BUILDING A "MAGNETISM" FOR INTERNATIONAL KNOWLEDGE MIGRANTS THROUGH A SCIENCE PARK

The case of Kennispark Twente.

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MASTER THESIS

FACULTY OF BEHAVIOURAL, MANAGEMENT AND SOCIAL SCIENCES

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DOCUMENT NUMBER - 1

BUSINESS ADMINISTRATION

2016-08-17

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I Abstract

In this master thesis, I explore how policy-makers can deliberately create science parks in the 21st century as "magnet infrastructures" to attract and retain international knowledge migrants from the global knowledge economy. Using a narrative method to analyse creators' and international knowledge migrants' narratives of everyday material practice in one science park, the Kennispark Twente (Knowledge Park) in the east of the Netherlands, I propose a new conceptual model, exploring the social as well as economic effects of science parks in the 21st century. Moreover, in order to understand the internal dynamic processes of science parks as social places, I add Wengers' (1998) concept of "Community of Practices" as an analytical lens to the existing knowledge-based urban development literature. With the help of my second proposed conceptual model, I explore the wider multilevel "magnetism" of science parks as well as the way how international knowledge migrants acquire particular local connections and entanglements with the local physical structure of a science park. The study results show that science spaces' wider "magnetism" is not solely based on an economical dimension, but also on the unique place-related culture and identity, which forms a science park's knowledge community precinct. Science parks therefore seem to operate multi-dimensionally and should be understood as complex social architectures that create internal social dynamics over time through its actors' interaction in local community of practices. In addition, due to these communities of practices, a science park can create both a local-global "magnetic infrastructure" for international knowledge migrants as well a local buzz for regional economic development and growth. The results suggest that policy-makers could benefit by thinking more carefully about ways to establish science parks with both traditional economic factors (e.g. sufficient transportation routes, career opportunities) as well as social factors (e.g. lifestyle amenities, nature, and diverse cultural offers) that support the creation of an international space environment and therewith the involvement of international knowledge migrants in a science park's local internal social dynamics.

II Acknowledgement

I would like to use this opportunity to express my deepest gratitude to everyone who supported me throughout the planning and writing process of this Master thesis. Special thanks should be given to *Dr. Paul Benneworth* (University of Twente), my research project supervisor, for his helpful and caring support and great assistance during all stages of my research project and to *Mr. Martin Stienstra MSc.* (University of Twente) for his useful and constructive recommendations on this thesis. I am very grateful for all their ideas and suggested improvements that brought my Master thesis to a further stage. In addition, I would like to thank all *interviewees* for giving their time for this research and my *family and friends* for their loving support, recommendations and encouragement during the entire process of my Master thesis.

This master thesis reports research funded by the *Leverhulme Trust*, formally under the title *"Global Science Scapes: Dimensions of Transnationalism" research network* (September 2014 – February 2017). I would also like to extend my thank to *David Valler* (Oxford Brookes University) and *Nicholas Phelps* (University College, London) as well as the *GSS team* for providing me with the opportunity to present my findings at the AAG conference in San Francisco (USA) and the Triple Helix conference in Heidelberg (GER) in 2016.

Gratefully,

Franziska Eckardt

(University of Twente, Enschede, August 2016)

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VI List of Abbreviations

BSP	Business and Science Park
CoP	Community of Practice
GSS	Global Science Spaces
KBUD	Knowledge-Based Urban Development
KCP	Knowledge Community Precinct
R&D	Research and development
RIS	Regional Innovation Systems
TIS	Territorial Innovation Systems
TOP	Tijdelijke Ondernemers Plaatsen (Dutch); Temporary Entrepreneurial Placements (English)
UT	University of Twente

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1 Introduction

In a more and more globalised work, knowledge is increasingly considered as a "panacea to specific economic problems" (Perry & May, 2010, p. 10). Therefore, there is an increasing academic and political interest in the way that international knowledge migrants identify with place-specific characteristics of particular regions in the new knowledge economy of the 21st century. Moreover, the way, in which these global citizens acquire particular connections and entanglements within specific regional localities that create spill-over effects that drive innovation-based regional economic development (Phan, Siegel, & Wright, 2005). Part of the debate has been tied up with Richard Florida's (2002) idea of "creative classes", which implicitly understands these workers' to have a predominant cosmopolitan and creative identity that is attached to particular lifestyles and professional interests. These are best exercised in appealing urban locations rather than necessarily being tied to particular places. When considering how major science, technology and business spaces, also known as science parks (e.g. the UK's Science Vale; Hsinchu Technopolis Taiwan), can offer assets and facilities to attract international knowledge migrants from the global knowledge economy, there is a tendency to think of this in primarily economic terms (e.g. career development and job opportunities; see: Phan, et al., 2005; Faggian and McCann, 2009). Since the turn of the last century, policy-makers therefore shifted in their (policy-) focus towards science parks, as deliberately created knowledge-based urban developments, thereby viewing them as attractors and anchors of human capital for effective innovation (Benneworth & Ratinho, 2015). However, if all these spaces offer is a kind of specialised suburban estate for existing economic opportunities, this makes it hard to understand the rising popularity of science parks for international knowledge migrants in the 21st century (Forsyth & Crewe, 2010). Moreover, this does not provide an answer to the question why certain (regional) localities in the global market economy seem to be more attractive to human capital than others.

I argue in this master thesis that contemporary policy-makers' focus on science parks is too simplistic and one-dimensionally oriented. Moreover, in order to understand a science parks' popularity (i.e. its wider "magnetism" in the global network economy), I argue that policy-makers, economists, and geographers comprehensively considering both economic- and non-economic factors may benefit from understanding a science parks' popularity. I follow Benneworth and Ratinho (2015) in arguing that these science parks might also operate as "dynamic (urban) spaces", in which particular communities act and interact with each other to achieve common desired goals (p. 3). Moreover, Benneworth and Ratinho (2015) refer in their study to science parks as "local knowledge community precincts" that can develop external network strengths by becoming a "place to be" in global innovation networks and attract external actors based on their specific kinds of knowledge embedded

within their learning communities (p. 43). Thus, if international knowledge migrants are attracted to a particular "magnetic force" of particular social spaces, this raises the question: how can policy-makers deliberately create science parks in the 21st century that attract and retain these international knowledge migrants beyond the economic opportunities they offer?

The contribution of my master thesis to regional and urban science literature in general is twofold. First, to fill the gap in so-called "knowledge-based urban" theories, I will investigate additional social factors (besides primarily economic ones) that operate multi-dimensionally in attracting international knowledge migrants to science parks. For this purpose, I develop and test a new conceptual model, exploring for the first time in literature the social as well as economic effects of science parks in the 21st century, viewing a science park as a local "Knowledge Community Precinct" with a wider "magnetic effect" for international migrants. Moreover, in order to understand the internal dynamic processes of science parks as social places, I add Wengers' (1998) concept of "Community of Practices" as an analytical lens to the existing knowledge-based urban development theories. With the help of my second developed conceptual model, I therefore aim to explore and understand the wider multi-dimensional "magnetism" of science parks as well as the way how international knowledge migrants acquire particular local connections and entanglements with the local physical structure of a science park.

1.1 Research question and sub-questions

Using an exploratory approach, I present in this master thesis a single case study of the Dutch *Kennispark* (Eng. Knowledge Park), thereby addressing the following main research question:

How can policy-makers deliberately create science parks in the 21st century as "magnet infrastructures" to attract and retain international knowledge migrants?

In order to answer this research question, I address the following three sub-questions:

- *How can people deliberately create a local physical environment of a science park that is attractive for international knowledge?*
- *How do international knowledge migrants perceive these efforts and outcomes?*
- *How do international knowledge migrants acquire particular connections and entanglements in particular (regional) localities?*

1.2 Research outline

In order to answer the research questions posed above, this master thesis proceeds as follows. In the theoretical framework, I first discuss the rising importance of human capital in the new knowledge economy as well as role of territorial innovation systems as attractors and producers of human capital (Sections 2.1 and 2.2). After discussing international knowledge migrants' migration behaviour in Section 2.3, I develop in Section 2.4 a conceptual model based on knowledge-based urban theories in order to understand the internal social dynamic processes within science parks as spatial concentrated environments. In Section 2.5, I conceptualise science parks as deliberately created knowledge-based urban developments (see Section 2.5.1) that function as "magnet infrastructures" to attract international knowledge migrants from the global market economy. After discussing the specific characteristics of science parks in Section 2.5.2, I will then present a second conceptual model in Section 2.5.3 explaining the multi-dimensionality of science parks in attracting international knowledge migrants. At this point, I am arguing that a science park has four operational effects: functional effect, regional upgrading effect, external recognition effect, and personal attraction affection. I will then proceed with the operationalisation of my key variables in Section 3. In Section 3.1, I first operationalise the four operational effects of science parks based on the literature discussed in 2.5.2. Second, based on the literature discussed in Section 2.4, I will then operationalise how international knowledge migrants acquire local connections and entanglements within a science park as a local knowledge community precinct. In Section 4, I will explain why I have chosen for a case study as research strategy (Section 4.1) and give a short introduction to the Kennispark Twente case study (Section 4.1.1). I will then elaborate on my chosen research design in Section 4.2. In my analysis (Section 5), I will test my earlier presented conceptual models of Sections 2.4 and 2.5.2 based on my gathered empirical evidence. I am doing this by first presenting in Section 5.1 creators' efforts and desired outcomes to establish the Kennispark as a science park that has four operational effects (Section 5.1.1 – 5.1.4). I will then compare this to international knowledge migrants' perception of these efforts and outcomes in Section 5.2, thereby elaborating on the same four operational effects (5.2.1 – 5.2.4). In the third part of my analysis (Section 5.3), I will investigate how international knowledge migrants acquire local connections in the Kennispark that lead to their entanglements with its physical structure. Based on the empirical evidence presented in Section 5, I will then discuss how policy-makers can deliberately create science parks in the 21st century as "magnet infrastructures" to attract and retain international knowledge migrants in Section 6. I will close this master thesis in Section 7 by elaborating on the broader contribution of my findings to regional and urban science literature as well further research possibilities.

2 Theoretical framework

In order to answer the research question posed in Section 1.1, I start in Section 2.1 by analysing the non-spatial impact of human capital on economic growth and development in the emerging knowledge economy of the 21st century. I then explicitly discuss the role of territorial innovation systems as attractors and producers of human capital in Section 2.2, thereby highlighting the importance of location within the global market economy. In Section 2.3, I discuss the spatial impact of human capital by elaborating on labour migration behaviour. In order to clarify the nature of the various theoretical links between human capital, economic growth models and migration, I introduce in Section 2.4 the "Knowledge Based Urban Development" (KBUD) literature, which focuses on how KBUDs can develop the capacity to attract, generate, retain, and facilitate knowledge and innovation. Using Wengers' (1998) "Community of Practice" approach as an analytical lens, I then propose a conceptual model for understanding the internal social dynamics of spatial concentrated environments. In Section 2.5, I argue that geographers and policy-makers' attention increasingly shifted towards an understanding of science parks (as KBUDs) as policy instruments with a planned and systematic character. I therefore present four characteristics that were found in previous KBUD literature, which form science parks as local hosts that attract and retain international knowledge migrants. Finally, based on the discussed theories and concepts in Sections 2.1 - 2.5.2, I propose a second conceptual model in Section 2.5.3 for understanding science parks' multidimensional effects in attracting international knowledge migrants.

2.1 The role of human capital in the knowledge economy

In recent academic literature, the concept of a "knowledge economy" (or "knowledge-based economy") is used to describe the new economy of the 21st century induced by information and communications technology-related economic developments since the end of the 20th century (Lundvall & Johnson, 1994). Powell and Snellman (2004) argue that production and services in this new economy are more and more dominated by knowledge-intensive activities that have been triggering the acceleration of technical and scientific processes since the early 1950s. During the early 1970s, the industrial system shifted from mass production towards more flexible specialisation, thereby enhancing the role of external communication, information and knowledge exchange in the new economy (Lundvall & Johnson, 1994). These technological changes were accompanied by a globalisation process, which increasingly transformed the global market economy into a "global factory" (Buckley & Ghauri, 2004) through the global distribution of parts of production.

New economic growth theorists highlight the importance of tertiary knowledge and the accumulation of knowledge capital as a key driver of macroeconomic development and growth in developing countries, thereby considering it as the "engine" of the new knowledge economy (Faggian and McCann, 2009; Powell & Snellman, 2004). Highly skilled human capital is more and more seen as a crucial factor related to technological change and diffusion as well as an essential element for countries to compete within the globalised knowledge economy (Faggian and McCann, 2009). This led to the recent trend across Western countries to increase investments in higher education and human capital (Faggian and McCann, 2009). At the microeconomic level, the new combination of knowledge is increasingly considered as the heart of unique knowledge creation (Cooke and Leydesdorff, 2006). Knowledge capital is therefore assumed to be a potential source for enterprises' competitive advantage, since knowledge spill-over and knowledge agglomeration increase returns on scale (i.e. innovation, Benneworth & Charles, 2005). By differentiating between various types of knowledge (e.g. tacit vs. codified), Lundvall and Johnson (1994) highlight the importance of human capital for the transfer of tacit knowledge (e.g. skills, ideas and experiences) among different localities in the global market economy. Viewing places as an open relational space, or as fields of social interaction (Ache, 2000), some forms of knowledge (e.g. tacit knowledge) are therefore best transferred via personal contacts through social learning processes (i.e. direct experiences). This is why Lundvall and Johnson (1994) refer to the contemporary knowledge economy as a "learning economy" (Howells, 2002).

2.2 Territorial innovation systems as attractors and producers of human capital

Although "knowledge, as embodied in human beings (as "human capital")", was found to be central to growth and development since the 1950s, it is only since the end of the 20th century that its relative importance is discussed in regional economic literature (i.a. OECD, 1996, p. 10; Laroche, Mérette, & Ruggeri, 1999). With regard to regional development, it is argued by Faggian and McCann (2009) that due to the lack of inter-regional boundaries, regions possess a higher degree of openness than nations, which in turn causes that "factors [(e.g. labour)] can flow relatively easy between them" (p. 137). Moreover, Abel and Deitz (2012) argue that within the new global knowledge economy, labour migration "plays an important role in the geographic distribution of human capital" (p. 2). In an increasing globalised market economy, in which technological changes and global competition have diminished many of the tradition roles of location, economic geography therefore is increasingly faced with a paradox (Porter, 2000). Although it is apparent to conclude that in an area of global competition, location is diminished in importance, what Cairncross (1997) described as "the death of distance", regional economists and geographers are puzzling with the question how (regional)

localities can develop unique, place-related conditions in the global economy to become attractors and producers of capital and labour.

