RUNIN
The Role of Universities in Innovation and Regional Development

Regional Mission Impossible?

The Twente Region and the University of Twente

WORKING PAPER 02/2018

Sofya Kopelyan
Centre for Higher Education Policy Studies (CHEPS)
Faculty of Behavioural, Management & Social Sciences
University of Twente, the Netherlands
s.kopelyan@utwente.nl

Lisa Nieth
Regio Twente, the Netherlands
Centre for Higher Education Policy Studies (CHEPS)
Faculty of Behavioural, Management & Social Sciences
University of Twente, the Netherlands
l.nieth@regiotwente.nl

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Marie Skłodowska-Curie grant agreement No. 722295.

Table of Contents

Figures

Boxes

Abstract

A well-functioning regional innovation system involves a lot of communication and interaction among the actors. However, sometimes the communication and interaction create tensions impeding regional development. In order to explore the reasons behind this, this study looks at the relationships between key stakeholders in the Twente Region in the Netherlands. The region has an established reputation for innovation and entrepreneurship, a high inter-connectedness between the actors, and a strong knowledge infrastructure. The research focuses on the University of Twente as a key actor contributing to regional growth in close cooperation with various stakeholders. This is an introductory interview-based case study that identifies four areas of tension between the university and its regional stakeholders. Our inquiry sheds light on the misalignment of stakeholders' interests and expectations that lessens the actors' capacity for policy formulation and strategic agenda setting, as well as hinders its successful translation into action. Then, the absence of clear intermediaries significantly increases the perceived distance between the University of Twente and the Twente region and impedes the university's collaboration with companies outside the science and business park. Next, the tension of discontinuity highlights the complexities of human resources and personalised networks – their diversity, multidimensionality, and overlaps make it harder to synchronise action and enhance reciprocal benefits. The knowledge asymmetry between the parties further complicates their communication and weakens commitment. In the end, the paper offers a few ideas for action for academic leaders and regional policymakers.

Keywords: Regional mission, Twente Region, University of Twente.

JEL: I23; O20; O30; R10; R58

This paper version was presented at the 12th Regional Innovation Policies Conference, which was held in Santiago de Compostela, Spain on October 26th - 27th 2017, and is currently under further work and improvement for becoming a book chapter in the framework of RUNIN project.

1. Introduction

Regions have recently gained increased attention as objects of study because policy makers and citizens have started to take into account local realities in order to understand 'the big picture' of socio-economic development. At the same time, scholars have been extensively analysing the role of innovation in regional settings, focusing on innovation ecosystems, networks, and triple-helix collaborations. A well-functioning regional innovation system involves a lot of communication and interaction among the actors which is meant to support regional development, but sometimes, to the contrary, impedes it. In order to explore the reasons behind this, one has to look at the diverse actors and their roles within the ecosystem.

The Twente Region has established a reputation for innovation based on a number of distinctive entrepreneurial initiatives (Garlick, Benneworth, Puukka, & Vaessen, 2006). For example, in 2017 it was nominated one of the top three "most innovative regions" of the Netherlands (Avrotos, 2017). Similarly, the University of Twente (UT) has been repeatedly featured as an example of a "world-class entrepreneurial university through its top-to-bottom innovative and entrepreneurial institutional culture, […] and its strong regional network" (Meerman, 2017, p. 2). It partially owes this reputation to Burton Clarks study*, Creating Entrepreneurial Universities* (Clark, 1998), that included the case of the UT.

Back in 2005, the specific higher education landscape of Twente and the tensions within the Twente Region were addressed in a study commissioned by the OECD (Garlick et al., 2006). Today, we realise that there are still multiple challenges that an entrepreneurial university faces when operating in its region. For instance, the problem of successful regional interaction and networking in innovative communities, as well as the match-making of regional needs to Higher Education Institutions' (HEIs) capacities (Schutte & Van der Sijde, 2000).

This study will therefore look at the case of the UT as a key actor contributing to regional growth in close cooperation with various stakeholders. We will address Twente's attempts at having a flourishing cooperation between entrepreneurs, research, education, and governmental authorities (called "the four O's" in regional

strategies: *ondernemers, onderzoek, onderwijs, en overheden*) and some challenges within the region.

This is a qualitative exploratory case study. Data were collected in April-June 2017 from primary and secondary sources, including documents, semi-structured open-ended interviews, and academic publications. The interviews looked into the participants' background, their understanding of the University of Twente's engagement with the Twente Region, as well as for its benefits, bottlenecks, and future scenarios. Interviewees were comprised of internal and external stakeholders, in equal proportion (purposive and snowball sampling, n = 12), from the following institutions: UT, Province Overijssel, Regio Twente, Twente Board, East Netherlands Development Agency Oost NV, Technological Circle Twente (TKT), Novel-T, World Trade Centre Twente, and a regional start-up. In what follows, the codes of interviewees from the UT start with the letter I, whereas the codes for the external stakeholder start with an E.

Section 2 describes how the University of Twente became an important technology-led institution in an old industrial region seeking to reinvent itself. Section 3 discusses the position of key actors in the Twente innovation ecosystem and the configuration of regional governance. In Section 4, we identify four areas of tensions between two groups of stakeholders – the UT and its regional partners. Subsequently, in Section 5, we reflect on our findings in the light of contemporary research and on what regional stakeholders can learn from those findings. Finally, in Section 6 we sum up the implications of our main findings for the future development of the Twente Region and share tentative ideas for action.

2. The Region of Twente and the University of Twente

2.1. General description and history

Twente is the most urbanised region of the Dutch province Overijssel located in the East of the Netherlands. It combines fourteen municipalities with around 626 500 inhabitants (3,6% of the Dutch population) who mainly live in the three largest cities of Almelo (72 500 inh.), Hengelo (81 000 inh.), and Enschede (158 000 inh.).

The region shares a border with Germany in the East and is part of EUREGIO, a geographic section of both countries (European Commission, 2017; Stam, Romme, Roso, van den Toren, & van der Starre, 2016).

Figure 1. The Region of Twente from an international perspective (Sijgers, Hammer, ter Horst, Nieuwenhuis, & van der Sijde, 2005).

Historically, the region had a weak agricultural economy, contingent on mercantile-oriented trading by interdependent farmers. Due to the unfertile lands, these regional producers moved from a specialisation in livestock farming towards manufacturing textiles. In the first half of the 19th century, Twente developed into the leading Dutch textile region, which subsequently facilitated the expansion of related industries like machinery, metal processing, and construction. Nevertheless, the 'Golden Age of Twente' marked by economic success of the region only lasted until the mid-20th century. The local textile sector, once the high-tech industry of its time, suffered a severe downfall after the 2nd World War, since it was not able

to adapt or innovate when its environment changed. This had a substantial negative impact on the economy of the region, as employment decreased drastically, and no other industries were able to compensate the destructive effects that followed. The number of employees in the textile industry plummeted from 44 000 in 1955 to 8 200 in 1980 (Benneworth, Charles, Groen, & Hospers, 2005, p. 32; Garlick et al., 2006).

As a result of the economic decline, the Dutch government decided to invest in human capital – more precisely, in technical higher education. The University of Twente (UT) was established in 1961 to revive the regional economy and introduce a new leading actor into the region. As the university's focus was set on technical education, and the region offered a rich industrial history, first degrees were in mathematics, physics, and diverse engineering specialisations. Social sciences were added to the UT's portfolio in 1969 to diversify the course spectrum. Currently, the UT offers degrees in engineering and social and behavioural sciences comprising five faculties. It has approximately 10 000 students and 3 000 staff members. Situated between the two municipalities of Hengelo and Enschede, the UT was built as the first campus university of the Netherlands, and therefore combines a diverse set of facilities within a bounded area (Timmerman & Hospers, 2016).

In the 1970s and 1980s, the university's vision shifted towards developing an entrepreneurial profile and building up an ecosystem that connects the diverse regional actors. The UT and other local stakeholders started promoting capacities for innovation and network integration. The Business Technology Centre (BTC) was founded in 1985 adjacent to the university as a public-private partnership between the Regional Development Agency, the University of Twente, and the University of Applied Sciences Saxion (Saxion UAS, back then *Enschede Hogeschool*). The BTC assisted start-ups, mainly of the high-tech sector, by providing accommodation and services. Hence, it laid a foundation for the Business and Science Park that developed at a later stage (BOX 1).

Two years after, the Chamber of Commerce (*Kamer van Koophandel*, KvK) decided to relocate in order to be close to the BTC and the companies that might need

their services. Furthermore, the Twente Technology Circle (*Technologie Kring Twente*, TKT) was established in 1990 as a networking organisation that connects high-technology entrepreneurs to each other and to large companies. Today, more than 150 companies are part of this vital network within the regional ecosystem (Benneworth, Hospers, & Jongbloed, 2006; Benneworth & Pinheiro, 2015).

BOX 1. Continuous collaboration between major regional actors

An exemplary coalition of regional actors that "plays a central role in facilitating and accelerating innovative collaboration in the Twente Region" (Scholten & Oxener, 2016, p. 31) is known today as Novel-T (formerly *Stichting Kennispark Twente* – Foundation Knowledge Park Twente). It is a joint initiative of the UT, the City of Enschede, the Region of Twente, the Province of Overijssel, and Saxion UAS.

Launched in 2005, the foundation mediates between industry, educational institutions, and government, and aspires to create the "best performing ecosystem for innovation and entrepreneurship in Europe" (Kennispark Twente, 2017a). In one way or another, Novel-T supports most of the 60 to 70 annually created start-ups through a wide range of services like financing, advising, and coaching. In the last 10 years, Novel-T has created around 11 000 new jobs and over 2 200 start-ups, some of which are internationally known – for instance, Booking.com, Demcon, and Xsens.

The foundation should not be confused with the physical innovation campus in Enschede, still known as Kennispark and directly linked to Novel-T. The physical Kennispark hosts around 400 companies with more than 9 000 people and is the largest Dutch Business and Sciences Park. In 2013, it was awarded the title of the "Best Business Park" in the Netherlands.

Source: Kennispark Twente (2013, 2017a).

The establishment of business training courses and start-up support programmes, like the TOP programme (the UT's investment fund for graduate and student spin-offs), went hand in hand with the evolution of entrepreneurial thinking in the university. Committing to a successful and innovative economic and social development of the region has been defined as an important factor for the university ever since.

Next to the UT, there is one other institute of higher education, the Saxion University of Applied Sciences. Established as a merger of two schools in 1998,

Saxion UAS offers more than 100-degree programmes in different fields. Today, it counts more than 26 000 students and approximately 2 800 staff members that work in six research centres within and outside of the Twente Region. In addition, Vocational Education and Training (VET) and adult education is offered by the Regional Training Centre (*Regionaal Opleidingen Centrum van Twente,* ROC). Its 18 000 students and 2 000 employees are divided into 12 colleges which work closely with the local industry by training students in a professional environment via internships or placements.

