



# Knowledge Triangles in Dutch Entrepreneurial Ecosystems

# 6

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## 6.1 Introduction

In knowledge-based economies, long-term wealth generation depends not only on human capital and research as separate resources but also on the complementarity between research and human capital in the creation of innovation (Cohen and Levinthal 1990; Qian and Acs 2013) and the feedback effects of innovation into the economy (Aghion et al. 2009). The interaction between education, research and innovation has gained prominence with the “Knowledge Triangle” concept (OECD 2015). In this chapter, we present an explorative study of knowledge triangles of research-education-innovation within Dutch entrepreneurial ecosystems (based on Stam et al. 2016). Knowledge Triangles do not evolve in a vacuum but are part of a

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broader set of interdependent actors and factors that, if coordinated in an adequate way, might enable entrepreneurship within a particular territory. We focus on the role of regional governance (i.e. networks and leadership) in the knowledge triangle and the entrepreneurial ecosystem more broadly. This is reflected in the main question addressed in this chapter: How is the interaction between research [knowledge] and education [talent] coordinated [by networks and leadership] to promote entrepreneurship in regional ecosystems in the Netherlands?

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## 6.2 Theoretical Framework

How do education, research and innovation interact to generate wealth? The generation of knowledge and accumulation of human capital does not automatically lead to innovation. The knowledge spill over theory of entrepreneurship (KSTE) suggests that entrepreneurship provides a crucial mechanism in translating knowledge into new value, and ultimately economic growth (Acs et al. 2005; Audretsch et al. 2006). Entrepreneurship necessarily involves individuals and their response to economic opportunities (Eckhardt and Shane 2003). Not only is the source of opportunities important (knowledge created in organizations), but so is the individual recognizing and commercializing these opportunities. Entrepreneurial opportunities are not exogenously given, but rather endogenously and systematically created under certain conditions; they are the outcome of investments in new knowledge and ideas (Schumpeter 1942; Audretsch et al. 2006) on the one hand, and the accumulation of knowledge in individuals (Shane 2000) and firms (Cohen and Levinthal 1989; Cohen and Levinthal 1990) on the other hand. Prior knowledge enables certain entrepreneurs to be alert to new opportunities (Shane 2000; Kirzner 1973). Both education and experience are therefore needed to absorb the knowledge that can serve as input for the entrepreneurial process (Shane 2000; Qian and Acs 2013). In addition, leadership experience (Stam and Wennberg 2009), the recruitment of talented students (Mian 1996) and experienced personnel (Audretsch and Stephan 1996; Audretsch and Lehmann 2006) are needed to scale up new firms and ventures. Talent, knowledge and experience are thus important resources for entrepreneurial activity in a knowledge-based economy. To accomplish economic growth, the interaction between these elements is critical. The systemic nature of these interactions is captured in two emerging concepts: the knowledge triangle and the entrepreneurial ecosystem.

The knowledge triangle has recently gained prominence in innovation policy thinking of the OECD and the European Commission. The OECD (2015) defines a knowledge triangle as “the interaction of education, research and innovation.” The central idea is that creating new knowledge from research and high-quality education in themselves are not enough to gain prosperity and economic growth. New knowledge and talented people need to be linked to innovation. Moreover, the knowledge circulation between these elements (resulting in a learning economy (WRR 2013)) increases their ultimate impact on prosperity. Even though innovation is a multi-player game, a system with a large set of agents involved beyond the focal

organization, it ultimately depends on individual action by entrepreneurs. Entrepreneurial action is needed to experiment and reduce the uncertainties arising from the long-term cycle of innovation (Stam and Nootboom 2011). Different types of entrepreneurship are involved, from entrepreneurs forging radical new combinations to entrepreneurs that realize the first successful applications of these new combinations and entrepreneurs who scale up these initial successes. Further along the cycle of innovation, entrepreneurs are needed to transfer and adapt these innovations to new contexts, potentially leading to radical innovations again.

