands lies in the high concentration of top technology firms it hosts, which, work in most of the Dutch focal sectors: High Tech Systems & Materials, Food, Automotive, Lifetec and Design. The strategy of Brainport is further strengthening the existing top clusters while simultaneously searching for new sustainable
markets through the development of several new clusters as smart mobility, smart materials, homecare, industrial design, solar energy, energy in the built environment and agrofood.

These clusters are composed by world players and multinationals among which we can find big names such as ASML, Océ, DAF, DSM, FEI, Fuji, Nunhems, NXP, Philips Electronics, OCÉ, VDL, Vion and TomTom. Besides competing among each other, these firms also cooperate together with international knowledge institutes and specialized SMEs on new innovations by sharing and reproducing knowledge in an open environment before they bring their products to the market. Such open environment helps the world players and multinationals strengthen and maintain their top positions by constantly innovating on the limit of what is technically possible; hence, the ecosystem upon which Brainport operates is quite appealing for foreign firms and knowledge workers to locate at.

<table>
<thead>
<tr>
<th>National Top Sectors</th>
<th>Southeast Netherlands</th>
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<tbody>
<tr>
<td></td>
<td>Top Clusters</td>
</tr>
<tr>
<td>HTSM</td>
<td>High Tech Systems</td>
</tr>
<tr>
<td>Chemical</td>
<td>Chemical Engineering and Chemistry</td>
</tr>
<tr>
<td>Life Sciences</td>
<td>Lifetech (Medical &amp; cardiovascular tech)</td>
</tr>
<tr>
<td>Energy</td>
<td></td>
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<tr>
<td>Creative industry</td>
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<tr>
<td>Agrofood</td>
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<td>Horticulture and Produce</td>
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<td>Water</td>
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<td>Logistics</td>
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</table>

Table 1.2. National Top Sectors vs. Clusters in the Southeast Netherlands (Source: Summary Brainport 2020, 2011).

Few other factors build further competitiveness to the region. First, Brainport counts with highly innovative SMEs that make use of 44% of national funds such as innovation vouchers, innovation performance contracts and other national innovation schemes and programs. This has resulted in a rough 26% of all companies in the Southeast Netherlands being innovative. Second, thanks to the high concentration of firms, Brainport works to gradually complete the value chains of its leading sectors, which contributes to the efficiency and economy of the region. And third, policy has been able to foster high synergy between the TU/e and local firms, which habitually sponsor research and provide internships. Tijssen et al. (2009) report that a study of university-industry research cooperation among 350 universities worldwide revealed that the TU/e has the largest share (10.5%) of scientific publications in cooperation with industry.

1.2.2 Knowledge in the region
Brainport spends a rough 8% of the Gross Regional Product on R&D and is thus the only region in the Netherlands – and one of the few in Europe – that achieves the European target of 3%. In 2012 it was published that the Southeast Brabant region is attributed 390 million euros of public funds and a good 2.1 billion euros of private funds in R&D investment, a third of the total Dutch private R&D expenditure, making it the number one R&D investor in the country, and among the top 15 regions in all Europe (Brainport Development, 2012).

Moreover, an easy way to visualize the diversity of Brainport’s knowledge industry is by taking a look at the various campuses and technology parks settled across the region. Among them, the most important ones are 1) the TU/e campus, which not only accommodates the different university faculties, but also the Dutch Polymer Institute (DPI), the Embedded Systems Institute
(ESI), Eurandom and offices to sponsor business start-ups and knowledge valorization; 2) the High Tech Automotive Campus in Helmond; 3) the Maastricht Health Campus; 4) the High-Tech Campus Eindhoven, which originated from the Philips NatLab (Physics Laboratory) and transformed into a cluster of cooperating firms based on an open innovation model and 5) the chemical innovation community Chemelot Campus, located in Sittard-Geleen. These last two campuses were built on the sturdy foundation of the Dutch world players in High Tech Systems & Materials and Chemical Engineering & Chemistry, Philips and DSM respectively. These campuses have their own profile which is reinforced by locating in them tens of companies that fit the ecosystem and by arming them with state-of-the-art research facilities and laboratories, which has turned these campuses into hotspots for innovation.

In terms of output, the region was responsible for 42% of the country’s manufacturing industry patent applications with Philips Electronics being the number one, accounting for approximately 3,928 patents (Brainport Development NV, 2013). Also, in regard to public R&D institutes, four of these settled in the Brainport Eindhoven Region were included in 2012’s top-30: the Dutch Polymer Institute (12), IPA (24), Engineering Mechanics (25) and Eindhoven Polymer Laboratories (26) (Brainport Development NV, 2013). Moreover, the Dutch leader of R&D institutes, TNO - based in Eindhoven and Helmond, among others -, is the number one of 2012 with 112 new patents (Brainport Development NV, 2013). All of this positions Brainport as one of Europe’s top three regions in terms of patent density.

After reviewing the empirical evidence of the great potential that the Brainport Eindhoven Region hosts, the following section presents explicitly the problem statement of this master thesis, after which the research methodology will be described in detail.

1.3 Problem Statement

As it has been briefly mentioned at the beginning of this chapter, the problem that this master thesis studies is the fact that a great number of NTBF in the region do not manage to develop into independent and fast growing firms after few years of operations, and instead, they either remain small or do not manage to survive at all. As it will be reviewed along the present section, the main reason for this is that entrepreneurs of NTBF in the Brainport Eindhoven Region lack two really important assets they need if they want to make it through the initial - and most critical - phases of their venture: access to the private capital, and managerial and financial expertise.

1.3.1 Start-Ups and Growing SMEs

As it can be appreciated in Table 1.3 below, Brainport Development has created a group of broad indicators not only to indicate what is relevant for the region to monitor, but also the expectations that regional managers have for future performance of the region. Despite of the great credibility of the reports of Brainport Development, the numbers presented in Table 1.3 in regard of rapid growers have been subject of controversies given that they encompass every type of business, and not only those which grow thanks to their technological capabilities. Dr. Onno Lint, from Lectureship Brainport, has commented on the issue by indicating that these group of rapid growers totals only tens of firms and not hundreds.
Table 1.3. Brainport’s Indicators for the ‘Business’ domain.

Additionally, in its 6th edition, the report ‘Brainport Monitor 2013’ reveals that even though the number of fast growing SMEs (at least 50 FTE, and ≥ 60% growth in 3 years) is higher in Brainport than in the Netherlands as a whole, the number of fast growers has continually decreased since 2008 - with the exception of 2011 (see Figure 1.2).

Figure 1.2: Number of Fast Growing SMEs (Brainport Development, 2013).

Nevertheless, this same report indicates that in 2012 there were an approximate of 257 start-ups in the Spearhead sectors of Brainport Eindhoven Region, with Design and High Tech Systems & Materials as the two most representative clusters. From these 257 start-ups, a total of 84 are considered medium and high-tech, with 16 manufacturing firms (highest number since 2008) and 68 service providers. This amount of medium and high tech Start-Ups is indeed a representative of the outstanding knowledge base of the region.

Despite of the fact that Brainport has witnessed years with higher amounts of Start-Ups and growing SMEs, we can still conclude that Brainport Eindhoven Region has a sufficient number of new entrepreneurs every year to generate positive impacts in the region’s economy. However, the fact that this is the strongest patent region in the world, and the number of rapid growers is only a handful, indicates that many opportunities to capitalize from knowledge are not being properly exploited.
1.3.2 Risk Capital
It has been identified by Brainport Development that Venture Capitalists are increasingly moving towards later stages of a firm’s life cycle for investment purposes, due to a need for lower risks. This has created a hole in the market for entrepreneurs in the need of pre-seed and seed capital in the region. This situation is worsened by the fact that subsidies are disappearing, and banks are willing to provide less and less capital to entrepreneurs.

Even though it is the role of the government to offer their support to ventures in their initial funding phases, a complementary private investment (business angels, crowdfunding, etc.) is also necessary. This, not only because entrepreneurs need to finance their ventures, but also because they need external experts in the areas of managing, networking, reputation and marketing to contribute to their firms. Despite of the fact that there exists an approximate of €300 billion in the Netherlands as private capital (mkb-fonds.nl/mkb_obligaties, 2013) and that the region is abundant in highly educated people, private investment is not occurring on a natural way.

1.3.3 Conclusion
Overall, the region’s triple-helix, represented in Brainport Development, has reached to the conclusion that the Southeast Netherlands needs more high-tech start-up companies with a strong market focus, and a bigger number of fast growing innovative SMEs. This, however, requires capital for product development phases, smart advice and social network access to entrepreneurs. Then, the question “How is Brainport Development addressing these challenges?” rises. The ultimate goal of this thesis project is to explore this question.

1.4 Methodology
1.4.1 Research Objective
As mentioned in the conclusion of the previous section, the aim of this research project is to find an answer to the main research question: How is Brainport Development addressing the problem of lack of access to seed capital that NTBF in the region face?

To answer the main research question seven sub questions are articulated, which will guide the drafting of this master’s report:

1. What can be learned from the current literature related to innovation processes occurring within the same territory? (Chapter 2)
2. Considering all relevant agents, how can the overall performance of Brainport Eindhoven Region be analyzed? (Chapter 2)
3. Under which circumstances are interventions in the region justified? (Chapter 2)
4. Whose role is it to plan and implement such interventions? (Chapter 2)
5. What kind of interventions does literature recommend for the specific case of increasing the availability of private (pre)seed capital to NTBF entrepreneurs? (Chapter 3)
6. What interventions is Brainport Development (co)planning and (co)implementing at the moment? (Chapter 5)
7. How adequately is Brainport Development intervening in the region with its projects and activities? (Chapter 5)
8. How can Brainport Development adjust its projects and activities in order to achieve a sustainable solution to the problems that current NTBF entrepreneurs face at the initial phases of their ventures? (chapter 5)
In specific, the objective of this study is to design an analytical tool for studying this issue in Brainport Eindhoven Region and to create knowledge about the private financing of young high-tech firms. In this way an investigation can be pursued in order to evaluate how the current interventions of Brainport Development could be improved.

1.4.2 Research method: Case study
This thesis project will be using the Case Study methodology because, as Yin (1994) remarks, a case study is “an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”. The lack of an experimental setup in this research methodology makes it useful for answering “how” and “why” questions, which suits the “how” kind of question of the present research project.

The case selected for the present thesis project has been described in sections 1.1 and 1.2, where Brainport Eindhoven Region was introduced as the context in which its Regional Innovation Agency, called Brainport Development, responds to market or system failures. This was further expanded in section 1.3 where the problem that Brainport Development has to respond to was introduced: most NTBF in the Brainport Eindhoven Region are not able to access private capital during their first operational years, which dooms these firms to either remain small or to eventually go bankrupt. Finally, the following section will discuss how and which data will be collected.

1.5 Data collection
In order to answer the research question and achieve the research objective, this study will make use of multiple sources of evidence. To accomplish data triangulation, i.e. construct validity, the following sources will be employed: academic articles, documents and reports, websites and semi-structured interviews.

1.5.1 Written resources
The literature review involved the use of scholarly articles, books, and reports by Brainport Development and from organizations that study relevant policy issues in different regions of the world. A complete list of these sources can be found in Appendix D. The primary sources were found through 1) Google scholar and 2) ScienceDirect; and then the set of literature was stretched through the snowball effect, i.e. key sources of the initial papers were additionally considered. And lastly, public documents released by Brainport Development were also included in the study.

1.5.2 Interviews
Semi-structured interviews are a valuable source of information in this study. As Yin (1994) arguments, semi-structured interviews are the most essential and valuable source of evidence within the case study methodology, which has been confirmed by Cooper and Schindler (2008), who also consider this data collection method as the primary data-collection technique in qualitative research. Not only does it allow the interviewer to be creative and elaborate deeper on the topics of interest, but it also permits more room for normal interaction between researcher and interviewee, which leads naturally to a greater diversity of responses (Baarda, 2010).

The interviewees were picked based on their experience and knowledge, as well as their relationship with Brainport Development and the work this hybrid organization executes. These respondents were contacted via e-mail on a first instance in order to invite them to participate in the research, from which a total of 5 people accepted to contribute. After asking for
permission, all the interviews performed were recorded. Four of the participants were inquired personally, while a last individual participated via phone call. These interviews were carried out in a predetermined sequence. And the information gathered was later processed by the method of pattern matching and theory building suggested by Yin (1994).

Further details on the subjects chosen for the interviews, as well as the information retrieved from these individuals can be found in section 4.1, which is complemented with information available in Appendices E, F, G and H.

1.6 Report Structure
The rest of this thesis project is organized as follows. First, Chapter 2 provides a literature review of the most relevant and fitting theoretical concepts for analyzing the Brainport Eindhoven Region itself, and it explains the rationales behind interventions in the region by both, the government and RIAs. However, as it will be explained, this research project will focus on testing which activities are being implemented by Brainport Development, as well as the adequacy of these interventions.

Later, in Chapter 3, the general analytical framework is used for approaching the problem statement described in section 1.3. This is executed under the support of literature on Venture Capital, Venture Capital policy and, in general, of private funding for young high-tech start-ups and spin-offs. Hence, the result of this chapter is a list of ordered propositions that are expected to be in place in any knowledge-based economy for the smooth creation and rapid growth of NTBF, and therefore, it will ultimately be verified/falsified if Brainport Development is taking action over them.

Next, Chapter 4 deepens on section 1.4 and 1.5, by thoroughly explaining the Methodology adopted in this research project. Here, the sources of information are presented, and their validity and reliability are discussed.

Next, Chapter 5 presents the results of the empirical research which, as explained in section 1.5, originates from desk research as well as from interviews to personnel of Brainport Development and the head of Lectureship Brainport. In other words, this chapter recollects all the programs, projects and activities executed by Brainport Development that address the issue presented in section 1.3, as well as the rationales behind each. And second, Chapter 5 verifies/falsifies each and every proposition made along Chapter 3’s literature review on Venture Capital and High-tech firms. Therefore, this chapter elaborates the answer to the main research question of this master thesis. Finally, Chapter 6 brings this thesis report to an end by discussing the results of the research and managerial implications for Brainport Development.


This chapter provides a literature review of the most relevant and fitting theoretical concepts for analyzing the Brainport Eindhoven Region, and it explains the rationales behind interventions in the region by both, government and Regional Innovation Agencies. As a result of this study a general analytical framework has been developed not only for identifying problems that affect the overall “health” of a knowledge-based region as Brainport, but also for deriving possible solutions to such issues.
2.1 Innovation Systems

The (re)discovery of Science as a socially embedded process argues that knowledge is now produced in many more places than previously thought. The merging of evolutionary economics with the apprehension of firms as ‘learning organizations’, and of research as a component of the innovation process (Arnold, 2004), has resulted in Innovation being regarded for at least 30 years now as a phenomenon of *dynamic and systemic nature*. This post-neoclassical perspective to research, innovation and technological change has brought about several concepts and models that try to capture the mechanisms that foster innovation in firms by also looking at the ecosystem and atmosphere these organizations are immersed in. I.e. besides the internal factors of an enterprise, successful innovation occurring in firms has been linked to their systemic interactions and exchanges with external institutions and agencies, supply and value chains, competitors, governmental policies and cultural and social practices characteristic of a territory. Therefore, this implies that for effectively supporting NTBF in the region, Brainport Development needs to consider not only the lagging internal aspects of these young ventures, but also the capabilities of their supporting and complementary organizations (e.g. research institutes, universities, innovation brokers, banks, venture capital, business angels, etc.), the links NTBF have with these other organizations, and the laws and cultural features inherent to the region.

This systemic approach to innovation has inspired many scholars to try and develop a heuristic model that facilitates the visualization of the ecosystem in which firms are immersed: Innovation Systems. Several are the authors who have tried to define Innovation Systems, which is why, I will try to integrate several definitions in order to reach a final image that incorporates as many aspects of the term as possible. First, I’d like to mention the definition of Freeman (1987), who describes Innovation Systems as “the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies”. Cassar (2006) goes a little bit further when explaining that Innovation Systems are conceptualizations that have the intention of capturing the main features of the “Innovation Universes” of firms and industries, which can be considered to be complex systems given the variety of dimensions they interact with. Edquist (1997), in his definition, specifies which are these other dimensions by referring to Innovation Systems as all relevant economic, social, political, organizational, and other factors that influence the development, diffusion, and use of innovations. Also, Patel and Pavitt (1994) add to these dimensions by remarking that Innovation Systems comprise national institutions, their competencies and incentive structures, which altogether determine the speed and direction of technological learning in a country. As Edquist (1997) clarifies, the concept of Innovation Systems refers to the determinants of innovations, and not their consequences (economic growth, employment, working conditions, etc.).

Aiming to combine all of the above, an **Innovation System** can be defined as:

> **The complex system of economic, social, political and organizational networks among institutions in the public and private sectors, whose competencies, incentive structures, activities and interactions develop, import, modify and diffuse new technologies.**

Even though this is a definition that embodies almost completely what the Brainport Eindhoven Region is, it still lacks a reference to its territorial characteristics. For this reason, the following two subsections explore deeper within the Innovation Systems literature in order to reach a more precise model for studying this top technology region in the Southeast Netherlands.
### 2.1.1 Types of Innovation Systems

Innovation Systems literature points at a number of categorizations of innovation systems. While some scholars make such classifications based on the type of technology or service being developed by the innovation system, others approach the subject from a territorial perspective.

In relation to the former, the two most popular categories in the literature are ‘Sectorial Innovation Systems (SISs)’ and ‘Technological Innovation Systems (TISs)’. Both of these involve a set of products and a set of agents not confined to national borders that perform market and non-market interactions for the development and release of such products (Malerba, 2002; Carlsson & Stankiewicz, 1991); however the difference relies in that TISs are more precise in scope and therefore more dynamic than SISs (Carlson et al., 2002).

Leydesdorff (2006) explains that for either cultural or political reasons one may want to define an Innovation System from a territorial perspective as either national or regional, however Innovation Systems evolve and therefore they do not have a predetermined shape. Chung (1999) and Braczyk et al. (1998) explain that different levels of scope can be identified, nonetheless, the most generally used are Regional Innovation Systems (RIS) and National Innovation Systems (NIS). I tend to agree with both authors, who denote the need of distinguishing a RIS from a NIS given that a RIS is seen as a more inclusive system in which regional development priorities are more emphatically taken into account. As it can be appreciated in Figure 2.1, this same distinction has also been recognized by Lim (2006), who has very clearly differentiated several levels of abstraction in regard to Innovation Systems.

As it can be seen in Figure 2.1, the elements of the NIS concern policy making and governance, while those in the RIS level deal with the actors of the Innovation System, their organization, interactions, knowledge exchange, the infrastructures supporting the system and everything that has an impact on technological innovations.

From this brief analysis of types of Innovation Systems it can be concluded that the Regional Innovation Systems model is the one that fits best with Brainport Eindhoven Region. Therefore, the next section of this chapter studies this concept in detail, which will ultimately contribute to the development of an analytical framework capable of thoroughly evaluating the knowledge-based economy of this region.

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**Figure 2.1. Levels of Abstraction in Innovation Systems (Lim, 2006)**
2.1.2 Regional Innovation Systems

Among other academics, Doloreux & Parto (2005) indicate that there is no generally accepted definition for what a RIS is; however, based on a suggestion from these two authors, an attempt to capture this concept has been developed:

A RIS is a set of interacting private and public interests, formal institutions and other organizations located in a common territory, which function according to organizational and institutional arrangements and relationships conducive to the generation, use, and dissemination of knowledge and new technologies.