2.2. A smart campus for a smart region

Spatial design and infrastructural aspects of university campuses can exert an ambivalent influence on university's engagement with nearby cities and the region at large. They can both facilitate and preclude communication and interaction between the university and its environment. Here, it bears repeating that the UT is the only campus university in the Netherlands that advocates student and staff accommodation onsite as a prerequisite for community building. However, it can be questioned whether the campus model is the best fit for a university with a pronounced regional orientation because it entails an out-of-town location, a concentration of living facilities and multiple services in one place, and a 'monastic' academic community (Timmerman & Hospers, 2016). In comparison, Saxion UAS explicitly chose to locate its campus in the city centre of Enschede.

Historically, the UT has been concerned with regional cooperation as a technical university and a leading member of the European Consortium of Innovative Universities (ECIU). Its physical disposition could, to the contrary, foster isolationist sentiments, 'Ivory Tower' or 'international bubble' imagery, and exaggerated opposition Us/Them among campus public and local citizens alike. Back in the Middle Ages and Early Modern Time, the Twente Region was itself physically isolated from the rest of the country by peaty and swamp areas, with a resulting marginalised economy. In the second half of the 20th century, the region was still trying to overcome this isolation by becoming a transport corridor from the West of the Netherlands to Berlin and Eastern Europe. At the same time, the university

was trying to open up to the region through a series of on-campus spatial experiments.

The UT campus – a green area of approximately 1 km wide and 1,5 km long – has been continuously evolving as a place of professional and personal development where academics, students, and external partners could meet and interact. To achieve that, it needed to overcome the original separation between a) the faculties residing in individual buildings, and b) the university and the business communities. Correspondingly, the campus site has been a construction site, striving for more functionality and adaptability. The Business and Science Park (Kennispark), MESA+ nanotech research laboratory, the Gallery business and technology centre, and the like were built and rebuilt as shared spaces of learning and knowledge co-creation. In 2011, for example, 170 MEUR was spent on removing a flyover, a significant physical barrier between the campus and the Kennispark situated right to the south of the university (Benneworth & Eckardt, 2017). By 2020, the Faculty of Geo-Information Science and Earth Observation (ITC), the only faculty located in the Enschede city centre, is planned to be moved to the academic heart of the campus – the Education and Research Square (*Het O&O Plein*). For that to happen, the current Citadel building needs to be completely demolished and replaced with a new 13-storey edifice. The common goal of these massive projects is community building, both inside the academia and across its borders.[1]

The UT has also attempted to integrate the campus into the social and cultural life of the region. It is adjacent to water reserves, parks and recreational zones. It hosts career fairs and Open Days, the Green Vibrations festival, the biggest student sporting event the Batavia Race (*Batavierenrace*), the city's annual Four Days of Walking festival, and so on. Additionally, when the neighbouring stadium holds matches of the local football club, the campus offers its grounds for parking (Hengstenberg, Eckardt, & Benneworth, 2017).

[1] For more information on the UT Campus and its infrastructural development, see University of Twente (2015, 2017a).

At the beginning of 2016, the UT conceptualised itself as a 'Living Smart Campus' (University of Twente, 2016), a controlled experimental environment that can be deployed for benefitting its dwellers as well as addressing societal challenges. Proposals for the programme are encouraged to involve academics, supporting staff, and external partners. Initial calls resulted in projects that investigate legal issues of drone operation and data safety of smart city sensors; explore the relationship between extra vacation days for the UT employees and the societal impact of the university; or support social entrepreneurship among refugees (BOX 3). To sum up, the programme allows to test solutions to the problems of our times before disseminating them in the society, using the university not only as a knowledge, but also as a physical resource.

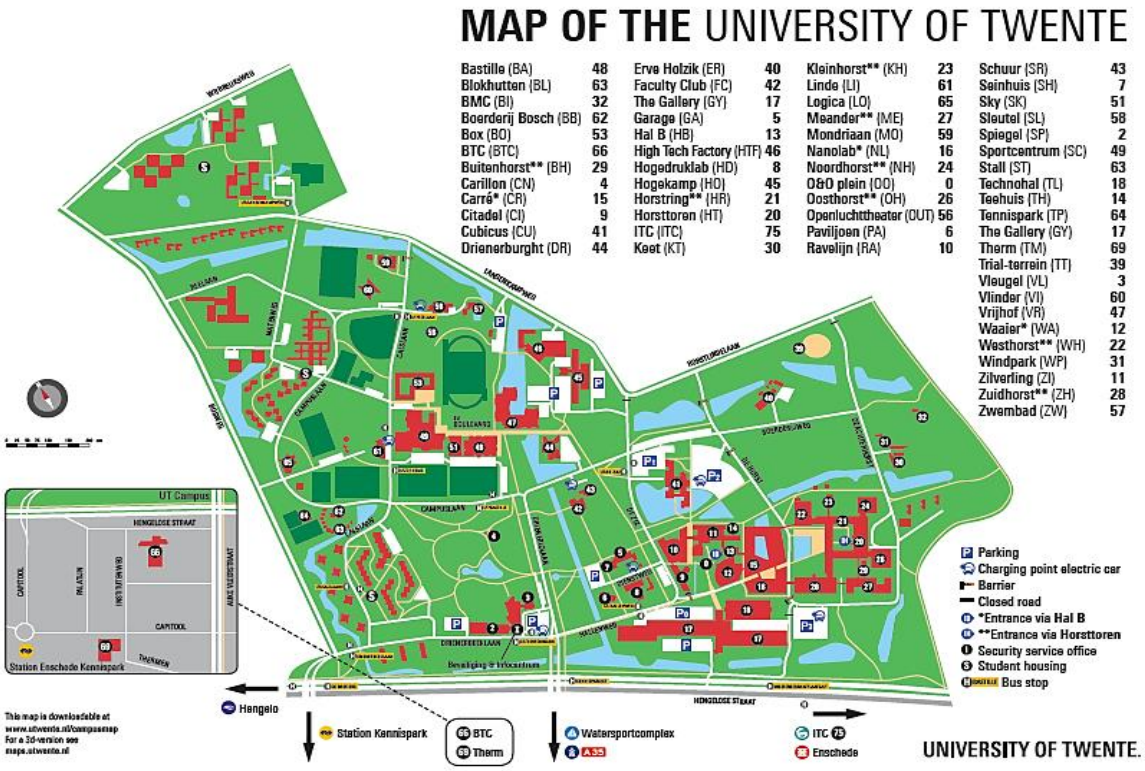

Figure 2. Map of the University of Twente (University of Twente, n.d.)

2.3. The Twente economy and culture

The Twente Region positions itself as an entrepreneurial region with a "strong technological profile and growing international ambitions" (Twente Board, 2015b). With a Gross Regional Product (GRP) of 19 553 MEUR in 2015, Twente accounts for

approximately 2,9% of the Dutch Gross Domestic Product (GDP). After a downward trend in 2012 and 2013, the Twente economy has seen positive economic growth, and in 2015 was even slightly higher than in the rest of the Netherlands (2,2% vs. 2,0%).

At the same time, the unemployment situation in Twente has been continuously defined as problematic. Recently, Scholten and Oxener (2016, p. 7) reported that lower skilled workers were facing an especially complex unemployment situation, and that the city of Enschede was the lowest participation level of all cities in the Netherlands (56%). SMEs play an important role in Twente's economy, as 78,3% of employees are situated in micro businesses (21,3%), small companies (23,8%), medium-sized companies (25,4%), or are self-employed (7,8%). According to Kennispunt Twente (2016), the growth of employment can be seen almost entirely in these four groups (Figure 3).

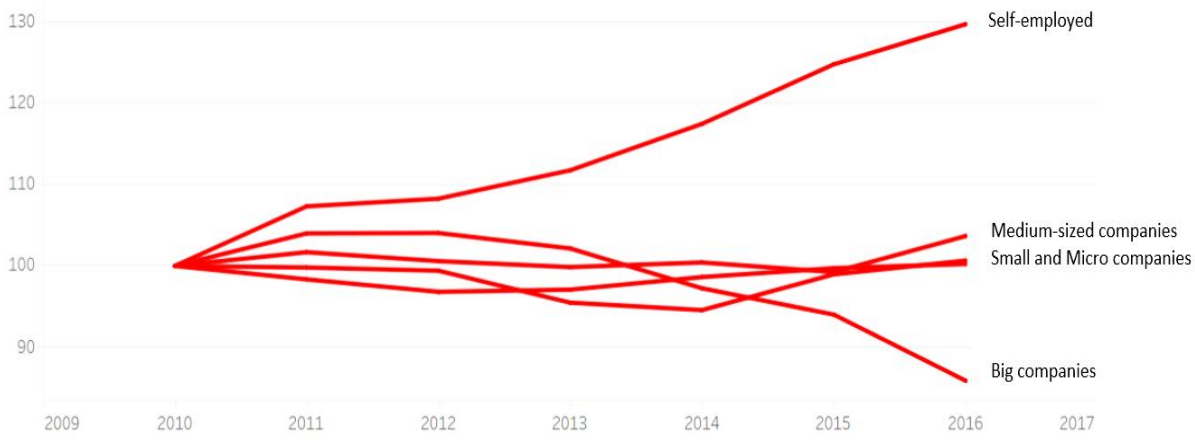

Figure 3. Development of employment by company size, Twente 2010-2016 (Kennispunt Twente, 2016).

National and regional stakeholders aim to develop Twente into a leading European technology region with an emphasis on the Topsector "High-Tech Systems and Materials" (HTSM). There are nine Topsectors overall, and the following four are considered most relevant by the Province of Overijssel: HTSM, Health, Agro & Food, and Energy & Environmental Technology. All of them have a high knowledge intensity, export orientation, and are important for the competitiveness of the

Netherlands in general.[2] The HTSM sector is of vital importance to Twente, with employment rates as high as 9,8% in 2015 (vis-à-vis 6,4% in the Netherlands). Furthermore, the sector is well connected to other regional focus areas like healthcare, production technology, and construction. Therefore, it is also important as a stimulus for employment and growth in related industries. The majority of the companies in the HTSM sector can be found in the big cities of Enschede (900), Hengelo (520), and Almelo (300).

Twente has high ambitions for its future economy. It has been able to attract companies and demonstrate good economic prospects, as well as present a growing portfolio. Due to its "business climate and the access to knowledge and talent" (Stam et al., 2016, p. 70), some bigger firms like Apollo and Ernst & Young relocated to Twente, while others returned to the region. Nevertheless, there are still multiple challenges that will have to be tackled on the way to achieving the region's economic goals.

Politically and socially, Twente is a relatively cohesive region where inhabitants have a common government, common identity, and a tradition of forming strong communal bonds (*noaberskop*, "neighbourship") that once were vital for surviving under unfavourable farming conditions. In our times, the practice of *noaberskop* translates itself into a tendency to form all kinds of associations, from governance bodies to cultural societies, creating dense and overlapping social networks.

The region has also been affected by another path dependency: massive industrial plants employing thousands of people factored into a job-for-life mentality and behaviour. This has led to lower adaptability and higher unemployment rates compared to other parts of the country. The gap between low-skilled and highly-skilled jobs is also larger than elsewhere, hindering talent retention and upward skill mobility (Benneworth & Ratinho, 2014; Garlick et al., 2006). Furthermore, industrialisation split rural and urban municipalities – the former being more socially cohesive and conservative, and the latter being more mixed and dynamic.