Each region has a specific context to organize the knowledge triangle. This variety, its causes and consequences can be analyzed by adopting an entrepreneurial ecosystem perspective (Stam 2015). The entrepreneurial ecosystem perspective is related to the innovation system approach, which argues that the quality and interaction of the elements of innovation systems (knowledge, producers, finance, demand) determines the innovation output of the system (Nelson 1993; Edquist 1997; Cooke 2001; Nootboom and Stam 2008).

Both the entrepreneurial ecosystem and innovation system approach emphasize the systemic nature of innovation. However, agency and especially entrepreneurial action is more central to the entrepreneurial ecosystem approach. An entrepreneurial ecosystem is a set of interdependent actors and factors coordinated in such a way that they enable productive entrepreneurship within a particular territory (Stam and Spigel 2018). Productive entrepreneurship here refers to entrepreneurs creating and exploiting opportunities for innovation in ways that lead to (significant) new value for society.

In this study, we focus on the regional governance of knowledge triangles: inter-organizational knowledge networks and leadership via regional economic boards. The knowledge networks are mechanisms for providing connection, whereas leadership involves a mechanism for giving direction. We address these questions of governance in three case studies of the most binding constraints within the ecosystem and the commitment among key stakeholders to invest in projects with collective and long-term returns.

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## 6.3 Case Studies

In researching the functioning of the knowledge triangle in the context of entrepreneurial ecosystems, we selected three cases. Elsewhere, we provide an extensive rationale for the selection of these cases and also describe the data collected for each case study (Stam et al. 2016). The three case studies are: Brainport Eindhoven, Metropolitan Region Amsterdam (MRA), and Twente.

### 6.3.1 Brainport Eindhoven

The Eindhoven area is one of the most industrialized regions in the Netherlands and has been the home base of multinationals like Philips (electronics), ASML

(lithography systems), NXP (semiconductors) and DAF (automotive). Until the end of the nineteenth century, this area was dominated by agriculture. Multinational corporation Royal Philips (founded in 1892 as a light bulb producer) played a very important role in the development of Eindhoven, creating a company town with a tight network of technical suppliers in the region (Engstrand and Stam 2002; Havermans et al. 2008). The concentration of specialized knowledge, labour force and experience provided fertile soil for new technological ventures, like the Philips-ASM International joint venture ASML (founded in 1984). The scaling down of Philips in the 1990s and early 2000s led to divestments which in their own right provided the foundation for many new companies in the high-tech systems sector. The high-tech expertise of the region has led to the area being dubbed “Brainport,” as a juxtaposition to the traditional main ports (Rotterdam Seaport and Schiphol Airport) as key assets of the Dutch economy.

In the 1990s, cooperation between industry, government and HEIs intensified due to the possible collapse of the industrial base. Car manufacturer DAF went bankrupt, and Philips had to scale down rapidly. Ten years of cooperation between leaders within government, industry and HEIs led to programmes that were able to revive large parts of the regional manufacturing base by creating new horizons, including new matches between design and technology (Horlings 2014; Schaap and Van Ostaijen 2015). This culminated in the formal establishment of the Brainport Foundation in 2006.

The Brainport region has a rich history of place-based policies for knowledge development and innovation with a large portfolio of physical campuses: science parks associated with either HEIs (TU/e Science Park), multinationals (ASML), or research institutes (Automotive Campus), but also privately owned locations characterized by open innovation (High Tech Campus Eindhoven, Strijp S). Leading companies—ASML, NXP and Philips—all have a large number of innovation projects in their portfolio and are major players in the national innovation system.

The largest university in the region is Eindhoven University of Technology (5500 bachelor students, 3200 master students, 1500 doctoral students, 2000 academic staff members). The Fontys University of Applied Sciences is the other large higher education institute in the region (44,000 students, of which 15,000 in the Brainport region, 4400 employees). Vocational education and training (VET) is provided by three colleges (21,000 students). When looking at the characteristics of knowledge networks, in the Brainport region, two large OEMs, as well as two HEIs, are central players in the project-based innovation networks.