One theory discussing this question is the "Territorial Innovation System" (TIS) theory. According to Porter (1990) and Krugman (1991), spatial proximity (e.g. business cluster formation) boosts economic activity due to enhanced knowledge exchange between actors within a concentrated spatial environment (Koschatzky, 2001). By introducing the notion of "New Industrial Spaces" during the 1980s, the Californian school of economic geography highlighted the importance of location with regard to technological innovation and industrial organisation (Moulaert & Sekia, 2003). Originally induced by Marshall (1890), the concept of "industrial districts" also dominated among Italian scholars during mid-1980s and 1990s (see: Belussi, 1996; Piore & Sabel, 1984), which focused on the "quality of formal and informal social, economic and political relations" in industrial districts "as determinate factor[s] of long-term development" next to "technological-related input factors" (Hospers, 2006, p. 7; Moulaert & Sekia, 2003, p. 3). Socio-cultural factors as well as local inter-personal interaction and cooperation are therefore assumed to have "created factories without walls" and "an industrial atmosphere" that led to economic growth and development (Hospers, 2006, p. 7). Within this "Marshallian" view, the notion of "embeddedness" is therefore seen as a "key analytical concept" for understanding how industrial districts operate and function (Moulaert & Sekia, 2003, p. 3).

More recently, modern spatial development theorists developed the concept of "innovative milieux", "which can be regarded as the French variant of the Italian notion of industrial districts" (Hospers, 2006, p.7). According to this view, knowledge innovation in the new knowledge economy is framed as a result of "collective learning processes" between different actors (such as firms and (semi)public bodies) who learned to "combine their material and immaterial resources to bring about new products and services" (Hospers, 2006, p.7). Moreover, Ache (2000) argues that the innovative knowledge capacity and economic success of a given locality is determined by its "interpersonal synergy and collective action" (p. 696). Based on this, Belussi and Pilotti (2000) highlight the importance of systemic learning, tacit knowledge and networking within spatially close localities and industrial districts. Knowledge innovation and learning are also key concepts in current studies on "Regional Innovation Systems" (RISs) (Hospers, 2006). Benneworth and Hospers (2007) define these RISs as "durable networks which exist between various actors involved in innovation, and which produce and exploit unique local knowledge assets" (p. 2). Highlighting the increasing global dimension of geography, Benneworth and Hospers (2007) conceptualise RISs as local knowledge pool having the ability to develop unique, place-related knowledge capital favoured through physical proximity at the regional level. In addition, they argue that RISs can function as "global-local pipelines"

that support mutual knowledge flows between regions and global markets, thereby "refilling the local knowledge pools, creating positive spill-overs for local firms" that attract international knowledge migrants and outside investments (Benneworth & Hospers, 2007, p.781). From this perspective, the global market economy of the 21st century can prospectively be seen as a mosaic of more or less developed regional innovation systems differing by their unique, place-related developed resources (human capital, social capital, knowledge capital).[1]

2.3 International knowledge migrants' migration behaviour

The preceding Sections 2.1 and 2.2 showed that there is a positive relationship between human capital and (regional) economic growth and that economic-geography literature offers a range of concepts (e.g. clusters, industrial districts, innovative milieux and regional innovation systems) aiming to explain how regions can develop unique, place-related conditions to gain a competitive advantage in the global market economy. However, these studies do not provide an answer to the question why certain localities and regions in the global market economy seem to be more attractive to human capital than others. Regional economic development also seems to depend on highly skilled migrants' decisions where to move to (Faggian and McCann, 2009).

Recent mainstream economic literature presents two prevailing opinions on why human capital is moving towards particular regional localities within the global market economy, namely the "human capital theory" and the "job-search theory" (Benneworth & Herbst, 2015). In human capital theory, migration is considered as any other investment, which has related costs and returns (Faggian and McCann, 2009). Migration flows are therefore caused by "individuals' higher expected returns to human capital investment" (Benneworth & Herbst, 2015, p. 6). According to job-search theories, individuals move to regional labour markets that match their career aspiration with their economic opportunities (Faggian and McCann, 2009). More recent studies, but also more contested studies, highlight the importance of softer factors as a cause of migration flows. For example, viewing labour migrants as a part of a group of people (e.g. family), Stark (1991) argues that individuals' decision to migrate is often subordinated to the collective. Moreover, Florida (2002a) suggests that people get attracted by regional localities that provide a range of lifestyle amenities. With his idea of "creative classes", Florida (2002b) has the implicit understanding that workers within the new globalised economy have a predominant cosmopolitan and creative identity that is attached to particular lifestyles and professional interests, being best exercised in appealing urban locations rather than necessarily being tied to particular places. Therefore, he argues that individuals of this creative classes

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[1] See next section: Conti (1993).

select their workplace based on an attractive location that offers a range of multidimensional experiences (e.g. with regard to quality of life and nature) rather than on financial and economic opportunities. Hence, he argues that the success of particular regional localities within the global economy is not determined by traditional economic factors (e.g. access to natural resources; distance to main transportation routes), but is based upon people's choices to live in particular locations.

2.4 Internal social dynamic processes within spatial concentrated environments

From the preceding Sections 2.1 – 2.3, I generate three main conclusions. First, unique, place-related knowledge, embodied in human capital is increasingly importance in the new knowledge-based economy and is now seen as a potential factor for (regional) economic growth and competitiveness. Second, the importance of locations has increased rather than diminished in the global knowledge economy. And third, human capital became more and more mobile (at both a sub-national as well as an international level) and (international) knowledge migrants seem to base their decision to migrate not only on primarily economic and financial factors, but also on softer factors. These and related paradigm-shifts, created the condition for the emergence of the "Knowledge Based (Urban) Development" (KBUD) literature in the 21st century, which "suggests that the economic future of cities and city-regions more and more depends on the capacity to attract, generate, retain and foster creativity, knowledge and innovation" (Yigitcanlar, 2011, p. 2). Hence, contemporary KBUD literature is concerned with the question how tacit and explicit forms of knowledge can be embedded "within all aspects of urban planning, development and management" (Yigitcanlar, 2011, p. 5). KBUD literature thereby focuses on the "precise processes by which knowledge-based urban agglomerations can facilitate knowledge spill-overs and social interactions that encourage knowledge combination and create supporting urban competitiveness" (Benneworth & Ratinho, 2015, p. 43).

In order to understand how certain cities and city-regions can develop the capacity to attract, generate, retain, and foster creativity, knowledge and innovation, we first need to understand the complex internal social dynamic process within these concentrated environments. Using a structural network approach, Yigitcanlar, O'connor and Westerman (2008a) and Yigitcanlar (2010) provide contemporary KBUD literature with an initial understanding of how new knowledge can be created within spatial concentrated environments and where it becomes facilitated in physical developments. Yigitcanlar, et al. (2008a) argue that within a spatial concentrated environment, actors get involved into a system of relationships and thereby become associated and entangled with its physical structure. By introducing the notion of "Knowledge Community Precincts" (KCPs), Yigitcanlar (2010) explains how knowledge becomes facilitated in spatial concentrated environments. He conceptualises

a physical development as a "precinct". According to Yigitcanlar (2010), knowledge is created within these precincts due to the interaction of a range of knowledge actors due to knowledge-based industry activities. As a result of this, he argues that new kinds of knowledge are created and simultaneously embedded within the KCP. Yigitcanlar (2010) claims that those kinds of developed knowledge in turn attract and recruit external actors towards these precincts, thereby extending their scope.

Whereas Yigitcanlars (2010) provides us with an understanding of how knowledge is created as a result of human interaction within a concentrated environment that can become attractive for external partners, I am interested in the deeper internal learning process within these knowledge communities that lead to the creation and embedding of new knowledge within these spatial concentrated environments. In order to do so, I use Wenger's (1998) concept of "Community of Practices" (CoPs) as an analytical lens to Yigitcanlar's (2010) KCP approach. Wenger extensively wrote about (situated) learning processes during the early 1990s (see e.g.: Wenger, 1991). Since the beginning of the 20th century, he is primary focussing in his work on social participation, thereby viewing the individual as an active member in practices of social communities (see: Wenger, McDermott & Snyder, 2002). In addition, during the 20th century, his CoP approach became increasingly adopted by other scholars, for example in knowledge management (see e.g.: Wasko & Faraj, 2000). According to Wenger (1998), a CoP is defined as a system of relationships among actors and their activities and the world, which can encounter with other actors from other CoPs over time. Actors within a CoP share a specific domain of interest and pursue their interest in their domain through joint activities and discussion, thereby sharing information (Wenger, 1998). Through involvement and interaction with other actors in the CoP and other CoPs, actors develop domain-specific resources (common experiences, stories, instruments, and ways of solving problems) over time including context-specific knowledge that can be only accessed by community participants (Wenger, 1998). In this way, a sense of place, purpose and common identity builds the source of learning within the CoP (Wenger, 1998).

Using Wenger's (1998) CoP approach, I propose in Figure 1 a conceptual model for understanding the internal social dynamic processes within spatial concentrated environments (precincts). Within a concentrated space environment, a range of different actors is assembled with different goals and interests. Through their interaction, these actors form CoPs with other actors over time who pursue and share the same interests. Within these different CoPs, actors create different context-specific knowledge through their collective learning processes, practices and activities, thereby developing a common set of norms, values and understanding. Following Ache (2000) (see Section 2.1) who views

places as open relational space, as fields of social interaction, I argue that knowledge and information are shared and transferred between the different actors of different CoPs through joint activities and discussions. In line with Yigitcanlar, et al. (2008a), I argue that the different CoPs within a concentrated space environment form a KCP, which is "united by a common set of norms, values and understandings" that creates and defines a KCP's domain-specific knowledge (unique, place related resources: human capital, social capital, knowledge capital). These unique, place related resources in turn form a place-specific identity within a particular (regional) locality.

According to Yigitcanlar (2010), it is exactly this place-specific identity and knowledge which attracts external actors towards a KCP. In line with this, I argue that due to the new globalised economy, CoPs within a local KCP operate among multidimensional and overlapping domains, since their actors increasingly get involved in network relationships with actors from other KCPs located in other countries (local/global network dialectics and dynamics). I therefore argue that, within the global knowledge economy, local precincts may function as "magnet infrastructures" that support the attraction of external actors from the global knowledge pool of the global epistemic community towards the local KCPs. The "magnetic effect" is caused by the interpersonal relationships and networks between actors from different CoPs in different local KCPs through the global epistemic community. Through their local/global dialectic with local actors of the other CoPs, external actors can become attracted to the CoP and may decide to migrate in order to became part of the other CoP. Consequently, local KCPs can develop external network strengths through their CoPs in the global innovation networks and attract external actors based on their specific kinds of knowledge embedded within their learning communities. Knowledge, embodied in human beings, is therefore moving from one local KCP to another one, which also has an influence on the domain-specific knowledge created within a KCP.

Global Epistemic Community

Country A

Region X

CoP
CoP
CoP
CoP

shapes

Local Knowledge
Community Precinct

KC
HC
SC

Country B

Region X

CoP
CoP
CoP
CoP

shapes

Local Knowledge
Community Precinct

KC
HC
SC

CoP = local community of practice (share a common set of norms, values and understandings)

— — — = collective learning processes, practices and activities

———— = local/global dialectics and network dynamics between knowledge community precincts' CoPs

◯ = place-related developed resources (human capital (HC), social capital (SC), knowledge capital (KC))

Figure 1. Overlapping operating domains of KCPs.
Source: Based on Coe and Bunnell, 2003.

2.5 Science Parks as a planned "magnet infrastructure"
2.5.1 Considering science parks as KBUDs

In an economy in which knowledge is more and more considered as a "panacea to specific economic problems, with a strong instrumental and strategic role", the strategic development of cities and city-regions became an important topic in KBUD literature (Perry & May, 2010, p. 10). The economic success of the high-tech hub Silicon Valley increasingly drove academic and policy-makers' interest in the use of "high-technological complexes as a means of driving innovation-based economic development" (Benneworth & Ratinho, 2015, p. 43; Hospers, 2006). Economists, geographers and policy-makers' attention therefore shifted towards an understanding of KBUDs as policy instruments with a "more planned and systematic character" to trigger economic development in especially less successful regions (Isaksen, 2001, p. 107). In line with this, an increasing amount of studies started to focus on the question "how old industrial regions reinvented themselves through innovation and learning" (Benneworth & Charles, 2005, p. 540). KBUD is therefore also often related to strategic post-industrial (urban) development; policy-makers' efforts to "build science cities, knowledge capitals, silicon alleys or technology corridors" that led to economic growth and development (Benneworth, Hospers, Jongbloed, Leiyste, & Zomer, 2011, p. 317; Yigitcanlar, 2011). Yigitcanlar (2011) conceptualises KBUD as a "paradigm with four major development domains – economic, socio-cultural, enviro-urban and institutional development" (p. 5). Besides this, he argues that KBUD also needs to be seen as a strategic management approach that aims to "bring together all of the main actors and sources so that they are able to organise and facilitate necessary knowledge-intensive activities and plan strategically for knowledge city (trans)formation" (p. 6). Benneworth, et al. (2011) highlight the complexity of KBUDs or urban science projects in general, considering all the different actors involved with their different goals and interests (public vs private). They argue that there is a misconception among KBUD literature, assuming that "all partners in particular urban science projects participate specifically to generate KBUD" (also referred to as "top-down master planning") and that successful strategic KBUD is therefore often dependent on policy-makers efforts to "coordinate a range of key rational stakeholders, to stimulate interactions and develop regional assets that support competitiveness" (also referred to as "strategic planning in networks") (Benneworth, et al., 2011, p. 2).

In this master thesis, I consider a science park as a form of KBUD. Phan et al. (2005) define science parks as "property -based organisations with identifiable administrative centre focused on the mission of business acceleration through knowledge agglomeration and resource sharing" upon the basis of unique local cultural knowledge that they produce (p. 166). Applying knowledge gathered from the previous section, I add to this definition that science parks also need to be understood as multidimensional and complex social architectures that gradually create a local KCP through their

internal social dynamics and therefore operate within multiple overlapping domains to attract local, national as well as global knowledge workers. In this thesis, I consequently conceptualise science parks as deliberately created KBUDs that develop over time into KCPs, thereby creating both a "magnetic infrastructure" for international knowledge migrants as well as a local buzz for regional economic development and growth.

2.5.2 Four characteristics of science parks

The following section presents a number of broad components that form science parks, thereby adding value in providing an attractive environment for international knowledge migrants and functioning as "magnet infrastructures" to attract and retain these global knowledge elites.

There is consensus in literature that ***inter-relationships between universities and localities*** help to form the core of KCPs for the nurturing of knowledge at the local level (Benneworth & Ratinho, 2015). Therefore, in order to create a unique local knowledge base that attracts international knowledge migrants, science parks normally display a close link between high-technological enterprises and research-intensive knowledge producers, such as universities and research and development (R&D) centres (Benneworth & Ratinho, 2015; Vedovello,1997). Quality of living and urban amenities are two necessary elements that support the integration of international knowledge migrants in a science parks' specific spatial environment to build a strong knowledge base (Yigitcanlar, Velibeyoglu, & Martinez-Fernandez, 2008b). In addition, to encourage "collective learning processes", an interactive space environment helps to bring various actors together due to shared activities during informal network meetings (Benneworth & Ratinho, 2015). Moreover, Baum, Yigitcanlar, Horton, Velibeyoglu, and Gleeson (2007) highlight that an ideal KCP for international knowledge migrants should resemble "a [network] space of many places – a stimulating, disjunctive environment that both echoes the multiplicity of contemporary knowledge production while, in its physical quality, compensating for the abstract nature of such work" (p. 66).