The concept of Regional Innovation Systems originates from a couple of literature bodies that conceive the origin and dynamics of Innovation from two different, but overlapping ways: Innovation Systems and Regional Science (Doloreux & Parto, 2005). The former introduces the systemic and dynamic nature of Innovation, arguing that it flourishes from the continuous interaction and feedback among several agents - those described in section 2.1.2.1 - , as well as from environmental circumstances. The latter body of literature, on the other hand, proposes to see Innovation as a process which is embedded with the territory where firms and knowledge institutions are conglomerated; emphasis is made in its leverage to attract talent and foreign firms and investment.

Therefore, the Regional Innovation System model is a normative and descriptive approach towards capturing the ways in which technological development occurs within a specific territory (Doloreux & Parto, 2005). The popularity of this heuristic is mostly due to an increasing awareness in regard to the diverse forms in which innovation can take place depending on the ‘region’ it develops at, and the policies and measures that are needed for a knowledge-based region to thrive in economic and technological terms.

2.1.2.1 Classification of RIS Actors

As it can be visualized in Figure 2.2 below, developed by Kuhlmann & Arnold (2001), a Regional Innovation System (RIS) consists of five different groups of agents or ‘subsystems’. First, an Education and Knowledge-producing subsystem which generates, collects and disseminates knowledge (from in and outside the region) throughout the economy. Intuitively, both universities and research institutions make up this group of actors. Second, there is a Knowledge-exploiting subsystem which processes knowledge into either products or services and which consumes innovations itself in order to increase its efficiency. Big firms, which include global competitors and MNCs, as well as SMEs, new ventures and spin-offs shape this subsystem. Third, the Political subsystem, which sets the framework conditions of the RIS and supports the other two subsystems in regard of infrastructural concerns; it consists of national and regional governments. A fourth group of agents can be noted, which deliver innovation and business support services in domains such as consultancy (taxation, business, legislation, etc.), networking, capital financing, and others. These agents are financial institutions, venture capitalists, pure brokering organizations, development agencies, and occasionally as in the Southeast Netherlands, hybrid organizations like Brainport Development. And fifth, the Demand of Innovation which is excited by final consumers and producers.
Overall, it can be argued that the RIS approach focuses on the knowledge infrastructure, the firms in the region, governments, the innovation support agents that facilitate, encourage and bridge the transfer of knowledge and (financial) resources among all agents, and the creation and understanding of demand.

Evidence suggests that constant and intense interaction between all subsystems leads a region successfully towards developing the innovative and technological potentials of its firms (Doloreux & Parto, 2005) due to rich knowledge and resource exchanges. These interactions, Edquist (2005) argues, are not only relevant for the territorial delineation of a RIS, but they are also a representation of market relationships and the social and cultural atmosphere of the place. Furthermore, these interactions can occur in the form of cooperation, sharing, knowledge spillovers and mobility of highly skilled labor within the same region. And as it was mentioned in section 1.1, the role of Regional Innovation Agencies such as Brainport Development is the creation and maintenance of network relations between and within the different types of agents described at the beginning of this subsection (Etzkowitz & Leydesdorff, 1998).

Asheim & Gertler (2006) point out that institutions, or the institutional infrastructure, can support regional clusters of firms. Regional authorities can, to a certain extent, strengthen this institutional infrastructure through policy interventions, which will allow them to influence the practices of firms in the region, and ultimately result in a ‘regionally networked innovation system’ (Asheim & Gertler, 2006). Even though this regional institutional infrastructure is not all independent, but usually strongly determined by national institutions and ingrained in the NIS, these institutions influence the behavior of firms and subsequently also the evolution of a RIS. Brainport Development, then, as a hybrid and innovation focused institution, can affect the behavior of firms, for which a clear and comprehensive awareness of the complete system is needed, which is facilitated by Figure 2.2 above.

In conclusion, as Lim (2006) has phrased it, a RIS can be defined as a system that stimulates innovation capabilities in a region, comprising the generation, diffusion and appropriation of technological innovations, which enhances its growth potential and regional competitiveness.
2.2 Analysis of Regional Innovation Systems

As it was discussed in section 2.1, academic researchers and policy makers have now recognized the dynamic and systemic nature of Innovation, realizing that the institutional and policy environments affect radically the speed and direction of innovation processes. Probably the greatest impact of this new viewpoint is that it has changed the justification of innovation policy intervention beyond markets failures, to System Failures, and quite recently, to Transformational System Failures (Weber & Rohracher, 2012).

Akin to this systemic perspective on Innovation, a comprehensive framework is needed by RIAs – like Brainport Development - in order to assess the performance of a region on a systemic level, additionally to the neoclassical approach of supporting the individual components of the system. This provides a better perception of the coordination and alignment of the different components of the system. Therefore, the goal of the present section is to develop a general framework that allows a structured and ordered evaluation, from a systems-level point of view, of the estate of a Regional Innovation System at any given moment.

As Wieczorek & Hekkert (2012) remark, the analysis of Innovation Systems in the literature has focused on either the structural components of an IS, or the functions that need to be executed in it by its actors. These authors were, however, the first ones to combine these two aspects into a single and comprehensive framework. Even though their work used (global) Technological Innovation Systems as the study unit, their framework is still useful for the analysis of Regional Innovation Systems - such as Brainport Eindhoven Region - by adjusting the diversity of agents that belong to the structure, and by making use of functions relevant to this type of Innovation System. Therefore, in order to reach a final analytical framework for the specific case of Regional Innovation Systems, the structural analysis of a RIS will be detailed first in section 2.2.1, after which the functional analysis of a RIS will be explained in 2.2.2. Together, these two sections combined will lead to the final general framework for the evaluation of Regional Innovation Systems in section 2.2.3.

2.2.1 Structural Elements of Innovation Systems

The structural analysis of Innovation Systems studies its four main elements, which are: actors (their presence/absence and capabilities); institutions (not as in organizations, but rather in terms of formal and informal rules of the game); infrastructure (knowledge, financial and physical); and interactions among actors and agents (Wieczorek, A. & Hekkert, 2012).

All of these different components have subcategories of their own. In the case of actors those mentioned in section 2.1.2 will be used to group them – firms, universities, research institutes, national and regional governments, Regional Innovation Agencies, Venture Capital & Banking, and final consumers and producers. This classification arises from the different roles that each organization has within the Innovation System. Institutions include all of those formal agreements usually represented in the form of legislation that govern the system (hard institutions), as well as all of those norms, shared concepts and customs (soft institutions) that are culturally embedded within a region. Also, for this framework interactions are understood as the cooperative relationships that exist both, at the level of networks and of individual contacts. This is not to be confused with networks, which are actually a type of actor such as industrial sectors, clusters, supply and value chains, etc. Finally, infrastructure is regarded here first, as the availability of finance for innovation in the form of subsidies, funds, venture capital or programs; second it refers to the physical infrastructure that comes in the form of roads, bridges, high-tech transportation systems, but also telecommunications infrastructure such as
telephone lines and broadband connectivity; finally, infrastructure also includes the aspect of knowledge, which comprises the knowledge, expertise, know-how and strategic information embedded in the region’s actors, i.e. tacit and coded knowledge. All of these components have been summarized in Table 2.1.

<table>
<thead>
<tr>
<th>Structural Dimensions</th>
<th>Subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actors</strong></td>
<td><strong>Knowledge-exploiting Subsystem</strong>: NTBF, SMEs, large firms, MNCs.</td>
</tr>
<tr>
<td></td>
<td><strong>Education &amp; Research Subsystem</strong>: Universities, Technology &amp; Research Institutes.</td>
</tr>
<tr>
<td></td>
<td><strong>Political Subsystem</strong>: National, Regional and city government organizations, economic development agencies.</td>
</tr>
<tr>
<td></td>
<td><strong>Innovation support actors</strong>: Regional Innovation Agencies, Venture Capital &amp; Banking, pure Innovation Brokers, etc.</td>
</tr>
<tr>
<td></td>
<td><strong>Demand</strong>: final consumers and producers.</td>
</tr>
<tr>
<td><strong>Institutions</strong></td>
<td><strong>Hard</strong>: rules, laws, regulations, instructions.</td>
</tr>
<tr>
<td></td>
<td><strong>Soft</strong>: norms, customs, common habits, routines, expectations, established practices, traditions, ways of conduct.</td>
</tr>
<tr>
<td><strong>Interactions</strong></td>
<td><strong>At level of networks.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>At level of individual contacts.</strong></td>
</tr>
<tr>
<td><strong>Infrastructure</strong></td>
<td><strong>Physical</strong>: roads, bridges, harbors, broadband networks, laboratories, incubation facilities, artefacts, instruments, machines, etc.</td>
</tr>
<tr>
<td></td>
<td><strong>Knowledge</strong>: knowledge, expertise, know-how, strategic information.</td>
</tr>
<tr>
<td></td>
<td><strong>Financial</strong>: private capital, subsidies, loans, financial programs, grants, etc.</td>
</tr>
</tbody>
</table>

Table 2.1: Structural Dimensions of a Regional Innovation System and Subcategories (Wieczorek & Hekkert, 2012; and Kuhlmann & Arnold, 2001).

2.2.2 Functional elements of a RIS

The structural analysis of ISs, described in the previous subsection, has been used for years in an attempt to recognize the causes for varying innovative performance between different nations and regions. This perspective, however, has been long criticized for its tendency to omit the inherent dynamics of an Innovation System. For this reason, the functional analysis emerged as a viable option that stresses the processes occurring inside the system. These functions categorize the most important processes for an Innovation System to perform well.

This recent trend has sparked many scholars (Johnson, 2001; Bergek et al., 2008; Mahroum et al., 2008) into suggesting lists of functions within the Innovation Systems literature, which all vary depending on the unit of study - be it SIS, TIS, NIS or RIS. Nonetheless, the most updated of these lists are provided by Mahroum, S. & Alsaleh, Y. (2012), Borrás, S. and Edquist, C. (2012) and Hekkert et al. (2007). Few of the functions originally listed by these authors are not relevant to the study of RISs because of the use of different units of study, and have therefore been left out; also, many functions have been worded by authors differently in spite of referring to the same concerns, which has allowed to pick the most suitable options for RISs. The resulting list can be found below in Table 2.2.

This list of functions aims at capturing not only those processes necessary for building capacity to innovate (F3), and create and exploit new knowledge locally (F5 and F6), but it also emphasizes the importance of accessing, anchoring and diffusing knowledge (F1, F2 and F4) from outside the region. This is important because the speed and direction of Innovation also depends on the knowledge provided by global networks, which can usually provide know-how complementary to the one created locally. In other words, these six first functions in the list imply that a RIS should cultivate both its absorptive and development capacities.
<table>
<thead>
<tr>
<th></th>
<th>Functional Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Accessing External Knowledge</strong>: capability of the various regional actors in an IS to secure benefits through network access or membership of regional and international networks.</td>
</tr>
<tr>
<td>2</td>
<td><strong>Anchoring External Knowledge</strong>: capacity of an economy to attract potential sources of knowledge (e.g. international talent, foreign firms and investment) and retain them locally.</td>
</tr>
<tr>
<td>3</td>
<td><strong>Competence building</strong>: individual learning and organizational learning &amp; formal and informal learning.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Diffusing Knowledge</strong>: collective capabilities available for an economy to adopt, adapt and assimilate new innovations and know-how in a broad manner.</td>
</tr>
<tr>
<td>5</td>
<td><strong>Knowledge Creation</strong>: ability to generate new knowledge (in the forms of ideas, discoveries, designs and inventions) in the world.</td>
</tr>
<tr>
<td>6</td>
<td><strong>Knowledge Exploitation</strong>: Commercialization of new products, new processes, Entrepreneurial activities (Start-Ups and Spin-offs), etc.</td>
</tr>
<tr>
<td>7</td>
<td><strong>Creating and changing organizations needed for developing new fields of innovation</strong>: agencies, specialized research, financing organizations, etc.</td>
</tr>
<tr>
<td>8</td>
<td><strong>Creating and changing institutions</strong>: patent laws, tax laws, environment and safety regulations, R&amp;D investment routines, cultural norms, etc.</td>
</tr>
<tr>
<td>9</td>
<td><strong>Incubation activities</strong>: provide access to facilities and administrative support to innovating efforts.</td>
</tr>
<tr>
<td>10</td>
<td><strong>Financing of innovation processes</strong>: and other activities that lead to the commercialization of knowledge and its adoption.</td>
</tr>
<tr>
<td>11</td>
<td><strong>Provision of consultancy services relevant for innovation processes.</strong></td>
</tr>
<tr>
<td>12</td>
<td><strong>Guidance of the search</strong>: choice of technological options for further investment.</td>
</tr>
<tr>
<td>13</td>
<td><strong>Market formation</strong>: create protected space for new technologies, through a) formation of temporary niche markets for specific applications of a technology; and b) create a (temporary) competitive advantage by favorable tax regimes or minimal consumption quotes.</td>
</tr>
<tr>
<td>14</td>
<td><strong>Mobilization of resources (financial &amp; human capital)</strong>: funds made available for long term R&amp;D programs set up by industry or government for specific technological knowledge, and testing of new technologies in niche experiments.</td>
</tr>
<tr>
<td>15</td>
<td><strong>Creation of legitimacy</strong>: put a new technology on the agenda, lobby for resources, favorable tax regimes, etc.</td>
</tr>
</tbody>
</table>

Table 2.2: Functions of a Regional Innovation System (Mahroum & Alsaleh, 2012; Borrás & Edquist, 2012; and Hekkert et al., 2007).

Moreover, the post-neoclassical approach emphasizes the ever changing and ever adapting nature of Innovation, which puts RISs in an ever evolving state. This demands the creation and reconstruction (i.e. innovation) of organizations and institutions (F7 and F8) within the Innovation Ecosystem.

Furthermore, it can be argued that a region is more autonomous from global events such as financial or raw material crises, that it is less susceptible to falling in technological lock-ins and that it creates more wealth for its citizens, the more diversity of firms and products it hosts within its territory. This is why increasing the number of spin-offs and start-ups is key to regional authorities. In line with this, functions that facilitate entrepreneurial activities (F9, F10 and F11) have been added to the list. From these, F10 - “**Financing of innovation processes (and other activities that lead to the commercialization of knowledge and its adoption)**” - which includes private and public funding, is the principal function to be analyzed throughout the present thesis project in Chapters 3 and 4.

In addition, the amount of resources in a region is always limited, which forces technology producers/users, financiers and industrial and government leaders to constantly exchange ideas, knowledge and information with the aim of ultimately choosing the technological options
worth to continue investing on. These choices can be done by industry leaders, the government and/or the markets; with the latter being the most important. In this way, Guidance of the Search (F12) refers to all of those activities within the RIS, which facilitate the clarity and visibility of user preferences and wants.

It is also the case with some new technologies that they find it hard to compete directly with already existing ones due to elevated costs or incompatibility with complementary artifacts. This however, has proved to be solvable thanks to governmental initiatives that protect those new and promising technologies. Examples of Market Formation (F13) include the creation of temporary niche markets for specific applications of a technology, and the creation of (temporary) competitive advantages by favorable tax regimes or minimal consumption quotes.

Human and financial resources are a basic need for the execution of all activities in an Innovation System, which takes us to Mobilization of Resources function (F14). In this regard, the government has the capacity of mobilizing such resources, which can come in the form of budgets for long term R&D programs initiated by either the public or private sector, investment in research done by Higher Education institutes, funds aimed at experimenting with new technologies in niche markets, etc.

Finally, new technologies are often prevented from succeeding due to vested interests that oppose the phenomenon of ‘creative destruction’ introduced by Schumpeter; or in a less extreme scenario, new technologies fail to reach critical mass in their diffusion due to a lack of visibility towards consumers or lack of support by authorities. Several processes as lobbying for resources, the setting of favorable tax regimes, or the creation of advocacy coalitions make up the function of Creation of Legitimacy (F15), which can make a difference towards the adoption and further refinement of new technologies.

There are several sources of information which can tell regional authorities if one of the functions is underperforming. This, however, comes usually in the form of periodic compilation of economic data by national/regional agencies, diagnostic surveys and interviews responded by representatives of the industrial sector, technology parks, entrepreneurs, universities, etc. Unfortunately, time pressure does not allow the inspection of such information sources within the present thesis project.

2.2.3 Structural Components and Functions.

The functional analysis of Innovation Systems has been used throughout the years with the purpose of identifying systemic failures, as well as emerging policy issues. However, Wieczorek & Hekkert (2012) argue that this is not a sufficient reference for an analysis because functions cannot be improved without adjusting in one way or another at least one of the structural components of an IS; and likewise, if a structural component is altered several functions might be affected. Therefore, these same authors suggest examining each identified function through the lens of each of the four structural components identified in section 2.2.1. In this way, after a function has been identified as underperforming, the reasons behind it can be traced back to the structural components of the RIS (e.g. F2: why is the anchoring of external knowledge not taking place?). And reversely, if regional authorities aim at strengthening or improving the performance of a system’s function, then it facilitates the identification of which structural element must be altered (e.g. F2: how can we improve our anchoring of external knowledge?).

Additionally, this joint structure, they claim, ensures that the analysis being executed has not left any aspect out of scope. Table 2.3 below shows an example of this framework using the first two functions identified in section 2.3; however the complete analysis of a RIS should, of course,
involve all 15 functions. A complete analysis of Brainport is, nonetheless, not the purpose of the present thesis project. In order to focus on the problem statement found in section 1.3, the analysis will be run only on function 10: ‘Financing of Innovation Processes’ along Chapter 3.

<table>
<thead>
<tr>
<th>System Functions</th>
<th>Structural Dimensions</th>
<th>Subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessing External Knowledge</td>
<td>Actors</td>
<td>Knowledge-exploiting Subsystem</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education &amp; Research Subsystem</td>
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<td></td>
<td></td>
<td>Political Subsystem</td>
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<tr>
<td></td>
<td></td>
<td>Innovation support actors</td>
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<tr>
<td></td>
<td></td>
<td>Demand</td>
</tr>
<tr>
<td>Institutions</td>
<td></td>
<td>Hard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soft</td>
</tr>
<tr>
<td>Interactions</td>
<td></td>
<td>At level of networks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>At level of individual contacts</td>
</tr>
<tr>
<td>Infrastructure</td>
<td></td>
<td>Physical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial</td>
</tr>
</tbody>
</table>

Continue with all 15 Functions of the Regional Innovation System.

Table 2.3: Joint function-structure framework (based on Table 2.2 and Wieczorek & Hekkert, 2012).

2.3 Rationales for Intervention in Regional Innovation Systems

2.3.1 Market Failures
The most widely known rationale for policy intervention is the market failure argument as developed by Arrow (1962). In the context of Innovation Systems probably the most relevant ones are ‘Information Asymmetries’ and ‘Knowledge Spill-overs’ because these two can lead to underinvestment in R&D as a consequence of high levels of uncertainty in the business environment and the public good character of certain types of knowledge. I.e. these two types of market failures may be responsible for the unwillingness of private agents to invest in the early stages of the firm lifecycle of NTBF, and it is the responsibility of Brainport Development to counteract these circumstances through adequate interventions. However, all four types of market failures are relevant to policy-makers seeking to further develop a RIS. Appendix A - Table 1 offers an overview of these market failures.

2.3.2 Structural System Failures
As it was mentioned at the beginning of section 2.2, Innovation Systems require fitness of not only the individual components of the system, but also coordination and alignment of these different apparatuses in order to ensure high overall-system performance. All of those problems that one way or another prevent or slow down the development and operation of an Innovation System, or negatively influence its direction and speed, are referred in the literature as Systemic Problems, Failures or Weaknesses (Wieczorek & Hekkert, 2012). As Weber & Rohracher (2012) explain, attacking these problems implies acting against conditions of perfect competition by, for example, promoting cooperation and collaboration among firms and knowledge institutes.