Dutch regions have a complex layering of coalitions and networks, and Brainport is no exception. The 21 municipalities in the region are organized in the all-government Metropolitan Region Eindhoven (MRE). The board of Brainport Foundation currently includes representatives of (1) all the major higher education institutes and vocational schools in the region, (2) the municipalities, (3) the province, and (4) large firms and industry associations. The board is chaired by the mayor of Eindhoven. Brainport Foundation in 2015 formulated a so-called “adaptive strategy,” which does not contain any quantitative long-term objectives but rather

aims at continually identifying opportunities to increase the competitive advantage of the region and being flexible enough to exploit them (Brainport 2015).

The Brainport Foundation has an executive organization named Brainport Development, responsible for the international communication strategy of the economic interests of the region, the international human capital agenda, the technology portfolio, and the creation of a favourable investment climate. The organization is funded by each of the stakeholders represented in the board, either in cash or in kind. Brainport Development has organized its initiatives along the lines of societal challenges (like transitions in energy, health and safety): a thematic focus instead of a sectoral focus to create new perspectives for the high-tech sector. The interviewees emphasize that Brainport Development is considered a neutral party, and therefore Brainport managers are often called upon to bring different public and private organizations together.

The Brainport Network seeks to reinforce its collaborative efforts and ambitions with eight other regional development boards elsewhere in the provinces of Noord-Brabant and Limburg. Brainport Industries is a network organization that unites around 300 first, second, and third tier suppliers of original equipment manufacturers (OEMs) in the region to provide its members with one strong voice as well as promote collaboration in order to improve the innovativeness of the companies. A major funding organization for the region is the Brabant Development Agency (BOM), which provides public funds for long-term investment schemes.

All the HEIs have solid ties with technology-driven companies inside and outside the region. At the level of VET, companies help revise the qualifications for their field and provide internships and lecturers for the school. Cooperation is institutionalized in Centres of Expertise (UAS), Centres for Innovative Craftmanship (VET), and academic research programmes, and aligned with the regional strategy. Both types of Centres are temporarily funded (by industry, HEIs, government).

The international companies based in the Brainport region are committed to the functioning of the ecosystem, and all have the capacity for a long-term strategy agenda. They need a continual influx of new knowledge and high-level suppliers. The international OEMs in the region are all high-tech firms, but mostly not direct competitors, which facilitates cooperation. Although they have high standards in terms of business climate, almost all have a long history with the region, making it easier for government and HEIs to come to long-term agreements with the private sector. One interviewee noted that “there seems to be a common goal to keep labour and knowledge beneficial for the region.” Another interviewee noted that “speed is the determinant for success in this sector and since most firms are specialists, collaboration is essential for survival.”

Additionally, the corporate culture of the large specialized suppliers in the region is rather cooperative in nature. Several interviewees noted a revival of this cooperative stance that has cropped during the recent financial crises, which has resulted in the region weathering the recession with minimal losses. This culture fosters many informal meeting moments between private sector leaders in the region, which adds to the quality of the network.

Overall, the governance of the Brainport ecosystem and knowledge triangle entails:

An orchestrating university that through its students, resources and research actively transfers knowledge to firms in the region and initiates, facilitates and completes projects that aim to improve the knowledge triangle.

An active network organization that facilitates the collaboration between public and private parties and aligns initiatives with the strengths of the region, but deliberately spins out these initiatives (if they are viable) to new or existing organizations.

A tightly knit high-tech community of OEMs and specialized suppliers that are willing to collaborate with competitors and partners in their value chains.

The organizations within the Brainport region perceive several constraints in the further development of the ecosystem:

The development speed in the high-tech sector far outpaces the renewal of educational qualifications, creating a larger gap between education and professional requirements.

A growing shortage of engineers and developers, who also prefer jobs at large OEMs instead of SMEs.