In order to be able to function as regional innovation systems that support ***mutual knowledge flows between regions and global markets***, the scale of the science park is highlighted by Yigitcanlar, et al. (2008a) as an important factor to "increase the knowledge pool created, as well as diversity and choices for knowledge workers and businesses" (p. 65). In addition, it is argued by Yigitcanlar, et al. (2008a) that a science park's accessibility plays an important role in "[encouraging] and [facilitating] the transfer and movement of knowledge" (p. 64). According to the OECD Territorial Review report in 2014, "distance" and therewith "travel time to metropolitan areas" have an impact on a science park's economic activities (OECD, 2014, p. 87). Moreover, Yigitcanlar, et al. (2008a) argue that a "strong organising capacity" is needed to establish broader "partnerships of public, private, academic and

community", which are the basis for the development of "human capital programs which generate and attract talented workers and business" from the global knowledge economy (p. 65).

Policy-makers might seek to **create a "magnetic value"** by producing a unique, territorial nature of knowledge to define a science park's status within global production networks. According to Yigitcanlar, et al. (2008b), policy-makers might choose to create a new knowledge precinct with a distinguishing identity for this purpose. This unique identity is partially dependent on the industrial structure of a region and partly developed through the creation of "learning value" (i.e. a "university-centred knowledge precinct") and "experimental value" (i.e. creation of a "true innovation ecosystem") (Yigitcanlar, et al., 2008b, p. 9).

Vedovello (1997) highlights the importance of an **attractive physical space environment** for the creation of a local KCP that that can awake knowledge migrants' personal attraction affection towards a space environment. Gallent, Bianconi, and Andersson (2006) argue that a person attraction affection can be awakened by a space environments' "identikit, tastefulness, and landscape" (p. 40). Van Herzele and Wiedemann (2003) emphasize the importance of the availability of accessible and attractive green spaces for a physical space environments' attractiveness. Moreover, Vedovello (1997) adds that a space that simultaneously provide an infrastructure for living, learning and leisure increases migrants' quality of life and therefore raises their personal attraction towards a space environment.

2.5.3 Towards a model for capturing science parks' functions as "magnet infrastructures"

In order to investigate how policy-makers can deliberately create science parks that have the qualities to attract and retain international knowledge migrants, I present and test in this master thesis a second conceptual model describing four operational effects that take place within a science parks' multidimensional environment. The model integrates theoretical considerations and concepts discussed in the previous Sections 2.1 – 2.4.2 with a diagram developed by Arbo and Bennneworth in 2007, which describes a higher education institutions' external engagement with its regional, national and global environment. Similar to Arbo and Benneworth (2007), I argue that science parks, usually consisting of accumulating enterprises and a research centre (e.g. a higher education institution), get externally engaged with their multidimensional environment. Moreover, I argue that science parks' regional upgrading effect depends on the efforts of a vast number of political actors from different external dimensions – regional, national and global – as well as the opportunities they offer for international knowledge migrants to access unique knowledge through their participation in CoPs on the local level. I therefore conceptualise science parks as emerging local KCPs that function as "magnet infrastructures". I regard them in this master thesis as having a "magnetic effect", since they

support mutual knowledge flows between regional and global markets, thereby filling the local knowledge base and creating spill-overs for local firms.

Figure 2 shows a static model of a science park's four operational effects as a local KCP as well as its multidimensional engagement within its external environment. However, in practice these three operational domains are not static and might overlap and become entangled with each other over time. At the regional as well as national level, policy-makers take efforts to create a unique local knowledge base (*functional effect*) with an attractive physical space environment for multiple actors creating and interacting with each other in CoPs through their social interaction and therefore become associated and entangled with the physical structure of the science park over time. These CoPs shape actors' common skills and practices, thereby creates a unique local KCP with a specific place-related unique identity and culture that for itself creates regional spill-overs for local and regional firms (*regional upgrading effect*). These regional spill-overs enhance regional innovation which becomes recognised at the national as well as global dimension (*external recognition effect*) and create a place-related driving force that attracts and retains international knowledge migrants by integrating them into the unique KCPs (*personal attraction affection*).

Figure 2. Multidimensional role of Science Parks
Source: Based on Arbo & Benneworth, 2007.
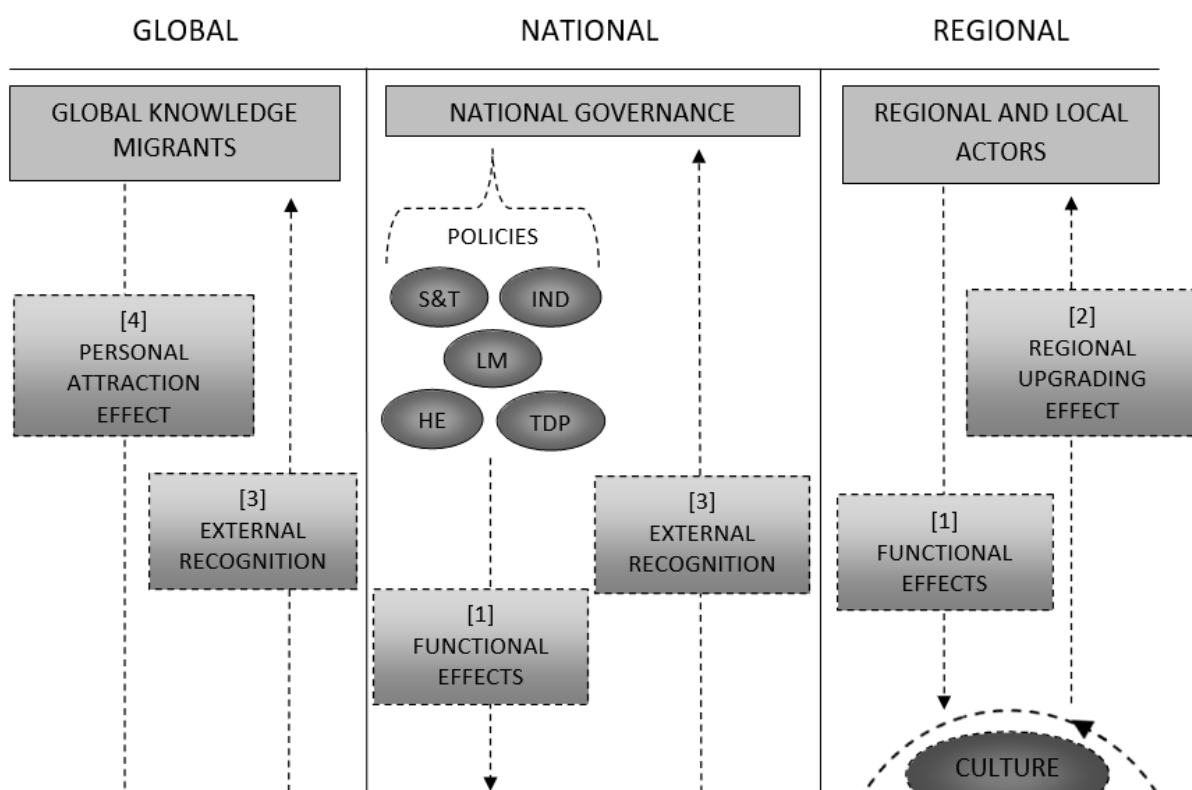
3 Operationalisation

Following Benneworth, et al. (2011), I view the deliberate creation of a science park as a strategic management project, in which policy-makers have to "agree upon and deliver best courses of action" with a range of different stakeholders to "create activities which position cities and regions […] more effectively in the global economy", thereby building a "magnet infrastructure" for international knowledge migrants (p. 2). In order to examine how policy-makers in the 21st century can deliberately create science parks that are attractive to the global knowledge elite, I will therefore focus in my master thesis on two separate units of analysis: first, actors who have a former or recent stakeholder interest to take action to create an attractive local physical environment to position the science park more effectively in the global market economy as a "magnet infrastructure" for international knowledge migrants (called hereafter "creators"), and second, "international knowledge migrants", who became attracted towards the science park. In order to investigate to what extent creators succeeded in their efforts to create an attractive science park that functions as a "magnet" for international knowledge migrants, I will compare international knowledge migrants' perception of the science park, as a local physical environment, with creators' former as well as current efforts and desired outcomes. In order to operationalise a science park's global attraction effect, I will make use of my newly developed conceptual model presented in Section 2.5.3. In Section 3.1, using theoretical insight gathered in Section 2.5.2, I operationalise creators' efforts and desired outcomes as well as international knowledge migrants' perception of these efforts and outcomes in four categories, based on the four operational attraction effects a science park is assumed to have. In addition, to measure how international knowledge migrants acquire particular connections and entanglements in science parks as KCPs, I will operationalise this using Wenger's (1998) concept of CoPs and Yigitcanlar's, et al. (2008a) concept of KCPs as an analytical lens (see Section 2.4). For this operationalisation, I will make use of my conceptual model presented in Section 2.4, explaining the internal social dynamic processes within spatial concentrated environments.

3.1 Operationalisation of operational effects
3.1.1 Functional effect

I use the term *functional effect* to describe all efforts of creators to establish a successful functional science park environment. Following Vedovello (1997), Yigitcanlar, (2008b), and Benneworth and Ratinho (2015), I relate this to creators' efforts to build a unique local knowledge base, such as universities and R&D centres. Moreover, a successful functional science park is related to creators' efforts to establish a physical infrastructure for co-location between actors in the science park. In line with Benneworth and Ratinho (2015), I regard the encouragement of social interaction and collective

learning processes among actors (i.e. a close link between enterprises and knowledge producers) as crucial for knowledge creation and the establishment of a well-functioning precinct. In line with this, I consider the creation of an interactive space environment as necessary to encourage the development of CoPs that build the source of learning within a KCP (see Baum, et al., 2007). Whether the created science park has a functional effect or not is dependent on international knowledge migrants' perception of the above stated efforts. This is dependent on international knowledge migrants' recognition of the science park as a valuable and unique knowledge base. Here, it is relevant whether international knowledge migrants value the proximity to (high-technological) enterprises or to a research-intensive knowledge producer in the space environment. Moreover, I will focus on their involvement in existing inter-relationships and contracts with other actors in the science park in order to examine whether creators succeeded in their efforts to establish a physical infrastructure for co-location. By asking international knowledge migrants how they interact with other actors in the science park, I will be able to evaluate whether creators' efforts to establish an interactive space environment were perceived by these migrants.

3.1.2 Regional upgrading effect

With the term *regional upgrading effect*, I describe a science park's effect as a (regional) innovation system. I view a science park as a knowledge pool, in which positive knowledge spill-overs are created through proximity that drives regional development and growth (see: Yigitcanlar, et al., 2008a as well as Section 2.2). In order to operationalise this regional upgrading effect, I will focus on two aspects: First, I focus on how creators' influence the creation of a unique, place related identity and culture that supports the creation of a unique knowledge pool. Second, I investigate how they used this place-related identity and culture to create a "magnetic value" (i.e. unique territorial nature of knowledge and skills) that enhances regional innovation and thereby drives the mutual knowledge flow between the science park and the global knowledge economy. Whether international knowledge migrants perceive a science parks' regional upgrading effect is dependent on their perception of the science park as a unique, cultural place with a space-specific identity that possess a magnetic value for them. Furthermore, their perception of a science parks' regional upgrading effect is also related to whether these knowledge migrants can benefit from the knowledge spill-over effects in the space environment. I argue that this is dependent on their level of involvement (i.e. their interactions, joint activities and discussions) and entanglement within CoPs in the KCP, since the unique territorial nature of knowledge and skills can only be experienced through actual participation.

3.1.3 External recognition

The extent to which a science park is recognised by international knowledge migrants in the global market economy is measured by a science parks' *external recognition* effect. Here, it is relevant to what extent creators succeed in their efforts to develop a science parks' external network strengths by becoming a "place to be" with a status in global innovation networks. Following Yigitcanlar, et al. (2008b), I argue that this is dependent on creators' efforts to create different kinds of place-related values (e.g. learning value or experimental value) that attract international knowledge migrants. A science park's external recognition is therefore related to international knowledge migrants' recognition of the science park as a "place to be" in the global market economy. This depends on their perception of the science park as a place that possesses a unique, place-related value. Here, I will also focus on the question whether international knowledge migrants got attracted to the science park because of its status within global production networks as an attractive place to work and live in.

3.1.4 Personal attraction affection

With the term *personal attraction affection*, I denote the place-related driving force that evokes international knowledge migrants' personal attraction towards a science parks. I assume in this thesis that a science park's attraction effect is dependent on three factors. First, creators' efforts to establish a beautiful space environment composition (e.g. with green spaces) is important (see: Gallent, et al., 2006; Van Herzele & Wiedemann, 2003). Second, following Floridas' (2002b) and Starks' (1991) argumentations that softer factors (e.g. importance of particular creative lifestyles and family), I argue that a science parks' attraction effect is also dependent on creators' efforts to establish a high quality of life and urban amenities for migrants (see Section 2.3). Third, in line with this, I will also focus on creators' efforts to establish mixed space environments that possess an infrastructure for living, working and leisure (see: Vedovello, 1997; Yigitcanlar, et al., 2008b). Whether a science park exerts a place-related driving force able to encourage international knowledge migrants to acquire particular local connections and entanglements is dependent on migrants' personal attraction affection towards the established space environment. Moreover, their personal attraction affection is influenced by whether they perceive the science park as a space environment that offers a high quality of life.

Table 1. Operationalisation of operational effects

Operational effects	Operationalisation	
	Creators	International knowledge migrants
Functional effect	Creators' **efforts** to create a Science Park • Creation of a *local knowledge base* • Creation of an *interactive environment* • Creation of a *physical infrastructure*	International knowledge migrants' **perception of these efforts** • *Recognition* of the Science Parks as a *valuable unique knowledge base* • *Existing inter-relationships* and *contacts* within the environment • *Recognition and use* of the built physical infrastructure
Regional upgrading effect	Creators' **acquired outcomes** • Unique place-related *identity* and *culture* is created • *Magnetic value:* unique, territorial nature of knowledge and skills, which enhances regional *innovation*	International knowledge migrants' **perception of these outcomes** • *Perceived* unique *place-related identity* and *culture* • *Perceived magnetic value* of the place
External recognition	Creators' **efforts** to gain external recognition • Efforts to get a *status* within global production networks • Efforts to create of a "*place to be*"	International knowledge migrants' **recognition of the space** • Recognition of the Science Parks' status • Wish to work and life in the Science Park as a "*place to be*"
Personal attraction affection	Creators **efforts** to create a space-related personal attraction • Efforts to create an *identikit, tasteful space environment* • Efforts to establish *quality of life* and urban amenities for migrants • Efforts to create *cultural mixed space environment*	**Place -related driving force** that retains international knowledge migrants • *Personal attraction affection* towards the space environment • *Perceived quality of life* within the space environment • *Perceived cultural mix* within the space environment

Source: based on the authors' own considerations.