Much has been written about system failures in the last 15 years (OECD, 1997; Jacobsson & Johnson, 2000; Smith, 2000; Chaminade & Edquist, 2010); however, the listing to be used in this thesis project is that of Klein-Woolthuis et al. (2005). These authors suggested four categories of system failures that fit the structural dimensions listed in Table 2.1: presence/capabilities, institutional, interaction and infrastructural problems.
So as it can be seen in Appendix A- Table 2, the work of Klein-Woolthuis et al. (2005) complements Table 2.1 “Structural Dimensions of a RIS” by pointing at the aspects that need to be inspected within and among the structural components of an Innovation System. This is greatly useful for RIAs, such as Brainport Development, because it allows a thorough and adequate design of intervention plans and programs for a Regional Innovation System.

2.3.3 Transformational System Failures
According to Weber & Rohracher (2012), both market and system failures discussed in the two previous sections are indeed valid and useful; however, they do not address the goals an Innovation System has when aiming to transcend towards economically, socially and politically desired changes: direction of change, articulation of demand, coordination and alignment of institutional change in innovation policy with other policy sectors (taxation, regional, economic or industrial policies), and finally, reflexivity in long-term and uncertain change processes. Be it a change towards sustainability, or the co-development of the VC Industry with new technological clusters, these scholars suggest that regional authorities must ensure that the policy instruments used have a strategic and transformational orientation. For this, additional failures need to be made visible and addressed.

Debates in transitions management and in sustainability policy have inspired these two authors to propose a set of four ‘Transformational System Failures'; an overview of which can be found in Appendix A - Table 3. Even though according to the definition of Regional Innovation Agencies suggested by the OECD (2011) - and presented at the beginning of this thesis report- the mission of these organizations is to respond to market and system failures, we hope to identify transformational failures over which Brainport Development can or does act upon in order to encourage and facilitate the development of the region.

2.4 Interventions in RISs
Intuitively, a pre-requisite for the design and selection of instruments to be used for intervening in a RIS is the identification of failures affecting the Innovation System, which is facilitated by the tools provided in sections 2.2 and 2.3. Additionally, these tools allow a comprehensive view of the IS, which prevents the creation or worsening of other problems.

Interventions come in the form of strategic decisions, programs or projects that target the identified failures, and ultimately improve the overall performance of the system. These strategies and tools should aim at resolving or improving the condition of one or more failures; and in the specific context of Brainport Eindhoven Region, they are implemented by either the government or by Brainport Development. Please refer to Appendix B - Tables 1, 2 and 3, which indicate the goals that such instruments should have in correspondence to all failures listed in the previous sections, and they additionally point at the executor of such tools of intervention.

Ultimately, this research project will test if Brainport Development is intervening, for the better performance of the function of ‘Financing Innovation Processes’, in all failures in which Regional Innovation Agencies are indicated as the executors within Tables 1, 2 and 3 in Appendix B., which are all potential failures with the exception of those that involve development and coordination of legislation.

2.4 Conclusion
The merging of evolutionary economics with the apprehension of firms as ‘learning organizations’, and of research as a component of the innovation process (Arnold, 2004), has resulted in Innovation been regarded for at least 30 years now as a phenomenon of dynamic
and systemic nature. I.e. besides the internal factors of an enterprise, successful innovation occurring in firms has been linked to their systemic interactions and exchanges with external institutions and agencies, supply and value chains, competitors, governmental policies and cultural and social practices characteristic of a territory. Therefore, this implies that for effectively supporting NTBF in the region, Brainport Development needs to consider not only the lagging internal aspects of these young ventures, but also the capabilities of their supporting and complementary organizations (e.g. research institutes, universities, innovation brokers, banks, venture capital, business angels, etc.), the links NTBF have with these other organizations, the laws and cultural features inherent to the region, etc.

This systemic approach to innovation has inspired many scholars to try and develop a heuristic model that facilitates the visualization of the ecosystem in which firms are immersed: Innovation Systems. Given that Brainport is an Innovation System that comprehends the Southeast Netherlands, the ‘Regional Innovation System’ (RIS) model has been chosen as the fittest approach for studying it. Based on a suggestion from Doloreux & Parto (2005), an attempt to capture this concept has been developed:

A RIS is a set of interacting private and public interests, formal institutions and other organizations located in a common territory, which function according to organizational and institutional arrangements and relationships conducive to the generation, use, and dissemination of knowledge and new technologies.

Furthermore, this new perspective on innovation as a dynamic and systemic phenomenon has changed the justification of innovation policy intervention beyond market failures, to System Failures, and quite recently, to Transformational System Failures (Weber & Rohracher, 2012). In line with this systemic perspective on Innovation, a comprehensive framework is needed by Regional Innovation Agencies – like Brainport Development - in order to assess the performance of a region on a systemic level, additional to the neoclassical approach of supporting the individual components of the system. Such framework has been developed throughout Tables 2.1, 2.2 and 2.3, which is an analysis of the structural components of a RIS, seen through the lenses of 15 different functions that summarize the most crucial processes occurring in this type of Innovation System.

This framework provides a better perception of the coordination and alignment of the different components of the system and allows a structured and ordered evaluation, from a systems-level point of view, of the estate of a Regional Innovation System at any given moment. However, analyzing all 15 functions is not the goal of this thesis project, but instead, with the aim of focusing on the problem statement disclosed on section 1.3, Brainport Eindhoven Region will be studied on the specific function of ‘Financing of Innovation Processes’.

Finally, Tables 2.7, 2.8 and 2.9 explain in general terms the goals that interventions should aim for, as well as the organization responsible of implementing such interventions. With this, it has been identified which failures we expect Brainport Development to be addressing. This will be tested via interviews throughout Chapters 4 and 5.

Chapter 3. Conceptual Framework

The main goal of the present chapter is to use the general analytical framework developed in Chapter 2 for the function of ‘Financing of Innovation Processes’, which regards the problem that the present research studies. This analysis is based on a literature review on Venture Capital
and other routes of private financing to innovation processes. The result of this process is an ensemble of activities that represent what we expect to find after empirically researching the actual activities of Brainport Development. As it was briefly mentioned in the previous chapter, with the exception of the development and coordination of legislation, we presume that Brainport Development is actively tackling all other listed market, systemic and transformational failures. However, all listed failures will be tested in order to validate this assumption.

3.1. Venture Capital.

As Cooke et al. (2001) point out, and as it was made explicit in Table 2.5, a key infrastructural issue of a RIS is its financial competence, which includes both private and public finance. In the specific case of entrepreneurial activities, it is crucial to have available seed capital because it is necessary for getting innovative initiatives from an incubation phase into an independent start-up enterprise, as well as for further growing an already independent firm.

As Gompers and Lerner (1999) remark, Venture Capital (VC) refers to “independently managed dedicated pools of capital that focus on equity or equity-linked investments in privately held, high growth companies”. Several types of VC organizations exist; while some specialize in specific industrial sectors of the economy, others focus their efforts in particular phases of a company’s life cycle (Avnimelech & Teubal, 2006).

However, the narrow definition of VC firms that will be used along this thesis project refers to those organizations which have a dominant focus on financing the early stages of New Technology-Based Firms (NTBF). These NTBF are young (1-5 years old) firms whose main activity is R&D up until the initial sales stage, they are commonly characterized by high levels of technological and market uncertainty, which is accentuated by the fact that they typically operate in fast changing markets, and they often hold very few tangible assets; nevertheless, they offer a potential high reward in the case of being successful. As it can be appreciated, this definition of VC firms fits with the current needs of Brainport Eindhoven Region given that, in line with the problem statement in section 1.3, it is precisely NTBF who currently require financial support and business advice.

A high concentration of venture capital investments are necessary from a regional point of view because it can stimulate Open Innovation by fostering the continuation of successful development paths, which broadens a region’s knowledge base and ultimately opens up new fields and opportunities (Chesbrough, 2003) of development. As Etzkowitz and Leydesdorff (2000) point out, “Venture Capital is a key component of the new open innovation system, and to a large extent the fourth helix of the new organization of the production of knowledge”.

This is confirmed by Baygan (2004), who indicates in her report for the OECD that Venture Capital in these countries tends to be geographically focused on regional clusters and their existing areas of economic activity. This is particularly palpable in regions active in the knowledge-based economy, which are characterized by a substantial supply of highly skilled labor, a strong technological base, and a risk-taking entrepreneurial culture. Silicon Valley in the United States, Ottawa in Canada, Tel Aviv in Israel, and Seoul in South Korea are examples of such regions with high VC funds absorption. In all of these cases it appears that even though a dynamic economic infrastructure is essential, it is not sufficient. Legal and institutional settings, as well as the fiscal environment, need to also be aligned to the goal of fostering VC investments in the economy. I.e. every type of intervention in the Regional Innovation System should strengthen and stimulate the growth of private investing organizations, which will have the profit motive as the incentive to be more proactive than the public system in using systemic innovation as a key resource for wealth accumulation.
3.1.1 Traditional vs. Systemic perspectives on Venture Capital

Rosiello et al. (2010) differentiate among two different streams of research regarding VC and VC policy in the last decades. The most common one, known as the \textit{traditional}, pays attention to VC’s role of overcoming market failure in the financing of innovative initiatives through either fiscal provisions or institutional changes, which are assumed to take the VC market to equilibrium. Something positive from this stream of research is that it advises policy-makers to concentrate on financial incentives, the resolution of contractual problems, and institutional changes capable of inducing VC market emergence. On the other side, this view supposes that such measures would be applicable to any economic context where creating a VC market is the goal, and it has a strong supply-side bias which puts very little attention on the development of the capabilities of SUs and VC firms. Hence, the biggest limitation of this approach might be that it omits the processes involved in the creation of capabilities and infrastructures that lead to the emergence and consolidation of new (VC) markets and industries.

Alternatively, the second view to VC and VC policy approaches these from an \textit{evolutionary} perspective, which is based on a dynamic analysis of the \textit{co-evolution between high-tech entrepreneurship and VC}, and on the consideration that VC policy needs to adapt in accordance to the state of the system (Metcalfe, 1994). I.e. the evolutionary perspective tells us that policymakers need to overcome not only market failure, but also dynamic system failures linked to the emergence of entrepreneurial high-tech clusters.

Hence, this systemic approach points at the potential complementarity among public capital and private investments as a key factor for designing an efficient and effective VC policy. While basic and even some aspects of applied research rely on public research funds, exploitation and commercialization of innovations are to be sought by venture capitalists, business angels, and other arms of the private sector. (Cooke et al., 2001).

One of the most important implications of this evolutionary perspective is that VC firms, for their optimal performance, need to be adjusted to:

a) \textit{Supply agents:} investors who are not only interested in reducing transaction costs and agency problems, but also in maximizing their own returns.

b) \textit{Demand agents:} entrepreneurs willing to trade equity on their ventures in exchange not only of money, but also (non-contractual) added value services in the fields of management, strategy, mentoring, networking and reputation.

c) \textit{Institutional Framework:} in line with the evolutionary perspective described above, VC firms need to have great adaptation to the institutional framework in order to better seize public funds to complement their investments, but also to be able to provide higher quality on those services that entrepreneurs demand.

Furthermore, it has been interesting to find that literature on both approaches to Venture Capital recommend actions either in the form of legislation, programs and projects or activities to counteract most market, systemic and transformational failures that a Regional Innovation System may suffer in regard to Function 10: “Financing of Innovation Processes”. As it was mentioned in section 2.2.2, this function is closely tied to functions 9 (Incubation activities) and 11 (Provision of Consultancy Services relevant for Innovation Processes) since the three altogether relate to \textit{entrepreneurial activities} in a RIS. Hence, few of the measures suggested by literature relate to these two other functions as well.

For a structured analysis of what literature suggests as drivers and facilitators that increase the access to capital to entrepreneurs, the analytical framework developed in Chapter 2 will be used.
This means that a literature review will be executed on which instruments address what market, systemic and transformational failures in regard to the function of Financing Innovation Processes. As it was mentioned in section 2.4, some of the intervention tools address more than one failure, which is why those that do will be mentioned more than once.

3.2. Interventions to counteract Market Failures in the Financing of Innovation Processes.

Among other scholars, Gompers & Lerner (1999) argue that, unlike the traditional banking system, VC firms mediate between investors and innovative companies through mechanisms that overcome the market failures that arise from asymmetric information: uncertainties leading to underinvestment in R&D, moral hazard and transactions costs. This is, of course, far healthier and efficient for the performance of a RIS than relying solely on the banking system.

VC firms, however, may not always count with the sufficient financial and social capital, as well as the technological know-how to be able to reduce uncertainties between investors and entrepreneurs, which is why assistance from either or both, governmental organizations and RIAs might be helpful to reduce uncertainties. In the case of the government, equity programs are a perfect example of an instrument that can help jump-start the private venture market by sharing the risk of new ventures between the public and private sectors. Among the most used schemes in the OECD countries are public equity funds and hybrid funds, which have shown to perform better in the hands of private managers (Baygan, 2004). Regional Innovation Agencies, on the other hand, have the role of fostering interaction among heterogeneous actors like private investors, entrepreneurs and academics, with the aim of reducing uncertainties in all of them (more on this issue in section 3.3.3). Proposition A: Therefore, we expect that Brainport Development is actively reducing uncertainties among heterogeneous actors by, for example, fostering interaction.

Similarly, the funding of entrepreneurial activities is also subject to suffer double moral hazard: entrepreneurs making unethical or inefficient use of funds, or vice versa, investors or VC firms reaping excessive shares of the rewards of the venture. This issue translates into contractual problems between NTBF and VC firms, which can be resolved through intervening on the whole VC cycle: from initial investment in the VC fund, to the VC fund’s investment in a portfolio company, to the exit from the portfolio investment to allow the VC fund’s cash and non-cash investment to be recycled. Proposition B: Hence, we expect Brainport Development or a governmental organization to mediate between VC firms and entrepreneurs when contractual problems arise.

Lastly, several methods can be used to reduce transaction costs. The most common form of reducing costs for any product or service is the development of a market place, which in this context implies the development of second-tier capital markets, preferably linked to global equity flows. This is, however, an objective that involves several years of preparation and work, and that implies a co-evolution between the VC market and high-tech clusters, as it has been seen in countries like Israel (Avnimelech & Teubal, 2006) and Scotland (Rosiello et al., 2010). Alternatives include instruments such as fund-of-funds, crowdsourcing, competitions, and recent accelerating initiatives such as Start-Up Boot Camps. Proposition C: Consequently, we
presume that Brainport Development would be using at least one of these mechanisms in order to decrease transaction costs to the demand and supply sides of seed capital.

3.3. Interventions to counteract Systemic Failures in the Financing of Innovation Processes.

Countries and regions have had very varying success in directing capital to NTBF, notably in the form of Venture Capital, due to the great differences in attributes that each of them exhibits in regard to all structural dimensions (found in Table 2.1). Therefore, incrementing the available amount and sources of capital (Financial Infrastructure) has proven to not be enough; for instance, a RIS also requires that entrepreneurs possess the sufficient managerial and absorptive skills to handle such funds, legislation needs to be coherent towards this goal, regions need to breathe the air of a risk-taking culture, and high amounts of interactions among heterogeneous actors are necessary in order to increase trust and better handle risk. I.e., all Structural System dimensions need to be on shape for the financing of innovative processes to perform optimally in a RIS. For this reason, along this subsection a literature review is executed seeking for the most common instruments and actions capable of contravening all Structural System Failures by regional authorities, be it Regional Innovation Agencies or governmental ones.

3.3.1 Act ors Failures

**Presence:** all relevant actors need to be present in the RIS; therefore, regional authorities need to stimulate and organize the presence of a critical mass of entrepreneurs, investors and venture capitalists with financial and technical expertise; but complementary to this, it’s relevant for a region to possess bodies that perform incubation activities, as well as governmental or hybrid projects and platforms that provide consultancy services for the function of financing innovative processes. Unfortunately, not all regions have enough quantity and quality in regard to these actors, which is why some of them put their efforts into attracting people from other regions, or even other countries. Examples of this are Canada and Israel, who confronted to a lack of venture capitalists with enough managerial and technical expertise, filled this gap by attracting American business angels (Baygan, 2004).

Nevertheless, the presence of these actors does not suffice if it occurs only at an individual level; in order to create greater visibility within the region’s high-tech sectors for each type of actor, the organization of networks of *homogeneous* agents can also be really helpful. These networks can be formed for venture capitalists (to learn from each other’s practices), or entrepreneurs (to share ideas, meet potential suppliers, and most importantly, potential clients that will bring income to the firm). However, probably the most relevant type of network is that one of Business Angels, which facilitates the access to capital and expertise to entrepreneurs because instead of investing in a lengthy search within their social networks, entrepreneurs now have highly visible and often highly professional organizations where to go directly asking for what they need (Mason et al., 2013). **Proposition D:** Accordingly, we expect Brainport Development to stimulate the presence of all relevant actors at both, the individual and network levels.

**Capabilities:** there have been numerous efforts in Europe to develop high impact VC policies; however, Rosiello et al. (2010) report that at the beginning of the 2000’s there was a consensus that such attempts had had results far below expectations. The main reason for this was that the government’s main objective was simply to fund the “gaps” (Baygan & Freudenberg, 2000;
Baygan, 2003); i.e. priority was given to increasing the access to capital, without any regard to the development of capabilities of both, entrepreneurs and VC firms.

Therefore, it is necessary to facilitate the specialization of VC firms in the different mechanisms of the investing process, and in the accompanying added-value services they offer to companies that function in specific industrial or technological sectors (Rosiello & Parris, 2009). Additional to these, relevant mechanisms that venture capitalists need to master are systemic search and selection procedures, because through these two it is possible to turn ‘systemic innovation’ into a tangible source of value and welfare (Cooke, 2001). Moreover, different schemes like government equity programs, or hybrid fund-of-funds allow the training of managers who can later start their own VC firms, which additionally contributes to the shaping of a venture culture. **Proposition E:** Thus, we believe that Brainport Development should be stimulating the capabilities of (new) VC firms by the two schemes previously described in order to reach critical mass in the number of high quality VC firms in the region.

And in line with this, as Mason & Harrison (2003) remark, policy must also facilitate the perfecting of entrepreneurial, managerial and technological capabilities of NTBF in order to generate a critical number of opportunities ready for investors, which allow VC firms to use systemic innovation as a source and channel of continuous re-investment and wealth creation. Addressing the development of capabilities in NTBF is relevant also because this ensures that governmental subsidies and investment are not wasted on young companies that are not credit worthy. An example of interventions in this regard is the “Investment-readiness” programs executed in the United Kingdom, which enhances not only small firms but also spin-offs originated in public research institutes and universities (Mason & Kwok, 2010). **Proposition F:** Therefore, we expect that Brainport Development supports the development of attractive business plans in NTBF, together with different schemes that enforce managerial and financial knowledge on entrepreneurs of the region.

3.3.2 Institutional Failures

**Presence:** ensuring the presence of hard institutions (laws, regulations and standards) is generally the responsibility of either national or regional governments, and not of Regional Innovation Agencies. For this reason, given that the focus of this research project is on RIAs, hard institutions will be discussed on a broad and general level. On the other hand, soft institutions can indeed be made present both, directly and indirectly, by Regional Innovation Agencies. **Proposition G:** Thus, we expect Brainport Development not to be responsible of developing any type of hard institution; however, this agency may indeed contribute to the reinforcement of soft institutions.