[2] For more details in English, see www.government.nl/topics/enterprise-and-innovation/contents/encouraging-innovation.

This is now paralleled by a split between internationally renowned advances in scientific excellence and high-tech entrepreneurship on the one part, and the local human capital base on the other.

In terms of culture, Twente has a diverse offer for leisure, shopping, and eating out. It hosts theatres and music halls, a branch of the Dutch national museum (*Rijksmuseum*), the University of the Arts ArtEZ, etc. The region preserves interesting zones of historical urban design like *Tuindorp't Lansink* in Hengelo, and can boast of an architecturally unique modern district called *Roombeek* in Enschede. Finally, Twente has a lot of parks and recreational forests for entertainment and eco-tourism. The cultural dynamics of Twente was recently recognized in nominating the Enschede city centre 'best city centre of the Netherlands' (Veldhuis, 2017). Nevertheless, the region has naturally been seen as not rich and vibrant enough, especially in comparison to the *Randstad* area with the four largest Dutch cities – Amsterdam, Rotterdam, the Hague, and Utrecht.

3. Stakeholders in the Twente innovation ecosystem

3.1. Innovation inside-out: The place of the university in the regional ecosystem

The UT's ability to create economic and social value from scientific and technological knowledge was recognised twice in a row, in 2013 and 2015, by a Valorisation Ranking that named the UT the most entrepreneurial university in the Netherlands and the top Dutch university in the area of commercial knowledge transfer (ScienceWorks, n.d.). The UT is an acclaimed driving force in the regional ecosystem – it supplies research and human capital to local companies, accommodates hundreds of enterprises, and plays a key role in new venture creation. Overall, the UT produced more than 1 000 spin-off companies, each having over nine full-time employees, on average (Meerman, 2017). The latest edition of U-Multirank (2017) reports an average of 11 newly founded graduate companies per 1 000 graduates. Furthermore, in the past three years, the university was annually awarded 13-16 patents. The UT was also an early generator of triple-helix type collaborations with businesses, authorities, and knowledge institutions in the province and the EUREGIO. Interestingly, while the share of research

publications in co-authorship with regional partners (within 50 km) increased over the past three years from 7,3% to 8,7%, the share of income from provincial sources slightly dropped, from 12% to 10% (U-Multirank, 2017).

BOX 2. Experimenting with new forms of regional engagement

Since the critical OECD's 2006 report (Garlick et al., 2006) that recommended to create physical locations for societal interaction, the UT has continuously experimented with engagement interfaces. Among them is the DesignLab, opened in 2014 as a campus-wide entry point to its expertise. It is a platform for translating science to society that provides infrastructure for productive interactions between students, academics, companies, governmental officials, and community leaders. On the one hand, design is a research field where high-tech disciplines meet social sciences; and on the other hand, it is a creative construction process – here, a process of constructing technologically disruptive and holistic solutions to complex societal challenges.

For students, the DesignLab is a space of learning, co-working, prototyping, and testing. They can participate in original courses like 'Design of Robotic Systems' or 'Philosophy of Technology'. Moreover, an international and interdisciplinary team of students runs the day-to-day operation of the lab. For researchers, the DesignLab is a place to work on real-life design-related questions and on societal impact of technology. Finally, external partners can participate in ideation "pressure cooker" sessions, workshops, student/PhD/PDEng/postdoc projects, promotion paths, and structural research collaborations.

Activities hosted by the DesignLab range from networking events with regional partner schools and refugee socialization projects to symposia on urban innovations and drones, or workshops on business evaluation and welfare robotics.

Source: University of Twente (2014a, 2017c)

The visualisation of the Twente innovation network presents a dense and well-connected system that potentially eases interaction and exchange of know-how (

Figure 4). As a result, within the Netherlands, Twente excels in a) the number of innovation projects per 1 000 companies residing in the region – 9,4 (second only to Brainport[3] with 10,11 projects per 1 000 companies); b) the average number of partnerships – 52,5; and c) the average number of organisations per project – 8,8 (Stam et al., 2016).

[3] For more details in English, see www.government.nl/topics/enterprise-and-innovation/contents/encouraging-innovation.

In view of the relative absence of large corporations in the region (with notable exceptions like Thales), higher education institutions have become central to the network. However, while Saxion UAS stands in the very heart of it, the UT is visibly more at the periphery, which is hardly surprising due to their respective strategic orientations. The regional embeddedness and mission of Saxion UAS are quite pronounced in word and deed. Its research, education, and community service are, by definition, of applied nature, have been continuously driven by regional demand, and have been executed in close cooperation with local partners (Saxion, 2015, n.d.; Stam et al., 2016, p. 40).

The UT, on the other hand, gives pride of place to its international ambition: "We are and will remain *Europe's* [emphasis added] leading entrepreneurial university" (University of Twente, 2014c, p. 11). Moreover, the vision statement reads:

> The world is our workplace. We develop knowledge in close collaboration with international partners, operating in and for an international context, with a strong focus on Grand Challenges. We educate our students to be the global citizens of the future. We attract a significant degree of international funding. (University of Twente, 2014c, p. 5)

At the same time, the UT's regional mission appears to be noticeably subordinated to global goals – the university reaffirms its commitment to the Twente Region (University of Twente, 2014c, p. 5), but it is the status of "a leading *international* [emphasis added] university that fuels the innovative power of the region and acts as a vital driving force for the regional economy" (p. 11). This partially explains why only some 20% of UT alumni stay in the region as opposed to 60% of graduates from Saxion UAS (by start-up location; Bazen, 2016). Graduate retention, however, is not an uncontroversial positive indicator when it comes to the absorptive capacity of the regional labour market. In terms of productivity and employment, the Twente ecosystem generates, on average, less value for its region than, for example, Amsterdam Metropolitan Area or Brainport (Stam et al., 2016).

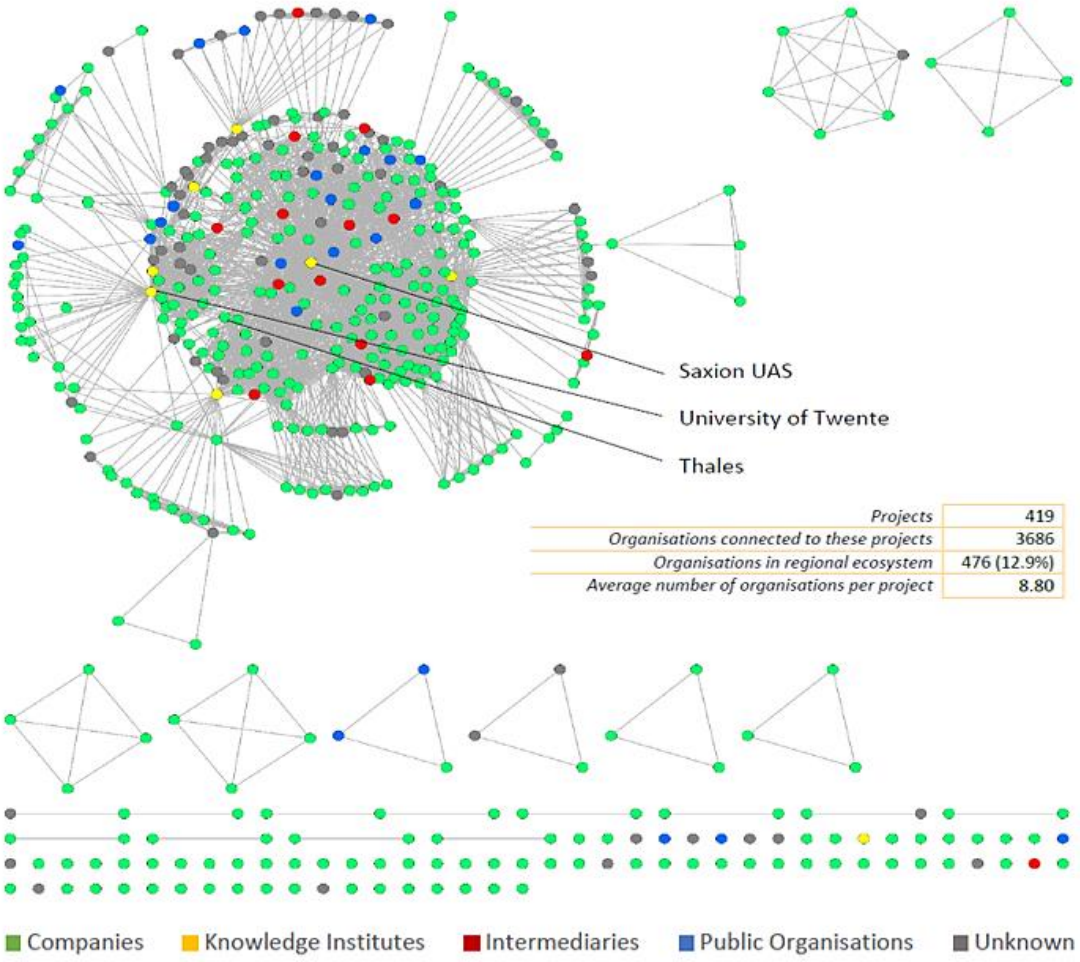

Figure 4. Network visualisation of the Twente regional ecosystem (Stam et al., 2016, p. 35).

The position of the UT in the local ecosystem has led to the development of Twente as one of the leading technological regions in the Benelux countries (Benneworth & Eckardt, 2017; Meerman, 2017). Moreover, the university offers effective start-up support through Novel-T and several innovation funds, including the Dutch Student Investment Fund, a joint initiative of the UT and Saxion UAS. This is the first venture capital fund in the European Union run by students for student entrepreneurs (www.dsif.nl).

What might be missing in this high-tech entrepreneurial picture is the 'human touch', or the fourth element in the helix model – citizens as co-creators of

knowledge and innovation, agenda-setters and democratic participants, and not just as end-users of products and services (see a positive counterexample in BOX 3 below).

BOX 3. Promoting social entrepreneurship

On the way to enhanced research valorisation, the University of Twente strives to address contemporary social issues in deprived regions. Therefore, it introduced Product Co-Creation Centres (PC3) – a programme that offers expert support to potential entrepreneurs with disadvantaged backgrounds, from conceiving an ingenious idea to prototyping and drafting a business plan. In the meantime, the regions serve as a living lab for PC3 academics who investigate how to boost regional economic development by stimulating grassroots innovation and empowering individuals with competences to set up own enterprises.

The programme embodies the university motto "High Tech, Human Touch", as it is run jointly by the Faculty of Engineering Technology and the Faculty of Behavioural, Management and Social Sciences. More precisely, by NIKOS, the Netherlands Institute for Knowledge-Intensive Entrepreneurship (research on entrepreneurship); the Department of Design, Production and Management (product development); and CSTM, the Department of Governance and Technology for Sustainability (sustainable technology).