3.2 International knowledge migrants' local connections and entanglements

Using Wenger's (1998) concept of CoPs and Yigitcanlar's, et al. (2008a) concept of KCPs, I developed a model in Section 2.4 aiming to understand internal social dynamic processes which take place in a spatial concentrated environment. With the help of this model, I argued that international knowledge migrants can become involved into a system of relationships through their participation in local CoPs of a science parks' KCP. In order to operationalise these internal social dynamic processes, as described in Section 2.3, I will focus in my analysis on two dynamic processes (see Table 2 for an overview).

The first process describes the way how international knowledge migrants establish connections with actors in their work environment that leads to their involvement in single or multiple CoP(s) in the precinct. I operationalise this first dynamic process by asking international knowledge migrants to provide me with a description of how they function and operate in their new scientific community/working community in daily life and whether people within this community have common ways of doing things. In order to examine whether international knowledge migrants adopt a place-related way of "doing things", I ask them to compare their current way of working in their scientific community/working community with former working experiences in scientific communities/working communities in (an)other country/countries. In order to get better insights in their learning processes, I ask international knowledge migrants to describe their interaction with their colleagues within these communities as well as to characterise the specific nature of knowledge and skills (i.e. shared ideas, certain ways of doing things).

The second process describes the way how international knowledge migrants become entangled in the local KCP through their connections and relationships in CoPs. With "entanglement", I understand the process in which international knowledge migrants' knowledge capital becomes invested through a CoP in the local KCP. In order to operationalise this "entanglement process", I will focus on whether international knowledge migrants perceive a specific place-related culture that influences their work and learning processes, thereby hampering them from migrating due to the resulting loss of their connection to the unique local knowledge pool. Moreover, to test whether they value the specific knowledge which is created in the CoP, I ask them whether they adjusted to a place-related sense of purpose and common identity and whether this positively or negatively influenced or changed their way of "doing things" (e.g. solving problems). Finally, in order to examine whether international knowledge migrants establish distinctive international scientific communities within the KCP, I will ask

them about their efforts to establish personal networks/social activities with actors, insight the local KCP, as well as outside the KCP (including the global level).

Table 2. Operationalisation of internal social dynamics

Operationalisation	
Community of Practice	International knowledge migrants get **involved in communities of practices** o Learn and create knowledge through mutual engagement/joint enterprise (alignment)/shared repertoire
Knowledge communities	International knowledge migrants feel **embedded into a KCP** o United by common norms, values, understandings o Establish local-global dialectics and networks o Establish distinctive international scientific communities

Source: based on Coe and Bunnell (2003) and the authors' own considerations.

4 Research methodology

4.1 A exploratory case study as research design

In my master thesis, I am using a single exploratory case study as research design to analyse the wider magnetism of one representative science park: the Kennispark Twente. This master thesis is part of a larger international research network, formally known under the title "Global Science Scapes (GSS): Dimensions of Transnationalism" (IN-2014-010, undertaken from September 2014 – February 2017) and funded by The Leverhulme Trust. The GSS research project aims to compare six case studies about different forms of science spaces worldwide (e.g. science parks, research parks, or high-tech parks), thereby focussing on: Science Vale (United Kingdom); Daedeok Innopolis (South Korea); Silicon Valley (United States); Hsinchu Science Park (Taiwan); Singapore Science Park (Singapore); and Kennispark Twente (the Netherlands) ("Global Science Spaces," 2015). This master thesis adds new field research on the Kennispark Twente case study in the Netherlands and therewith adds new elements to my previous research on this topic (see: Eckardt, 2016). I approach the in Section 1.1 posed research question "how policy-makers can deliberately create science parks in the 21st century as "magnet infrastructures" to support the attraction and facilitation of international knowledge migrants from the global market economy" from a critical realist perspective: in line with Fleetwood (2005), I view action as a "continuous, cyclical, flow over time […] with an arbitrary starting point for an analysis" (p. 7). Moreover, I argue that the "reality, as we know it, is socially constructed" and that people do not have the "complete knowledge, of what they are doing and why they are doing it", they only have an "idea of what they are doing and why they are doing it" (Fleetwood, 2005, p. 7). Through the construction of "a narrative of reality", I aim to get a meaningful understanding of the "nature of reality" and explore the underlying social mechanisms and dynamics within a science park (Benneworth, & Ratinho, 2015, p. 11). Following Yin (1994), this approach is not a typical method for a case study, which is usually selected for the "critical test of a […] theory" (p. 40). However, in line with Benneworth and Ratinho (2015), I argue that a case study is an appropriate research strategy for the purpose of this master thesis, since it can be seen as an "interesting example of a theoretical phenomenon" (p. 11). In addition, through the examination of this phenomenon, I can gain "insight into the architecture of the theory" and thereby gather empirical evidence for the justification of my proposed conceptual models (Benneworth, & Ratinho, 2015, p. 11).

4.1.1 A short introduction to the "Kennispark Twente" case study

The science park "Kennispark Twente" (eng. knowledge park Twente), which is a 180 ha. site located in the Dutch Twente region, close to the German border (see Figure 3). It was established around 2000, starting from the basis of the regional located University of Twente (UT) and the Business and Science Park (BSP) formed in 1987. Originally established in 1961 on the footprint of the former country estate "Drienerlo", located between the two cities Hengelo and Enschede, the UT[2] was an attempt of national policy-makers to revive the region economically in response to the region's suffering textile industry during the 1960s. When the UT was established during the 1960s, the Dutch government decided to provide budget schemes for the establishment of new governmental institutions as well as educational institutions. This governmental financial support facilitated the establishment of the first campus university in the Netherlands with a space environment, in which architecture and arts followed the "principles of Modern Architecture or New Objectivity" (Bakker & Timmerman, 2011, p. 5). Subsequently, as part of the during the 1980s established profile as an "Entrepreneurial University", the UT established, supported and funded public-private partnerships that where characterised by tight cooperation between business communities and leading knowledge institutes in the Twente region (Mora, Detmer, & Vieira, 2010). During the 1990s, the UT's active engagement with

Figure 3. The Twente region
Source: ITC, University of Twente, Enschede.

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[2] The university was founded in 1961 as the "Technische Hogeschool Twente". In 1986, it changed its name to Universiteit Twente (University of Twente).

the regional industry, regional policy-makers, municipalities, and regional and national actors finally led to the creation of the Kennispark Twente, merging companies located in the earlier established BSP with the university campus (Benneworth & Ratinho, 2015).

Around 9300 people are currently working in the Kennispark ("Kennispark Twente," 2016). With more than 700 spin-off firms that created more than 3,134 new job opportunities in the Twente region, the UT was declared by the Dutch Elsevier magazine in 2013 the 'most entrepreneurial university' in the Netherlands and therefore belongs to one of the most successful entrepreneurial universities in Europe (Van Leeuwen, 2014; Karnebeek, 2001; Mora, Detmer & Vieira, 2010).

4.2 Research design

In the following section, I present my used research design. According to Yin (1994), a research design is a "blueprint of research" that describes how the data in a study are "collected, analysed and interpreted" (p. 12). In Table 3, the different components of the research design are summarised and these will be discussed in detail in the following two sub-sections.

Table 3. Components of case study research design

Key variables	Unit of analysis	Data collection	Analysis technique
Creators efforts and desired outcomes (to create a science park)	10 creators	Document analysis & semi-structured face to face interviews	(Comparative) narrative analysis
International knowledge migrants' perception of these efforts and outcomes	10 international knowledge migrants	Document analysis & semi-structured face to face interviews	(Comparative) narrative analysis
Internal social dynamic processes	10 international knowledge migrants	Semi-structured face to face interviews	Narrative analysis

Source. Based on the authors' own considerations.

4.2.1 Data collection method and unit of analysis

In order to construct a narrative of reality and to understand the complexity of the nature of reality in a science park, I use a set of qualitative data. I based my primary dataset for this master thesis on qualitative data gathered in 20 semi-structured face to face interviews with creators and international knowledge migrants (see Section 3) as well as data received from a diverse range of grey literature documents published on the Kennispark Twente.

As discussed in Section 3, for the purpose of my later conducted comparative analysis presented in Section 5.1 to 5.2, I differentiate between two units of analysis in this master thesis: creators and international knowledge migrants. I therefore gathered my qualitative dataset in two waves of data

collection. During the first wave of data collection (September 2015 – February 2016), I primarily focused on the creators of the Kennispark to get a better understanding of stakeholders' efforts and desired outcomes to create a science park with an external attraction effect for international knowledge migrants. For this purpose, I conducted ten interviews with former and recent Dutch cabinet members from the municipality of Enschede and the UT, architects, and managers working in the BSP, who were or still are involved in the development of the Kennispark (see Appendix II, Table 8 for a detailed description). Concerning the used data sampling technique, I approached initial interviewees after a consultation with my supervisor (Dr. Paul Benneworth) who wrote extensively about the Kennispark (see i.e. Benneworth & Charles, 2005; Benneworth & Hospers, 2007; and Benneworth & Ratinho, 2015). I approached further interviewees using a non-probability snowball sampling technique where existing study subjects nominated further interviewees among their acquaintances (Steenhuis & Bruijn, 2006). I recognized that I gathered a valid picture of Kennispark creators' efforts and desired outcomes when creators started to cross-reference to each other.

During the second wave of data collection (February 2016 – June 2016) I focused mainly on international knowledge migrants.[3] To investigate the extent that creators' efforts and desired outcomes were perceived and recognised by international knowledge migrants as well as whether international knowledge migrants got entangled with physical structure of the science park, I conducted an additional ten interviews with knowledge migrants working at the UT or local enterprises in the BSP (see Appendix III, Table 9 for a detailed description). I approached interviewees using two sampling techniques: first, as an international student studying at the UT, I approached initial interviewees based on my personal international network. Second, similar to the first wave of data collection, I used a non-probability snowball sampling technique to approach further international knowledge migrants working at both parts of the Kennispark. This data collection technique enabled me to gather a first picture of international knowledge migrants' perception of the Kennispark.

Since the creation of a science park is not a static but a continuous ongoing process, which involved many changing actors over time, I filled gaps within and between the narratives of the interviewed creators with data from grey literature to establish a chain of evidence over time (Yin, 1994). For this purpose, I used a diverse set of grey literature documents, which ranges from historical documents (e.g. published books about the establishment of the Kennispark) to current news reports (see Appendix III, Table 10 for a list of used grey literature document types).

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[3] One creator-interview was conducted in June 2016.

4.2.2 Narrative analysis technique and interview technique

In order to explore the underlying magnet attraction of the Kennispark, I chose a narrative analysis technique in this master thesis. Following Webster and Mertova (2007), a narrative analysis seems appropriate for the purpose of my study, since narrative "inquiry attempts to capture the 'whole story'" and is "well suited to [address] the complexity and subtleties of human experiences" and learning (p. 3, p. 1). With the help of this analysis technique, I was able to gather insights about ways in which creators and international knowledge migrants made and used narratives in their own or a foreign language (English) to describe and interpret the world around them, thereby transmitting a set of facts that helped me to construct a narrative of reality (Webster & Mertova, 2007). Narrative inquiry is therefore not an "objective reconstruction of life – it is a rendition of how life is perceived" (Webster & Mertova, 2007, p. 3).

For the purpose of my narrative analysis, I recorded the interviews either in English, German or Dutch and transcribed them afterwards in English. Figure 4 presents an example of a narrative analysis technique process. It shows how I gathered my empirical evidence that helped me to derived first conclusions about the underlying social mechanisms and dynamics within a science park. Through the translation of, for example, an international knowledge migrants' answer into a textual form, I was able get a deeper understanding of how these migrants got embedded in the immediate local environment. Similar to a relational content analysis, I used the transcribed narratives to explore and identify conformity and relationships within and between narratives of the interviewees. As elaborated in Section 3.2, this not only helped me to identify cross-references between the study subjects, but also to investigate whether creators' efforts and desired outcomes matched with international knowledge migrants' perceptions of the Kennispark. For this purpose, I used Table 1, presented in Section 3.1.4, in which I operationalised and summarised the four operational effects in notes.
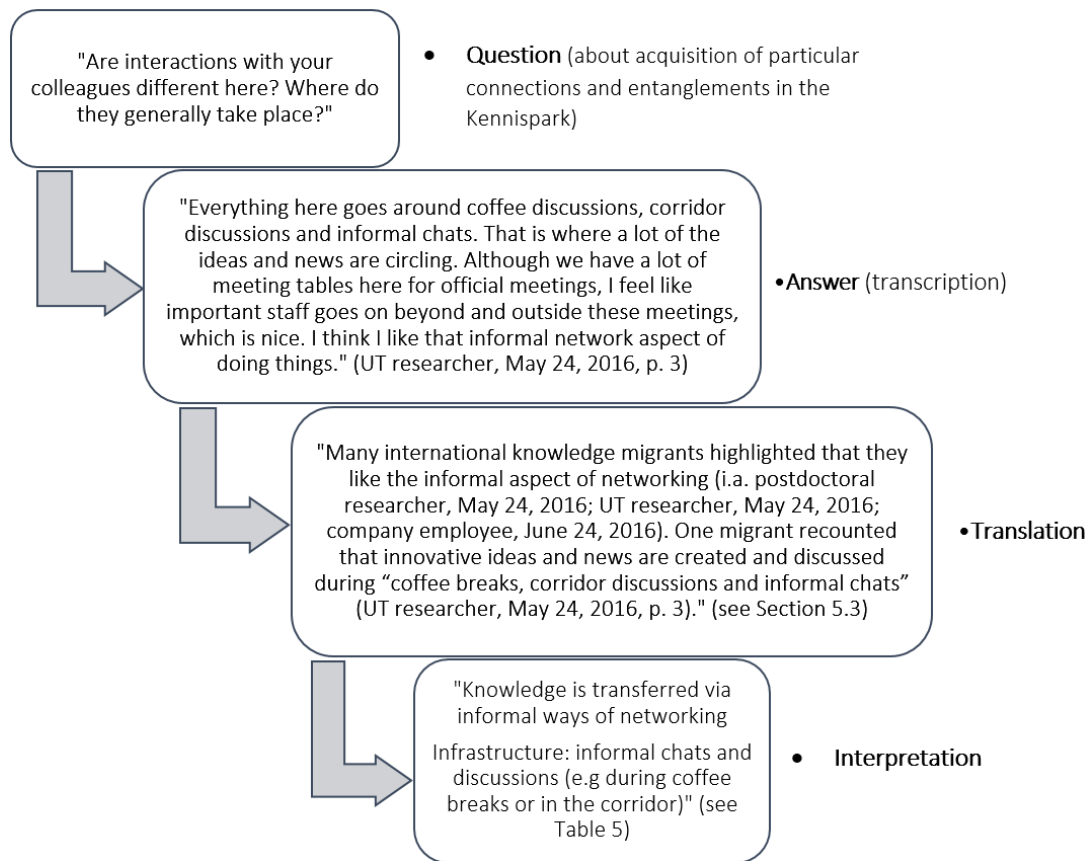
Figure 4. Example of a narrative analysis technique process
Source: Retrieved from an interview transcription produced by the author.