**Capacity:**

**Hard Institutions:** regions may need a complete array of hard institutions that should preferably be tailored to their specific economic systems and stages of development in order to ensure a continuous access and flow of capital to young firms. In short, Baygan (2004), Rosiello et al. (2010) and Avnimelech & Teubal (2006) recommend, the consideration of institutions that reduce quantitative restrictions on investors, reduce opacity of venture capital funds and protect investors, remove barriers to inflows of foreign venture capital finance, simplify tax treatment of capital from different sources and types of investments, reduce tax rates for high capital gains and wealth, remove barriers to entrepreneurship, facilitate alternative investment pooling vehicles, such as funds-of-funds or crowdfunding, ease alternative exit routes such as Mergers & Acquisitions, etc.
**Soft Institutions:** an interesting study performed over Silicon Valley by Micklethwait & Wooldridge (2000) aimed to unveil, among others, the cultural characteristics that contributed to this region’s outstanding innovative performance. The results identified tolerance of treachery and failure, risk-seeking attitudes, meritocracy, collaboration, restlessness and desire to reinvest in the cluster as conducive to an ecosystem that fosters and rewards innovation.

**Proposition H:** Accordingly, we expect Brainport Development to use any type of instrument that contributes to these cultural institutions in a RIS, such as workshops, seminars or university courses.

### 3.3.3 Interaction or Network Failures

**Presence:** as it has already been mentioned before, guaranteeing the occurrence of interactions and open communication among all heterogeneous actors involved in the funding of NTBF, at the individual and network levels, is key to the reduction of uncertainties as well as to the development of a private VC investment culture, the increase of trust, reputation and reliability among people (Cooke, 2004), and very importantly, the effective coordination and partnership among different actors of the RIS. **Proposition I:** Therefore, we expect Brainport Development creates spaces where (potential) investors, venture capitalists, banking representatives, regional authorities, academics and entrepreneurs meet at both, the individual and network levels delineated in section 3.3.1, because this is crucial to the flow of funds that fuel new ventures.

Baygan (2004) remarks as something of high impact to facilitate links among business angel networks and private and public technology incubators since really interesting outcomes can arise from linking these, like a sudden and explosive increase of deals; but also, larger funds can be pooled when these regional networks are linked to national or even international business angel networks. Also, given that business angels are people that invest their own personal funds, in the case that the venture fails it can have very detrimental results for their personal affairs. For this reason it is reasonable to encourage interaction among them and venture capital firms, so that business angels can share the risk involved in their investment through shared funds.

In this regard, governments or semi-public agencies can sponsor venture fairs, seminars and workshops on private equity in order to motivate the formation of such shared pools of funds, and to create synergies among informal and formal risk capital providers (Baygan, 2004). With the same aim of providing better communication flows among heterogeneous actors, recent years have witnessed the development of informational tools (mostly provided through the Internet) that link entrepreneurs with investors and regional agencies or other organisms that can provide them with support. Even though these communication and information exchange platforms are usually developed by the private sector, public efforts can be directed towards kick-starting projects of this kind.

**Proposition J:** Consequently, we expect Brainport Development to encourage the creation of links among business angels and public technology incubators or public research spin-offs.

**Proposition K:** And likewise, we expect this RIA to actively create links among local and regional business angel networks, as well as with national networks of this kind.

### 3.3.4 Infrastructural Failures

**Financial Infrastructure:** several are the potential sources of seed and growth capital in a region; nonetheless, these are not always (properly) tapped on, which can makes it seem like there is not enough private capital available. **Proposition L:** For this reason, we expect Brainport Development to actively increase access to new pools of capital for NTBF entrepreneurs to use.
Ideally, mature VC markets will only need the available private capital for fueling new ventures; however, capital equity markets that are just emerging need the investment of public capital as a catalyst towards their development. Rosiello et al. (2010) explain that the creation of hybrid, privately owned and managed funds was one of the most important approaches that led towards to consolidation of the VC market in Israel. This complementarity of investments not only increased the pools of finance for entrepreneurs in Tel Aviv, but it also encouraged private investors to take risks and contribute to the clusters with their expertise. Nevertheless, as Gilson (2003) remarks, complementarities are context dependent, meaning that tailored schemes are preferred over the replication of solutions from elsewhere. **Proposition M:** Despite of this, we expect Brainport Development to seek for complementarities among public/private investments.

Another investment pooling vehicle that is currently gaining attention around the globe is **crowdfunding** which, if properly regulated, has the potential of allowing entrepreneurs to access pools of capital with no precedent, while at the same time distributing the risk of a venture among several participants. **Proposition N:** For this reason, we expect Brainport Development to encourage the creation of a space for experimentation and development of crowdfunding.

Furthermore, an important aspect of the financial infrastructure of a RIS is the exit mechanisms that regions offer, by which investors reap their profits. The success of exits affects the circulation of capital to different ventures because investors will be willing to reinvest in the clusters only if they perceive their investments are being properly rewarded. With this been said, the most common exit mechanisms are in the form of IPOs or Mergers & Acquisitions (M&As), which if monitored in a regional level can be a great way of benchmarking the profitability of VCs. For this reason, Baygan (2004) encourages the formation of second-tier stock markets that are adequately linked to global equity flows and with less stringent admission requirements and lower costs in relation to first-tier stock markets. This, however, has proved to be a challenging goal for any region as very varied and disappointing results have occurred in many countries. **Proposition O:** Thus, we expect Brainport Development to encourage the formation of second-tier stock markets, parallel to enhancing the processes involved in M&As.

**Appendix C – Table 2 offers an overview of the goals of Instruments used to counteract Structural System Failures in Financing Innovative Processes.**

### 3.4. Interventions to counteract Transformational Failures in the Financing of Innovation Processes.

As it was already mentioned in section 2.3.3, transformational failures refer to four main issues that need to be tackled by regional authorities when an economic, social or political change is desired in an Innovation System. In the particular case of Financing of Innovation Processes, transformation is desired only in regard of the first two spheres:

- The desired economic transformation is the consolidation of long-term mechanisms that permit the systemic reinvestment of private funds within the clusters or sectors in which the region specializes. This involves routes of both, investment and exits.
- From a social perspective, the transformation that is sought after is that of a venture culture, with high tolerance to failure and treachery, risk-taking attitudes, meritocracy, eagerness to collaborate and restlessness until success has been achieved.

The first failure concerns **directionality**, which in general terms refers to a lack of vision, collective incoordination, and insufficient regulations and standards to guide the desired changes.
In the case of long-term mechanisms that allow the systemic reinvestment of private funds in the RIS, several regions in the world have created the vision of creating first or second-tier equity markets linked to global equity flows. For this, collective coordination is organized through long-term programs that aim to ensure the presence of a critical mass of the most relevant agents (VC firms, business angels, and credit-worthy entrepreneurs), and to adjust regulation progressively as the VC market evolves. Moreover, as it has already been discussed along the current chapter, a different mechanism for pooling funds is the creation of funds-of-funds, which again needs the coordination of heterogeneous agents (principally governments and private investors and managers), and the development of regulations that secure an appropriate use of the resulting pools of capital. However, equity markets and hybrid funds are “traditional” solutions that have been around for many decades, and which have not proved to be appropriate for every region due to their complexity and the long time it takes to implement them. Nonetheless, current informational technologies might very well offer innovative solutions that are simpler and shorter to enable, like the case of crowdfunding. Due to its recent introduction, the feasibility of this source of capital still needs to be properly studied, after which regulations and standards to guide its development must be designed. Proposition P: Therefore, we expect that Brainport Development is actively trying to get stakeholders in the region to agree in the vision of a schemes which would allow the systemic re-investment of funds within the region’s Spearhead sectors.

In regard to social transformations, the vision of developing an entrepreneurial culture in the RIS must be made shared among all stakeholders of a knowledge-based economy because everyone takes a part on it. For example, while RIAs can encourage entrepreneurial behavior through assertive marketing campaigns, universities can contribute to this goal through courses, forums, seminars and workshops that motivate future professionals, and the private sector has the chance of creating a greater tolerance to failure through different incentive mechanisms as part of their corporate culture. Moreover, actions like this can be properly coordinated by RIAs through long-term programs that involve all triple-helix actors, which must be guided by proper regulations and funding. Proposition Q: Thus, we expect that Brainport Development and its partners are all actively seeking the reinforcement of an entrepreneurial culture within the region through several complementary routes.

Next, the demand articulation failure is undertook by having a closer look at the needs of all stakeholders involved in the function: investors, venture capitalists and entrepreneurs. For example, investors will have an expected Return on Investment rate (ROI) that puts pressure on both entrepreneurs and VC firms because if it not met, the funds of these individuals will most probably be invested somewhere else; venture capitalists, on the other hand, need to have access to a big pool of investment-ready opportunities, as well as an institutional environment that provides them relatively easy access to complementary capital and expertise, and that facilitates them reaping the rewards of their work through appropriate exit mechanisms; and lastly, entrepreneurs need access to capital and complementary know-how in order to make their ventures a success. Proposition R: Consequently, we expect that Brainport Development is actively seeking to articulate all of these needs with a deeper level of detail.

Policy coordination is the third transformational failure that can take place. Policy is typically not the responsibility of RIAs, therefore it suffices to say that VC policy must be coordinated across different systemic levels – regional, national and European -, but it should also create synergies with other research, technology and innovation policies. Proposition S: Therefore, we expect that Brainport Development does not contribute to the coordination of different levels and spheres of entrepreneurship, science and innovation policy.
Lastly, policy-makers and RIA managers must learn from past occurrences and failures. Therefore, there needs to be persistent **reflexivity** processes and mechanisms that monitor the transformations happening in the RIS, and which facilitate the anticipation of events and therefore the development of adaptive strategies. **Proposition T**: Thus, we expect that Brainport Development possesses a monitoring tool capable of providing constructive feedback to the agency about the impact of their activities over the behavior and situation of entrepreneurs, VC firms and investors.

**Appendix C – Table 3 offers an overview of the goals of Instruments used to counteract Transformational Failures in Financing Innovative Processes.**

### 3.5. Conclusion.

Along the present chapter, the general analytical framework developed in Chapter 2 was used for studying the function of ‘Financing of Innovation Processes’, which includes the problem statement presented in section 1.3. Based on the traditional and systemic perspectives on Venture Capital - and other routes of private financing to innovation processes - , a total of 20 propositions where developed. The latter indicate what we expect to find after empirically researching the actual activities of Brainport Development.

With 20 different - but connected - items to verify, this conceptual framework has allowed the easy identification of issues and opportunities in a RIS from the perspective of Regional Innovation Agencies and regional governments. This shows that RIA managers may find it useful to guide the design of their projects and programs aimed at increasing the availability of private capital and managerial knowledge to NTBF, through Tables 3.1, 3.2 and 3.3.

The first limitation of this framework, however, is that it serves only as a checklist that ensures that every single important aspect is taken into account; i.e. RIA managers have the flexibility to creatively design programs and projects that address several of the issues - found in Tables 3.1, 3.2 and 3.3 - with different combinations adjusted to the specificity of the RIS at hand. Moreover, even though several mechanisms have been proposed throughout this chapter thanks to a literature review on actions taken in other regions in the world, other and innovative mechanisms may offer better results to Brainport Eindhoven Region. Therefore, discovering that Brainport Development aims to improve the situation on the region through novel mechanisms is expected.

**Chapter 4. Methodology**

The current chapter expands on the Methodology of the empirical research, which was already introduced in sections 1.4 and 1.5. As it was mentioned there, this thesis project uses the Case Study methodology because, as Yin (1994) remarks, a case study is “an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”. The lack of an experimental setup in this research methodology makes it useful for answering “how” and “why” questions, which suits the “how” kind of question that motivates the present research project: “How is Brainport Development addressing the problem of lack of access to seed capital that NTBF in the region face?”
4.1 Data Collection

In order to answer the research question and achieve the research objective, this study will make use of multiple sources of evidence. To accomplish data triangulation, i.e. construct validity, the following sources will be employed: desk research – which includes documents, reports and websites released by Brainport Development, Fontys University of Applied Sciences and BOM –, as well as semi-structured interviews with relevant project leaders in the region. These two main sources of information give a very clear picture of the current programs, projects and other activities executed by this hybrid organization in regard to the financing of young high-tech firms in the Brainport Eindhoven Region.

4.1.1 Desk Research

Brainport Development has two main sites on-line that offer information about this issue; the first one is the general site of this agency in which general information is provided, while the second one is specific for the Brainport Networking Financials (BNF) program, in which details are given in regard to most projects part of BNF. Furthermore, Fontys University of Applied Sciences offers information on the research they are currently working on for the benefit of contributing to this problem. Likewise, using the search engine Google, it was possible to find reports regarding the topic, which were released by the region’s governmental agency BOM. A list of these sources is presented in Appendix E.

4.1.2 Interviews

This subsection describes the preparation of the interviews performed for this research project, which includes the choice for the various interviewees and what information the interviews aimed to retrieve from each participant.

4.1.2.1 Interview Subjects

As Yin (1994) remarks, semi-structured interviews are the most essential and valuable source of evidence within the case study methodology. The interviewees were picked based on their experience and knowledge, as well as on their involvement with Brainport Development’s work towards supporting NTBF in the region. These respondents were contacted via e-mail on a first instance in order to invite them to participate in the research, from which a total of 5 people accepted. After asking for permission, all the interviews performed were recorded. Four of the participants were inquired personally, whilst a last individual participated via phone call. The list of participants can be found below, in Table 4.1 (for more detailed information in the experience and responsibilities of the interviewees refer to Appendix F).

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Job Position</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Onno Lint</td>
<td>Head of Lectoraat Brainport research group</td>
<td>Fontys University of Applied Sciences</td>
</tr>
<tr>
<td>Carina Tielemans</td>
<td>Project Leader of Brainport Networking Financials</td>
<td>Brainport Development</td>
</tr>
<tr>
<td>Anne Verhaag</td>
<td>Project Manager of European-level projects, and part of the 'Strategy' sector of the agency</td>
<td>Brainport Development</td>
</tr>
<tr>
<td>Gijs Van De Molengraft</td>
<td>Business Consultant</td>
<td>Brainport Development</td>
</tr>
<tr>
<td>Monique Sonnemann</td>
<td>Business Consultant</td>
<td>Brainport Development</td>
</tr>
</tbody>
</table>

Table 4.1: List of interviewees.

The interviews were carried out in a predetermined sequence. The person chosen to be the first participant was, Dr. Onno Lint, professor at Fontys University of Applied Sciences and head of the research project Lectoraat Brainport (more on this project in section 4.2.4), which has been
investigating the question “How will Brainport, the world’s smartest region, grow high-tech top companies at comparable rates to top international regions?” since 2011; and besides this, Dr. Lint has 25 years of experience as an investor in high-tech firms with a strong R&D base. These two characteristics made Dr. Lint the perfect first interviewee as he had the knowledge and experience to contribute with the broadest and deepest perspectives to this research project. Likewise, the research team he leads is currently focusing on the study of alternative routes to funding such as crowdfunding, which allows us to retrieve information about future possibilities for the region from him.

Subsequently, Mrs. Carina Tielemans, the project leader of the recently launched program Brainport Networking Financials (BNF), was interviewed. As it will be thoroughly explained along the next subsections, this is the umbrella program that has been initiated in Brainport Development specifically for addressing the problem of lack of access to private capital that NTBF entrepreneurs face in the region. She was a key interviewee for this master thesis as Mrs. Tielemans is involved in every single project part of the BNF program, which has made herself acquainted in the last year with the views and needs of all agents involved (entrepreneurs, bank representatives, VC firms and business angels). Furthermore, as a project leader, Mrs. Tielemans was capable of providing information regarding activities being carried out now and which have not yet been released to the mainstream media, and regarding future actions to be taken by Brainport Development in the coming months.

To complement these interviews other relevant personnel from Brainport Development participated in the interviews, like Mrs. Anne Verhaag whose main contribution concerned the way in which the strategy of Brainport Development is framed. And finally, Gijs Van De Molengraft and Monique Sonnemans, who provide consultancy services in the areas of management and finances to NTBF and SMEs in the region, were interviewed in order to get better acquainted with the quality of both entrepreneurs and VC firms in the region, as well as to confirm the information provided by Dr. Lint and Mrs. Tielemans.

4.1.2.2 Interview Set-Up

The general purpose of the interviews is to gather information about the activities and projects that Brainport Development performs in order to contribute to a greater number of NTBF in the region growing into independent and fast growing firms, by increasing their ability to access private capital and managerial advice. For this purpose, using the semi-structured type of interview is the best choice as it will allow to gather in-depth information. The main benefit of this interview format is that the answers provided are more likely to contain information beyond what was specifically asked; such information is not obtained when the structured interview format is used. The topics that the interviews discuss were defined as propositions throughout Chapter 3. This listing of actions to take in order to tackle market, systemic and transformational failures served as the basis for the Interview Guide presented in Appendix G; however, the questions did not follow the same order in which the propositions were presented, by starting with those belonging to transformational failures, followed by those corresponding to market failures, and finalizing with those that regard structural system failures.

Due to the variety of participants and the semi-structured format, the Interview Guide was slightly adapted along the interviews in order to obtain deeper information regarding specific knowledge of each interviewee. Given that the exact texts of the interviewees cannot be published due to a decision of Brainport Development to keep them confidential, a summary of the information retrieved at each of these interviews can be found in Appendix H. The main results of the interviews, as well as the written sources will be discussed in Chapter 5.
4.2 Validity and Reliability

A great disadvantage of reports released by Brainport Development is that the information published by this organization has a great probability of being biased given that besides informing, these reports have the additional goal of promoting the region among national and international agents. This type of bias is also an inherent characteristic of the information retrieved from the semi-structured interviews executed due to the exploratory nature of this study. Below, a description of the efforts made in order to increase the validity and reliability of this research.

The first efforts consists on data triangulation, for which 3 different sources of information were used: scholar articles, reports published by Brainport Development and other European organizations, and a series of interviews. Internal validity is increased by making use of these academic articles about the region, by sourcing from national institutions such as the Municipality of Eindhoven and the Ministry of Housing (Ministerie van Volkshuisvesting), as well as by referring to reports released by European organizations such as Technopolis. This, however, reduces the ability to generalize findings.

Second, the interviews address direct and indirect parties involved in intervening on the Regional Innovation System of Brainport Eindhoven Region in regard to the pressing issue (as described in section 1.3) of lack of access to seeding capital that entrepreneurs of NTBF face. In this way, besides talking to the project leader of the BNF program (direct party), the head of the research team in Fontys University of Applied Sciences that focuses on this problem was also interviewed (indirect party), along with two consultants of Brainport Development who support NTBF with business and financial advice (indirect party). Including the perspectives of these other parties offers a broader vision of the current situation in the region, as well as a more extensive view of potential solutions. This means that the research collected both general and in depth data.

Moreover, an additional menace to the validity of the information obtained through the interviews is the ‘social desirability’ bias. In particular, parties do not want to reveal information that by being published might be detrimental to the image of Brainport Development or any of its projects and activities. In order to counteract this every participant was informed that the information disclosed by them would be confidential.

Fourth, in order to improve the reliability of the study, all respondents were given the opportunity to reflect on the results of their interviews. This was done via e-mails in which they were requested to review and approve the statements made in them; unfortunately, only 3 out of 5 participants responded to this procedure. The reflections received were all positive, with only small corrections concerning Dutch-to-English and other grammatical errors; despite of this, the overall validity and reliability of the results cannot be considered high. This is mainly due to the low number of respondents, as well as the exploratory nature of this study.

The following Chapter provides an in depth analysis of the main results of the interviews, together with information retrieved from websites belonging to Brainport Development and the Brainport Financials Network program and a report released by BOM.
Chapter 5. Results

The main objective of the present chapter is to, first, introduce the activities that Brainport Development performs in regard to the problem statement described in section 1.3: a large number of NTBF in the Brainport Eindhoven Region do not succeed at developing into independent and fast growing companies after the first few years of their operations, mostly due to a general lack of access to seeding private capital and a lack of expertise in the areas of management, financing, social networking and marketing.