International enterprises in the region place higher demands on infrastructure, which is currently underdeveloped for the future.

The ecosystem is very dependent on a small number of large manufacturers.

Research and innovation funding becomes increasingly complex and tight for HEIs and companies alike.

The public–private partnerships that have been established by HEIs, such as Centres of Expertise, have yet to find a sustainable business model and meanwhile continue to lean on government funding.

### **6.3.2 Metropolitan Region Amsterdam (MRA)**

The economic strength and diversity of the Amsterdam region go back to the sixteenth century, when international trade, finance and transport (shipping) intertwined to create the base for prosperity. The city of Amsterdam enjoyed strong economic recovery during the last twenty years, following a decline in inhabitants and economic growth during the 1960s and 1970s. The economic structure of the city of Amsterdam largely depends on professional services (including financial services, marketing agencies, IT-services), transport, wholesale and creative industries. The larger MRA has a more diversified economic structure, including food processing industry, steel manufacturing, manufacturing of metal products and machinery, logistics, broadcasting and high-tech horticulture (Metropoolregio Amsterdam 2016).

The MRA has an abundance of business locations with a strong signature, including central business districts, creative campuses and start-up hotspots. Academic campuses and campuses for applied research are scattered around the city.

The ecosystem in the MRA includes a large number of institutes for higher education. The most important institutes are the University of Amsterdam (30,000 students), the Free University (23,000 students) and the Amsterdam University of Applied Science (50,000 students). The second University of Applied Science is InHolland, with four locations in the MRA (15,000 students). The largest institute for vocational education and training is the ROC of Amsterdam (36,000 students). The Amsterdam HEIs count more than 100,000 students (which is 12% of all Dutch students at universities for applied science and 22% of all Dutch university students). It is the largest concentration of students in the Netherlands. The formal knowledge networks in Amsterdam are dominated by a larger set of HEIs.

The MRA includes 36 municipalities, two provinces and the regional authority. The coordination of regional economic policy is executed by the all-government Platform Regional Economic Structure (PRES). PRES oversees several organizations dedicated to separate tasks: IAMsterdam (international marketing), Amsterdam in Business (foreign direct investment), Plabeka (Platform for the planning of business and office locations), and the Amsterdam Economic Board (triple helix collaboration for innovation).

The Amsterdam Economic Board (AEB) was established in 2010, as the offspring of the Kenniskring Amsterdam (1994) and the Amsterdam Innovation Motor (2004). As a form of triple helix cooperation, the AEB aimed to invigorate the competitiveness of seven (and later eight) industrial clusters in the metropolitan area and guarantee future competitive advantages for the Amsterdam region. The AEB has 20 members and is chaired by the mayor of the City of Amsterdam. The AEB has been able to build upon existing networks and social capital. Part of the structure of AEB is the Amsterdam Network Council (paid membership, uniting nearly 150 influencers from large corporations, governments and knowledge institutes), and Young on Board (functioning as a liaison between young professionals and AEB).

There are different perspectives on the level of commitment of leading firms. Key actors from regional industrial clusters (like logistics, horticulture) are active members of the AEB. Financial services, an important sector in the Amsterdam economy, are not represented directly. The connections between the start-up community and the AEB is indirect. One interviewee observed that “for start-ups there appear to be other focal points like [the accelerators] Rockstart and StartupBootcamp.” It has turned out to be difficult to connect with and get the commitment of SMEs in all sectors stretching from creative industries to manufacturing. There are different levels of commitment of HEIs as well. Amsterdam universities have less staff engaged in business interaction and knowledge transfer than other European universities that have excelled in these areas (BiGGAR Economics 2014). Representatives from knowledge-intensive new industries, like fintech, have identified large gaps between HEIs and their community in terms of quality of education, the development of new, interdisciplinary

knowledge and understanding the needs of new industries. The presence of two universities enhances competition, even where collaboration to set up new programmes would be more appropriate and efficient. Interviewees from HEIs and SMEs share the opinion that research universities and universities of applied science should bridge their different views on education to provide better programmes for both students and industry. The broadly supported Human Capital Agenda aims to reduce the lack of efficiency in vocational education and turn competition between institutes into more tailor-made education in Amsterdam and its surroundings.