Due to the chosen narrative analysis technique, which focuses mainly on "story telling", I tailored each interview to the specific interviewee. In order to enhance internal validity of the master thesis, I took the interviews with international knowledge migrants in English (or German, if appropriate) and interviews with creators in Dutch. In addition, since the results of this study are part of a bigger series of international comparative case studies, I followed the English version of a suggested interview schedule for either creators or international knowledge migrants in each interview, which I translated if necessary into Dutch or German. Both interview schedules consist of three items, including an invitation message introducing the study and twenty-two questions in total (see Appendix I and II). Moreover, the twenty-two questions were separated into two parts. Both interview schedules started with questions about the interviewee's personal education and professional background. The second part of the interview schedules differed from each other due to the nature of information I was aiming to receive. I also adapted the manner of question-asking to the background of the interviewee. For example, whereas I asked creators outright about their efforts, desired outcomes and difficulties to establish a science park with a magnetic effect, I talked with international knowledge migrants in a more roundabout way about their perceptions of the Kennispark (e.g. first impressions, perceived differences between the Kennispark and other places).

5 Analysis

The following analysis is divided into three main sections. First, empirical evidence is presented concerning the question how creators of the Kennispark aimed to establish a local environment that attracts international knowledge migrants (see Table 4). In so doing, the above operationalised four operational effects are discussed in detail. Second, after the discussion of the creators' efforts and outcomes, it is described how these operational effects are perceived by international knowledge migrants working in the Kennispark (see Table 5 for an overview). Third, it is analysed whether and how these knowledge migrants acquired particular connections and entanglements in the Twente region (see Table 6 for an overview).

5.1 Creators' efforts and outcomes to establish a Science Park
5.1.1 Functional effect
5.1.1.1 Establishment of a knowledge base

After World War II, the Netherlands was in a dynamic period of rehabilitation and reconstruction. This period was characterised by the Dutch government's strong industrialisation efforts; by putting science education central as an important driver of social development and process (Sorgdrager, 1981). This resulted in the Dutch governmental plans to establish a third technical university[4] in the Netherlands, next to the already existing institutions in Delft and Eindhoven (Sorgdrager, 1981). Since the Twente region suffered heavily from the demise of the textile industry during the 1950-60s[5], it was decided in 1961 by the Dutch government to build the third technical university (afterwards referred to as UT) between the two cities Enschede and Hengelo to support both the regional as well as national economy by increasing the number of highly skilled engineers (Ex CvB member, October 15, 2016; Sorgdrager, 1981).

The collapse of the Textile industry during the 1970s caused an economic depression in the Twente region and therewith created a rather unfriendly environment for the still young university (Clark, 1998). Due to remaining low enrolment rates as well as the Dutch governmental need to cut down national university budgets[6], voices were being raised during the early 1980s to close the UT (Clark, 1998). At this point, the UT board[7] had the institutional idea to establish an "entrepreneurial

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[4] Mr. Carls (Secretary of State for Education, Arts and Science) proposed this plan in a '*Nota Uitbreiding Wetenschappelijk Onderwijs*' to the Dutch Parliament in 1961 (Ex CvB member, 15 October, Sorgdrager, 1981).
[5] This decision was based on a report called 'Waarom Twente', which affirmed earlier reports in 1949 composed by the Economic Technologisch Instituut voor Overijssel in collaboration with the three northern provinces (Sorgdrager, 1981).
[6] Due to the oil crisis in the early 1970s, the Dutch government started to cut university budgets (Sorgdrager, 1981).
[7] This new institutional idea was initiated by Harry van den Kroonenberg, professor for mechanical engineering and rector between 1979-1982 at the UT (Clark, 1998).

university"; a university which proactively establishes linkages and contracts with industry[8] as well as city and regional governments (Ex CvB member, October 15, 2016; Clark, 1998). For this purpose, a Business and Technology Center Twente (BTC-Twente) was established in 1982, aiming to offer office space, workplaces, and laboratories to start-ups as well as innovative growing companies (Ex CvB member, October 15, 2016). In addition, a so called TOP scheme (Eng. Temporary Entrepreneurial Placements) was created by the UT in 1984, designed to support innovative entrepreneurs coming from the UT who wanted to start their own business ("TOP Program," 2016). Besides these two developments, a Business and Science Park (BSP) was created during the 1980s adjacent to the university campus and the Enschede city centre, which offered additional office accommodations for businesses (Clark, 1998).

During the early 2000s, creators' efforts to formally integrate the BSP with the university campus into a single knowledge base led to the creation of the "Kennispark Twente" (Ex CvB member, October 15, 2016). This initiative was led by five founding fathers: the UT, the municipality of Enschede, the province of Overijssel, the Twente Region, and the in 1998 established Saxion University of Applied Sciences in Enschede, which got involved later in the project (Ex CvB member, October 15, 2016; Kennispark director, October 29, 2015).

5.1.1.2 Establishment of an interactive space environment

During the 1960s and early 1970s, UT creators choose the two young architects Van Tijen and Van Embden to create the physical space environment (campus) for the UT. For this purpose, the two architects divided the campus environment into three clearly separated functional areas: first, an academic area comprising lecture halls and offices, second, a retail and leisure area, located in the core of the campus, and third a residential area providing housing for teachers and students (see Figure 5; architect, November 30, 2015). Next to its retailing purpose, the retail and leisure area was also developed to function as the centre of the Campus environment where teachers and students could interact with each other by doing sports, going to the refectory, café or the theatre, or meeting each other accidentally in the supermarket. Moreover, next to the functional disposition of the campus environment, Van Tijen and Van Embden aimed to establish a functional campus architecture (architect, November 30, 2015). Inspired by the idea to support interaction between people through architecture, they decided to establish part of the campus buildings based on structuralistic architecture (see Graphic 1 and 2, architect, November 30, 2015). In structural architecture,

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[8] In 1985, the UT established a private enterprise called Technopolis Twente (later known as UT-Extra) in order to circumvent the Dutch public law which prohibited universities to undertake entrepreneurial activities (Clark, 1998).

interaction between people is stimulated through forms and their functions. Different kinds of forms of buildings therefore have the function to create natural zones, where communities can interact with each other. Based on this idea, for example, some buildings on the campus were established similar to labyrinths, in which people naturally had to interact with each other to find the right direction or the
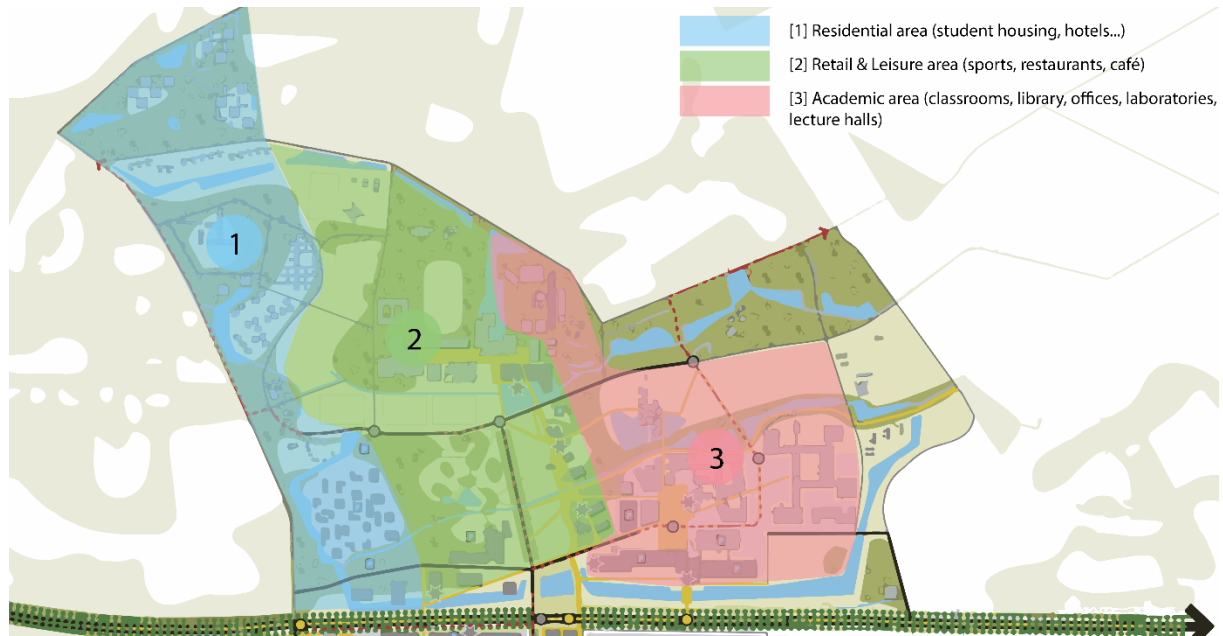
Figure 5. Functional disposition of the Campus
Source: Based on "Twente Kennispark. Masterplan Gebiedsontwikkeling Kennispark Twente," 2009.

way out of the building (architect, November 30, 2015).

Graphic 1. Cubicus building on the UT campus
Source: "Beeldbank. Utwente," 2016.

Graphic 2. Insight of Bastille building on the UT campus
Source: "Beeldbank. Utwente," 2016.

With the Real Estate Plan of 2000, creators of the UT decided to upgrade the campus environment (architect, November 30, 2015), since they were worried that the functional disposition of the campus

environment might create monocultures (architect, September 3, 2015). Consequently, they decided to build new residential facilities in the retail and leisure area and to move the refectory to the core of the academic area (architect, September 3, 2015) in order to centralise the campus around two instead of one nuclei (academic area and retail and leisure area). In addition to this, after a big fire in 2002 which destroyed big parts of one of the academic facilities on UT Campus, the UT board decided to conduct a restoration operation of the old campus buildings since these did not meet current Dutch safety standards anymore (UT policy director, November 3, 2015). The reason for this was that part of the structuralistic campus buildings turned out to be a serious risk with regards to security standards, since emergency exists were not available or not easy to find in case of an emergency (UT policy director, November 3, 2015). The operation lasted until 2011 and was supported by the Dutch government, which provided the UT with a budget (called "IVH operatie")[9] (UT policy director, November 3, 2015).

5.1.1.3 Establishment of a physical infrastructure

With the establishment of the Kennispark in the early 2000s, creators formally integrated the UT with the BSP into a single "knowledge park". For this purpose, they decided to establish an integrated Kennispark infrastructure, a process master-planned and overseen to this day by Hoogstad Architects (former policy director, November 3, 2015). They established this physical infrastructure in two ways (see Figure 6).

Figure 6. Integrated Kennispark architecture
Source: Based on "Twente Kennispark. Masterplan Gebiedsontwikkeling Kennispark Twente," 2009.

First, by establishing a visible university-industry linkage, in which existing purely academic facilities (e.g. former laboratories) located at the campus were reconstructed to shared academic and corporate facilities. Second, to encourage interpersonal interaction and knowledge exchange between both sides of the Kennispark, architects tried to provide the Kennispark with a virtual space-architecture. Through the co-location of business facilities and research-related facilities in building on the campus, architects aimed to encourage social interaction and collective learning processes among actors in the Kennispark space environment (see Graphic 3; architect, September 3, 2015).

For the latter way, the Hoogstad Architects decided to break down a viaduct, which was a physical

Graphic 4. Virtual Space architecture in the Gallery
Source: copyrights owned by the author.

Graphic 3. Hengelosestraat 'Viaduct' (demolished in November 2010)
Source: "AEGEE – Dringelo," 2011.

differentiation between the BSP and the Campus (see Graphic 4; architect I, September 3, 2015).

5.1.2 Regional upgrading effect

5.1.2.1 Development of a unique place-related identity and culture

In 1985, it was decided by UT creators to establish a unique profile for the still young technical university. Based on academic literature at the time, creators decided to establish an entrepreneurial university which a close link to the industry (companies in the BSP), because new knowledge can be created through the concentration of university research and high-technological enterprises. During the mid-1990s, the UT board aimed to transform the initial simple idea of an entrepreneurial university into a strong recognizable organisational culture which formed the ideological basis for faculties and departments at the UT (former director, October 29, 2015). This initiative came from the rector at the time[10], who recognized that the UT regressed into a traditional university, which became increasingly less driven by its originally entrepreneurial spirit, fragmented into small and autonomous working research groups, and overshadowed by other Dutch universities (e.g. Delft) at the national as well international level (former UT rector, October 29, 2015). Consequently, a new 'Management Team' was set up in 1997, consisting of three central UT board members and all the UT deans (Clark, 1998, p. 45). They decided to implement a new managerial policy at the UT aiming to change the university' focus away from a research-based fundamental oriented approach towards a more applied approach (former UT rector, October 29, 2015). Consequently, to dissolve the existing fragmented research structure, two research institutions (MESA+ and MIRA) were established, combining different research groups related to nanotechnology, biomedical technology and technical medicine (former UT rector, October 29, 2015).

5.1.2.2 Development of a "magnetic value"

With the decision to implement a more managerially-oriented policy at the UT during the 1990s, plans were also made to empower the unique symbolic value of this particular university, thereby focusing more on differentiation and specialisation (former rector, November 29, 2015). In order to distinguish the UT from other universities, the UT board took the following measures. First, new interdisciplinary programs were established in communication studies, philosophy, public administration and European studies (former rector, November 29, 2015). Second, next to the wish to implement the new Bachelor and Master system as quickly as possible[11], the UT board decided to introduce a new multidisciplinary major and minor system which offered students the possibility to establish knowledge in related or

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[10] Frans A. Van Vught.
[11] During the Bologna discussions in 1999, it was decided by the European Union (Bologna declaration) to introduce a three cycle system (Bachelor degree, Master degree, professional doctorate) to integrate the European Higher Education Area.

different academic fields for a fixed period (former rector, November 29, 2015). Third, by following a more design-oriented rather than practical approach, it was decided by the UT board to establish a professional doctorate in engineering (PDEng) next to professional doctorate (PhD), which did not exist in Europe yet (former rector, November 29, 2015).

Initiated by the wish to dissolve the existing fragmented research structure of the UT, the establishment of the two research institutions MESA+ and MIRA also aimed to empower the "magnetic value" of the UT through a strong specialisation in the two fields of nanotechnology and medical technology (former rector, November 29, 2015). In addition to this, efforts were made to establish economic-cluster cooperation with Dutch universities (e.g. with the medical research institute in Wageningen) as well as cross-border universities (e.g. the German University of Münster) to share available research facilities (former rector, November 29, 2015).