Second, all of the propositions developed in Chapter 3 will be verified/falsified by using the information retrieved from both, the desk research and the interviews.

5.1. Programs, Projects and Activities of Brainport Development

Supporting the creation and rapid growth of SMEs is a key priority to the Triple-Helix representatives of Brainport given that these firms are the main propellers of innovation, its valorization and the economic growth and job creation that come with it. For this reason, Brainport Development created at the beginning of 2012 an umbrella program called Brainport Networking Financials (BNF), which agglomerates a total of 5 projects and activities that aim at increasing the access to *private* capital for entrepreneurs in the region. While few of them aim at increasing the links among heterogeneous actors in the region (i.e. bank and government representatives, investors, venture capitalists, researchers and entrepreneurs), others try to increase and diversify the sources of capital available to entrepreneurs, and a last one is fully dedicated to the study and analysis of new alternative mechanisms to help this concern (sites.google.com/a/brainportdevelopment.net/brainport-networking-financials/home, 2014).

Before going into detail about the BNF program, however, it is worth mentioning that activities aimed at helping this pressing issue are not limited to this program. A simple but very useful initiative has also been co-initiated by Brainport Development: the site “SME Financing Guide” (mkbfinancieringsgids.nl, 2013). This website provides SMEs with a guide to all financing alternatives in the region, ranging from subsidies and loans, to venture capital. All that entrepreneurs need to do is indicate their location, the sector their firms operate in, the amount of capital they require, and this site will provide them with a list of options and contact information to get things started. Also, in this website entrepreneurs will find tips for successful funding application and information about different institutions that can provide them with advice and support; all of it without any charge.

Likewise, Brainport Development, in collaboration with Fontys, the TU/e and BOM, initiated the project “Bright Move”. This is an initiative that has three main objectives. First, the aim is to cultivate an entrepreneurial culture in young people since an early stage throughout their educational programs with courses and workshops on entrepreneurship. Second, it creates a space to actively transfer knowledge from universities and high-tech companies with consolidated R&D departments to NTBF, in order to assist the latter in overcoming the problems and difficulties of their initial development phases. And lastly, this program puts patent and financial experts, as well as business developers, at the disposal of start-ups and university spin-offs so they can build a financially and technically viable business plan; this is then complemented with *public* capital in the form of *loans* which comes from the Dutch Ministry of Economic Affairs, the province of North-Brabant and SRE, which allows these young firms to grow and develop into independent companies. So, as it can be appreciated, this joint effort is very thorough. It not only supplies NTBF with their most relevant necessities, i.e. capital and expertise, but it also contributes to the reinforcement of soft institutions (i.e. risk-taking
attitudes and behavior) in the region; however, this is all done only by making use of *public* funds. Therefore, Brainport Development intends to complement this initiative by stimulating a greater access to *private* capital and expertise through the BNF program.

Finally, it is worth mentioning once more (as in Chapter 1) that Brainport Development assists regional industry with corporate advice and funding, starter provisions, corporate housing, incubation facilities and business centers. Relevant to the problem statement of this research project is the fact that, without any charge to entrepreneurs, business consultants support young firms in the development of sound business propositions with the aim of making these firms more attractive to investors, which ultimately increases their chances of developing into independent and fast growing companies. Fortunately, two of Brainport Development’s business consultants agreed to contribute to this research; an abstract of the interviews can be found in Appendix H, interviews 4 and 5.

The following subsections treat in detail the objectives and mechanisms of each of the six different projects and activities which are part of Brainport Networking Financials.

### 5.1.1 Next OEM

The next OEM is an acceleration program which has been co-initiated by Brainport Development in partnership with Brainport Industries, PricewaterhouseCoopers, Brabants Chamber of Commerce, and the Employers’ Organization for Brabant and Zeeland, and which to date counts with both private and public investment partners – a group of 10 venture capital firms, and BOM, which is the regional arm of the Dutch Ministry of Economic Affairs for Brabant ([http://www.nextoem.com/home/](http://www.nextoem.com/home/), 2013).

Next OEM is aimed at young high-tech companies which have already passed their POC (Proof of Concept), have preferably already achieved their first launching customer, and which have the potential and are eager to grow into global Original Equipment Manufacturers (OEM).

Parties involved have benchmarked the most successful business plan competitions and acceleration programs for technology firms in the world, with the aim of creating tailor-made six-month agendas that will help 10 companies every year to grow from less than €10 million euros of income a year, to over €100 million euros in the next 5 to 10 years. The scheme of the program includes master classes, workshops, an international trip and peer-review sessions with other participants. This ambitious goal is to be achieved through professional industrialization, the linking to new international customers, business planning, intellectual property protection and financing provided by elite teams of experienced high-tech entrepreneurs, a large number of specialists in a broad arrange of fields, and investors. In exchange for all of the assistance and resources provided to entrepreneurs, partners who intervene in each project propose to receive 1% of the shares of the new OEMs as reward, which ensures meritocracy as the basis of the competition.

This is a fairly new initiative, which up until now has spent all of its efforts in the organization and design of its program, which is why its first round is expected to run at the beginning of 2014.

### 5.1.2 Brabant Equity (Dutch: Brabants Vermogen)

Brabant Equity is a program which Brainport Development initiated quite recently together with other parties - Bright Move (mentioned at the beginning of this section), TIC, Starterslift, BOM and Rewin -, and is therefore still on an initiation stage. The main idea behind this project is the creation of a portal website in which innovative start-ups and growing firms of the region can
obtain a greater visibility for their ventures; this with the objective of attracting both, venture capital and business angels.

The approach of Brabant Equity is three-fold. First, it tries to create awareness among regional actors through workshops and presentations. Also, it profiles both, start-ups and investors, with the aims of enriching the database that will eventually be published in the portal, and to use this information as an input for their third focus of activities, which is about to be explained. And finally, Brabant Equity tries to link heterogeneous actors in the region through networking events and special matchmaking meetings. The latter, is complemented with the competence of accountants, tax consultants and lawyers who contribute to the development of high quality investment propositions, with the intention of grabbing the attention of potential investors. Given the newness of this project, Brabant Equity is concerned in monitoring the investment propositions that they release to the market, in order to receive feedback that would allow them to improve their services.

As it was mentioned before, Brabant Equity is a project that has been started only recently, and therefore its impact is still hard to evaluate. However, its activities are quite relevant and promising.

5.1.3 Healthy Aging Venture Forum
In 2012 the first Ambient Assisted Living Forum took place in the city of Eindhoven. This is an event that gathered more than a thousand attendees from which only a fourth consisted of Dutch nationals, and as its name indicates, this is an event that has a sectorial focus: ICT technology in the field of Ambient Assisted Living.

The main goal of this initiative is making an exchange of insights on policy, business models and interesting technological solutions related to this area among stakeholders in Brainport, the rest of the Netherlands and other regions of Europe. For this, the event tries to attract the most influential firms in the sector, young fast growing companies, Dutch and international investors (funds and companies), venture capitalists, academic and research institutes, public purchasers, Dutch and European political figures, care institutions and, of course, elder people representing the final consumers of this sector. Moreover, the event offers a diverse array of activities such as lectures, workshops, pitches, a commercial exhibition fair, field visits and meet & greet sessions that stimulate participants into initiating discussions and exchanging ideas and contact information.

As a result of such exchange, the forum has several ambitions. First, the identification of discrepancies among policy and technological developments, that could encourage policy-makers to create better synergies among these two at regional, national and European levels. Second, the forum expects entrepreneurs to feed themselves with attractive areas of research as well as with possibilities to initiate joint endeavors together with motivated investors in the future. All in all, the ultimate goal is building a community around the sector which is more aware of the future opportunities for researchers, entrepreneurs, investors and the elder.

The year 2013 did not see an AAL Forum event; however, a second and improved version is already scheduled for May 2014. Evaluations will be made in order to assess the best timing for continuing with this initiative, and even extend it to other sectors.

5.1.4 Lectureship Brainport (Dutch: Lectoraat Brainport)
One of the most useful initiatives to resolve the issue that this thesis project studies, is the creation of ‘Lectureship Brainport’. This is a research project that emerged in late 2011 as a
collaboration between Brainport Development and Fontys’ faculty of Management, Economy and Law, whose purpose is finding an answer to the question “How will Brainport, the world’s smartest region, grow high-tech top companies at comparable rates to top international regions?” (http://fontys.nl/Over-Fontys/Fontys-Hogeschool-Management-Economie-en-Recht/Lectoraat-Brainport.htm, 2013).

In order to provide this answer these two organizations have organized several research teams that include postdocs, staff of Brainport Development as well as students and lecturers of Fontys. While Brainport Development offers regional business data, as well as data from monitoring other international knowledge regions, Fontys performs practical studies in relation to the development of new regional development strategies and financial instruments.

In specific, the focus of these teams is doing applied research in regard to two key areas: the real needs of entrepreneurs, and the spatial conditions in which innovations are created. Hence, the first field examines the valuation, financial needs and possibilities, as well as the performance of recently launched and rapidly growing firms in the Brainport Eindhoven Region. The second one analyses the causes and effects of a firm’s regional embeddedness, which involves the study of the vacancy, aging and oversupply problems of the corporate real estate market. With this strategy, Lectureship Brainport expects to be able to give useful results to policy-makers and other stakeholders in relatively short periods of time.

To date Lectureship Brainport has already released a list of areas in which they consider that study and follow-up is necessary in order to help NTBF have access to financing and develop into independent fast growing firms:

1. **Monitoring fast-growing high-tech:**
   a. Development of a bottom-up monitoring instrument to determine demographics and DNA of rapidly growing companies.
   b. Coupling of this new instrument to regional policy and top sector policy.
   c. Use this tool to benchmark with other top knowledge regions in the world.

2. **Funding:**
   a. Apply a different assessment to the financing of NTBF.
   b. Better use of financial instruments during the different growth phases of a company, both from regional funds and incentives as from the private sector.
   c. Investigate the possible role of very wealthy individuals in financing NTBF.
   d. Possible role of crowdsourcing and crowdfunding for NTBF.
   e. Possible role of a hybrid fund-of-funds in order to spread risk and return.

### 5.1.5 Business Angel Network Brabant

This last initiative is a project in which Brainport Development aims to collaborate closely with BOM. At the time this text is being written its objectives and ambitions continue to be articulated and its organization is still on the planning; however, Brainport Development strives to get it running on January 2014.

In brief, Business Angel Network Brabant aspires to create a network of informal investors so that the financial infrastructure of the region is easier to map by regional authorities, and so that these investors gain more visibility in front of entrepreneurs. Likewise, a professional profiling of these investors is necessary in order to identify expertise complementarities with which they could contribute to the growth and market consolidation of NTBF.
5.1.6 Conclusion
Along this chapter all the projects and activities of Brainport Development in regard to the problem statement described in section 1.3 have been detailed. As it has been explained, all of these initiatives are new, with few of them still on organization and planning phases, which is why assessing the impact of Brainport Development’s work remains difficult. However, in order to comprehend the potential effect of these initiatives in the NTBF of Brainport Eindhoven Region, this thesis project will assess each of them against the propositions developed in Chapter 3; the results of such analysis, though, will not be conclusive towards the quality and adequacy of the work performed by Brainport Development. Such analysis, which is provided in the coming sections of this chapter, will aim to provide a final answer to the research question.

5.2 Verification and Falsification of Propositions
The objective of the current section is to evaluate the activities of Brainport Development against the propositions developed in Chapter 3 in regard to the function “Financing of Innovation Processes”. This analysis is fed by the information disclosed in section 5.1 (which mostly originates from desk research), as well as by remarks made during interviews by staff of Brainport Development and the head of Lectureship Brainport, in Fontys University of Applied Sciences.

It is expected that this evaluation will give a thorough answer to the research question that motivates this thesis project: “How is Brainport Development addressing the problem of lack of access to seed capital that NTBF in the region face?”

5.2.1 Market Failures
As it was explained in section 3.2, for the specific case of Financing of Innovation Processes in an Innovation System, literature indicates that three main market failures arise from information asymmetries: uncertainties leading to underinvestment in R&D, moral hazard and transaction costs. As follows, an evaluation will be performed on the way that the different projects and activities of Brainport Development address each of these issues.

Proposition A: Decreasing uncertainties among Entrepreneurs and Capital Sources
The Next OEM acceleration program screens firms that apply to it and as a requisite they expect that they have already passed their Proof of Concept stage, and additionally they ask that the firms have preferably already landed their first launching customer. These two conditions already decrease technological and market uncertainties that the product or service may have; however, acknowledging that this might not be enough, this acceleration program decreases uncertainties about the outcome of the investments by making sure that their industrialization process is optimal, that the business plan is financially viable, that the technology is protected and by helping the firm to locate international customers. Moreover, BOM contributes with cash to each and every firm, in order to absorb part of the risks of these ventures. This thorough mix of services are definitely an invitation to private individuals to invest their money in the firms which are part of the accelerator.

In the same way, Brabant Equity organizes special matchmaking meetings, before which both investors and entrepreneurs are prepared. In the case of the latter, the program aims to systematically release high-quality investment propositions in which risks have been reduced thanks to a group of specialists, which aspires with this to attract a significant number of investors.

Lastly, the Healthy Aging Venture Forum reduces uncertainties among heterogeneous actors by putting them all together under the same roof and providing them with a space not only to
interact individually, but also to approach large and diverse audiences in the form of lectures, workshops, pitches and a commercial exhibition fair. Such an intense interaction reduces uncertainties effectively, and promotes that further contact is maintained.

Dr. Lint supports this analysis by indicating that uncertainties are reduced in two ways: coaching to entrepreneurs to ensure sound product-market combinations, and by reducing financial uncertainties through co-financing high-risk companies with funds of the Province of Brabant. In this regard Mrs. Tieleman also said that uncertainties are being reduced by coaching firms and by linking entrepreneurs with investing firms with experience in order to ensure adequate management of the ventures.

In conclusion, as the interviewees agree (Appendix H), Brainport Development reduces market uncertainties by offering coaching to entrepreneurs in order to ensure attractive product-market combinations, reduces financial uncertainties by co-financing NTBF with funds of the Province of Brabant, and by linking entrepreneurs with VC firms that fit their needs.

**Proposition B: Elimination of Moral hazard**

It was remarked by Dr. Lint that he is not aware of contracting problems in the region. Mrs. Tieleman indicated that the deals between investors and entrepreneurs happen solely among them, without Brainport Development intervening in that. And the two business consultants agreed that moral hazard is not perceived as a problem, to which Gijs Van De Molengraft added “if you do business with well-established VC firms then you don’t have any arguments”.

In conclusion, Brainport Development does not perceive moral hazard to be a problem happening in the region, which is why it does not require intervention from Brainport Development.

**Proposition C: Reduction of Transaction Costs**

The first activity by Brainport Development that helps with the reduction of transaction costs is the SME Financial Guide, not only because this saves a lot of time and effort to entrepreneurs in their seek of funding sources for their ventures, but also because the advice provided in this site allows them to start their application processes earlier and it increases their chances of success.

Also, one of the most important advantages that competition-based programs, such as Next OEM, offer to investors is indeed the reduction of costs, because as Dr. Onno Lint from Fontys remarks “(VC firms) can cherry-pick the best propositions”. This means that the costs of searching and screening for attractive alternatives of investment are reduced for investors.

Similarly, once the website platform that Brabant Versmogen intends to build is ready, this tool will also reduce costs, but not only for investors, but for entrepreneurs as well because both sides will have easy and fast access to information regarding their counterparts.

Moreover, Lectureship Brainport is currently studying the possibility of implementing crowdfunding as a new source of funding capital. If, and when, this alternative is applied, Onno Lint mentions he expects transaction costs of both VC firms and entrepreneurs to further decrease.

Finally, our last two interviewees, Gijs Van de Molengraft and Monique Sonnemans, indicate that an average VC firm would charge entrepreneurs a selection fee between €2,000 and €10,000, while Brainport Development does it for free. Also, several fund managers charge fees for these services that range between 0.5% and 3% of what the fund is worth; and firms which
focus on exits charge up to 25% of the money earned with the exit. Therefore, it is accurate to say that all programs of this agency save transaction costs because entrepreneurs pay nothing.

5.2.2 Structural System Failures
As it was noted in section 3.3, for the Financing of Innovation Processes to perform optimally in a RIS all Structural System dimensions need to be on shape; however, as Table 2.7 indicates, not all structural system failures can be addressed by RIAs given the fact that it is the role of governmental organizations, such as BOM in the case of the province of Brabant, to attend to some of these. As follows, an assessment will be performed on the way that the different projects and activities of Brainport Development address each of these systemic problems.

Proposition D: Stimulate and organize the presence of all relevant actors
Individual Level
All of the projects belonging to the BNF program, with the exception of Lectureship Brainport, stimulate and organize the presence of all actors involved in the financing of NTBF: entrepreneurs, business angels and other informal investors, venture capitalists, governmental representatives, scholars and research institutions, private consultancy services, accountants and tax consultants, patent experts, lawyers, and in the specific case of Healthy Aging Venture Forum, even final consumers.

In other words, stimulating and organizing the presence of all stakeholders is the departure point for most projects and activities executed within the BNF program. As Carina Tielemans indicates (Interview 2 - Appendix H), this is mostly done through coaching and networking events. The projects leader of the BNF program indicates that this initiative is now starting to work from the Cluster perspective in order to reach a more efficient organization. Furthermore, besides confirming that the presence of relevant actors is stimulated via coaching and networking, Dr. Onno Lint emphasized the fact that Brainport Development is not doing this alone, but with the Province of Brabant, Fontys and the TU/e contributing to a bigger network of agents.

Network Level
The focus of Brainport Development in this regard is the organization of the BNF network, which consists of any and every type of financial representatives, among which we can find venture capitalists, business angels, financial service providers and banks. Mrs. Tielemans indicated that this RIA gets all of these agents in touch with each other, and keeps them updated in regard to new projects in case any of them is interested in contributing to these. The network has around 100 members at the moment. However, this same interviewee remarked that the creation of networks specifically for either venture capitalists or entrepreneurs does not fall currently within Brainport Development’s responsibilities. Despite the previous, within the BNF program we can find the Business Angel Network Brabant, which is key to the financing of NTBF because of the visibility given to this source of capital and expertise.

Proposition E: Create space for VC firms to develop their capabilities.
Unfortunately, as Mrs. Tielemans reports, Brainport Development does not deal directly with the development of capacities of VC firms, nor business angels; not only because of lack of expertise, but also because according to her that is not the role of the agency. Even though according to Gijs Van de Molengraft and Monique Sonnemans, there are plenty VC firms out there which lack the necessary capabilities to be of an actual help to a team of entrepreneurs, it seems like the market itself takes care of filtering the good from the bad VC firms in the basis of reputation and funds and projects managed in the past. Nevertheless, it is worth mentioning
that, as it was explained in section 3.3.1, a scheme that can help train fund managers is government equity programs put in the hands of private managers. Brainport did this already in the year 2000 when it initiated a public fund called “Stimulus Venture Capital Fund BV” (SVCF), which was put under the management of private managers but remained monitored by the RIA until the year 2007, when the fund proved to be sufficiently well managed and therefore turned independent. Now the fund managing firm is called “Eindhoven Corporate Finance Group (ECFG)” and besides the SVCF fund it also manages an additional one called the Eindhoven Venture Capital Fund BV (EVCF). As this scheme has already proved to work in the region, Brainport Development could risk executing it once more in the need of high quality VC firms to manage either public, private or hybrid funds.