The PC3 project was successfully implemented in Colombia and is currently being adapted for the Netherlands, India, and South Africa. In partnership with Delitelabs (http://delitelabs.com), a non-profit Amsterdam-based foundation that offers free training in entrepreneurship to refugees and young unemployed people, the UT is working on integrating the programme into the Twente ecosystem. The outcome – Enschede Refugees Entrepreneurial Initiative (EREI) – is expected to both aid refugees in socioeconomic integration and accelerate research on social entrepreneurship.

Source: personal communication, April 11, 2017; University of Twente (2017b).

3.2. Innovation outside-in: Actors and governance in the regional ecosystem

As we have seen in the last section, Saxion UAS as well as the UT take dominant roles within the Twente ecosystem. This is a rather distinctive setting in contrast to other Dutch regions, where non-university actors have been more impactful and taken lead roles in regional innovation processes. Accordingly, outside-in activities from the private sector are less visible in Twente and the few big innovative firms tend to innovate in isolation. At the same time, SMEs experience difficulties in

finding access to the UT unless they have come directly out of the university setting (for example through the TOP scheme or Novel-T). This is in direct contrast to other Dutch regions, like Brainport, where big industrial players assume a leading role within the development of an economic and innovative future (Benneworth, 2007; Stam et al., 2016).

Next to the HEIs and the industry, other institutions and activities have been positioning themselves prominently in the regional ecosystem. Most of these have been mentioned within the first paragraphs of this section: the City of Enschede, the Region of Twente, the East Netherlands Development Agency Oost NV, the Province of Overijssel, the Twente Technology Circle (TKT), and Kennispark Twente (BOX 1).

The Agenda for Twente is an investment agenda that was launched in 2007 by the 14 municipalities of Twente with contributions from the province of Overijssel. The necessity for a common agenda was recognised as urgent when Twente was highlighted as a region economically lagging behind the rest of the Netherlands (Regio Twente, n.d). The municipalities and the region agreed that they needed to face the challenges together and create a multi-annual plan (2008-2017) that would strengthen the regional ecosystem. Ultimately, it should transform Twente into one of the top five European regions and one of the top two Dutch regions in the area of innovation and technology (Twente Board, 2015a, 2015b).

In addition to the Agenda for Twente, exists the Twente Board that devolved in 2014 from the 'Strategy Board Twente' and the 'Economic Development Board Twente'. According to Meerman (2017), it is the Twente Board that governs the regional ecosystem. The Board is a regional collaborative body consisting of 10 representatives from industry, different levels of government, and HEIs. In 2015, they published the activity plan 'Twente Works' (*Twente Werkt*) that was intended to promote regional economic development and internationalisation with a focus on the HTSM sector, entrepreneurship, and the labour market (Twente Board, 2015b). This plan defined straightforward quantifiable targets, to be measured and

openly circulated via the 'Twente Index' (www.twenteindex.nl) that was designed "in the image and after the likeness" of the Silicon Valley Index.

As a matter of fact, the objectives of the Agenda for Twente are in line with the goals of the Twente Board, but a formal connection between them does not exist yet. In order to overcome this duplicity of regional strategies, the Twente Board has taken on a bigger role in the development of the new Agenda for Twente (currently in design) as an advisor and – potentially – as a steering body.

BOX 4. Policy facilitation of regional development

In the Netherlands, the regional component of innovative development was first formally recognized in 2004 with *Pieken in de Delta* (*Peaks in the Delta*), a nationwide policy focusing investments on existing regional strengths. In 2010, the Dutch Ministry of Economic Affairs and the Ministry for Education, Culture and Science launched a Valorisation Programme aiming to achieve sustainable economic and social valorisation of knowledge through the development of integrated and focused ecosystems. A total budget of 63 MEUR was divided among 12 innovation hubs, including Kennispark Twente (presently Novel-T, BOX 1).

In the Region of Twente, the national valorisation programme was translated into *Koploper aan de A1* (Frontrunner of the A1[4]), an exemplary policy initiative which includes actors from all the levels of the Triple Helix. The project was dedicated to the enhancement of knowledge by connecting Kennispark with the UT, Saxion UAS, and businesses in the area. A fund of 13 MEUR (2011-2017) encouraged entrepreneurship, accelerated innovation, and growth in existing businesses. It focused on six areas: 1) entrepreneurship in education, 2) connecting with business, 3) knowledge protection, 4) funding, 5) creating a knowledge network, 6) inspiring and connecting teachers.

Preliminary analysis shows that the programme helped Twente in doubling the number of start-ups and the number of students taking entrepreneurship courses. Also, it yielded 595 start-up companies and transformed Twente into the region which has the biggest number of spin-offs in the Netherlands. Recently, it was decided that the project would be continued, and another 10 MEUR would be invested in linking knowledge and entrepreneurship in order to make the Netherlands globally competitive.

Source: Eijkel (n.d.); Kennispark Twente (2017b); Saxion Centrum voor Ondernemerschap (2017).

[4] The A1 is a highway and its usage here signals to include the whole area of the Twente region up to, and including, the region around the city Deventer.

4. Regional Innovation in Twente: Stakeholder tensions

4.1. Misalignment of stakeholder interests and expectations

4.1.1. Tensions around regional boards and strategies

Within Twente, there seems to be a lack of competency to couple the diverse interests into a common strategy. Thus, one regional actor (EB) pointed out that numerous types of "planning bodies" failed this mission in the past. Therefore, while the Twente Board could be *the* body that creates a common thread for the region, it might suffer the same fate as its predecessors. Respondents claim that, in general, actors like the universities, cities, and companies in Twente are mainly interested in benefitting themselves while not being flexible to adapt to others (EB, EC, IC). Additionally, the composition of strategic boards has been criticised, as they do not include a substantial number of diverse regional actors. For instance, a major problem is that the development of the region depends too much on few individuals instead of relying upon "a complete base of people who all together have the same goal" (EB).

This regional stakeholder (EB) also criticised the boards of the past for not offering real strategic planning, new ideas, or longer time frames. According to another regional actor (EC), the Twente Region and its players are unable "to tell the same story", and therefore, a common strategy must clearly communicate a uniform message to the outside world. It has also been questioned whether the current strategy is realistic, and whether Twente can cover a broad high-tech spectrum, since "a region of 600 000 inhabitants can't compete with Paris, or London, or Frankfurt" (EF). In Brainport, for example, the regional development agency has taken the lead in strategic planning. Accordingly, a participant from a regional institution suggested that a similar agency could be a solution for Twente, especially because in the future there could be "less money for more subjects, more objectives, [and] more themes" (EF).

The respondents expressed more positive views on regional strategy building and the respective boards. For instance, it was pointed out that the newly installed Twente Board needed time to prove itself, and definitely had the potential to be

"the place where it all comes together" (EB). Then, the economic development of the region could be planned as a joint action (EB). Comparably, a university actor shared a positive perception of the Agenda for Twente as "a regional ambition that brings regional partners together" (IF). Nevertheless, even after formulating an aligned strategy, there is still a challenge to successfully translate the plans into action and execute them to everyone's satisfaction (EE).

4.2.2. Tensions around university missions and strategies

The strategic vision of the UT towards 2020 combines a strong desire to become more international-based, while simultaneously focusing on more local collaboration within the region (Section 3.1). However, a few interviewees claimed that the university used to be important for the region, but presently detached itself from it. A participant from the university (IB) believed that the UT focused too much on the "global landscape" in order to be innovative and attractive. Similarly, a regional respondent asserted that while the "community of the university is becoming more and more international, […] the needs of the region are more and more Dutch, or local of the region" (EF). In direct contrast, a participant from the region (EE) described the UT as a technical university struggling to advance because it is locked into the region, whereas its scope should be national and transnational. Likewise, a university actor (IA) emphasised that it was important to be a main player worldwide, and strictly regional universities were of no value to the global knowledge community. Some interviewees question whether regional and international missions can be equally well implemented within the university. These two parallel developments obviously compete with each other, but, as a UT participant (IF) assumes, could be mutually enhancive if managed smartly.

Another tension stems from university-business interactions. One respondent highlighted that Twente has a "fragile industrial profile" (EA) with *a high share of SMEs* and few big companies. Yet, other external and internal stakeholders (EB, ID) stated that the UT was interested in big companies and international deals, and *was not open to small companies*. To quote, there is a "really big wall around the university with big signs [saying] 'Don't enter! It's our!'" (EA). Similarly, companies

may feel that if they are not part of the science park (i.e., Kennispark), they are not innovative enough, even though this is not accurate (IB). Many interviewees agree that the university needed to find a way to serve the interests of companies of all sizes in order to fulfil its regional function.

Furthermore, a participant from the university lamented not having a policy on regional engagement, uttering that "if the university works with the region, it is often by coincidence [and not] by strategy" (IB). S/he argued that, while there could be many possibilities to reinforce the cooperation between the region and the UT, what the university primarily needed were the "people that want to do it [and] that are interested in it" (IB). Respondents from the UT found that even though regional and international ambitions could be combined thematically, employees did not have enough time and capacity to "work on both sides" (IA, IF). They also criticised the current human resource policy and system for not being able to address this challenge (IA, IC). Thus, when facing a busy agenda, university employees would favour excellent research and education over regional engagement (ID, IF).

In fact, it is not uncommon for actors on both sides (inside and outside of the UT) to expect that the other one takes a step forward. For instance, regional actors expect the UT's researchers to translate their knowledge into economic development, and intermediaries expect both the UT and the companies to open up and team up with each other (EA, EB, EC). Two participants (EA, ID) observed a split inside the UT between the steering core who appeared to understand the regional value of the university and the academic staff who seemingly did not. To illustrate the misalignment of expectations: an interviewee from the regional side pointed out that "Novel-T is one big living lab for Public Administration professors [that] do not come" (EA), while a counterpart from the UT explained that there was no need for this because "[Novel-T's] focus is not on engaging researchers" (IA).

4.2. Absence of clear intermediaries

Questions like "What is the phone number of the university?" (IB) reveal that some regional actors have a vague idea of the university as organisation, and how to approach it. "The university *does not exist* [for companies; emphasis added]" (EC).

Equally, the region "*does not exist*" for the UT – that is, lecturers use examples from international textbooks, and students do not know where to look for local traineeships/internships (IB).

As a matter of fact, there are several intermediaries between the UT and its external environment – namely, Novel-T, Kennispark, Science Shop Twente (SST), DesignLab, EU-Office, Strategic Business Development (SBD) team and valorisation managers in departments, as well as individuals engaged with the outside world. These channels are in different phases of growth and visibility and may have quite specific foci. For instance, SST mediates between the UT and non-profit organisations, interest groups, and private persons rather than companies. Participant IC reported SST to be of great value for regional stakeholders, but also very dependent on intra-university networks for matching external demand with student talent. SBD was, on the contrary, more interested in large industrial players and scaling up local start-ups. According to IC, this is why people had been getting confused about the university's offer to the public, not knowing which "door" to knock on.