The original long-term aim of the Kennispark project was to create 10,000 extra jobs in the region during the first 20 to 25 years of the 20th century (Ex CvB member, October 15, 2016). Although the Kennispark project has not achieved its original long-term aim yet, distinct processes have been achieved in some municipalities of the Region (e.g. Enschede) (Turbantia, 2016). In addition, much lower unemployment rates have been recorded during the last decade among highly-skilled people than among low-skilled people in the Twente Region (former UT rector, October 29, 2015). A study by Karnebeek (2001) showed that spin-offs played an important role not only for the Kennispark, but also for the Twente region since the beginning of the 21st century. Whereas 23% of all knowledge-intensive companies fostered by the UT had offices in the Kennispark (either on the UT campus or at the BSP), 78% of the spin-off companies were based in the Twente region, thereby fostering regional development and growth (Karnebeek, 2001, p. 5). In 2014, it was decided by the American Cottonwood Technological Fund (CTF) to open its first office in Northern Europe in Enschede. Currently, the CTF offers seed and pre-seed-stage technological commercialisation funds for companies in the Kennispark.

5.1.3 External recognition effect
5.1.3.1 Efforts to get a status within global production networks
Due to its strong collaboration with leading international research universities during the late 1990s, the UT became a member of the European Consortium of Innovative Universities in 1998 (ECIU) (former rector, November 29, 2015). In addition, several universities' research centres had established formal national recognition during the mid-1990s (Clark, 1998). For instance, a former rector said that the university's Centre for Higher Education and Policy Studies (CHEPS), which existed at the time for 12 years, had developed into a recognized national as well as international research centre (former

rector, November 29, 2015). It is mainly financially supported by institutional money and outside sources, and known for its policy work for diverse outside agencies such as the "World Bank, UNESCO, and the South African government" (former rector, November 29, 2015; Clark, 1998, p.52).

The UT's with the BSP into a single Kennispark enhanced Twente's external recognition, which was expressed by subsidies from Dutch companies as well as the national government (former rector, November 29, 2015). However, this picture changed during the first decade of the 20th century with the rapid increase of science spaces at the national as well as international level (former rector, November 29, 2015). As a reaction to this, the original entrepreneurial profile of the UT became increasingly innovative driven, aiming to combine academic excellence with an entrepreneurial spirit that supports innovative start-ups and existing businesses in the Kennispark with knowledge generation at the UT. Today, the BTC has developed into one of the largest business incubator centres around the world and the Kennispark not only led to the creation of more than 700 spin-off companies, but also generated revenue from national and international intellectual properties (Kennispark director, November 3, 2015). Due to its strong industry-university linkage, the Kennispark became an attractive space environment for new national as well as international innovative enterprises (Kennispark director, November 3, 2015). One example for a spin-off company of the UT that is located in the Kennispark and which became internationally present is Xsens. Xsens developed a new technology for producing sensors with a millimetre accuracy, which are used for the production of drones and airplanes, as well as in the film and game industry for computer animations (Kennispark director, November 3, 2015). The international presents of successful UT spin-offs led to an increasing amount of investments in the Kennispark, mostly done in the form of formal funds and corporate venturing. Moreover, through the Cottonwood Technology Fund, which opened its first office in Europe in the Kennispark, more international contacts and networks are established with big companies (e.g. Samsung, KPN) that search for innovative technologies (Kennispark director, November 3, 2015).

5.1.3.2 Efforts to create a perception of a "place to be"

In order to achieve more external recognition, the Kennispark invited a number of well-known Dutch personalities during the 2000s (e.g. king Willem-Alexander, Prime Minister Mark Rutte, and the former Dutch European Commissioner for Digital Agenda Neelie Kroes) (Kennispark director, November 3, 2015). In addition, the current UT board decided to strive towards enhanced international recognition, through its effort to increase the number of international research contracts and partnerships (Kennispark director, November 3, 2015). For instance, a joint degree in European Public Administration with the German University of Münster was established in 2002.

In order to get new insights to further enhance its position in the global production network, the Kennispark organisation established an intensive knowledge exchange with managing directors in the Silicon Valley (USA) (Ex CvB member, October 15, 2016). Since 2008, delegations staffed with representatives of the municipality, Kennispark enterprises, media (Oost NV), the Chamber of Commerce, and the UT are visiting Silicon Valley on a two-year basis, which was also followed by revisits from the Silicon Valley delegation (Ex CvB member, October 15, 2016; Kennispark director, October 29, 2015).

5.1.4 Personal attraction affection

5.1.4.1 Efforts to create an attractive space environment

During the 1960s, creators of the UT decided to establish an Art commission to lay out an attractive campus environment (Dutch: *ruimtelijke vormgeving*) (architect, November 30, 2015). The two young architects in charge, Van Tijen and Van Embden, decided to build a self-contained Campus environment on the footprint of a former country estate, comprising of meadows, woodland, water and old farms from the 19th century (architect, September 3, 2015). Like a monastery, they deliberately placed trenches at the edge of the campus environment to create a closed territory, physically separated from any business or other outside activities (see Graphic 5; architect I, September 3, 2015). Inside these trenches, the architects developed a functional campus architecture (see section 4.1.1) which provided a mixture of teaching, studying, residential and recreational facilities, combined with open spaces embellished with public arts, intended to radiate a sense of warmth to residents and visitors (see Graphic 6; architect, September 3, 2015).
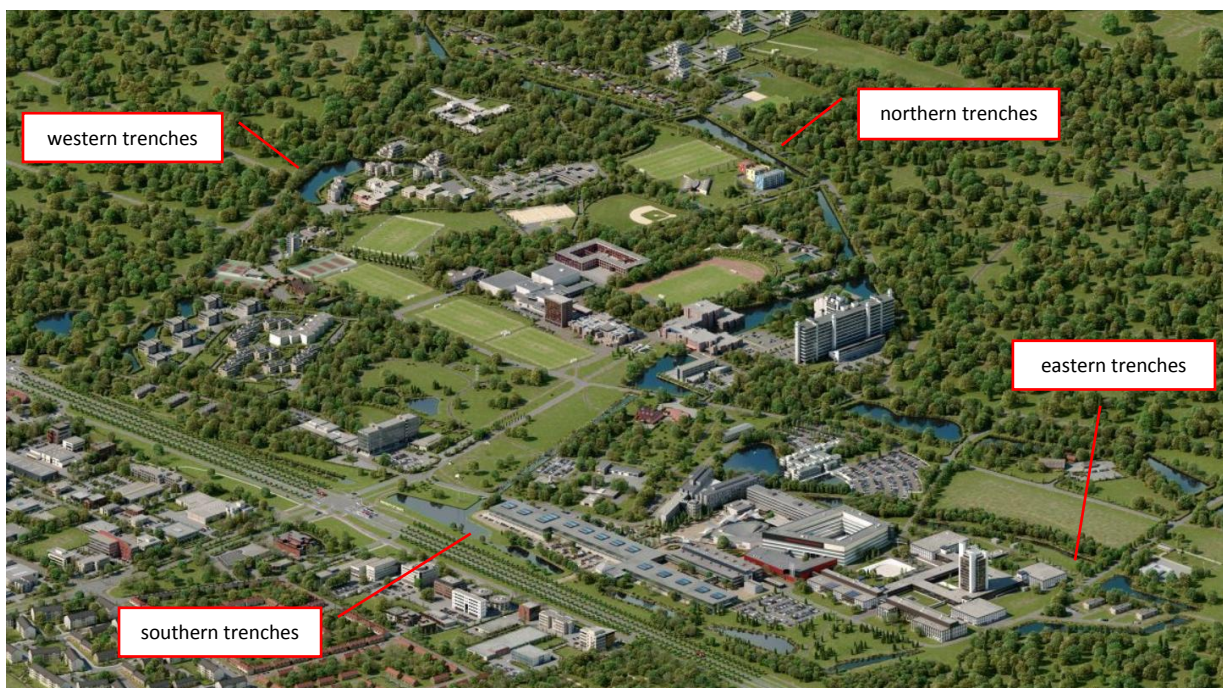
Graphic 5. Self-contained Campus environment

Graphic 6. Public arts on the UT Campus environment
Source: "Beeldbank. Utwente," 2016.

Source: "Beeldbank. Utwente," 2016.

5.1.4.2 Efforts to establish quality of life and urban amenities

Graphic 8. Open-air pool on UT campus
Source: "Beeldbank. Utwente," 2016.

Nowadays, within the retail and leisure area of the self-containing campus environment an extensive range of different sport facilities can be found (e.g. open-air swimming pool, tennis court, gym, soccer field, running track) (see Graphic 7; facility director, October 12, 2015). With almost 40 different sport clubs, the UT developed into a university that embraces a diversification of sports. Creators established and integrated a number of running routes, mountain bike tracks as well sport facilities into the campus environment (architect, September 3, 2015). For instance, theatre performances are given on a regular basis, either in the indoor theatre or outdoor amphitheatre located in the rail and leisure area of the campus (see Graphic 8). Occasionally, the UT is also hosting festivals, career-related events and national sport events in this area (architect, September 3, 2015). In addition to this, other amenities are located in the retail and leisure area, such as a supermarket, café, hairstylist and pub.

In order to support international knowledge migrants in adapting to the new environment, companies in the Kennispark refer their international employees to the Expat Center Twente, located in Enschede (Human resource manager, July 29, 2016). The ECT advises and supports international knowledge migrants regarding issues with formalities, housing, Dutch taxation, and insurance. Moreover, it

informs international knowledge migrants about urban amenities and helps them to find a school or job for their immediate family (Human resource manager, July 29, 2016).

5.1.4.3 Efforts to create cultural mixed space environment

In order to create a more international space atmosphere at the UT, the objective was set by the UT board in 2016 to offer English-speaking Bachelor and Master programmes only from 2020 onwards (former director, October 29, 2015). However, besides these efforts, no measures were taken by creators to facilitate a cultural mixed environment for international knowledge migrants in the Kennispark.[12]

Table 4. Empirical evidence: efforts and outcomes of creators

Operational effects	Creators

Functional effect	❖ Creation of a functional knowledge base (consisting of UT and BSP)
	❖ Creation of an attractive and functional campus environment/architecture
	❖ Creation of an integrated Kennispark infrastructure
	   ○ Visible university-industry linkage
	   ○ Virtual space architecture

Regional upgrading effect	❖ Creation of an innovative-driven entrepreneurial profile and applied research-oriented university culture
	❖ Creation of a unique, place-related "magnetic value"
	   ○ Initiation of interdisciplinary study programmes
	   ○ Initiation of multidisciplinary major and minor system
	   ○ Initiation of a professional doctorate in engineering
	   ○ Cottonwood Fund

External recognition	❖ Establishment of unique research institutes at the UT
	   ○ UT is member of the European Consortium of Innovative Universities (1998)
	   ○ Visits of a number of well-known Dutch personalities
	❖ Establishment of international contacts and networks (through CTF)
	   ○ Silicon Valley delegation
	   ○ Establishment of international research networks
	❖ Spin-off
	   ○ BTC developed to one of the largest business incubator centres around the world

Personal attraction affection	❖ Creation of an attractive self-containing campus environment
	   ○ Modern Architecture + Art
	   ○ Campus offers a vast amount of sport facilities and cultural offerings
	   ○ Campus occasionally hosts festivals, career-related events and national

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[12] This statement is based on the authors' consideration of empirical evidence and therefore should not be taken by the reader for granted.

5.2 International knowledge migrants' perception of the Science Park

5.2.1 Perceived functional effect

5.2.1.1 Recognition of the Kennispark as a valuable and unique knowledge base

The UT is perceived by the interviewed international knowledge migrants as a young and ambitious university (i.a. postdoctoral researcher, May 24, 2016; PhD student, May 17, 2016). Some international knowledge migrants stated that they were surprised by the fact that prestigious scientists from their field of science are working in research institutes at the UT (i.e. MESA+) (postdoctoral researcher, May 24, 2016; PhD student, May 17, 2016). Furthermore, many international knowledge migrants stated that they were attracted to the UT's strong experimental and applied focus in research as well as to its good established relationships and research collaborations with industry (postdoctoral researcher, May 25, 2016; PhD student, May 17, 2016; UT researcher, June 6, 2016). This is confirmed by an international knowledge migrant working in the BSP, who stated that the UT with its research institutes is also seen by (international) enterprises as a valuable and unique knowledge producer for enterprises' R&D centres (company employee, June 24, 2016). Due to close inter-relationships and research contracts between enterprises and UT research groups and individual researchers, new materials and technologies can be developed and tested in UT research facilities (company employee, June 24, 2016). However, although international knowledge migrants recognise and value the existing relationships between enterprises and the UT within the Kennispark with regard to research, the Kennispark as such is often professed as a "mythical and vague place" (UT researcher, October 6, 2015, p. 3).

5.2.1.2 Recognition of the UT's interactive space environment

All interviewed international knowledge migrants working at the UT stated that they appreciate the composition of the campus environment (UT researcher, October 6, 2016; UT researcher, September 26, 2015; postdoctoral researcher, May 24, 2016; UT researcher, February 3, 2016; PhD student, May 17, 2016). They like the combination of open spaces and UT facilities, since it invites for little walks around the campus during lunch breaks and coffee breaks. One interviewee stated that walking around the campus enhances her "mental balance" and that she is enjoying the quietness of the protected space environment from urban traffic noise (UT researcher, October 6, 2015, p.1). Many migrants stated that they make use of the campus facilities (i.e. sport centrum and cafés) located in

the retail and leisure area on a daily basis for either doing sports or getting drinks and having appointments (i.a. UT researcher, September 26, 2015; UT researcher, February 3, 2016). Creators' efforts to upgrade the campus environment by introducing the Real Estate Plan in 2000 were recognized and approved by some international knowledge migrants (UT researcher October 6, 2015, p.1; UT researcher, May 24, 2016). For example, it was stated by one interviewee that the campus is looking "more inviting" and that activities on the campus have been increased due to the new centre in the academic and research area (UT researcher, May 24, 2016, p. 2). One migrant, however, claimed that UT creators "should build more meeting points, and try to integrate migrants in a better way and create attractions that really attract people" (UT researcher, September 26, 2015, p. 1).

5.2.1.3 Recognition of the Kennispark's physical infrastructure

Although creators' efforts to establish a visible university-industry linkage are recognised by some international knowledge migrants (i.a PhD student, May 17, 2016; UT researcher, February 3, 2016), most migrants perceive the Kennispark as an undefined and borderless area (i.a. company employee, June 17, 2016; PhD student, October 6, 2015; UT researcher, October 6, 2015). In addition, the existence of the BSP stays rather unrecognised by international knowledge migrants working at the UT, because of the absence of a clear linkage between the university campus and the enterprises located in the former BSP (UT researcher, September 26, 2015; PhD student, October 2, 2015). One reason mentioned for this physical disconnection is the presence of a boulevard between the two parts of the Kennispark (PhD student, October 6, 2015). Another reason mentioned is that the Kennispark is not perceived as a physical enclosed space environment with a clear entrance and exit (UT researcher, October 6, 2015; company employee, June 17, 2016). In addition, although the UT with its beautiful campus environment and specialised research institutes [13] is perceived by international knowledge migrants working in the BSP as a unique place providing the opportunity to establish useful inter-relationships and research contracts with regard to R&D, it was stated by the interviewed migrants that no interaction with UT researchers and enterprise employees is taking place during lunch walks across the campus (company employee, June 24, 2016; company employee, June 17, 2016). Business related facilities on the campus are often not noticed by international knowledge migrants working at the UT or their purpose is mainly misunderstood (PhD student, October 6, 2015; PhD student, June 25, 2016). Nevertheless, it was stated by one UT migrant that he enjoys the Kennispark as an interactive space environment, since he can "meet practicing entrepreneurs almost daily, because they [are] located right across the street" (PhD student, May 17, 2016, p. 1).