**Proposition F: Create space for entrepreneurs to develop their capabilities.**

Entrepreneurs, on the other hand, as the interviewees confirm, experience quite the opposite. Bright Move, Next OEM and Brabant Equity, they all have couching components within their schemes aimed at improving the managerial, financial and marketing capabilities found in NTBF. This, of course, has a great impact on the function given that chances of failure are reduced, which attracts more private capital. It is worth mentioning, additionally, that outside the BNF program Brainport Development offers an entire sector dedicated to providing services to SMEs such as management and financial advice, networking, incubation programs, and even the rental of facilities for new and small firms. The presence of suppliers of such array of services is extremely relevant given that they have the capacity to increase the quality of business plans and investment propositions, allowing for the financing function to unfold smoothly within the RIS.

**Proposition G: Secure presence of ideal hard institutions.**

Both, the desk research and the interviews revealed that indeed, none of the programs or projects executed by Brainport Development address the development and implementation of hard institutions. Instead, this is fully the responsibility of the government.

**Proposition H: Secure presence of ideal soft institutions.**

Having Brainport Development and its different partners as intermediaries between the supply and demand sides of risk capital is something that has definitely stimulated trust among the different parties, especially because this RIA counts with very high standards when choosing people and organizations as collaborating partners in their projects. Evidence of this is the number of private investors who are eager to contribute to programs like the Next OEM.

In terms of projects, the most relevant one is Bright Move given that it contributes directly to the promotion of entrepreneurial attitudes among students through courses and workshops since early years of university programs in the TU/e and Fontys. Additionally, Brabants Vermogen aims at increasing awareness of the different mechanisms that entrepreneurial activity can benefit from, which encourages people in the region to venture into high-tech firms. However, Gijs Van de Molengraft and Monique Sonnemans revealed that Brainport Development is aware that it needs to increase and improve its marketing efforts in regard to the promotion of an entrepreneurial culture in the region.

Lastly, it could be argued that all activities by Brainport Development aimed at reducing risks encourages risk-taking attitudes among investors, which after reaching a critical mass could have an impact in the culture of the region.
Proposition I: Stimulate the occurrence of interactions among heterogeneous actors

As Mrs. Tielemans indicates, BNF itself is a space that Brainport Development has created for different financiers in the region to continually interact, among which we find informal investors, VC firms, representatives of banks, financial services, government and research institutions. This same interviewee reports that Brainport Development organizes three or four meetings every year, where few presentations are made in order to inform the network of their working projects, and invite them to participate in them. This type of events bring a lot of value to Brainport Development as they facilitate the identification of gaps within the offer of capital throughout the different stages of a firm’s life cycle.

Furthermore, the new initiative Brabant Equity will focus a part of its efforts into linking heterogeneous actors through networking events and special matchmaking meetings. Within medium and high-tech oriented firms, this project does not have a sectorial focus, which means that interesting links could be made in the future among firms from different clusters that try to solve the same problems. And as Dr. Lint adds, it aims at creating links between regional and national networks of different financial parties; particularly Business Angels.

And lastly, the project that creates the largest amount of links among heterogeneous agents is the Healthy Aging Forum. Even though this is an event with a sectorial focus, the complexity of the field allows for a great variety of ideas and solutions to inspire participants; but maybe even more importantly, it can serve as an example or benchmark for future events directed towards any other cluster or technology in particular. Given the great diversity of participants and of spaces given to reach an audience, events like this allow different agents to initiate coordination and organization processes for future developments in the cluster at every possible stage: R&D and innovation, commercialization, growth and expansion of markets, etc.

In order to prevent too weak ties among these heterogeneous actors, and to allow important updates in the field to be brought to relevant spectators, Brainport Development has set the goal of offering these events on a seasonal fashion; however, as Dr. Lint and Mrs. Tielemans report, it is unclear for how long this will remain.

Proposition J: Stimulate the creation of links among business angels and public technology incubators or public research spin-offs.

The desk research indicated that Bright Move is a program which has a special focus on facilitating the growth and development of mostly university and public research spin-offs; and that even though managerial and financial advice is offered to these new ventures, the capital that helps them grow is all public and therefore, in the form of loans. Nonetheless, Dr. Lint reported in the interview that business angels are being linked to incubation activities through this program. This incongruence can be explained by the fact that this approach is new to the Bright Move program.

Despite of the fact that Next OEM and Brabant Equity do create links between business angels and public research spin-offs, at the moment there is no official initiative that aims at linking these type of agents. Consequently, this is a great area of chance for Brainport Development to take further action and spark the interest of investors.

Proposition K: Stimulate the creation of links among local, regional and national networks of business angels

As Mrs. Tielemans indicates, however minimal, Brainport Development is investing some of its efforts into linking regional investors with national networks. For example, BNF belongs already to NVP (Nederlandse Vereniging van Participatiemaatschappijen, or Netherlands Community of

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Venture Capitalists - nvp.nl, 2013). So whenever a big project is being held in the region, Brainport Development contacts NVP and informs them about it so NVP would promote the projects on a national level. Also, Mrs. Tielemans adds that, Brainport Development has tried to create international links. An example of this is a trip to New York made by the mayor of Eindhoven with regional representatives, in which they had a round table with international investors. Even though contact is maintained, international investors is not a priority for the moment.

**Proposition L: Increase the sources of seed and growth capital in the region**

The Next OEM acceleration program, Brabant Equity and the formation of Brabant’s Business Angel Network, all aim at creating access to private capital pools for entrepreneurs in the region that weren’t available to ventures before, which is already an increase of sources of capital. Additionally, Mrs. Tielemans reports that Brainport Development is working on a digital platform for companies and investors, which is expected to increase links among both types of actors and in this way increase the amount of capital available to entrepreneurs.

**Proposition M: Complementarities among public and private investments**

Furthermore, as it was described in section 5.2.3, Brainport Development contributed to the creation of the fund managing firm “Eindhoven Corporate Finance Group (ECFG)” which at the moment manages two significant funds. This is a great example of how private managing firms have arisen from a public intervention in the Brainport context which aimed at stimulating private investment by decreasing the risks they had to cope with; despite of this success, however, Brainport Development is not trying to emulate the scheme at the moment. Together with this, it has been reported by the interviewees that the creation of a fund-of-funds is not currently being considered nor studied. As it was mentioned thoroughly in Chapter 3, this mechanism has had excellent results in other regions of the world, which is why not dedicating enough time and resources to this alternative is regarded by this research as something limiting to the solution of the problem statement.

**Proposition N: Space for Experimentation and Development of Crowdfunding**

Moreover, as it has been mentioned already, a topic of study within Lectureship Brainport’s agenda that may have an even greater potential for significantly increasing the sources of capital and therefore the amount available for entrepreneurs is crowdfunding. Dr. Lint and Mrs. Tielemans indicate that results on the potential and implications of this scheme are still expected, and has therefore not been implemented yet; however, investing time and resources on its study is definitely a responsible attitude taken by Brainport Development.

**Proposition O: Encourage the formation of Second-tier Markets and M&As**

In regard to exit mechanisms, it has been made clear by the different interviewees who participated in this research that no regional stock market is planned for the future. As Mrs. Verhaag indicated, Brainport Development does not have the responsibility of coming up with solutions by itself, and even less if they involve long-term courses of action; and instead, the agency aims at allowing all triple-helix agents to come up with solutions themselves. In line with this, some desk research unveiled that regional authorities plan to create an inventory of follow-on investors and another one of potential purchasing parties with both strategic and financial capabilities, with the aim to be able to recover the capital invested as well as rewards for investors (BOM, 2013). This, however, does not create a systematic mechanism that would allow firms to visibly and transparently recover their investment and fund-raise for further growth and expansion; and instead, it creates the necessity to continually have a team of people working towards searching, screening and attracting these follow-on investors from around the globe.
Given that the number of NTBF in the region, as well as the amount of VC firms have still not reached critical mass, the need of a systematic exit mechanism has not yet been felt by the different agents in the region. Nevertheless, considering the outstanding knowledge base of Brainport, and therefore its great potential to increase the number of NTBF in the future, the need of such systematic exit mechanism might turn more tangible in the coming decade.

5.2.3 Transformational Failures
In the particular case of Financing of Innovation Processes, the Brainport Eindhoven Region needs transformation on two connected spheres: an economic transformation towards the creation of long-term mechanisms that permit the systemic reinvestment of private funds within its Spearhead sectors; and from a social perspective, a transformation towards a venture and entrepreneurial culture, characterized by high tolerance to failure and treachery, risk-taking attitudes, meritocracy, eagerness to collaborate and restlessness until goals have been achieved. With this mind, the following subsections analyze the activities of Brainport Development in regard to transformational failures.

Proposition P: Directionality towards a mechanism that allows systemic re-investment in the region’s Spearhead Sectors.
Dr. Lint, Mrs. Tielemans and Mrs. Verhaag, all reported that agents in Brainport don’t have the long-term goal of creating second-tier stock markets linked to global equity flows as a systematic mechanism for the reinvestment of private capital on promising NTBF. However, in the case of exit mechanisms, regional authorities are indeed already working on creating inventories of potential buyers for firms in the region. And on the other end of the of the investment cycle Brainport Development has been active in the study of one crucial alternative to fund raising through Lectureship Brainport: crowdfunding. This type of analysis, nonetheless, should also be done for the alternative of creating (hybrid) funds-of-funds. Additionally, the launching of high-impact projects such as the Next OEM, the consolidation of relevant networks and the creation of a portal website, confirm what Anne Verhaag (Appendix H – interview 3) made clear during her interview: the mission of Brainport Development is not to develop full and thorough long-term strategies, but instead, to kick-start projects and initiatives among all or most parties, and then allow them to come up with ideas and long-term goals.

Despite of this, we do consider that Brainport Development could initiate thematic discussions and arguments aimed at finding long-term solutions with the help of all parties. Finally, the particular issue of consolidating systematic, visible and transparent exit mechanisms is a topic that needs to start being discussed among regional authorities and relevant stakeholders.

Proposition Q: Directionality towards stronger entrepreneurial culture.
Desk research has unveiled that, with the aim of reaching 3% of economic growth by 2020, all Triple-Helix agents agree that the region needs a stronger entrepreneurial culture. Connected to this, Brainport Development wants regional participants to feel ‘Brainport pride’ in order to improve international image and energy to the atmosphere of the region. For this reason, as it has already been mentioned, courses and workshops are continually offered to students in regard to entrepreneurship, and few marketing efforts by the agency are visible for the same purpose.

Proposition R: Articulation of demand of all actors
As it was mentioned in section 4.2.4, Lectureship Brainport has as one of its main goals the better articulation of entrepreneurs’ needs. This has the goal of being developed thoroughly by analyzing the different stages of a firm’s life cycle in the context of high-tech industries, and the
specific necessities at each of the stages. This has been confirmed by Dr. Lint, who mentions that the needs of both, start-up entrepreneurs and fast growing company entrepreneurs are being actively articulated.

In the case of VC firms, however, no initiatives have been necessary given that their needs are obvious, with them being high quality business propositions, which promise high returns in the shortest possible period of time. And, as Mrs. Tielemans adds, more channels so that VC firms can access and invest more easily on firms.

**Proposition S: Contribute to a better alignment among different bodies of policy**

Policy development does not fall under the responsibility of Brainport Development; nevertheless, they have proved to be capable of contributing to its refinement through the Healthy Aging Venture Forum initiative. By providing a space for policy-makers - from regional national and European levels - to hear and create links with firms, investors, researchers and final consumers, Brainport Development facilitates the creation and improvement of policies across different systemic levels, and of synergies with other research, technology and innovation policies. This program is Cluster specific, which is why organizing similar events for the other relevant clusters of the region would be greatly beneficial to their development.

**Proposition T: Provision of tools to monitor the Financing of Innovation Processes**

Lastly, as it was disclosed in section 4.2.4, Lectureship Brainport has already manifested that it aims at developing a bottom-up monitoring instrument that would be coupled to regional policy and top sector policy. This is really relevant and quite urgent, as interviews with the heads of Lectureship Brainport and the BNF program (Appendix H – interviews 1 and 2) revealed that sound monitoring tools are not available yet, and therefore evaluating the impact of the initiatives of Brainport Development and all of its partners is so far not possible. I.e. data does not exist yet that could generate feedback to this RIA nor to any other organization. However, Mrs. Tielemans reports that the investor side is being monitored well: number of investments made last year, and number of interested investors in the region. To this she adds that efforts on the side of the entrepreneurs are still very much needed. The goal is knowing which type of companies are there in the region, and which are their specific needs in terms of couching and risk capital. And in line with this, Gijs Van de Molengraft and Monique Sonnemans report that the impact of the incubation activities that the “SME services” sector of Brainport Development execute are still not being measured; nevertheless, efforts are being invested in this.

Among the implications of this we can state that policy-makers do not have yet the opportunity to experiment and learn from different policies because feedback is still not yet available, and therefore it is still also difficult for them to adjust policy according to circumstances, and organizations like Brainport Development and BOM cannot adjust their programs towards stimulating specific needs and results.

**5.3 Conclusions**

Confronting the projects and activities of Brainport Development against the analytical framework that was developed in Chapter 3 has revealed that Bright Move and the BNF program are indeed addressing most, but not all, failures on an active way; however assessing their efficacy over the RIS is still not possible. Additionally, it has been revealed that there is still plenty of room for expanding previous successes across other top clusters of the region. The latter is to be expected given the short time period for which these projects have been active.

Among the opportunities for improvement that the analysis performed in section 5.2, we can find the following. First, even though the increase in number of VC firms is not an urgent issue,
in order to accelerate the offer of private capital to NTBF, Brainport Development could replicate the success it had with the “Stimulus Venture Capital Fund BV”. Hybrid funds put in the hands of private managers have not only worked in other countries, but Brainport has seen the same success too, which is why this alternative seems viable. Furthermore, other schemes can be sought in order to generate complementarities among public and private capital funding, such as hybrid funds-of-funds.

Moreover, the linking of business angels with incubation initiatives and public research spin-offs has not been made formal and sufficiently aggressive yet, which is why we recommend promoting Bright Move to business angels in a more intense manner. The fact that the desk research did not unveil such connection of agents suggests that improvements can be made in this area. However, direct linking of TNO and other public research institutes in the region with business angels could even be done through an independent project aimed specifically at this goal.

Also, one of the most pressing issues is the lack of a long-term plan for the development of one or several mechanisms that allow systemic exit routes, which can lead to a more efficient re-investment of funds within the clusters operating in the region.

And lastly, the most urgent need of this function right now is the development of a sound monitoring tool that would help better direct funds, actions and policy towards empirically verified needs of the region.

Chapter 6. Conclusions, Recommendations and Reflection

Along this chapter the conclusions of this master thesis are presented, after which a reflection of the results of the interviews and desk research are elaborated. Subsequently, managerial recommendations to Brainport Development project leaders will be presented. Finally, the limitations of the research will be discussed, together with future research recommendations.

6.1 Conclusion

A large number of NTBF in the Brainport Eindhoven Region do not manage to develop into independent and fast growing companies after the first few years of being started, and contrary to this, they either remain small or do not manage to survive at all. Brainport Development and its partners have identified as main reasons for this the fact that entrepreneurs confront two crucial disadvantages throughout the initial and most critical phases of their ventures: lack of access to private capital, as well as a lack of managerial, financial and marketing expertise.

Even though it is the role of the government to support innovative ventures in their initial funding phases, a complementary private investment – mainly in the form of Venture Capital and business angels – is also necessary. This due to the fact that entrepreneurs need not only capital in order to reach success, but also smart managerial, financial and marketing advice, coupled with access to a greater social network from which links with potential customers and suppliers can be made. However, Brainport Development and its partner organizations have taken notice that Venture Capitalists are increasingly moving towards latter phases of a firm’s life cycle for investment purposes due to a need of lower risks. This has consequently created a hole in the market for NTBF entrepreneurs in the need of pre-seed and seed capital, which is
worsen by the fact that subsidies are disappearing and banks are less and less willing to provide capital to entrepreneurs.

With €300 billion in the Netherlands as private capital (mkb-fonds.nl/mkb_obligaties, 2013), and a region abundant in highly educated people, it would be incorrect to assume that the root of this problem is an insufficiency of private financial and human resources in Brainport. Hence, the main roots appear to be, first, a lack of connections among entrepreneurs and private financial sources, and second, a lack of “credit-worthy” start-ups in the region – which means that investors do not find most business propositions compelling enough. In this way an investigation was pursued in order to be able to answer the main Research Question “How is Brainport Development addressing the problem of lack of access to seed capital that NTBF in the region face?” For this, the objectives of this study were to, first, design an analytical tool for studying this issue in Brainport Eindhoven Region, and second, to create knowledge about the private financing of NTBF.

An empirical research demonstrated that Brainport Development and its institutional partners are effectively tackling the two roots of the problem, which were mentioned above. This is done through different schemes of projects and activities that involve mainly both, business coaching to entrepreneurs and their teams, and networking events and infrastructures that aim to create links among private capital sources and NTBF. All of these activities, however, have been initiated very recently, which is why the potential for expansion (to more clusters) and refinement is still very large.

An important finding in this study is that tackling the problem statement of this thesis research proved adequate with the analytical tool developed in Chapter 3. First, the thoroughness of its components include all aspects of the activities of Brainport Development and its partners; and second, this analytical framework allowed the identification of potential improvements to their interventions. And even though the general Analytical Framework developed in Chapter 2 (Table 2.3) was not tested in its totality along this research, we believe that it adds to Regional Innovation System literature by allowing a comprehensive analysis of all relevant functions (found in Table 2.2) taking place in a Regional Innovation System, which can be of much help to Regional Innovation Agencies and regional governments for the design of suitable and effective interventions.

Furthermore, the evaluation of the empirical study with the analytical tool revealed that the SME service sector of Brainport Development, the project “Bright Move” (brightmove.nl) and the program BNF are, together, addressing most failures on an active manner. Unfortunately however, the effectiveness that these interventions have had in the NTBF of the Brainport Eindhoven Region can still not be empirically validated at the moment since monitoring tools being developed are not ready yet. This is precisely one of the most urgent needs of Brainport Development project leaders and the regional government since at the moment it is not possible for them to experiment and learn from initiatives because feedback is still not available. Nonetheless, as it will be briefly explained below, projects and activities of Brainport Development appear to be in the right direction.

6.2 Reflection on Results
Complete and deep results from confronting the propositions developed in Chapter 3 with the projects and activities of Brainport Development and its partners can be found in the second section of Chapter 5; however, the following paragraphs will mention the most important findings.
First, on the positive side, the most comprehensive initiative is the AAL Venture Forum (thoroughly described in section 4.2.3), which is an event with the sectorial focus of ICT technologies for the field of Ambient Assisted Living. Among its attendees are Dutch and international NTBF entrepreneurs, investors, VC firms, researchers, public purchasers, political figures, care institutions and elder people representing final consumers. During its few days, the venture forum hosts a diverse set of knowledge exchange and networking meetings such as lectures, workshops, pitches, a commercial exhibition fair, field visits and meet & greet sessions, all of which stimulate participants into initiating discussions and exchanging ideas and contact information. Everything that has been described in these short lines tackle most market, system and transformational failures that the ‘Funding of Innovation Processes’ may suffer in a Regional Innovation System, which makes initiatives like this outstanding in their effect over the Cluster. This event took place for the first time in the first quarter of 2012, and a second occasion is scheduled for 2014. An interview with the project leader of Brainport Development’s BNF program revealed that the agency is starting to work with a Cluster approach, which means that after enough experimentation has taken place this same type of event may be expanded to focus on other top sectors of the region (Table 1.2).