There is a strong commitment of local and regional governments to the AEB. At the start, the AEB could build upon the fundament of the seasoned all-government platform PRES. The AEB extended this cooperation to HEIs and enterprises. There is consensus on the importance of the City of Amsterdam, for example with regard to funding and staffing: “without the City of Amsterdam, the AEB would not have existed.” Also, the energy and commitment of individual members of the Amsterdam city council are widely praised. The human capital agenda is a successful example of a broadly supported, promising and collective policy agenda for a better match of supply and demand on the labour market. On the other hand, there are several programmes that have been initiated by the City of Amsterdam but are not part of the agenda of the AEB, like the local start-up policy programme Start-up Amsterdam.

The AEB has recently seen a major change in strategy, organization and approach. The industrial cluster approach has been abandoned. Instead, five societal challenges have been formulated to mobilize SMEs, corporates, HEIs and governments into joint action. As a consequence, also the aim to remove institutional obstacles for industrial cluster development and business development more broadly (one of the initial goals of the AEB) has been transferred to other parties (municipalities and industry organizations). Initiatives and projects will be judged on “semi-commercial” criteria (feasibility, scalability, competitive advantage). A relevant barrier to overcome, is the lack of commitment of partners, within and close to the Board, to actively take the lead in projects and programmes. A new strategy has been crafted to address this problem. When looking at the dominant industries in the MRA, the question might be to what extent HEIs add to innovation in these sectors beyond the (one-way) delivery of human capital. In this sense, the conclusion of the OECD (2010) in 2010 still stands: “To reach its potential Amsterdam can and should make better use of the two legs it has to stand on: a strong knowledge base and strong businesses. Amsterdam’s problem is that it has too many strengths.” The results from the network analyses on innovation projects confirm this statement (Stam et al. 2016). The large set of HEIs in Amsterdam provides a strong base in terms of the scale of both human capital and knowledge, but at the same time, it appears difficult to align the HEIs to the needs of the highly diversified business community.

Overall, the governance of the MRA has to deal with a highly diversified economic structure and strong entrepreneurial dynamics:



The governance appears to have become increasingly adapted to the diverse structure of the regional economy, moving its focus from industrial clusters to societal challenges, a turn that paves the way to cross-sectoral innovations and open innovation strategies.

The ecosystem seems to be largely driven by self-organization, without firm guidance or steering by the AEB.

The board has especially been successful in making sense of a shared vision on the ecosystem and providing a platform for collective action in particular niches.

The most binding constraints of this governance system appear to be:

The lack of connections of start-up communities with the AEB and the ensuing limited entrepreneurial leadership in the entrepreneurial ecosystem.

The lack of entrepreneurial leadership might also be an obstacle in the necessary adaptation of educational programmes—although there are some good examples of industry-led educational changes.

The wide variety of governmental actors (municipalities, regional authorities, two provinces) carries the risk of slowing down effective governance and collective action. In that sense, the recent collective policy agenda for the MRA might be considered a milestone.

However, the MRA region appears to have a well-developed capacity for bottom-up self-organization, enabled by the density of entrepreneurial individuals and the density and diversity of ventures, skills and human talent. As a result, the constraints previously listed might not be very binding for the performance of the region.

### 6.3.3 Twente

The region of Twente is located on the eastern border with Germany. Until the first half of the twentieth century, the textile and related industries (machine manufacturing, construction) constituted the primary economic pillar of the Twente region. As of the 1950s, however, the textile industry in Twente suffered from a structural decline. This led to a decrease of 80% in employment in the textile industry in the period 1955–1980, a loss of about 40,000 jobs (Sijgers et al. 2005). Therefore, key agents from industry and local government started lobbying for academic education, which resulted in the establishment of the new University of Twente in 1964. As of the 1980s, investments in higher education, as well as substantial support from European funds, helped the Twente region to somewhat recover from its decline in preceding decades. But overall, the economic structure of Twente is still relatively weak in terms of the educational level of its population as well as R&D and innovation expenditures.