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[13] E.g. MESA+ (institute for nanotechnology) and MIRA (Institute for Biomedical Technology and Technical Medicine)

5.2.2 Perceived regional upgrading effect

5.2.2.1 Recognition of a unique place-related identity, culture and unique "magnetic value"

Although being a small, rather unknown local place, international knowledge migrants perceive the Kennispark and its unique innovative entrepreneurial profile as a space that encourages young entrepreneurship and applied science (PhD student, October 5, 2015, PhD student, May 17, 2016). In addition, it was highlighted by one migrant that several funding opportunities[14] make the Kennispark as a place also more attractive to international knowledge migrants (PhD student, October 5, 2015). Whereas most international knowledge migrants working at the UT got attracted by the UT's research institutes and unique opportunities (e.g. Nanolab, multi-disciplinary study program) (PhD student, October 5, 2015; UT researcher, September 26, 2015; UT researcher, October 6, 2015), others reported that they had not heard of its profile before and rather ended up in the Twente region coincidentally or via their supervisors' personal research contacts (UT researcher, September 26, 2015; PhD student, May 17, 2016; postdoctoral researcher, May 24, 2016). Some international knowledge migrants working at the UT state that whereas the UT is perceived as a unique project on a national level, the concept of a campus university or the combination of technology with social science is not unique on a global level (UT researcher, October 6, 2015; UT researcher, May 24, 2016). Most international knowledge migrants stated that they do not perceive a place-related identity or culture of the Kennispark. For instance, one interviewee mentioned that he knows that his company is located in an area called Kennispark, however, that this does not have a specific meaning or value for him at all (company employee, June 17, 2016).

5.2.3 Perceived external recognition

5.2.3.1 Perceived status within global production networks

Most of the UT international knowledge migrants stated that they had not heard from the Kennispark before they came to the UT (i.a. UT researcher, October 6, 2015; company employee, June 17, 2016; postdoctoral researcher, May 24, 2016). Whereas some international knowledge migrants perceive the Kennispark as a "provincial place" in the periphery of two small rural towns (UT researcher, September 26, 2015, p. 2), others perceive the Kennispark as a place that unfolds its local attraction through its actual experience (e.g. campus life) (UT researcher, October 14, 2015; PhD student, October 2, 2015; UT researcher, October 26, 2015). Many migrants working at the UT did not expect such a high level of "research activity and business activities from a small place like this" (PhD student, May 17, 2016, p. 1; i.a. UT researcher, May 24, 2016). However, whereas one interviewee points out that the Kennispark is a "great place" with well-known international research institutes in different

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[14] TOP scheme: UT funding program for start-ups

disciplines, another stated that it is difficult to establish international contacts due to limited financial resources in a very demanding and competitive world economy (PhD student, May 17, 2016, p. 1; UT researcher, September 6, 2016).

5.2.3.2 Efforts to create of a "place to be"

The UT creators' internationalisation efforts are recognized and appreciated by some international knowledge migrants working at the UT (ia. PhD student, October 2, 2015; UT researcher, October 14, 2015; UT researcher, October 26, 2015). In addition, one migrant stated that during the last nine years the city is also "doing a good job in trying to make itself more appealing and more welcome" for international knowledge migrants (UT researcher, June 6, 2016). However, all interviewed migrants agree one the fact that they do not perceive the Kennispark as a "place to be", yet. It is highlighted by many international knowledge migrants that the Kennispark could do more to promote itself (i.a UT researcher, May 17, 2016; UT research, May 24, 2016). For example, one UT migrant stated: "It has got all the right ingredients and I just think we could be just a bit more on the stage than we are" (UT research, May 24, 2016, p. 5). Furthermore, it was stated by a migrant working at the BSP that the location of the Kennispark is insufficient for multinational companies due to its long distance to the metropolitan areas in the West and big airport in the country (company employee, June 24, 2016). Nevertheless, one interviewee was excited about the fact that the UT is a sister city of Palo Alto in California (United States).

5.2.4 Perceived personal attraction affection

5.2.4.1 Efforts to create an attractive space environment

The functional campus architecture with its different buildings, green areas and artefacts is appreciated by most of the international knowledge migrants as a unique, beautiful oasis that provides a pleasant and recovering work and study environment (PhD student, October 6, 2015; teacher, September 26, 2015; teacher, October 14, 2015). Its functional disposition into three areas (studying, living and recovering), which provides a mental internal closeness, attracted most international knowledge migrants when they saw the campus for the first time (PhD student, October 2, 2015; PhD student, October 5, 2015; PhD student, October 6, 2015). In addition, international knowledge migrants working in the BSP value the park atmosphere of the campus space environment (company employee, June 24, 2016; company employee, June 17, 2016).

5.2.4.2 Efforts to establish quality of life and urban amenities

Nevertheless, some migrants stated that they were not satisfied with their quality of life situation and urban amenities offered in Enschede. Many migrants mentioned that this is due to the fact that the city does not offer a variety in food options and cultural options (UT researcher, June 6, 2016; UT

research, May 24, 2016; company employee, June 24, 2016). For example, it was stated by a few international knowledge migrants that Enschede is "too quiet" for their taste (i.a company employee, June 17; UT researcher, September 26).Whereas migrants working at the UT expressed their satisfaction for the childcare facility and the doctor's office, migrants working in the BSP stated that they miss facilities for migrants and their relatives in Enschede (i.e. help with job hunting) (UT researcher, June 6, 2016; UT research, May 24, 2016; company employee, June 24, 2016). A few international knowledge migrants stated that the location does not matter that much for them. For instance, one international knowledge migrant stated that he and his wife are used to move to different places on a three to four yearly basis and that they have built up a "survival instinct" as well as "coping strategy" to deal best with these kind of situations (UT researcher, May 24, 2016, p. 4). In line with this it was stated by another international knowledge migrant that he likes the place and his work and that this is coping for the bad weather, the bad food and the poor cultural options (UT researcher, June 6, 2016).

5.2.4.3 Efforts to create cultural mixed space environment

It was highlighted by some international knowledge migrants that with time the campus is lacking a metropolitan and multicultural buzz due to this oasis effect (UT researcher, September 26, 2015; PhD student, June 25, 2016). Many international knowledge migrants also stated that they perceive the campus as a small village showing a picture of individual internationalism that "lacks a multicultural international dimension" (UT researcher, September 26, 2015; PhD student, October 2, 2015; UT researcher, June 24, 2016; PhD student, June 25, 2016). The picture is confirmed by international knowledge migrants working in the BSP who stated that the number of international employees is small, although people are open minded towards migrants (company employee, June 24, 2016; company employee, June 17, 2016). In addition, most international knowledge migrants stated that they do not perceive Enschede as well as other cities in the region as a cosmopolitan (company employee, June 24, 2016). Some migrants stated that they expected the region and its cities to be "more diverse", "more like the West" (UT researcher, May 24, 2016, p. 3; i.a. company employee, June 24, 2016).

Table 5. Empirical evidence: perception of international knowledge migrants

International knowledge migrants' perception		
Operational effects	**Positive**	**Negative**
Functional effect	❖ UT is perceived as a young and ambitious university with a strong experimental and applied focus in research ❖ UT's research institutions are internationally recognition as valuable and unique knowledge producers ❖ Existing inter-relationships and contacts between enterprises and UT research groups ❖ Appreciation of the functional campus environment (combination of open spaces and UT facilities) ❖ Interactive space environment is valued by some international knowledge migrants	❖ Kennispark as a "science park" is often professed as a mythical and vague place ❖ Kennispark is perceived as an undefined and borderless area (no entrée and exit) ❖ Physical disconnection between UT campus and BSP ❖ No interaction between UT researchers/employees and enterprise employees ❖ Too little meeting points and real attractions on the UT campus
	Positive	**Negative**
Regional upgrading effect	❖ Perceived place-related innovative entrepreneurial profile and applied research-oriented university culture ❖ Kennispark unfolds its local attraction through its actual experience	❖ Difficult to establish international contacts (limited financial resources, long distance to airport) ❖ All international knowledge migrants have not heard from the Kennispark before ❖ Perceive Kennispark as a "provincial place" in the periphery of two small rural towns
	Positive	**Negative**
External recognition	❖ Some UT research groups are externally recognised ❖ Surprising high level of "research activity and business activities from a small place like this" ❖ Recognized and appreciated internationalization efforts of the UT ❖ Surprising high level of "research activity and business activities from a small place like this"	❖ Kennispark is not perceived as a "place to be" yet ❖ Kennispark is not recognised at the global level ❖ Kennispark is perceived as a "provincial place" located in the periphery of two small rural towns ❖ Inconvenient location
	Positive	**Negative**

Personal attraction affection	❖ Unique, beautiful campus environment ❖ Campus increases international knowledge migrants' quality of life	❖ Perceived lack of metropolitan & multicultural buzz (village atmosphere) ❖ Perceived picture of individual internationalism (also in town) ❖ Some migrants expected Enschede to be "more diverse", "more like the West"

5.3 Internal dynamic processes within the Kennispark Twente
5.3.1 Establishment of connections within the local CoP(s)

Regarding the question whether international knowledge migrants perceive a common way of "doing things" within their scientific community/working community, many international knowledge migrants describe the Kennispark as a place that "shows a lot of Dutch culture", characterised by flat communication lines and informal relationships (postdoctoral researcher, May 24, 2016, p. 1; PhD student, May 17, 2016, UT researcher, May 24, 2016; company employee, June 17, 2016). Many international knowledge migrants highlighted that they like the informal aspect of networking (i.a. postdoctoral researcher, May 24, 2016; UT researcher, May 24, 2016; company employee, June 24, 2016). One migrant recounted that innovative ideas and news are created and discussed during "coffee breaks, corridor discussions and informal chats" (UT researcher, May 24, 2016, p. 3). Furthermore, it is argued by this migrant that discussions are less lead by emotion and more based on rational thinking and the willingness to actually discuss (UT researcher, May 24, 2016). In line with this, it was stated by another international knowledge migrant that people are easily approachable, open minded and prefer critical thinking (PhD student, May 17, 2016). Moreover, an interviewee describes her colleagues as "helpful" and "really focused while they work" with "a lot of knowledge, which is valuable especially in research" (postdoctoral researcher, May 24, 2016, p. 1). One international knowledge migrant working at the UT describes her working environment as "provincial" and "less raff" compared to more global and international universities (i.e. Amsterdam), which are stated to be more competitive (UT researcher, September 26, 2016). This was confirmed by an interviewed migrant working in the BSP, who stated that his working environment was cosier and less demanding (company employee, June 24, 2016). For instance, he stated that he was surprised by the fact that he had to ask people kindly for their help instead of simply giving calls and directions to impart the needed information (company employee, June 24, 2016). In addition, he stated that it took him a while to adopt to this new culture. However, overall, most international knowledge stated that they like the place-related way of "doing things" (UT researcher, May 24; UT researcher, February 3, 2016). For example, one migrants stated "there is no micro management, no top down, no kind of boss-senior manager, slaves. Those kind of things does not exist here. I really had much of this in my previous work, […]. So that is quite refreshing!" (UT researcher, May 24, p. 3).

With regard to their interaction with their colleagues, many international migrants stated that they are value the richness of collaboration in for example projects or cross-function teamwork (e.g. UT researcher, May 24, 2016; UT researcher, February 3, 2016). Within these projects, people get the possibility to exchange ideas as well as learn a lot of expertise from older staff (UT researcher, May 24, 2016). Some international knowledge migrants stated that they enjoy the interaction with their working colleagues, since interaction is task specific and well organized (post-doctoral UT researcher, May 2, 2016). Two migrants highlighted that people think more in collective (group) terms rather than having a uni-centric mindset (UT researcher, May 24, 2016; PhD student, May 17, 2016). People easily share their knowledge rather than keeping it for themselves (post-doctoral UT researcher, May 2, 2016). One migrant beliefs that through the international composition of group work, different kinds of people with different ideas come together and that this is creating new knowledge which is really valuable (company employee, June 24, 2016; PhD student, May 17, 2016). Furthermore, although people collaborate a lot due to different project, some international knowledge migrants argued that they perceive a lot of autonomy, independence and trust with regard to their own work (UT researcher, May 24, 2016, p. 3; PhD student, May 17, 2016).

5.3.2 Acquisition of local entanglements in the Kennispark

Most international migrants emphasised that they feel part of a place-related scientific/work community (i.e. in a research group, working department) (postdoctoral researcher, May 24, 2016; UT researcher, May 24, 2016; company employee, June 24, 2016; UT researcher, February 3, 2016). Moreover, whereas some migrants stated that they only established loose relationships with their colleagues at work (company employee, June 17, 2016; UT researcher, September 9, 2015), others emphasised that they became part of distinctive communities, ideas and outside their work (postdoctoral researcher, May 24, 2016; UT researcher, May 24, 2016; company employee, June 24, 2016). One migrant perceived his work community as a place with nice people and a high level of camaraderie. It was furthermore highlighted by this migrant that the establishment of good working relationships with colleagues was helpful to acclimatise (PhD student, May 17, 2016). Many international knowledge migrants stated that they established most of their personal contacts through the participation in social communities with other international knowledge migrants from their home country (UT researcher, June 6, 2016; PhD student, May 17, 2016; company employee, June 17, 2016).

It was mentioned by a few international knowledge migrants that they took efforts to establish strong working relationships with their former work place or university (postdoctoral researcher, May 24, 2016; UT researcher, May 24, 2016). Many international knowledge migrants agreed on the fact that the huge contact network is the biggest strength of the UT (i.a. UT researcher, May 24, 2016;

postdoctoral researcher, May 24, PhD student, May 17, 2016). One migrants described the scope of the UT's contact network as "twenty thousand wires along the world" (UT researcher, May 24, 2016). Furthermore, another international knowledge migrant expressed his enthusiasm about the UT as an attractive location due to the access to a wider entrepreneurial network (company employee, June 17, 2016). Many international knowledge migrants stated that integrating within the scientific community or working community was relatively easy due to their personal contacts they already had or established rather quickly within the local scientific or working community (UT researcher, May 24, 2016; postdoctoral researcher, May 24). One migrants for example stated: "I did not see my work here as change because of the strong international focus that we [as an institution] have […] it is an institute which I knew very well from my previous work, since it was linked to projects I was working on before" (UT researcher, May 24, 2016, p. 3).