Moreover, as it was insinuated in the previous section, Brainport Development focuses a lot of its efforts into increasing the quality of business propositions of NTBF. This is of extreme importance in order to encourage VC firms to invest in the early phases of NTBF’s life cycle. The agency has experience with this for few years now through their SME services sector; however, it has been interesting to find that through projects like the Next OEM (section 4.2.1) or Bright Move this has been taken a step forward. In case of the former, by benchmarking the best and most rigorous business competitions of the world, the Next OEM project not only builds solid business plans for highly promising young firms, but it also puts them in contact with business angels ready to invest large amounts of capital, and it even helps these NTBF to get customers all over the world. And in the case of Bright Move, even though this initiative does not involve the participation of private financiers (funds of the region are at the disposal of entrepreneurs in the form of loans), additional to helping entrepreneurs with managerial, financial and marketing advise, this project goes a step forward by investing its resources in the development of a stronger entrepreneurial culture in the region.

Furthermore, in regard to the need of increasing the interactions and links between entrepreneurs of NTBF and private capital sources, the Brainport Networking Financials program includes two projects with this as a main goal. First, Brabants Vermogen intends to create a portal website in which both NTBF and investors can create their own profiles. In line with the goal of improving the quality of business propositions, Brabants Vermogen offers entrepreneurs the support of accountants, tax consultants and lawyers, with the intention of grabbing the attention of potential investors. This project remains in a development phase; however, the idea of granting larger visibility to both types of actors will sure encourage larger interactions among them. Portals of this kind have already seen quite some success in the United States (e.g. rockthepost.com, fundable.com, etc.), which confirms that this initiative is worth the risk. Second, the Business Angel Network Brabant project aspires not only at increasing the visibility of informal investors in front of entrepreneurs, but also, through a professional profiling of these business angels, Brainport Development hopes to be able to encourage matchmaking among both parties with an optimal fit. Unfortunately, as Brabants Vermogen, the Business Angel Network Brabant has also not started running yet. Despite of this, the concept behind it tackles in an assertive way the problem of lack of connections among entrepreneurs and investors, which is why we believe this is the right direction.
Finally, Lectureship Brainport is a research team that emerged in late 2011 in collaboration between Brainport Development and Fontys’ faculty of Management, Economy and Law, whose purpose is finding an answer to the question “How will Brainport, grow high-tech top companies at comparable rates to top international regions?” The incorporation of a research team towards the solution of this problem is something of great value; in specific, the development of a monitoring instrument which will be coupled to regional and top sector policy is on its way, together with studies regarding the different alternatives for the financing of NTBF. As it has been mentioned before, the development of such monitoring tool is of upmost importance because so far it is not known to any party within the region which is the impact of the actions taken by Brainport Development and its several institutional partners; therefore, this lack of feedback hinders the possibility of adjusting and improving the interventions of these organizations on the regional system. Moreover, the study of alternative routes of funding, such as crowdfunding and fund-of-funds is something really important as these can significantly accelerate the availability of private capital for NTBF. Unfortunately, the interviews revealed that the initiative of a (hybrid) fund-of-funds has been put on hold for the moment.

As it can be appreciated, there is still plenty of room for expanding the audience of the initiatives of the BNF program to NTBF and agents focused on all Top Sectors of Brainport. Lectureship Brainport, the governmental agency BOM, Brainport Development and the BNF program are all actively contributing to the consolidation of a VC Industry and a stronger entrepreneurial atmosphere in the region. This is a slow process that requires time, so improvements and refinement are expected in the coming months and years.

Among the most pressing issues we found in this research is the lack of a long-term plan for the development of one or several mechanisms that allow systemic exit routes, which can lead to a more efficient re-investment of funds within the clusters operating in the region. It is expected that such direction has not been defined yet given that it has only been two years since financing representatives of the region are being organized; since the start of the BNF program. The creation of efficient exit routes is, however, not the full responsibility of Brainport Development, despite of which this idea can be handed to relevant agents in the region in order to stimulate dialogue and new initiatives. Nevertheless, it became apparent throughout the interviews that this issue has not yet been brought up to the attention of any stakeholder.

Furthermore, more attention must be put to the development of capabilities of VC firms, given that having too few high quality organizations of this kind will limit the supply of the very much needed complementary expertise that entrepreneurs seek. The creation of hybrid funds, as “Stimulus Venture Capital Fund BV” initiated in the year 2000, seems a viable route of action.

Moreover, it is our belief that linking business angel networks with public incubation initiatives, as well as with public research institutes can contribute to a more efficient valorization of the knowledge base of the region.

And lastly, we would like to emphasize that the most urgent need of this function of ‘Financing of Innovation Processes’ right now is the development of a sound monitoring tool that would help direct funds, actions and policy towards empirically verified needs of the region. Brainport Development and Lectureship Brainport at Fontys are currently developing such monitoring tool.

As a conclusion, Brainport Development and its institutional partners are indeed aiming to tackle the low quality of business proposals and the lack of connections among heterogeneous actors in an adequate way, but a lot of work remains to be completed in the future if the aim is to
contribute to all top sectors of the region from a cluster perspective, as the research has unveiled. The strong knowledge base of the region and the large amount of private capital available in the country show that these interventions in Brainport could have been initiated years earlier, so the timing of the programs is indeed late in regard to the development of the top sectors in the region. From the figures shown throughout Chapter 1, it appears that the global financial crisis of 2008 was the spark needed to get different agents moving towards proactively linking the private capital industry with the evolution of high-tech industries. Therefore, in order to allow the development of the VC industry to catch-up with the evolutionary rhythm of Brainport’s top sectors, it might be beneficial to invite more people to join Brainport Development to help deal with all the remaining workload to make this happen fast enough for the region not to not lose its competitive position.

6.3 Managerial Implications for Innovation System Managers

First, Innovation System managers trying to intervene in favor of improving Innovation Performance are recommended to make use of the framework found in Tables 2.7, 2.8 and 2.9 which deal with market failures, structural system failures and transformational failures. Together, these represent thoroughly the problems that may hinder the development of an Innovation System. The use of this tool, however, implies adjusting the functions used to the type of Innovation System and the context where it is intended to be applied; this means that those functions listed in Table 2.2, altogether, are valid for the specific case of Regional Innovation Systems.

Second, for the function of ‘Financing of Innovation Processes’ RIA managers may find it useful to guide the design of their projects and programs through Tables 3.1, 3.2 and 3.3 found in Chapter 3. These contain a list of actions and activities to counteract every failure that a Regional Innovation System may suffer when faced with the problem of lack of private risk-capital for high-tech entrepreneurs.

And third, the analytical framework developed in Chapter 3 ‘Financing of Innovation Processes’ showed that the projects and activities used by Brainport Development and its partners are adequate and comprehensive enough to be worth of been benchmarked by other regions aiming to address a similar problem.

6.4 Literature contributions

Besides the managerial implications to Innovation System managers discussed in the subsection above, this thesis also contributes to academic literature. No analytical framework has been developed before for the specific study of Regional Innovation Systems. Based in the study of National Innovation Systems and Technological Innovation Systems by Mahroum & Alsaleh (2012), Borrás & Edquist (2012) and Hekkert et al. (2007), Chapter 2 (table 2.2) has developed a comprehensive list of functions for Regional Innovation Systems. This tool allows the easy identification of issues and opportunities in a RIS from the perspective of Regional Innovation Agencies and regional governments. A complete use of this framework is not possible in the present research project due to its time and space constraints; however, entrepreneurial functions (9, 10, and 11) have been taken into account for the analysis of the specific issue of lack of high-risk capital to start-up firms.

6.5 Limitations

The first limitation of this thesis project is the small amount of data recollected from the region. As it was thoroughly explained in section 4.1.3 the validity and reliability of the empirical research are both low. This is mainly due to the low number of respondents, as well as the
exploratory nature of this study. A range of four different efforts were made in order to increase the validity and reliability of this research, all of which have been described in section 4.1.3. Second, the BNF program is still on an incubation phase. Because of this, hard data on the issue is still not available, making it still too early to verify any impact on VC firms, business angels and NTBF. Therefore, we propose a future research to improve the investigation on the case study by using additional primary data from interviews to representatives of these three main types of actors, and by using data retrieved from monitoring tools to be developed by Brainport Development together with Lectureship Brainport.

6.6 Future research
We propose another future research once the time-lag of the effect of Brainport Development’s actions are not a problem anymore. Similarly, the development of a monitoring tool is already under way, so using hard data in the future may expand the insight to Brainport Development’s managers, as well as to future investors and high-tech entrepreneurs.

Additionally to this, it is worth mentioning that Lectureship Brainport is currently studying the opportunities and implications of adding a new funding sources to the system: crowdfunding. The results of this study may open new lines of research in Innovation Sciences as this new source of private capital is expected to have significant accelerating effects on the development of technological paths.

Finally, we tend to agree with authors as Etzkowitz and Leydesdorff (2000) who point out that “Venture Capital is a key component of the new open innovation system, and to a large extent the fourth helix of the new organization of the production of knowledge”, as well as with Rosiello et al. (2010) who has deeply studied the co-development of Israel’s world re-known high-tech industry with VC firms. Therefore, research is suggested in order to unveil the possibility of co-developing a Venture Capital Industry with High-Tech Clusters composed of research and business organizations, in the European context. We believe that innovative schemes like VC firms managing funds originated in all different capital sources might arise as viable alternatives for making a great use of the knowledge base of territories such as Brainport Eindhoven Region.
References

- Baarda, B. (2010). *Research: This is it! Guidelines for setting up, doing and evaluating quantitative and qualitative research*. Groningen, Houten: Noordhoff Uitgevers B.V.


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## Appendixes

### Appendix A – Overview of Market, Structural System and Transformational Failures

Table 1: Market Failures in the Innovation System context

<table>
<thead>
<tr>
<th>Type of Failure</th>
<th>Failure Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Asymmetries</td>
<td>Uncertainty about outcomes and short time horizon of private investors lead to undersupply of funding for R&amp;D.</td>
</tr>
<tr>
<td>Knowledge spill-over</td>
<td>Public good character of knowledge and leakage of knowledge lead to socially sub-optimal investment in (basic) research and development</td>
</tr>
<tr>
<td>Externalization of costs</td>
<td>The possibility to externalize costs leads to innovations that can damage the environment or other social agents.</td>
</tr>
<tr>
<td>Over-exploitation of Commons</td>
<td>Public resources are over-used in the absence of institutional rules that limit their exploitation (tragedy of the commons).</td>
</tr>
</tbody>
</table>

# Table 2: Overview of Structural System Failures

<table>
<thead>
<tr>
<th>Structural System Failures</th>
<th>Failure</th>
<th>Failure Mechanism</th>
</tr>
</thead>
</table>
| **Actors Failure**         | Presence: the actor is absent from the system.  
Capabilities: lack of appropriate competences and resources at actor and firm level or lack of absorptive capacity that prevent access to new knowledge, and lead to an inability to adapt to changing circumstances, to open up novel opportunities, and to switch from an old to a new technological trajectory. I.e. actors find it difficult to point and articulate their needs, leading to underperforming visions and strategies. |
| **Institutional Failure**  | Presence: either hard or soft institutions are absent from the system.  
**Capacity:**  
Hard institutional failure: excess or shortcomings of formal institutions such as laws, regulations, and standards (in particular regarding IPR, research institutes and investment) create an unfavorable environment for Innovation.  
Soft institutional failure: Informal institutions (e.g. social norms and values, culture, entrepreneurial spirit, trust, risk-taking) that hinder Innovation. |
| **Interaction or Network Failure** | Presence: relevant networks to the system (clusters, supply chains, firm-university, value chains, planned actors for long-term project) are absent from the system due to cognitive distance among actors, lack of trust or differing objectives, capabilities and assumptions.  
**Intensity/Quality:**  
Strong network failure: Intensive cooperation in closely tied networks leads to lock-in into established trajectories and a lack of infusion of new ideas, due to i) excessive inward-looking behavior, ii) lack of weak ties to third actors and iii) dependence on dominant partners.  
Weak network failure: too little interactions and knowledge exchange with other actors inhibits exploitation of complementary sources of knowledge and processes of interactive learning. Also referred as complementarity problems. |
| **Infrastructure Failure**  | Presence: relevant infrastructure components of the system (connectivity, transportation systems, expertise & know-how, seed capital, financial incentives from government) are absent from the system.  
**Capacity/Quality:**  
Physical: lack of connectivity to relevant knowledge and financial cities, low broadband penetration, insufficient/inappropriate real state, laboratories, research institutes, etc.  
Knowledge: mismatch between basic and applied research, lack of knowledge infrastructures due to large scale, etc.  
Financial: Insufficient seed capital sources, long time horizon of operation and ultimately too low ROI for private investors, inappropriate governmental incentives, demand (consumers/producers) with either low purchasing power or interest in innovative products, etc. |

Source: Klein-Woolthuis et al., 2005; Wieczorek & Hekkert, 2012.
<table>
<thead>
<tr>
<th>Type of Failure</th>
<th>Failure Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directionality Failure</td>
<td>Lack of shared vision regarding the goal and direction of the transformation process; Inability of collective coordination of distributed agents involved in shaping systemic change; Insufficient regulation or standards to guide and consolidate the direction of change; Lack of targeted funding for research, development and demonstration projects and infrastructures to establish corridors of acceptable development paths.</td>
</tr>
<tr>
<td>Demand Articulation Failure</td>
<td>Insufficient spaces for anticipating and learning about user needs to enable the uptake of innovations by users. Absence of orienting and stimulating signals from public demand. Lack of demand-articulating competencies.</td>
</tr>
<tr>
<td>Policy Coordination Failure</td>
<td>Lack of multi-level policy coordination across different systemic levels (e.g. regional–national–European or between technological and sectorial systems; Lack of horizontal coordination between research, technology and innovation policies on the one hand and sectorial policies (e.g. transport, energy, agriculture) on the other; Lack of vertical coordination between ministries and implementing agencies leads to a deviation between strategic intentions and operational implementation of policies; No coherence between public policies and private sector institutions; No temporal coordination resulting in mismatches related to the timing of interventions by different actors.</td>
</tr>
<tr>
<td>Reflexivity Failure</td>
<td>Insufficient ability of the system to monitor, anticipate and involve actors in processes of self-governance; Lack of distributed reflexive arrangements to connect different discursive spheres, provide spaces for experimentation and learning; No adaptive policy portfolios to keep options open and deal with uncertainty</td>
</tr>
</tbody>
</table>

**Source:** Weber & Rohracher, 2012.
Appendix B – Overview of Objectives of Interventions used for contravening Market, System and Transformational Failures & Corresponding Executors

Table 1: Overview of Objectives of Interventions used for Market Failures in RISs

<table>
<thead>
<tr>
<th>Failure</th>
<th>Objective of Intervention</th>
<th>Executor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Asymmetries</td>
<td>i) Decrease the uncertainties among agents.</td>
<td>Regional Innovation Agencies</td>
</tr>
<tr>
<td></td>
<td>ii) Eliminate double moral hazard.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Reduce transaction costs.</td>
<td></td>
</tr>
<tr>
<td>Knowledge spillover</td>
<td>Shaping of specific protection and incentive structures such as a system of IP rights.</td>
<td>Governmental Organizations</td>
</tr>
<tr>
<td>Externalization of costs</td>
<td>Internalize costs.</td>
<td>Governmental Organizations</td>
</tr>
<tr>
<td>Over-exploitation of Commons</td>
<td>Prevent over-exploitation of commons.</td>
<td>Governmental Organizations</td>
</tr>
</tbody>
</table>

Table 2: Overview of Objectives of Interventions used for Structural System Failures in RISs

<table>
<thead>
<tr>
<th>Failure</th>
<th>Objective of Intervention</th>
<th>Executor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors Failure</td>
<td><strong>Presence:</strong> Stimulate and organize the participation of various actors (NGOs, companies, government, different networks, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Capabilities:</strong> Create space for actors’ capability development (e.g. through learning and experimenting).</td>
<td>RIAs, Governmental Organizations</td>
</tr>
<tr>
<td>Institutional Failure</td>
<td><strong>Presence:</strong> Secure the presence of (hard and soft) institutions.</td>
<td>Hard: Government</td>
</tr>
<tr>
<td></td>
<td><strong>Capacity:</strong> Prevent institutions being too weak or too stringent.</td>
<td>Soft: RIAs</td>
</tr>
<tr>
<td>Interaction or Network Failure</td>
<td><strong>Presence:</strong> Stimulate the occurrence of interaction among heterogeneous actors (e.g. by managing interfaces and building a consensus).</td>
<td>Regional Innovation Agencies</td>
</tr>
<tr>
<td></td>
<td><strong>Intensity/Quality:</strong> Prevent ties that are too strong or too weak.</td>
<td></td>
</tr>
<tr>
<td>Infrastructure Failure</td>
<td><strong>Presence:</strong> Physical, financial and knowledge infrastructure.</td>
<td>RIAs, Governmental Organizations</td>
</tr>
<tr>
<td></td>
<td><strong>Capacity/Quality:</strong> Ensure that the quality of the infrastructure is adequate (strategic intelligence serving as a good example of specific knowledge infrastructure).</td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Overview of Objectives of Interventions used for Transformational Failures in RISs

<table>
<thead>
<tr>
<th>Failure</th>
<th>Objective of Intervention</th>
<th>Executor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directionality Failure</td>
<td>Build a shared vision, and coordinate the different agents involved in the transformation process.</td>
<td>RIAIs</td>
</tr>
<tr>
<td>Demand Articulation Failure</td>
<td>Anticipate and learn about user needs, as well as develop demand-articulating competencies.</td>
<td>RIAIs</td>
</tr>
<tr>
<td>Policy Coordination Failure</td>
<td>Multi-level policy coordination across different systemic levels (e.g. regional–national–European or between technological and sectorial systems; Horizontal coordination between research, technology and innovation policies on the one hand and sectorial policies (e.g. transport, energy, agriculture) on the other; Vertical coordination between ministries and implementing agencies; Ensure coherence between public policies and private sector institutions.</td>
<td>Governmental Organizations</td>
</tr>
<tr>
<td>Reflexivity Failure</td>
<td>Create ability in the system to monitor, anticipate and involve actors in processes of self-governance; provide spaces for experimentation and learning; create adaptive policy portfolios to keep options open and deal with uncertainty.</td>
<td>RIAIs, Governmental Organizations</td>
</tr>
</tbody>
</table>
Appendix C – Goals of Interventions used for contravening Market, System and Transformational Failures in “Financing Innovation Processes”.