The Twente ecosystem includes two institutes of higher education: the University of Twente (10,000 students) and Saxion University of Applied Sciences (26,000

students). All intermediate vocational education is offered by the ROC Twente (18,000 students).

Important agents and bodies in Twente's ecosystem are the City of Enschede; Region of Twente (all-government platform with 14 municipalities); Province of Overijssel; Technologie Kring Twente (informal business network uniting 150 high-tech companies); Twente Board (triple helix platform); and Kennispark Twente (joint initiative of the University of Twente and Saxion University of Applied Sciences, the City of Enschede, the Region of Twente and the province). Kennispark Twente is considered a key orchestrator of Twente's knowledge triangle, rooted in its mission to further develop a climate of innovative entrepreneurship in the region of Twente, with incubator-like programmes, programmes stimulating industrial innovation and provision of business locations.

In formal collaborative innovation networks in Twente, the two HEIs are most central, also due to the absence of large Dutch corporations. Compared to knowledge networks in the other regions, Twente has the highest average number of partnerships, the highest density, the highest connectedness, and the lowest average distance between nodes (Stam et al. 2016).

In the last fifteen years, the Twente region has set up various regional bodies, such as a Regional Innovation Platform, later followed by a Strategy Board. The latter was transformed into the Twente Board in 2014. At the regional level, the Twente Board operates as a collaborative body, set up to stimulate Twente's economic development, with a focus on the top sector High-Tech Systems and Materials (HTSM). The Twente Board consists of 10 representatives from the triple helix and is chaired by an independent chairman. The first action undertaken by the Twente Board in 2014 was to assess the state and strategy of the Twente region. The audit confirmed that Twente needed to maintain its unique expertise in high-tech systems and materials but also had to develop entrepreneurship in new industries. The report of the visitation committee led the Twente Board to develop an activity agenda "Twente Werkt" ("Twente Works") in 2015. The chair of the Twente Board thus observed that "we have moved towards one shared agenda, with clear targets such as 5000 new jobs in Twente and 500 new jobs at the German side of the border (...) and objectives such as increasing the participation rate and the regional gross domestic product." Another key initiative taken by the Twente Board is to visit 100 enterprises in the region, of which 75 visits have been completed in the Board's first year. The Twente Board has adopted a rather lean operational structure. The members of the Twente Board turn to their own staff (e.g. at the University of Twente, Saxion, Twente region, or province Overijssel) to actually run the projects. In this respect, the chairman of the Twente Board believes "it is important in Twente to avoid further institutionalization, and instead focus on making connections with the key actors and their initiatives."

The university is the driving force behind the knowledge triangle, as one interviewee states: "There are hardly any large firms that can fulfil this role, but instead many start-ups and SME's. We have had a few fast-growing companies, but they often relocate outside the region when they become too big for the local labour market." The key role of the University of Twente is also evident in Kennispark

Twente, of which the University of Twente is the key occupant and (majority) owner. The stable governance system of Kennispark Twente appears to have contributed to its successful performance as an incubator of new firms; its historical track record in terms of spinoff creation is still unmatched in the Netherlands and has also long been a benchmark in Europe (Benneworth and Charles 2005; Benneworth et al. 2010).

The public ownership and control of Kennispark Twente imply that local industry is not represented in its management and governance. Several interviewees observed this governance approach helps the board of Kennispark to steer away from any possible conflicts of (business) interest. The flipside is that there are no private investors in the knowledge infrastructure. Kennispark Twente is under-financed, also as a result of the budgetary constraints of the University of Twente and the University of Applied Sciences Saxion.