As a result, it was natural to encounter an external participant (EF) arguing for a clear unambiguous structure that would initiate or channel the UT's engagement with regional stakeholders (e.g., a liaison office). Echoing this point, IC believed that such a structure should provide corresponding facilities and services without being subordinated to any academic unit. This would allow to avoid conflict of interests and overcome internal fragmentation. Conversely, both participants (EF, IC) raised doubts about the effectiveness and flexibility of centralised offices and top-down design of intermediary structures. Moreover, the number of entry points could be increased on the regional side. For instance, each municipality in Twente has a business support type of organisation that could potentially become a mediating body. However, these organisations and their counterparts on the regional and provincial levels were criticised by EB and IC for being too focused on creating benefits for their administrative areas and too distant from academic knowledge.

Although the UT is one of the founding partners of Novel-T, this organisation is an independent intermediary if compared to the DesignLab or SBD. In the words of IC, "It's not the university and not the outside, but something in-between", and respondent IF described its coupling with these strictly inside-out intermediaries as quite loose and uncoordinated. To date, Novel-T has been named a major player in the planning and implementation of the interaction between the university and the region (ED, EF). EF, for example, claimed that "Novel-T is seeing itself as the incubator of the university, the knowledge switch between the business or the entrepreneurs and the university … the liaison office. They are trying to extend the ecosystem of the region". Yet, Novel-T is limited to a specific niche in the innovation network (start-up support), and various participants saw its future development somewhat differently. Thus, EA believed that Novel-T should outline its offer more sharply to enable local companies to easily find their way to it, while EE envisaged Novel-T as the market place that would not only solve regional challenges but also take part in defining them.

The ambiguity around the entry points seems to contribute to the persistent image of the UT as an "academic bubble" and to an exaggerated perception of the distance between the university and potential partners: "People in Twente don't understand what the university is doing. They are too far away from it. It is difficult for SMEs to go to the UT and ask question or ask for research" (EB); "[People] don't know if you can just knock on Novel-T's door and ask any question" (EC); "For the SMEs and the industry it's very difficult to get really involved with the university and find the right people" (ED).

4.3. Absence of continuity

Interviewees from the university pointed to a tension between staff turnover and continuity of roles. For participant IC, a professional organisation like the UT or Novel-T, ideally, should not depend on individuals in supporting positions, allowing people to move faster in their career trajectories. In reality, however, role performance is heavily dependent on personal networks, and people need to intensify efforts to maintain campus networks and stay informed after moving to a position outside the UT that would require or benefit from previous knowledge

and experience. As IA articulated, if somebody leaves, the successor starts all over again or even destroys earlier attainments. This takes the heaviest toll on the organisation or a project in the case of leadership succession (IA).

While advantageous for innovation and adaptability, this lack of continuity is detrimental to the quality and consistency of operation, and to the organisational image in the eyes of the stakeholders (IC). To give a concrete example shared by ID, a university employee who had volunteered to mediate between faculty researchers and external partners moved to another position, causing the process at the faculty to freeze. This was also reported as a challenge by an external stakeholder (EB): "A problem of the UT [is that] a lot of people are in place for some years, then they take another step, and they are gone. And then you see mostly all the things you have built up gone … [This is] not a knowledge system that keeps the knowledge". Parenthetically, most interviewees did not have successors for their roles, either due to the specificity of their networks or because of organisational arrangements.

In the same way, individual researchers incentivised by regional budgets depend on the continuity of this type of funding to carry on their engagement projects. "Every project always has a beginning, a starting point, and an end, but the nice thing would be if there would be continuity, and in fact we have not been able to realise that" (IA). Additionally, a project could be discontinued because the commitment of participants was not strong from the beginning or weakened in the process (EA).

Lastly, respondents indicated a few instances of false continuity. EA denounced inflexibility – for instance, holding on to models that do not work or managing the content of the project rather than the process – as something that would create obstacles for genuine continuity. IC brought up another type of adverse continuity – hidden continuity, when change happens only on the surface, whereas internally people persist in their mind-set and routines.

4.4. Knowledge asymmetry

Knowledge asymmetry is at the root of many tensions between the university and its region. Paraphrasing Rönkkö and Mäkelä (2008), it is a condition that emerges when different actors possess different stocks of knowledge. Inside the UT, there are discipline-, unit-, and group-specific knowledge networks. From IC's point of view, this often leads to a situation in which people working and living on campus, students and academics alike, are not aware of what is happening next door, or of available services. Nevertheless, this interviewee doubted whether a simple increase in the quantity of widely accessible information could help raise the awareness. Instead, it could lead to information overload or suffer from a possible mismatch between goals and channels. To clarify, formal organisations on campus have a weaker influence on students' motivation than the social media. Therefore, advertising a regional engagement event for students through student organisations would be less effective than through targeted student communities in the Internet (IC). To complicate things further, the campus accommodates professors with independent agendas, unaware (often by choice) of strategic initiatives and other undertakings (IF).

Participants' discussions on data management at the UT also revealed a certain knowledge asymmetry between the university and the region. Interviewees ID and IE reported, that, firstly, data were dispersed over many systems (research, HR, finances, business development, etc.). Secondly, some data were not registered/administrated, or were partially known, or were in fact estimations (e.g., the number of student internships in the region, or the number of strategic partnerships with the region on different university levels). Thirdly, in the past, valorisation officers focused on the assessment of funded projects and economic impact. Since there was no formal enquiry or interest in the regional component of university performance, it was not singled out within the bulk of general institutional data (IE). This situation was said to be changing, with more data on regional engagement to follow, as more and more attention was given to the UT's societal impact (ID).

While there is naturally a lot of tacit knowledge inside the university, even explicit knowledge may remain invisible to regional partners. For example, a university actor (IG) explained that advances in ICT valorisation were outside the scope of policymakers because ICT companies were scattered all over the region and did not require big centralised facilities like a Nanolab that could be easily demonstrated to visitors. Moreover, the region could hardly absorb all university knowledge, as there are simply no companies for some branches of science on the regional level (IA). To illustrate, in fields like nanotechnology, academics translate knowledge through publications rather than spin-offs and look for national and international clients. Here, EA emphasised that it was easier to do so on the European level because on the national level there was no coordination of regional innovation initiatives.

Last but not least, a university interviewee (IA) believed that regional activities were entirely absent from the university newspaper, and that, symmetrically, the UT's contribution to the Region of Twente was absent from the regional newspaper. In IA's eyes, a lot was happening between the university and the region – big projects promoting innovation in regional companies, little projects involving citizens in developing vacant city parts, etc. Without proper coverage, however, one could end up thinking that "because the university does not really care about the region, and the region doesn't really know what is happening [there], they are not coming together" (IB).

5. Regional mission impossible? Discussion of stakeholder tensions

5.1. The complexity of strategic governance

5.1.1. Regional governance

Section 4.1 highlighted the clash between personal and/or organisational interests and a common regional strategy as a challenge for the Twente Region. Benneworth and Hospers (2007b) explain that the lack of regional competency to strategically couple the diverse interests of stakeholders is often underestimated. Pike, Rodríguez-Pose, and Tomaney (2006, p. 18) likewise observe the complexity of

designing and implementing appropriate development strategies for regions, emphasising that "the risks of failing to identify the correct assets [...] or of a poor implementation of the strategy, are high".

Similarly, even when stakeholders are able to create a special body to articulate and implement visions of regional futures (like the common 'Twente Board' or the former 'Economic Development Board Twente'), the functioning of these bodies may still be problematic. According to our interviewees, these boards achieve to link various actors, but get criticised for low levels of strategic planning, missing new ideas, and concentrating on rather short time frames. The complexity of this challenge is not unique for the Twente Region, but has been recognised in the literature on regional leadership (Collinge, Gibney, & Mabey, 2010; Sotarauta, Beer, & Gibney, 2017), collaboration and networks (Benneworth, 2007; Oinas, 2002), and the roles of regional actors per se (Uyarra, Flanagan, Magro, Wilson, & Sotarauta, 2017).

Furthermore, Sotarauta (2016) explains that governance structures and processes are often very fragmented and competitive, thereby generating a setting that is not in favour of rational and comprehensive strategies. Stam et al. (2016, p. 78) observe that the density of the Twente innovation network is partially due to an overlap of actors and initiatives – earlier projects continue their existence side by side with new ones. For instance, instead of asking the Twente Board to work on strengthening the enterprise and knowledge cluster of advanced materials and manufacturing (in particular, on the development of the Twente airport territory), the Province of Overijssel and the city of Enschede created a parallel taskforce called 'Topteam'.

Finally, empirics of other regions have shown that while a strategy document is easy to be formulated, the implementation of this 'plan' repeatedly becomes a challenge that regional bodies and/or boards cannot live up to (Sotarauta & Lakso, 2000). For instance, although all stakeholders within the Twente Board agree that the region is to become an "enterprising high-tech region" (Ondernemende high-tech region) – with "high tech" being the driver for the future economy – there

seems to be confusion about how to define "high tech" and how to translate this into action. Accordingly, Sotarauta (2016) claims that regional strategies can be too broad, therefore becoming easy to support, but failing to identify fundamental new directions. Consequently, in Twente, there might be a need to review the plans made by diverse bodies and check if they are too general or lacking the power to guide actions.

5.1.2. University governance

The situation is further exacerbated by the internalisation policies of the UT. At the institutional level, internalisation is "the process of integrating an international, intercultural, or global dimension into the purpose, functions or delivery of postsecondary education" (Knight, 2003, p. 2). By 2020, the UT envisions itself as a fully internationalised university (University of Twente, 2014b), and in Section 0 we observed a clear division of opinions on whether this poses a benefit or a threat to the Twente Region. Thus, some stakeholders were downright against the internationalisation of the university arguing that the UT should focus on regional needs – for example, on Dutch-speaking students that would work in local companies. Others, on the contrary, believed that the international mind-set of the university could bring great opportunities for the region. For instance, the newly installed Project Centre by Fraunhofer, Europe's largest application-oriented research organisation[5], moved to Enschede because the UT is internationally known and can be used as a stepping stone to the Dutch market. Even though the Fraunhofer Centre addresses smart industry products and production worldwide, it is also expected to significantly advance Twente in becoming a key high-tech region in the Netherlands.

Universities and their knowledge are, by definition, international entities because information and talent flow increasingly across borders. Effectively, tensions around internationalisation escalate when it gets exceedingly prioritised and

[5] For more details in English, see www.ipt.fraunhofer.de/en/Press/Pressreleases/20170123_opening-of-the-fraunhofer-project-center-at-university-of-twente.html.

promoted at the expense of the regional mission (Benneworth, Young, & Normann, 2017; Pinheiro, Benneworth, & Jones, 2012). Academics stress that internationalisation is not an end in itself but a means to achieve strategic goals (Mihut, Altbach, & Wit, 2017) like pooling resources to work on grand challenges, being connected to the latest developments in science, educating global citizens, and attracting funding. In the UT's case, it has been regarded nothing less than a precondition for regional innovation and for maintaining the university's image of a "global – local pipeline" (Benneworth & Hospers, 2007a). The key question is, how to balance the international and the regional dimensions of its operations, as failure to do so induces a 'mission stretch' (Scott, 2007), already attested by several participants, as well as performance and reputation losses.