Table 1: Goals of Instruments used to counteract Market Failures in Financing Innovative Processes

<table>
<thead>
<tr>
<th>Type of Failure</th>
<th>Goals of Policy Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Failures</td>
<td></td>
</tr>
</tbody>
</table>
| Information Asymmetries         | • Decrease the uncertainties among High-Tech Entrepreneurs and seed/growth capital sources: interactions, equity programs, etc.  
|                                 | • Eliminate double moral hazard between VC and entrepreneurs and vice versa (E.g. resolution of contractual problems).  
|                                 | • Reduction of transaction costs: accelerator programs, VC market, fund-of-funds, etc.       |
| Knowledge spill-over            | Does not apply                                                                               |
| Externalization of costs        | Does not apply                                                                               |
| Over-exploitation of Commons    | Does not apply                                                                               |
Table 2: Goals of Instruments used to counteract Systemic Failures in Financing Innovative Processes

<table>
<thead>
<tr>
<th>Structural System Failures</th>
<th>Failure</th>
<th>Goals of Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actors Failure</td>
<td>Presence:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Stimulate and organize the presence of a critical mass of investors/business angels, venture capitalists, and talented entrepreneurs.</td>
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<td>- Help consolidate networks of actors; e.g. Business Angel Networks.</td>
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<td><strong>Capabilities:</strong></td>
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<td></td>
<td></td>
<td>- Create space for both sides to develop their capabilities through learning and experimenting. VC firms: systemic scanning of the environment seeking after good opportunities, and provision of added-value services to NTBF.</td>
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<td></td>
<td>Entrepreneurs: develop managerial, marketing and absorptive capacities.</td>
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<td>Institutional Failure</td>
<td>Presence:</td>
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<td></td>
<td></td>
<td>- Secure presence of hard and soft institutions.</td>
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<td><strong>Hard institutional failure:</strong></td>
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<td>- Investment regulations capable of increasing sources of funding.</td>
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<td>- Tax systems which do not overly penalize capital accumulation.</td>
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<td>- Removal of barriers to entrepreneurs.</td>
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<td>- Encourage alternative routes of financing (funds-of-funds, crowdfunding).</td>
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<td>- Facilitate the alternative exit routes (2nd-tier equity markets, M&amp;As, etc.).</td>
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<td><strong>Soft institutional failure:</strong></td>
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<td>Increase trust, collaboration among individuals and organizations.</td>
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<td>Increase of entrepreneurial/risk-taking culture in the region.</td>
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<td></td>
<td>Foster a culture characterized by meritocracy, restlessness, and reinvestment in the RIS.</td>
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<td>Interaction or Network Failure</td>
<td>Presence:</td>
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<td></td>
<td></td>
<td>- Stimulate the occurrence of interactions among heterogeneous actors part of the funding of innovation processes.</td>
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<td><strong>Weak Network Failure:</strong></td>
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<td>- Prevent too weak ties among actors through granting higher visibility for networks of business angels, entrepreneurs and VC firms.</td>
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<td>- Lead to an increase in cooperation in R&amp;D projects among Universities, research institutes and NTBF through greater visibility of complementarities among public and private aid to entrepreneurs.</td>
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<td>Infrastructure Failure</td>
<td>Grow the Financial Infrastructure of the region by: i) investing in funds to be managed privately that decrease risk to investors, and work as catalysts to the VC market; ii) explore funding alternatives such as fund-of-funds and crowdfunding. iii) explore exit alternatives as IPOs in 2nd-tier equity markets, and M&amp;As.</td>
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Table 3: Goals of Instruments used to counteract Transformational Failures in Financing Innovative Processes

<table>
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<tr>
<th>Failure</th>
<th>Goals of Interventions</th>
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</table>
| **Directionality Failure**   | • Create a shared vision, coordinate different agents, put place regulations and standards and invest in research in:  
                                 • Long-term mechanisms for systemic reinvestment in the RIS.  
                                 • VC or Entrepreneurial culture. |
| **Demand Articulation Failure** | • Articulation of entrepreneurs' demand of funding and added-value services for each different technological field/industrial sector.  
                                 • Articulation of investors demand in terms of ROI and timing.  
                                 • Articulation of VC firms demand in terms of institutional environment, and cultural features of the region. |
| **Policy Coordination Failure** | Contribute to a better alignment among bodies of policy, reducing redundancies and building synergies among them.                                   |
| **Reflexivity Failure**      | • Provide policy-makers with the tools to monitor the VC market.  
                                 • Provide policy-makers with a space for experimenting and learning.  
                                 • Develop capacity in policy-makers to adapt instruments according to the evolutionary phases of the VC market. |
Appendix D – Context Information on Brainport Eindhoven Region


Appendix E – Sources of Desk Research.


Appendix F – List and Description of Interview Respondents

1. **Dr. Onno Lint**: this interviewee has 25 years of experience as an investor in high-tech firms with a strong R&D base. For two years now, Dr. Lint has been a professor at Fontys University of Applied Sciences, working in Lectoraat Brainport. This research group focuses on investigating the general question: “How will Brainport, the world’s smartest region, grow high-tech top companies at comparable rates to top international regions?”

2. **Mrs. Carina Tielemans**: with a legal background, Mrs. Tielemans is the project leader of the recently launched program Brainport Networking Financials (BNF) in Brainport Development.

3. **Mrs. Anne Verhaag**: with a background in Economic Geography, Mrs. Verhaag has several responsibilities in Brainport Development. First, she is the manager of several European-level projects in which this agency is involved. Moreover, she is part of the department of Strategy in Brainport Development, in which she monitors and implements strategy related to international affairs.

4. **Gijs Van De Molengraft**: Mr. Van de Molengraft has a little bit less than 10 years of experience boosting companies in the Netherlands and has recently joined Brainport Development in order to advise NTBF (80%), as well as more established growing companies (20%) in terms of business development: business plans, management, the creation of networks, etc.

5. **Monique Sonnemans**: Mrs. Sonnemans has 20 years of experience as a business analyst and project leader in different companies in the Netherlands, and now as part of Brainport Development, she offers support and advise to NTBF (80%) and more established growing companies (20%) in terms of business development: business plans, management, the creation of networks, etc.
Appendix G – Interview Guide

Thank you very much for the opportunity of interviewing you. The purpose of this talk is to develop my master’s thesis at the TU/e. The aim of my research is to understand how Brainport Development contributes to the challenge of increasing the access to private funds to NTBF in Brainport.

It is of course very insightful to discuss these issues with someone working in [NAME OF THE ORGANIZATION], and particularly from the standing point of [JOB TITLE].

For the completion of my thesis project I am interested in learning from your experience dealing with such issues. There are no right, nor wrong answers. What I want from you is to share your thoughts and opinions with me.

It is your decision what information you want to give me, and please, if you have any questions during the interview, feel free to ask me.

This interview will be taped and I’ll take some notes. This is to make sure nothing said is forgotten. I am the only person who will have access to this information. I expect the interview to take approximately 30 minutes.

General Questions

1. Could you describe briefly your position and responsibilities within your organization? What are your day-to-day tasks?
2. For how many years have you worked here?

Transformational Failures

Thanks to the website of Brainport Development, it is now of my knowledge that the projects and activities of Brainport Development towards solving the issue previously mentioned are all under an umbrella program called Brainport Networking Financials (BNF).

Based on Literature Review, I have identified a short list of goals that the projects and activities used should focus on. Please, let’s briefly go over these.

1. Besides the goals delineated in Brainport 2020, is there a shared vision of all regional stakeholders for Brainport’s VC Industry in the future? Which is this? (E.g. a regional stock market integrated into global equity flows, seasonal/yearly execution of programs, etc.).
2. Are there efforts being made towards articulating the needs of both, entrepreneurs and investors, better?
   • Entrepreneurs’ demand: funding and added-value services.
   • Investors demand: ROI and timing.
3. Does BD have any DIRECT OR INDIRECT power over VC policy in the region? If so, are there efforts being made towards aligning different STI Policies with VC policy?
4. Have policy-makers had space for experimenting and learning with and about effective policies? Maybe pilot projects as “Next OEM”, benchmarking with other regions in the world, etc.?

Market Failures

5. What type of uncertainties are being decreased on entrepreneurs and investors? How?
6. Bad contracting along the entire VC cycle (from initial investment in the VC fund, to the VC fund’s investment in a portfolio company, to the exit from the portfolio investment,
to allow the VC fund’s cash and non-cash investment to be recycled) is likely to cause moral hazard between VC firms and entrepreneurs. Is this issue being addressed somehow?
7. Are there efforts being made to reduce transaction costs among VC firms and entrepreneurs? I.e.: monetary contracting costs, search costs, negotiation costs, monitoring costs, and enforcement costs.

Structural System Failures
8. How are your instruments stimulating and organizing the presence of:
   a. Investors VC firms?
   b. Business Angels?
   c. "Investor-ready" Start-Ups?
9. Are Brainport Development's activities creating space for VC firms to build their managerial, strategic, networking, reputation, marketing and mentoring capabilities?
10. Are Brainport Development's activities creating space for entrepreneurs to build their capabilities to be credit worthy?
11. If # 3 is positive, how are Brainport Development's activities adapting the regional policy in order to increase seed capital access to NTBF?
12. How are Brainport Development's activities preventing weak ties among investors, business angels, VC firms and entrepreneurs?
13. Are Brainport Development's activities linking local and regional business angel networks to each other and to national networks?
14. Are Brainport Development's activities /programs linking business angel networks with public technology incubators or public research spin-offs?
15. Are Brainport Development's activities increasing and diversifying the sources of capital in the region? Which new sources have already emerged and which are planned to emerge in the future?

Impact
16. Is it already tangible, after two years of the program running, that the number or percentage of NTBF in the region that survive the so called “Valley of Death” has increased?
   a. Why do you think this is?
17. Likewise, is there evidence that the # or % of rapid growers in the region has increased?
18. How much has the financial infrastructure of the region grown thank to the BNF program?
19. Are there any projections for the future in terms of the two previous questions?

Closure
1. Do you consider there is something we left out and that you think might be important for me to know for my research?
2. Do you have any questions about my research?
3. Thank you for your time and kindness in answering these questions. Would you mind answering more questions in case I find that I left something out?

Thank you once more for your valuable time and insights!
Appendix H – Abstracts of Interview Transcripts

Interview: 1 of 5

**Interviewer:** Eduardo Guerrero  
**Interviewee:** Dr. Onno Lint  
**Date of Interview:** 20 November 2013  
**e-mail:** o.lint@fontys.nl

- Dr. Onno Lint is a professor at Fontys University of Applied Sciences, working in Lectoraat Brainport for two years now.
- **Directionality Failure:** The strategy of the BNF program is simply to align people and ideas into a network organization.
- **Demand Articulation Failure:** Brainport Development and Fontys are working together in:
  - Supply-side articulation: financial instruments for SMEs operating in high-tech life sciences and chemicals.
  - Demand-side articulation: needs of start-up entrepreneurs and fast growing entrepreneurs.
- **VC Policy Coordination Failure:** Brainport Development has no power over VC policy. This RIA only initiates, stimulates, networks, and conducts research. However, it does give recommendations on policy to the Brainport Eindhoven Region, the Province of Brabant and the Ministry of Economic Affairs of the Netherlands.
- **Reflexivity Failure I:** Programs like Next OEM and Bright Move are considered pilot projects helpful for policy makers’ learning and experimenting processes. These are also based on best practices from abroad.
- **Information Asymmetries Failure - Uncertainties:** Uncertainties are being decreased in two ways:
  - Coaching to entrepreneurs to ensure sound product-market combinations.
  - Reduction of financial uncertainty through co-financing high-risk companies with funds of the Province of Brabant.
- **Information Asymmetries Failure – Moral Hazard:** The interviewee is not aware of the existence of moral hazard (bad contracting) problems in the region.
- **Information Asymmetries Failure – Transaction Costs:**
  - Reduction of transaction costs is already happening through programs like the “Next OEM”, “Bright Move” and “Start-Up Boot Camp High-Tech XL” – a private initiative taking place in High Tech Campus Eindhoven – where investors can cherry-pick the best propositions. It is unclear for how long will these programs be run, but it is expected that between 2 and 4 years.
  - Crowdfunding is currently being studied as an alternative to reduce transaction costs.
- **Actors Failure – Presence and Capabilities:** Stimulation and organization of entrepreneurs and VC firms happens in the basis of coaching and networking. Brainport Development is not the only organization doing this; strategic partners: Province of Brabant, Fontys, and TU/e.
- **Interaction Failure:**
  - Brabant Versmogen is an initiative which has started very recently, but it aims at creating links between regional and national networks of different financial parties; particularly Business Angels.
  - Business Angels are being linked to incubation activities through “Bright Move”.

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• **Reflexivity Failure II:**
  - Hard numbers indicating the impact of Brainport Development and its partner organizations in the region, such as an increase in the number of start-ups that grow into independent companies, or an increase in the number of rapid growers, DO NOT exist as of now. Fontys and Brainport Development are currently working on improving this situation.
  - Onno Lint estimates that the number of rapid growers should be in the magnitude of the tens. However, he adds that the parameters to define what a rapid grower firm is, are not well defined currently, which turns these metrics into something fuzzy.

**Interview: 2 of 5**

**Interviewer:** Eduardo Guerrero  
**Date of Interview:** 25 November 2013  
**Interviewee:** Carina Tielemans  
**e-mail** c.tielemans@brainportdevelopment.nl

• Mrs. Tielemans is a project leader in Brainport Development, who focuses her day-to-day activities in the program Brainport Networking Financials. The latter is a networking program where efforts are put into increasing the links between entrepreneurs and different financial organizations. Moreover, the program also focuses on ways to stimulate the growth of companies through coaching schemes as well as workshops, venture events, networking events.

• **Directionality Failure:** The strategy of the BNF program is simply to get investors more familiar with the companies in the region, and the other way around, to get entrepreneurs more familiar with their financing options.

• **Demand Articulation Failure:** most of the projects are trying to capture better the needs of both entrepreneurs and VC firms:
  - Supply-side: VC firms need less risky alternatives for investment, so the assistance we provide to companies reduce the risk for investors. And also, we are opening VC firms more channels so they can access and invest more easily on firms.
  - Demand-side articulation: we are assisting entrepreneurs with couching so that growing their firms is either more easy or faster.

• **VC Policy Coordination Failure:** Mrs. Tielemans expressed that herself, she has no control over policy. She thinks that it’s possible that the board of Brainport Development has some type of control, but she is not certain, so therefore cannot make a comment in this regard.

• **Information Asymmetries Failure - Uncertainties:** Uncertainties are being decreased in two ways:
  - Coaching to entrepreneurs to ensure attractive (less risky) propositions to investors.
  - On the other hand, entrepreneurs are linked with investing firms with experience.

• **Information Asymmetries Failure – Moral Hazard:** the SME services sector of Brainport Development advice entrepreneurs so that they have it easier attracting investors; however the deals are something happening between investors and entrepreneurs and Brainport Development does not intervene in that.

• **Actors Failure – Presence and Capabilities:**
Stimulation and organization of entrepreneurs happens in the basis of coaching and networking. BNF is starting now to work from the Cluster approach (High-tech Systems and Materials, Food sectors, Automotive in Helmond, etc.). Capabilities of entrepreneurs are being addressed through the coaching activities already mentioned.

Financial representatives are being organized through the BNF network, which includes venture capitalists, business angels, financial service providers, banks (ING, ABN Amro, etc.). They are all in touch with each other, and Brainport Development keeps them updated in regard to new projects in case any of them is interested in contributing to these. The network has around 100 members at the moment. In terms of capabilities of financiers, Brainport Development does not take care of that, not only because of lack of experience, but also because that is not the role of this agency.

**Interaction Failure:**
- BNF has already managed to link around 100 members of regional financiers through network events where presentations are held about different topics and participants are given a space to talk to each other.
- There are also efforts to link regional investors with national networks. For example, BNF belongs already to NVP (Nederlandse Vereniging van Participatiemaatschappijen, or Netherlands Community of Venture Capitalists). So whenever a big project is being held in the region, Brainport Development contacts NVP and informs them about it so NVP would promote the projects on a national level.
- Likewise, Brainport Development has tried to create international links. An example of this is a trip to New York made by the mayor of Eindhoven with regional representatives, in which they had a round table with international investors. Even though contact is maintained, international investors is not a priority for the moment.

**Infrastructural Failure:** increasing and diversifying the sources of capital in the region:
- Besides creating channels for accessing capital of Business Angels, Brainport Development is studying right now the possibility of crowdfunding in collaboration with Brainport Lectoraat. Points of intervention have not been defined yet.
- Additionally, Brainport Development is working on a digital platform for companies and investors. This is expected to increase links among both types of actors and in this way facilitate the match-making process.

**Reflexivity Failure:**
- Brainport Development is working with Brainport Lectoraat in monitoring tools. Mrs. Tielemans reports that the investor side is being monitored well: number of investments made last year, and number of interested investors in the region.
- Efforts on the side of the entrepreneurs are still very much needed. The goal is knowing which type of companies are there in the region, and which are their specific needs in terms of coaching and risk capital.
Mrs. Verhaag has several responsibilities in Brainport Development. First, she is the manager of several European-level projects in which this agency is involved. Moreover, she is part of the department of Strategy in Brainport Development, in which she monitors and implements strategy related to international affairs.

Unfortunately, there was an inconvenience with the recording of this interview. Ultimately, it was possible to recover only the last 3 minutes of interaction among interviewer and interviewee. However, notes were taken by the interviewer with the most relevant points.

First, Mrs. Verhaag supplied general information about her work in the agency.

Directionality Failure: Later, motivated by the question “Besides the goals delineated in Brainport 2020, is there a shared vision of all regional stakeholders for Brainport’s VC Industry in the future? E.g. a regional stock market integrated into global equity flows, seasonal/yearly execution of programs, etc.).” Mrs. Verhaag explained that the purpose of Brainport Development is not to create such long-term strategies and later try to impose them to the regional actors. Instead, what Brainport Development tries to do about this project is simply to get all relevant actors involved and interacting among each other. Kick-starting these projects allow actors to share knowledge and information, and therefore, Brainport Development expects that these regional actors come up with initiatives themselves.

Gijs and Monique work in the SME services sector within Brainport Development. They advise start-ups (80%) and more established growing companies (20%) in terms of business development: business plans, management, the creation of networks, etc. Gijs has a little bit less than 10 years of experience boosting companies in the Netherlands with his own firm, which has seen big successes already. And Monique has 20 years of experience as a business analyst and project leader in different companies in the Netherlands.

Monique was absent for the first few minutes of the interview, so after she joined the meeting she was briefed with all the questions she missed in case she had something new to contribute with.

Interaction Failure:

- Besides business angel networks there is also a network for informal firms that execute activities very similar to those of a VC. This Business Informal Network is called NvO.
- Brainport Development is still not looking too actively for investors outside the country; however, the personal experience of the interviewees indicates that people abroad are interested on what is happening in the Netherlands. Therefore, opportunities are to be sought in the future.
Brainport Development collaborates with other institutions, such as VC firms and banks, which altogether make sure that firms in all stages of the firm lifecycle are adequately supplied with finance. However, initial stages of a firm demand the supplementary input of business advice, which both Brainport Development and VC firms/business angels, can provide.

- **Actors Failure – Capabilities:**
  - VC firms: there are few VC firms that indeed do understand the business. These firms usually categorize ventures and then focus their investments on specific niches (e.g. SaaS, life sciences, etc.) and they make sure that the capabilities of the entrepreneurs or their networks are more than sufficient for boosting the companies. However, most VC firms only want to be in the right place at the right time and they usually don’t manage big funds. Additionally, Gijs mentioned that VC firms do not recover their investment through exits and mergers only; some of these firms earn money from interests they charge to the firm (similar to what banks do).
  - Entrepreneurs: most start-ups in the region are technical-driven; they specialize in the products or service they provide. However, for a venture to be successful it has to be market-driven as well, and most entrepreneurs in the region lack that. So therefore, investment managers take an operational function within the firm and they get a seat on the management level to make sure the exit is successful.

- **Hard Institutional Failure:** it is the opinion of both specialists that laws in the country are not a hindering problem for the issue of financing innovation processes.

- **Soft Institutional Failure:** Brainport Development has the role of marketing cultural features in the region that would lead to an increase of entrepreneurial activities; however, it is the opinion of Gijs and Monique that the agency still has room for improving in this regard.

- **Information Asymmetries Failure – Moral Hazard:** Moral Hazard is not perceived as a problem.

- **Information Asymmetries Failure – Transaction Costs:** all of the programs carried out by Brainport Development saves money to entrepreneurs. An average VC firm would charge a selection fee between €2,000 and €10,000, and Brainport Development does it for free. Also, some funds charge fund management fees that go between 0.5% and 3% of what the fund is worth; and firms which focus on exits charge up to 25% of the money earned with the exit. Therefore, it is accurate to say that all programs of this agency save transaction costs.

- **Reflexivity Failure:** the impact of the incubation activities that the “SME services” sector of Brainport Development execute are still not being measured. Nevertheless, efforts are being invested in this.