Overall, we observe a strong commitment of the two leading educational organizations and three local government levels (cities, region, and province) to the knowledge triangle in terms of both investment and governance. The large population of small and medium-sized firms mainly contributes to developing and sustaining the regional ecosystem via representatives in formal bodies (such as Twente Board) as well as via informal settings and meetings (such as in *Technologiekring Twente*).

The Twente ecosystem has gradually evolved into a “start-up region” par excellence, with a well-developed governance system around Kennispark Twente. The recently established Twente Board can potentially offer orchestrator capability that complements the public ownership and governance of Kennispark Twente. However, as several interviewees observed, the Twente Board still operates rather loosely, and in the next few years, it will have to demonstrate that it can effectuate this capability.

The research also suggests that the Twente region continually adds new bodies and initiatives to an already dense network of taskforces, cluster organizations, and agencies, thus further enhancing institutional complexity. Several interviewees observed that (representatives of) most municipalities tend to prioritize the interests of their own municipality above those of the region.

A recurrent theme in the interviews with representatives from the Twente ecosystem is the shared perception of Twente being (geographically) distant from the heart of the Netherlands, which would reduce access to national funds and programmes. External observers have recently argued that the Twente region is in need of a new connector, or group of connectors, that would reduce its current dependence on the University of Twente (including Kennispark) as the main connector (Van Agtmael and Bakker 2016).

Overall, the governance system of the Twente knowledge triangle appears to entail:

A well-functioning Kennispark system, with a stable configuration of public owners and investors.

A relatively new Twente Board that still has to establish itself and demonstrate its capability and added value (especially relative to Kennispark Twente) to orchestrate and facilitate the economic growth of the region.

A tendency to further increase the institutional complexity of the region, by continually adding new initiatives, teams and taskforces to the existing landscape of collaborative bodies.

The most binding constraints of this governance system are:

Its (perceived) distant location relative to more densely populated regions in both the Netherlands (e.g. Randstad) and Germany (e.g. Ruhr region).

The historical demise of most (home-grown) large industrial firms, which has made the region largely dependent on the University of Twente and Saxion as primary orchestrators of the knowledge infrastructure (supported by several layers of local government).

The relatively small stock of human and financial resources that new start-ups, as well as SMEs and large corporations, have access to, given limitations arising from the local labour market.

A regional profile around “High Tech Systems and Materials” that in the longer run may not be sufficiently distinctive to attract new investors, companies and knowledge institutes.

In Twente the HEIs have a dominant position both in knowledge networks and in the governance of the knowledge triangle. In Brainport these positions are being filled by the closely collaborating OEMs and HEIs. However, in Amsterdam the HEIs—dominant in formal collaborative projects—are weakly connected to the other segments in the knowledge triangle. It seems that the larger and more diversified the economic structure, the more complex the governance of the knowledge triangle and entrepreneurial ecosystem at large.

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## 6.4 Conclusions

In this chapter, we focussed on the entrepreneurial ecosystem context of knowledge triangles and, in particular, on two elements of the regional governance of the knowledge triangle: inter-organizational knowledge networks and leadership via regional economic boards. The knowledge networks are mechanisms for providing connection, whereas leadership involves a mechanism for giving direction. Connections between education, research and entrepreneurial actors are at the heart of the knowledge triangle, while the direction is needed to target the most binding constraints in the ecosystem and to facilitate collective action in tackling key socio-economic challenges in the region.