In a case study of HEIs' competitive horizons and spatial ties in Germany, Kosmützky and Ewen (2016, p. 232 & 237) distinguish between two university types: "deeply rooted in the region, striving for internationalisation" and "internationally established, grounded in regional strength". Now, the Twente Region hosts both – the Saxion UAS and the UT, respectively. Perchance, the key to a balanced strategic planning and performance lies in a better coordination of the regional roles of these universities. For instance, the UT could focus on those regional demands that require global resources, while Saxion UAS could cater to more locally engaged stakeholders. Nonetheless, ere yet all regional parties coordinate their engagement with each other, they need to clarify and align mutual expectations of such roles, which brings us back to the discussion of regional governance.

5.2. The complexity of intermediary structures

To the external environment, the UT appears a "black box", firstly, because people do not know what is happening inside; and secondly, because the centuries-long image of the university as something that cannot be approached by "laymen" constitutes a mental barrier on the way to regional interaction. A core argument made by our interviewees is that many actors outside the university network do not know how to contact the university. Hence, the university is still perceived as an 'ivory tower' (Etzkowitz, Webster, Gebhardt, & Terra, 2000), and because there

seem to be many entry points, uncertainty about who to approach within the UT is widespread. This complex situation has been recognised in the literature: Having different companies and institutions with diverse needs for knowledge transfer in one region, leads to the appearance of various sorts of heterogeneous intermediaries, all aiming to "bridge the gap between universities and industry" (Wright, Clarysse, Lockett, & Knockaert, 2008, p. 1208).

The confusion about entry points is also related to the current debate around the governance of knowledge transfer activities by universities. It has been extensively discussed whether knowledge transfer should be formalized in one specific entry point or should take place apart from a centralised structure (see Geuna & Muscio, 2009). On the one hand, there is a need for a clear unambiguous structure that initiates or channels the UT's engagement with regional stakeholders (for instance, in a technology transfer office). Such a structure would provide corresponding facilities and services without being subordinated to any academic unit to avoid conflict of interests and overcome internal fragmentation; the DesignLab can be considered as a step in this direction (BOX 2).

On the other hand, considerations of effectiveness and flexibility may prevail over the efficiency of centralised offices. In a similar vein, our interviewees highlighted that an intermediary organisation should not be designed top-down, as it is an evolving assemblage of human and financial resources (Section 4.2). Research literature recounts diverse strategies and governance structures for knowledge transfer and exchange, and there is no common formula that determines which knowledge transfer approach 'fits' a specific context (Geuna & Muscio, 2009; Mitton, Adair, McKenzie, Patten, & Perry, 2007). The UT is a comparatively small university that can afford being more informal than bigger HEIs. Furthermore, its entrepreneurial culture and mission resist hierarchy and singularity. Therefore, installing only one entry point might not be the solution to the problem. Taking into account the discussed literature and the spirit of the UT, it seems to be more advisable to keep the structure diversified. Thus, instead or along with introducing formalised knowledge exchange and valorisation processes, the UT could try to create a more supportive environment for engaged faculty members.

Although the choice of a suitable intermediary that supports knowledge exchange is critical (Wright et al., 2008), one of the main constraints that invariably hinder the exchange of knowledge is "insufficient information to identify partners" (Hughes & Kitson, 2012, p. 746). Therefore, it is vital that regional actors accept their responsibility in identifying and analysing suitable entry points to the university. Both – the university as well as the corresponding regional partners – have to act upon their engagement responsibilities. Siegel, Veugelers, and Wright (2007, p. 640) strengthen this point by concluding that "universities *and* [emphasis added] regions must formulate and implement coherent and feasible technology transfer/commercialization strategies". In this context, interviewees expressed an opinion that Saxion UAS is a knowledge partner that is easier to approach in Twente, and a more natural partner for the local economy. The same point has been made in the literature, suggesting that companies situated in "an economy dominated by small and medium-sized firms with an intermediate technological and industrial base" (which is the case in Twente) might absorb knowledge created through applied research more easily (Pickernell, Packham, Brooksbank, & Jones, 2010, p. 267). We have also seen that, presently, Saxion UAS stands in the very centre of the Twente innovation ecosystem (Section 3.1). Taken together, this poses a strategic challenge to the UT that, while not being a direct competitor for Saxion UAS, is perceived as such or is expected to be in competition for regional engagement. In response, the UT could sharpen its profile communicating some alternative vision of its regional mission to stakeholders, and/or join forces with Saxion UAS like it did in the case of Novel-T.

Novel-T, one of the best-known intermediaries in the Twente region (BOX 1), has been repeatedly described by the participants in this study as an independent partner that currently helps start-ups. They observed that Novel-T's regional scope had been limited because its activities exclusively included spinoffs and companies within its closed network (Section 4.2). At the same time, they believed that Novel-T had the potential to advance its network and give support to an even wider share of regional companies. Nevertheless, in order to become a clearer and more prominent regional intermediary, Novel-T would need to balance stakeholder interests and human resources representing different functions and funders.

5.3. The challenge of knowledge continuity

Just like elsewhere[6], innovation actors in the Twente Region are affected by a typical downside of job turnover, project-based funding, and project management logics – it is difficult to secure continuity. Participants' discussions of the tensions around continuity (Section 4.3) reveal three distinct types: continuity of roles, continuity of projects, and adverse continuity (i.e., when it deters progress). Naturally, there are many reasons for failing to keep projects rolling or to recognise instances of disadvantageous perseverance – for example, financing policies and mechanisms, changes in market demands and partners' commitments, lack of experience, and so on. Still, one of the most common reasons is that leaders and team members with institutional memory of the project leave the job. Therefore, the discussion below focuses on the first type of continuity.

Larty, Jack, and Lockett (2017) provide important insights into the value of key individuals within organisations, their social networks, and their knowledge capital for regional development. Such individuals possess the necessary experience and locally-specific resources accumulated over time, and are vital for establishing links and mediating collaborations between regional actors. Not only can it be problematic to identify and hire them, it is an even more demanding task to build succession and maintain stakeholder relationships after they resign. That being said, if a university or an intermediary organisation is unable to ensure continuity of roles for regional engagement, it might appear as irresponsible and untrustworthy to its partners.

This problem was initially detected in the business sector with the advent of the knowledge economy, and from then onwards, knowledge continuity management (KCM) has been promoted as a possible way to counter it. For example, Beazley, Boenisch, and Harden (2002, pp. xiv-xv) describe KCM as "the efficient and effective transfer of critical operational knowledge – both explicit and tacit, both individual and institutional – from transferring, resigning, terminating, or retiring employees

[6] See examples from Canada, Finland, Mexico, and the UK in Charles, Kitagawa, and Uyarra (2014); Goddard, Asheim, Cronberg, and Virtanen (2003); Greenhill and Graham (2011); Meyer et al. (2016); OECD (2009).

to their successors". They provide guidelines and instruments for implementation that may be neither universal nor exhaustive, but could be customised in different settings. At the very least, recommendations like involvement of human resource departments, revision of organisational culture and reward systems, or creation of people-centred management processes are all points on contemporary universities' agendas (Coates, Goedegebuure, & Meek, 2015). What is more, they might have a strategic impact on HEIs' resilience (Herbane, Elliott, & Swartz, 2004).

Lastly, approaching the issue of network maintenance, it would be helpful to call on the concept of 'community of practice' (CoP). In a glossary to one of his articles, Miller (1995) defines CoP as "a sustained, cohesive group of people with a common purpose, identity for members, and a common environment using shared knowledge, language, interactions, protocols, beliefs, and other factors not found in job descriptions, project documentation or business processes". Lam (2002) understands CoPs as units for learning, competency and career development both within and across institutional boundaries. Perhaps, capitalising on CoPs as "a governance form situated between hierarchy and networks" (Lam, 2002, p. 5) could help sustain the infrastructure of regional engagement amidst losing individual knowledge brokers.

5.4. The challenge of knowledge exchange

From participants' reports on knowledge asymmetry inside the UT (Section 4.4), it appears that internal asymmetry stems from the nature of the university as organisation and is related to the challenges of organisational knowledge management. For more than 40 years, educational institutions have been described as loosely coupled systems (Weick, 1976), whereby different constituents have very little knowledge of each other. The softness of this structural arrangement "preserves novel solutions, facilitates local accommodations, and meets professional needs for autonomy" (Weick, 1982, p. 675). Yet, it also inhibits effective knowledge exchange among individuals, groups, and levels in organisational hierarchies (Nätti & Ojasalo, 2008). In the context of the present study, this may underpin the asymmetry between strategic goals and actual practices, or tensions between university leaders and academics.

The above-referred knowledge continuity (Section 5.3) and the asymmetry in question are both discussion topics in knowledge management literature. It largely suggests that the solution to the challenge of loose coupling lies in improving communication by, for instance, creating interfaces for interaction and fostering a continuous dialogue between individual actors and collegial groups (Eppler, 2006; Paquette, 2006). As noticed by Foss and Pedersen (2003), the governance of intra-organisational heterogeneity – choices regarding the level of interdependence between the units, their autonomy in decision-making, and the intensity of communication – has a bearing not only on the flow of knowledge, but also on its characteristics, such as the share of tacit vs. explicit elements. Other studies recommend high-commitment human resource management (Chiang, Han, & Chuang, 2011) and managerial interventions based on relational models (Boer, Berends, & van Baalen, 2011) to enhance knowledge sharing. While there is no universal solution, the UT is clearly trying to find its way. Thus, for example, all university research is currently being aligned under a few major themes, whereas research groups and chairs within faculties are being organised in clusters to increase internal collaboration. However, the outcomes of this reform will have to be analysed after some years.

It has been highlighted that the system and its environment – in our case, the university and its region – by default, feature asymmetry that cannot and should not be completely eradicated (Kastberg, 2011). At the same time, policy pressures make HEIs pay considerable attention to their societal impact and define their roles in regional innovation systems (Akker & Spaapen, 2017). In order to build a viable regional identity on the organisational and individual levels, avoid empty rhetoric, produce a successful image, and orchestrate interactions with regional stakeholders (see Alvesson, 2001), it is essential for university management to lessen the asymmetry between what they know and what is actually happening. As our data shows, the UT was both lacking reliable facts and figures of its regional performance and missing some opportunities for institutional learning in the domain of regional engagement. Benneworth, Coenen, Moodysson, and Asheim (2009, p. 1646) warn that "misunderstandings around the practicalities or realities of converting university-based knowledge into commercially applicable [and/or

societally relevant] knowledge" often transform early optimism and euphoria of university-region interaction into scepticism and frustration. Moreover, these feelings can be intensified by the limited capacity of regional actors to negotiate and absorb academic knowledge.

Charles (2016) explains that it can be more difficult for universities in rural regions to support the local economy, because businesses have a propensity of being smaller, the economic base is diverse, and because there tends to be a lower presence of knowledge institutions. This argument can be easily applied to the UT that generates specific knowledge which often cannot be absorbed by the region, and is instead disseminated internationally. Another important aspect is the clear articulation of what is demanded by business and industry as a prerequisite for any interaction or knowledge transfer. Jongbloed, Enders, and Salerno (2008) argue that SMEs face particular challenges when articulating their needs, which often hinders successful knowledge exchange. Local SMEs might not be able to "determine whether they have the internal capabilities that enable them to absorb university-derived information and to access assistance in those areas that need to be upgraded" (Pickernell et al., 2010, p. 271). Again, the Twente Region is precisely a rural region of SMEs, therefore facing these challenges.

The points presented suggest that there is an imbalance between demand and supply in the knowledge infrastructure of the Twente Region. It appears that the development of the UT is not in correspondence with the absorptive capacity of the local industry. Therefore, knowledge intermediaries within the Twente ecosystem could give more consideration to this challenge, as it affects the knowledge translation process. By providing services like demand articulation and network brokerage they could "contribute to relieve several of the constraints that have emerged for both the demand and the supply side" (Klerkx & Leeuwis, 2008, p. 273). At the same time, balancing this mismatch should be one of the major targets of regional governance and needs to be considered when new or existing planning boards draw up development strategies for the Twente Region.

6. Conclusion

Considering the not-so-favourable geographic configuration and the vicissitudes of economic development, the Twente Region has by far exceeded the expectations. It has been a champion in reinventing and redefining itself. It has been value-driven, innovative, and has demonstrated an exceptional track record in start-up creation and business incubation. The core competence of the region is a high inter-connectedness between the actors in the regional innovation system and an excellent knowledge infrastructure with a focus on high-tech systems and materials (medical diagnostics, robotics, photonics, etc.). Nevertheless, Twente lags behind the rest of the Netherlands in a number of areas, such as unemployment rates and economic acceleration, and is under pressure from its direct competitors in core sectors. Therefore, we have looked at some potential factors of the region's decelerated growth. Since the University of Twente plays a key role in the local innovation network, we concentrated specifically on the tensions between the UT and its stakeholders.

Our research sheds light on the misalignment of stakeholders' interests and expectations that lessens the actors' capacity for policy formulation and strategic agenda setting, as well as hinders its successful translation into action. Then, the absence of clear intermediaries significantly increases the perceived distance between the UT and the region and impedes the university's collaboration with companies outside the Science and Business Park. Next, the tension of discontinuity highlights the complexities of human resources and personalized networks – their diversity, multidimensionality, and overlaps make it harder to synchronise action and enhance reciprocal benefits. The knowledge asymmetry between the parties further complicates their communication and weakens commitment.

Many of these tensions have already surfaced in scholarly literature (Benneworth, Pinheiro, & Karlsen, 2015; Clark, 1998; Garlick et al., 2006; Stam et al., 2016), but still have not been resolved. Therefore, future research should look for working solutions to the indicated challenges. Meanwhile, we can offer a few preliminary ideas for action. Our analysis of the case suggests that the key to the problem of

decelerated growth in the Twente Region is coordination of human agents who would need to find innovative ways of combining diverse interests into common strategies and prevent overlaps of strategic bodies, functions, and actions. Furthermore, there seems to be an acute need for more communication between the stakeholders in order to clearly define entry points to knowledge institutions, select unambiguous intermediaries, and balance the demand for knowhow in the region with HEIs' abilities to meet it. Whereas the UT could enhance its regional prominence by doing quality institutional research on its local engagement and creating more interfaces for exchanging expertise, one soldier does not make a battle. Both academic and non-academic actors would have to be more proactive in their approaches to regional partnerships, knowledge management, and network governance if they would like to change the current state of affairs even better.

Lastly, one more tension that calls for diligent consideration is the competition between the tendencies for internationalisation and regionalisation. Despite the UT's reputation of 'Stanford on the Dinkel', a title which likens it to the Stanford University in Silicon Valley (Timmerman & Hospers, 2016, p. 105), the university occupies a somewhat 'footloose' position at the fringes of local developments when compared to Saxion UAS. To secure its continuity and gain mass, the UT might invest more heavily in its role of the main connector between regional and global players, attracting more exogenous enterprises and enabling home-grown businesses to scale up. The university could, once again, reinvent the region by offering a strategy and a brand that would eventually distinguish Twente from its current high-tech competitors inside and outside the Netherlands.

The study we have offered here is an exploratory introductory first take at the relationships between key stakeholders in the Twente Region. Although the tensions we have discovered are far from being marginal, the region has managed to move forward despite their persistent presence. In the future, it would be advisable to identify the mechanisms that mitigate the existing tensions and enable regional innovation.

7. References

Akker, W. v. d., & Spaapen, J. (2017). *Productive interactions: Societal impact of academic research in the knowledge society* Retrieved from Leuven: http://www.leru.org/files/publications/LERU_Position_Paper_Societal_Impact.pdf

Alvesson, M. (2001). Knowledge work: Ambiguity, image and identity. *Human Relations, 54*(7), 863-886.

Avrotos. (2017). De Nederlandse Innovatie Prijzen. Retrieved from www.avrotros.nl/site/over-avrotros/nieuws/artikel/item/avrotros-presenteert-de-nederlandse-innovatie-prijzen/

Bazen, J. (2016). Innovation driven regional development, Case study region Twente, Eastern Netherlands. Retrieved from www.slideshare.net/jacquesbazen/economic-history-of-the-region-twente-the-netherlands

Beazley, H., Boenisch, J., & Harden, D. (2002). *Continuity management: preserving corporate knowledge and productivity when employees leave*: John Wiley & Sons.

Benneworth, P. (2007). *Leading innovation: building effective regional coalitions for innovation*. Retrieved from London: www.nesta.org.uk/sites/default/files/leading_innovation.pdf

Benneworth, P., Charles, D., Groen, A., & Hospers, G.-J. (2005). *Bringing Cambridge to Consett? Building university-centred entrepreneurial networks in peripheral regions: Case Study Report 2: Twente, the Netherlands*. University of Twente.

Benneworth, P., Coenen, L., Moodysson, J., & Asheim, B. r. (2009). Exploring the Multiple Roles of Lund University in Strengthening Scania's Regional Innovation System: Towards Institutional Learning? *European Planning Studies, 17*(11), 1645-1664.

Benneworth, P., & Eckardt, F. (2017). *Kennispark Twente as Global Science Scape*. GSS working paper. Global Science Spaces (GSS), (23, 5). Oxford, UK.

Benneworth, P., & Hospers, G.-J. (2007a). The New Economic Geography of Old Industrial Regions: Universities as Global — Local Pipelines. *Environment and Planning C: Government and Policy, 25*(6), 779-802.

Benneworth, P., & Hospers, G.-J. (2007b). Urban competitiveness in the knowledge economy: Universities as new planning animateurs. *Progress in Planning, 67*(2), 105-197.

Benneworth, P., Hospers, G.-J., & Jongbloed, B. (2006). New economic impulses in old industrial regions: the role of the University of Twente in regional renewal. In *Innovation : technical, economic and institutional aspects*. Berlin: Lit Verlag.

Benneworth, P., & Pinheiro, R. (2015). Involving Universities in Regional Upgrading in the Periphery: Lessons from Northern Europe. In M. Fonseca & U. Fratesi (Eds.), *Regional Upgrading in Southern Europe: Spatial Disparities and Human Capital* (pp. 299-321). Cham: Springer International Publishing.

Benneworth, P., Pinheiro, R., & Karlsen, J. (2015). Strategic agency and institutional change: investigating the role of universities in regional innovation systems (RISs). *Regional Studies, 51*(2), 235-248.

Benneworth, P., & Ratinho, T. (2014). Regional innovation culture in the social knowledge economy. In R. Rutten, P. Benneworth, D. Irawati, F. Boekema, & T. Ratinho (Eds.), *The social dynamics of innovation networks*. London: Routledge.

Benneworth, P., Young, M., & Normann, R. (2017). Between Rigour and Regional Relevance? Conceptualising Tensions in University Engagement for Socio-Economic Development. *Higher Education Policy*.

Boer, N.-I., Berends, H., & van Baalen, P. (2011). Relational models for knowledge sharing behavior. *European Management Journal, 29*(2), 85-97.

Charles, D. (2016). The rural university campus and support for rural innovation. *Science and Public Policy, 43*(6), 763-773.

Charles, D., Kitagawa, F., & Uyarra, E. (2014). Universities in crisis?-new challenges and strategies in two English city-regions. *Cambridge Journal of Regions, Economy and Society, 7*(2), 327-348.

Chiang, H.-H., Han, T.-S., & Chuang, J.-S. (2011). The relationship between high-commitment HRM and knowledge-sharing behavior and its mediators. *International Journal of Manpower, 32*(5-6), 604-622.

Clark, B. R. (1998). *Creating entrepreneurial universities : organizational pathways of transformation* (1st ed. ed.). Oxford ;: Published for the IAU Press by Pergamon Press.

Coates, H., Goedegebuure, L., & Meek, V. L. (2015). Increasing the Attractiveness of the Academic Profession: A Challenge for Management. In U. Teichler & W. K. Cummings (Eds.), *Forming, Recruiting and Managing the Academic Profession* (pp. 297-315). Cham: Springer International Publishing.

Collinge, C., Gibney, J., & Mabey, C. (2010). Leadership and place. *Policy Studies, 31*(4), 367-378.

Eijkel, K. (n.d.). *Koploper aan de A-1*. Retrieved from Rijksdienst voor Ondernemend Nederland: www.rvo.nl/sites/default/files/bijlagen/Koploper%20aan%20de%20A-1.pdf

Eppler, M. J. (2006). Knowledge Communication. *Encyclopedia of Knowledge Management*, 515-526.

Etzkowitz, H., Webster, A., Gebhardt, C., & Terra, B. (2000). The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm. *Research Policy, 29*(2), 313-330.

European Commission. (2017). Region Overijssel. Retrieved from https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/overijssel

Foss, N., & Pedersen, T. (2003). *The MNC as a knowledge structure: The roles of knowledge sources and organizational instruments in MNC knowledge management*. DRUID Working Paper. Center for Knowledge Governance. Retrieved from http://hdl.handle.net/10398/7317

Garlick, S., Benneworth, P., Puukka, J., & Vaessen, P. (2006). *Supporting the contribution of higher education institutes to regional development - Peer review report: Twente in the Netherlands*. OECD.

Geuna, A., & Muscio, A. (2009). The Governance of University Knowledge Transfer: A Critical Review of the Literature. *Minerva : A Review of Science, Learning and Policy, 47*(1), 93-114.

Goddard, J., Asheim, B., Cronberg, T., & Virtanen, I. (2003). Learning regional engagement. *A re-evaluation of the third role of Eastern Finland universities. publications du Conseil finlandais d'évaluation de l'enseignement supérieur (Finnish Higher Education Évaluation Council), 11*.

Greenhill, A., & Graham, G. (2011). *The Role of Local News Media in University Public Engagement Report*. Retrieved from http://hummedia.manchester.ac.uk/institutes/cresc/sites/default/files/Research_Report_version_4.doc

Hengstenberg, Y., Eckardt, F., & Benneworth, P. (2017). Reflections from a living smart campus. *Rooilijn, 50*(1), 44-49.

Herbane, B., Elliott, D., & Swartz, E. M. (2004). Business Continuity Management: time for a strategic role? *Long Range Planning, 37*(5), 435-457. doi:https://doi.org/10.1016/j.lrp.2004.07.011

Hughes, A., & Kitson, M. (2012). Pathways to impact and the strategic role of universities: new evidence on the breadth and depth of university knowledge exchange in the UK and the factors constraining its development. *Cambridge Journal of Economics, 36*(3), 723-750.