Overall, the regional economic boards in all three case study regions aim to make HEIs and other educational institutes more relevant for their regional ecosystem and share a triple helix-based approach in which key stakeholders are frequently

consulted. Even though the regional economic boards in all three regions have adopted a regional governance approach centred around an ongoing dialogue between key agents in the region, they differ substantially in several key domains. We mention three of them:

#### **6.4.1 The Ability to Prepare the Region for the Future**

The Brainport region faces the huge challenge to make its successful high-tech industries “recipe” more future-proof by enabling more bottom-up new economic activities in order to make the region more resilient and less dependent on a limited number of high-tech OEMs. The Amsterdam region competes with metropolitan areas like London and Berlin in attracting foreign firms and high-level professionals. The growing collaboration between HEIs in the MRA region and (emerging) business activities may facilitate the development of new knowledge (networks) and thus make it more competitive compared to these metropolitan areas. However, most of these collaborations are both fluid and fragile: good for flexibility, but a lack of commitment may also be harmful to large-scale changes. The Twente region has an excellent track record in new business incubation and creation, but its capacity to nurture and retain fast-growing firms is relatively low. This illustrates that regions differ significantly in how they (as an entrepreneurial ecosystem) are configured, and therefore also face fundamentally different challenges in terms of economic growth and competitiveness.

#### **6.4.2 The Coordination of and Emphasis on Industrial Clusters**

The three regions studied are distinct in their place-based strategies and policies. The Twente region has a well-established Kennispark, entirely governed by public agents. The Brainport region has deliberately developed a larger portfolio of campuses, some initiated by public agents and others by private agents. The MRA can draw on a large number of attractive locations, even in the absence of a regional strategy for industrial clusters. This suggests that a collective sense of urgency about the local economic situation (e.g. in Twente and Eindhoven in the 1980s, respectively 1990s) may be a critical condition for any regional leadership to initiate a strategy for industrial clusters. In the MRA, the scattered pattern of locations with each its own strategy and client base did not hinder the emergence and growth of start-ups.

#### **6.4.3 The Balance Between Top-Down Steering and Bottom-Up Leadership**

In regions with a relatively homogenous and interwoven economic base and knowledge network, like Brainport, effective collective action is more probable due to the

shared understanding of how economic value is created in the region. MRA's diversity in industries and knowledge institutes and its almost autonomous economic development constrain the ability of a regional board to steer it. In this type of highly distributed settings, bottom-up leadership in emerging niches might be much more effective.

Regarding the ability to guide a region in a particular direction, targeted industrial policies seem to have become a remnant of the past. All three regions in this explorative study followed, until recently, an industrial cluster strategy: backing strong sectors. Two of the regional boards in the Dutch regions are now moving away from this type of industrial policy in favour of an approach aimed at grand societal challenges (societal outcomes). In the Brainport ecosystem, there is consensus that shaping an industrial portfolio is less productive than making the region more adaptive towards yet unknown circumstances. This suggests each region has a unique history in shaping collective action and has also been developing a (region-specific) balance between top-down steering and bottom-up leadership.

In contrast to the expectations of the recent entrepreneurial ecosystem literature, none of the economic boards includes entrepreneurs that (sufficiently) represent the community of (potential) scale-ups. This omission may be a significant constraint on improving the conditions for productive entrepreneurship that has been recognized to be of major importance for the regional economy.

#### **6.4.4 Relation with Government**

All three regions have gradually been moving towards a triple helix mode of collaboration. Even the Twente region, where the local industry has for a long time not been directly involved in the governance of Kennispark Twente, has recently established a tripartite Twente Board. The Twente Board, as it currently operates, is highly dependent on the administrative support and project management capacity offered by governmental agencies. This may create tension between the intentions and policies developed in the tripartite constellation of the board itself and the capability to make these intentions and policies work. When it was first established, the Amsterdam Economic Board was for a major part, dependent on staffing and collective funding by nearly 40 local governments. Business partners and HEIs were member of the board but not financing it and were merely financially participating at the level of programmes and projects. With AEB's recent strategic change, the financial commitment will be redistributed to all partners in the triple helix. The Brainport board, by contrast, has its own support staff and budget for project management, which may enable it to operate more independently between all stakeholders of the knowledge triangle. The latter model, as such, may therefore better enable business leaders to participate in and contribute to regional governance in the context of a regional board that co-creates conditions for enhancing the viability of the region. Overall, there are substantial differences between regional boards with regard to their ability to choose where, when and how to act—especially as a result of how they are funded and organized.

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