Jongbloed, B., Enders, J. r., & Salerno, C. (2008). Higher education and its communities: Interconnections, interdependencies and a research agenda. *Higher Education : The International Journal of Higher Education and Educational Planning, 56*(3), 303-324.

Kastberg, P. (2011). Knowledge asymmetries: Beyond to have and have not. *Fachsprache, 24*(3-4), 137-151.

Kennispark Twente. (2013). Innovate & Accelerate, Kennispark Twente. Retrieved from www.kennispark.nl/wp-content/uploads/2013/03/brochure-kennispark-engels-1.pdf

Kennispark Twente. (2017a). Kennispark Twente becomes Novel-T. Retrieved from www.kennispark.nl/news/12750-kennispark-twente-becomes-novel-t/

Kennispark Twente. (2017b). Koploper aan de A1' zorgt voor enorme sprong voorwaarts. Retrieved from www.kennispark.nl/nl/nieuws/12639-koploper-aan-de-a1-zorgt-voor-enorme-sprong-voorwaarts/

Kennispunt Twente. (2016). Twente Index 2016. Retrieved from www.twenteindex.nl

Klerkx, L., & Leeuwis, C. (2008). Matching demand and supply in the agricultural knowledge infrastructure: Experiences with innovation intermediaries. *Food Policy, 33*(3), 260-276.

Knight, J. (2003). Updated definition of internationalization. *International higher education*(33), 2-3.

Kosmützky, A., & Ewen, A. (2016). Global, national and local? The multilayered spatial ties of universities to society. In D. M. Hoffman & J. Välimaa (Eds.), *Re-becoming universities? Higher education institutions in networked knowledge societies* (pp. 223-245). Dordrecht: Springer Netherlands.

Lam, A. (2002). *Communities of practice and networks: key concepts and issues* Position paper prepared for European Commission Loc Nis Workshop on Knowledge Management and Governance Within the Frim. Retrieved from https://repository.royalholloway.ac.uk/file/0f90a8a1-ee96-8333-e926-8cf7e28d1034/8/CoP_and_Networks_position_paper_Loc_Nis_2002.pdf

Larty, J., Jack, S., & Lockett, N. (2017). Building regions: a resource-based view of a policy-led knowledge exchange network. *Regional Studies, 51*(7), 994-1007.

Meerman, A. (2017). *University of Twente: The entrepreneurial University of the Netherlands through high-tech and human touch*. Retrieved from https://ub-cooperation.eu/pdf/cases/W_Case_Study_Twente.pdf

Meyer, W. S., Bryan, B. A., Summers, D. M., Lyle, G., Wells, S., McLean, J., & Siebentritt, M. (2016). Regional engagement and spatial modelling for natural resource management planning. *Sustainability Science, 11*(5), 733-747. doi:10.1007/s11625-015-0341-5

Mihut, G., Altbach, P. G., & Wit, H. d. (2017). Understanding Higher Education Internationalization: Insights from Key Global Publications. doi:10.1007/978-94-6351-161-2

Miller, W. L. (1995). A broader mission for R&D. *Research-Technology Management, 38*(6), 24-36.

Mitton, C., Adair, C. E., McKenzie, E., Patten, S. B., & Perry, B. W. (2007). Knowledge Transfer and Exchange: Review and Synthesis of the Literature. *The Milbank Quarterly, 85*(4), 729-768.

Nätti, S., & Ojasalo, J. (2008). Loose coupling as an inhibitor of internal customer knowledge transfer: findings from an empirical study in B-to-B professional services. *Journal of Business & Industrial Marketing, 23*(3), 213-223. doi:10.1108/08858620810858472

OECD. (2009). *OECD Reviews of Regional Innovation: 15 Mexican States*: OECD Publishing.

Oinas, P. (2002). Competition and Collaboration in Interconnected Places: Towards a Research Agenda. *Geografiska Annaler. Series B, Human Geography, 84*(2), 65-76.

Paquette, S. (2006). Communities of practice as facilitators of knowledge exchange. *Encyclopedia of communities of practice in information and knowledge management*, 68-73.

Pickernell, D., Packham, G., Brooksbank, D., & Jones, P. (2010). A recipe for what? UK universities, enterprise and knowledge transfer
 Evidence from the Federation

of Small Businesses 2008 survey. *The International Journal of Entrepreneurship and Innovation, 11*(4), 265-272.

Pike, A., Rodríguez-Pose, A. s., & Tomaney, J. (2006). *Local and regional development*. London: Routledge, Taylor & Francis Group.

Pinheiro, R., Benneworth, P., & Jones, G. A. (2012). *Universities and regional development: A critical assessment of tensions and contradictions*. London and New York: Routledge.

Regio Twente. (n.d). Agenda van Twente. Retrieved from www.agendavantwente.nl

Rönkkö, M., & Mäkelä, M. M. (2008). *Asymmetries of Knowledge Between Engineering and Marketing in Software Product Development*. http://aisel.aisnet.org/ecis2008/223

Saxion. (2015). *Saxion Strategic Plan: 2016-2020*. Retrieved from file:///C:/Users/Gebruiker/Downloads/Saxion+Strategic+Plan+16-20%20(1).pdf

Saxion. (n.d.). Strategic Agenda 2012-2016: Vision, Focus, Action. Retrieved from www.saxion.edu/wps/wcm/connect/6cca6c47-d8d6-403a-a326-a3c97e6d19c2/Strategic%2BAgenda%2B2012-2016_ENG.pdf?MOD=AJPERES

Saxion Centrum voor Ondernemerschap. (2017). Nederland Valoriseert - Resultaten van het valorisatieprogramma. Retrieved from https://saxion.nl/centrumvoorondernemerschap/site/_news/nederland%20valoriseert%20-%20resultaten%20van%20het%20valorisatieprogramma

Scholten, C., & Oxener, D. (2016). *Regional Innovation Monitor Plus 2016: Regional Innovation Report Overijssel*. Retrieved from https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/sites/default/files/report/2016_RIM%20Plus_Regional%20Innovation%20Report_Overijssel.pdf

Schutte, F., & Van der Sijde, P. (2000). *The University and its region: examples of regional development from the European Consortium of Innovative Universities*. Enschede (Netherlands): Twente University Press.

ScienceWorks. (n.d.). Inkomsten vanuit de samenleving voor universiteiten komen steeds minder van bedrijven. Retrieved from https://scienceworks.nl/best-valoriserende-universiteiten-bekendgemaakt/

Scott, P. (2007). Back to the future? The evolution of higher education systems. In B. M. Kehm (Ed.), *Looking back to look forward. Analyses of higher education after the turn of the millennium* (pp. 13-29). Kassel: University of Kassel.

Siegel, D. S., Veugelers, R., & Wright, M. (2007). Technology transfer offices and commercialization of university intellectual property: performance and policy implications. *Oxford Review of Economic Policy, 23*(4), 640-660.

Sijgers, I., Hammer, M., ter Horst, W., Nieuwenhuis, P., & van der Sijde, P. (2005). *Supporting the contribution of Higher Education Institutes to regional development, Self-Evaluation Report of Twente*. Retrieved from http://doc.utwente.nl/103960/1/OECD%20report%202005.pdf

Sotarauta, M. (2016). *Leadership and the city: power, strategy and networks in the making of knowledge cities*. London: Routledge, Taylor & Francis Group.

Sotarauta, M., Beer, A., & Gibney, J. (2017). Making sense of leadership in urban and regional development. *Regional Studies, 51*(2), 187-193.

Sotarauta, M., & Lakso, T. (2000). *Muutoksen johtaminen ja luova jännite: Tutkimus Kainuun kehittämistoiminnasta [Management of change and creative tension: A study of development work in Kainuu region]*. Suomen Kuntaliitto [Finnish Local and Regional Authorities]. Helsinki.

Stam, E., Romme, A. G. L., Roso, M., van den Toren, J. P., & van der Starre, B. T. (2016). *Knowledge triangles in the Netherlands: an entrepreneurial ecosystem approach*: OECD.

Timmerman, P., & Hospers, G.-J. (2016). *Campus in Context*. Enschede: Stichting Stad en Regio & Studium Generale UT.

Twente Board. (2015a). Purposes. Retrieved from www.twenteboard.nl/en/twenteboard/functions/

Twente Board. (2015b). TwenteBoard: Economic Development. Retrieved from www.twenteboard.nl

U-Multirank. (2017). University of Twente. Retrieved from http://www.umultirank.org/#!/explore?trackType=explore&sightMode=undefined&section=exploreUniversityDetail&detailUniversity=1250&name=university-of-twente

University of Twente. (2014a). DesignLab University of Twente turns design process 'topsy turvy'. Retrieved from www.utwente.nl/en/news/!/2014/9/323643/designlab-university-of-twente-turns-design-process-topsy-turvy

University of Twente. (2014b). *Vision 2020: Innovate, Experiment, Pioneer*. Retrieved from https://issuu.com/utwente/docs/14337_brochure_vision_2020_eng.

University of Twente. (2014c). *Vision 2020: Innovate, Experiment, Pioneer*. Retrieved from https://issuu.com/utwente/docs/14337_brochure_vision_2020_eng

University of Twente. (2015). Campus. Retrieved from https://www.utwente.nl/en/campus/

University of Twente. (2016). Living Smart Campus. Retrieved from https://www.utwente.nl/en/organization/news-agenda/special/2016/living-smart-campus/

University of Twente. (2017a). Long Term Strategy for Housing. Retrieved from https://www.utwente.nl/en/lths/

University of Twente. (2017b). Social Entrepreneurship. Retrieved from www.utwente.nl/en/bms/nikos/valorisation/soceship/

University of Twente. (2017c). Welcome to the DesignLab! But what is it? Retrieved from www.utwente.nl/en/designlab/

University of Twente. (n.d.). Map of the Unviersity of Twente. Retrieved from www.utwente.nl/download/campusmap.pdf

Uyarra, E., Flanagan, K., Magro, E., Wilson, J., & Sotarauta, M. (2017). Understanding regional innovation policy dynamics: Actors, agency and learning. *Environment and Planning C: Politics and Space, 35*(4), 559-568.

Veldhuis, F. (2017). Enschede genomineerd voor titel Beste Binnenstad van Nederland. Retrieved from www.huisaanhuisenschede.nl/nieuws/zakelijk/175169/enschede-genomineerd-voor-titel-beste-binnenstad-van-nederland

Weick, K. E. (1976). Educational Organizations as Loosely Coupled Systems. *Administrative Science Quarterly, 21*(1), 1-19. doi:10.2307/2391875

Weick, K. E. (1982). Administering Education in Loosely Coupled Schools. *The Phi Delta Kappan, 63*(10), 673-676.

Wright, M., Clarysse, B., Lockett, A., & Knockaert, M. (2008). Mid-range universities' linkages with industry: Knowledge types and the role of intermediaries. *Research Policy, 37*(8), 1205-1223.