With regard to the question, whether international knowledge migrants belief that the Kennispark is a good location for migrants to stay for a longer period, the answers of international knowledge migrant varied strongly. One international knowledge migrant states: "Yes, it is a great place, since it provides a valuable access to resources and international networks" (PhD student, May 17, 2016, p. 4). Furthermore, it was added by this migrant that he has the perception that the UT is known and valued by internationally knowledge migrants because it is also internationally seen as a producer of unique and rare local knowledge resources (PhD student, May 17, 2016). A few international knowledge migrants stated that the Kennispark is an attractive location, since all people, also those at the farmers' market, speak either basic English, German or Dutch (company employee, June 17, 2016, UT researcher, May 24, 2016). Whereas most questioned international knowledge migrants stated that they have no recent plans to move, a few did not know yet. One migrant, for instance, explained that "international knowledge migrants are people who are always open to move. We always have the wish to move to different places where [we] can find funding, or a different challenge. People want to do that, they always choose to move once the kind of work [we] do is valuable in the market" (PhD student, May 17, 2016, p. 4).

	International knowledge migrants' perception of internal social dynamics

Community of Practice	❖ Knowledge is transferred via informal ways of networking and learning
	     o flat communication lines
	     o no hierarchies
	     o Infrastructure: informal chats and discussions (e.g. during coffee breaks or in the corridor) and group work
	 ❖ Transfer/circulation of knowledge is open and less competitive

Knowledge communities	❖ Establishment of local/global connections
	     o Some international knowledge migrants have local as well as global dialectics and networks
	     o Few international knowledge migrants took efforts to establish distinctive international scientific/work communities
	 ❖ Entanglement process within local KCP
	     o Rather quick and easy (high level of camaraderie, good work relationships, many people talk English)
	     o Good access to resources and huge contact network of the KCP
	     o Hampered by the fact that migrants are always open to move (they like the aspect of moving)

Table 6. Empirical evidence: internal social dynamics

6 Kennispark – a "magnet infrastructure" for international knowledge migrants?

In order to answer how policy-makers in the 21st century can deliberately create science parks as "magnet infrastructures" to attract and retain more international knowledge migrants to (regional) localities, I will discuss in the following section the empirical evidence presented in Section 5 based on my proposed conceptual frameworks presented in Section 2.4 and 2.5.3. By comparing international knowledge migrants' perceptions of the Kennispark with creators' former as well as current efforts and desired outcomes, I will discuss in the first sub-section of this section whether creators succeed to establish a science park as a physical "magnet infrastructure" that has social as well as economic attraction effects (see for a comparative overview Table 7). The second sub-section focuses on the internal social dynamics within the physical space environment of the Kennispark more in detail. I will then discuss how international knowledge migrants acquired particular connections and entanglements in the environment of the Kennispark.

6.1 Kennispark – attractive for international knowledge migrants?

Creators seem to have succeeded in their efforts to establish a Kennispark with a functional knowledge base. The UT is perceived by most international knowledge migrants as a young and ambitious university with a strong experimental and applied focus in research. Moreover, it was stated by many international knowledge migrants that they perceive the UT as a valuable and unique knowledge producer and that its research institutions have an international recognised status. In contrary, creators appear to have partially failed in their efforts to establish an interactive functional science park environment with an integrated infrastructure that encourages interaction and social learning and knowledge exchange among its actors. All questioned international knowledge migrants indicated that they perceive a physical disconnection between the two parts of the Kennispark and, indeed, describe the Kennispark as a mythical, undefined and borderless place. Moreover, the presence of a physical disconnection between both sides of the Kennispark seems to hamper creators' efforts to establish a kind of innovative milieux (Benneworth & Hospers, 2007) where actors are able to cooperate and exchange information easily due to proximity and face-to-face contact. However, this picture changes when contemplating on the UT with its planned functional campus disposition and virtual space architecture. Although some international knowledge migrants personally dislike the place-related provincial atmosphere, the campus environment seems to affect international knowledge migrants in their operations and interactions with their colleagues at the UT in conscious as well as unconscious perceived ways (e.g. little campus tour with colleagues during breaks,

participation in sport associations). UT-creators' efforts to build a complex social community, a field of social interaction (Ache, 2000), within a self-containing campus environment that is integrated in a self-leading virtual infrastructure, therefore seems to unfold for some international knowledge migrants a place-related attraction; a sense of belonging to a place related identity (Gallent, et al., 2006). Furthermore, although the close link between enterprises and the UT is not physically perceived by most of the questioned migrants, I question at this point the importance of its real perception for the function of the core of a KCP. In particular, a few international knowledge migrants emphasise that they value the idea of physical closeness between the university and the industry in the Kennispark.

Creators efforts to establish a unique local knowledge pool through the creation of an entrepreneurial profile and culture succeeded partially. Although many international knowledge migrants stated that they perceive a place-related innovative entrepreneurial profile and applied research-oriented university culture, many migrants stated that other factors are hampering its regional up-grading effect as well as external recognition effect. For example, many of the international knowledge migrants argued that their efforts to establish new international contacts and networks are withheld by the Kennisparks' inconvenient location and small scope. These findings support previous research arguing that a science park's accessibility plays an important role in encouraging and facilitating the transfer and movement of knowledge (Yigitcanlar, et al., 2008a). In addition, many international knowledge migrants stated that the Kennispark does not have a recognised status in the world, since they did not hear of it before. Although many of the international knowledge migrants stated that the Kennispark or the Twente region as such is not recognised on a global level, UT creators seem to be successful in their efforts to achieve external recognition on an international level. Many international knowledge migrants stated that some of the UT's research groups have an excellent external reputation and that they are appreciating the UT's current efforts to establish a wider external partnership network. Moreover, many of the questioned international knowledge migrants stated that they have initially perceived the Kennispark as a provincial place in the periphery of two small rural towns. International knowledge migrants however agree on the fact that the Kennispark is unfolding a local attraction affect due to its actual experience. Although many international knowledge migrants perceive the scope of the Kennispark as small, many of them were surprised by the UTs' high level of research activities and business activities. In line with this, it was argued by some international knowledge migrants that the Kennispark just needs more time in order to become a well-known "place-to-be" in the global network economy.

All International knowledge migrants indicated that they were attracted by the unique and beautiful composition of the UT's campus environment. In fact, international knowledge migrants living on the campus perceive it as an oasis that exerts a recovering effect and increases their quality of life. However, although migrants perceive a place-related attraction affection for the campus space environment, many of them sense a place-related lack of a multicultural and metropolitan buzz. Especially outside their work environment, they perceive a picture of individual internationalism, which is caused by a village atmosphere with poor food and cultural options. Many migrants stated that this lacking international dimension is preventing them from acquiring local connections and establishing new relationships. Most international knowledge migrants wish that the city was more diverse, more like the metropolitan cities in the West of the Netherlands, with rich cultural offers and short distances to international transportation routes. Many international knowledge migrants indicated that they are missing a metropolitan infrastructure which might support their efforts to establish new distinctive international scientific communities within the global epistemic community.

6.2 Internal social dynamics within the Kennispark

Most international knowledge migrants state that they feel part of a place-related scientific/work community and that their interaction with their colleagues in this community is determined by a perceived specific place-related culture, which they describe as open-minded, outspoken and less competitive. Furthermore, migrants indicated that ideas, news and information are often created and transferred via informal ways of networking within these knowledge communities (e.g. informal chats and discussions during coffee breaks or on the corridor). This is in line with the findings of Belussi and Pilotti (2000) and Hospers (2006) who argue that an interactive space environment supports the creation of CoPs within KCPs. Most international knowledge migrants stated that they acquired first local connections and entanglements through the support of their colleagues within the knowledge community. Furthermore, many international knowledge migrants working at the UT highlighted that they are valuing the research groups of the UT as unique research-intensive knowledge producers in various field of science (e.g. geo-information science, Nano-technology) at the international level. Furthermore, they were delighted by the fact that people within their scientific community are willing to share their knowledge easily, which provides them with a good access to local knowledge resources as well as to contact networks. Following Ache (2000) who describes places as open relational space, fields of social interaction, I argue that this indicates that knowledge and information are shared and transferred between the different actors of different CoPs through joint activities and discussions. Moreover, many international knowledge migrants working at the UT highlighted that they came to work at the UT not because of its internationally known reputation, but because they met individual scientists working in UT research groups abroad during international collaborative field work or they

were highly interested in the attractive job-description. Most of them stated that they later perceived the unique local place-related experimental research identity and entrepreneurial culture through its actual experience and therefore they were surprised by the places' unexpected high level of research activity and business activity, which they had not been expecting from such a small place. Consequently, contrary to Yigitcanlar, et al. (2008b) who argues that it is the scale of a science parks' knowledge base which is crucial, I argue that it is the range of the KCP's CoPs, their international networks and relationships other CoPs of the global epistemic community that play an important role in attracting the international knowledge elite.

6.3 Discussion of the results

The results of my case study indicate that creators of the Kennispark established a science park with a physical infrastructure that has both an economic as well as a social effect. As proposed in my conceptual mode (see Section 2.5.3), science parks therefore seem to have four operational effect, which are highly interconnected with each other. With regard to its functional effect, the results show that the Kennispark Twente supported the local reconstruction of the Twente region through the establishment of a strong knowledge base with a new and unique entrepreneurial profile. Creators' efforts to establish a science park that exerts a regional up-grading effect were also recognised by international knowledge migrants who were surprised by the high level of business and research activity in the rather small space environment of the Kennispark. Although most international knowledge migrants do not perceive the Kennispark as a "place to be", many of them were very optimistic about its future development. With its rather limited reputation and status in the global market economy, the Kennispark seems to attract international knowledge migrants less due to is external recognition (reputation and status), but more due to a wider social network of contacts, relationships and collaboration-research projects. As proposed in my second conceptual model, actors from the local CoPs therefore seem to build social "magnet infrastructures" between their local KCP through the global epistemic community towards external KCPs through their interaction in international networks and relationships. Moreover, through internal social dynamics within their local CoPs, international knowledge migrants seem to gain access to the local knowledge pool which supports their individual learning processes. However, the results show that, contrary to my previous theoretical assumption, the pure access to the local knowledge pool seems to be insufficient for international knowledge migrants to establish distinctive international scientific/work communities that endorse the attraction of further international knowledge migrants. This highlights the importance for creators to establish a functional metropolitan infrastructure, which supports the actual physical transportation of people between the KCPs. Furthermore, although a science park's established magnet infrastructures may increase the flow of international knowledge migrants

between the different KCPs of science parks in the global market economy, I argue that this is not the driving force behind what is retaining and facilitating these migrants within the local KCPs, thereby supporting the creation of regional upgrading effects (e.g. positive knowledge spill-overs for firms). International knowledge migrants highlight that it is rather the unique and interesting work experiences which is causing them to stay. I derive from this that a science park's external attraction effect and personal attraction affection effect is highly dependent on a science park's functional knowledge base that produces unique knowledge, which is a crucial factor in the global market economy.

Table 7. Comparison of empirical evidence

Creators efforts and desired outcomes				
	Functional effect	**Regional upgrading effect**	**External recognition**	**Personal attraction affection**
	❖ Creation of a functional knowledge base ❖ Creation of a functional campus environment ❖ Creation of an integrated Kennispark infrastructure	❖ Creation of a unique entrepreneurial profile and culture ❖ Creation of a unique, place-related magnetic value (TOP-program)	❖ Establishment of unique research institutes at the UT ❖ Establishment of international contacts and networks (through CTF) ❖ Spin-off	❖ Creation of an attractive self-containing campus environment ❖ Internationalisation efforts ❖ Expat Center Twente
International knowledge migrants' perception of creators' efforts and outcomes				
Positive points	❖ UT is perceived as a young and ambitious university with a strong experimental and applied focus in research ❖ UT's research institutions are internationally recognition as valuable and unique knowledge producers ❖ Existing inter-relationships and contacts between enterprises and UT research groups ❖ Appreciation of the functional campus environment (combination of open spaces and UT facilities) ❖ Interactive space environment is valued by some international knowledge migrants	❖ Perceived place-related innovative entrepreneurial profile and applied research-oriented university culture ❖ Kennispark unfolds its local attraction through its actual experience	❖ Some UT research groups are externally recognised ❖ Recognized and appreciated UT creators' efforts to establish a wider external partnership network ❖ Surprising high level of research activity and business activities from a small place like this ❖ Kennispark is not perceived as a "place to be" yet	❖ Unique, beautiful campus environment ❖ Campus increases international knowledge migrants' quality of life
Negative points	❖ Kennispark as a "science park" is often professed as a mythical and vague place ❖ Kennispark is perceived as an undefined and borderless area (no entrée and exit) ❖ Physical disconnection between UT campus and BSP ❖ No interaction between UT researchers/employees and enterprise employees	❖ Difficult to establish international contacts (limited financial resources, long distance to airport) ❖ All international knowledge migrants have not heard from the Kennispark before	❖ Kennispark is not recognised at the global level ❖ Perceive Kennispark as a "provincial place" in the periphery of two small rural towns ❖ Inconvenient location	❖ Perceived lack of metropolitan & multicultural buzz (village atmosphere) ❖ Perceived picture of individual internationalism (also in town) ❖ Some migrants expected Enschede to be "more diverse", "more like the West" ❖ Poor food options and cultural options

7 Conclusion

Using a single case study of the Kennispark Twente, I proposed and tested in this master thesis two new conceptual models for understanding the wider magnetism of science parks and their multidimensional operational effects in attracting international knowledge migrants (see: Section 2.4 and 2.5.3). My findings suggest that the establishment of a distinctive and unique space environment can help to awake international knowledge migrants' attraction towards a particular (regional) locality. This supports Gallent's et al. (2006) idea of "identikit places", which implies that creators of science spaces can attract international knowledge migrants through active local place-making beyond a purely economic dimension, since they can awake a personal affection towards a specific place that is characterised, for example, by an "identikit and tasteful landscape"" (p.40). In addition, as the example of the interactive campus environment with its virtual space architecture shows, the deliberate construction of a functional interactive infrastructure can support the creation of an innovative milieux within a science park's local KCP that supports the creation of a unique, place-related culture. Moreover, the findings support my prior theoretical assumption that a science park's regional upgrading effect as well as external recognition is dependent on the number of ranges that are created through individual actors in local CoPs establishing international networks and relationships with global CoPs. A science park's established CoPs can therefore metaphorically be understood as social "magnet infrastructures" between different local KCPs through the global epistemic community, thereby providing the local precinct with access to the global knowledge pool, which supports the attraction of international knowledge migrants. In addition, the findings of my study indicate that, through the combination of two or more operational effects, a science park's magnetic effect in the global network economy can be enhanced. For instance, the creation of an interactive space environment with a more cosmopolitan atmosphere might enhance local actors to form unique, place-related local CoPs and network dynamics through which actors can establish local-global magnet infrastructures that support the attraction of the international knowledge elite towards the particular locality.

Within the local KCP, my findings indicate that it is the specific place-related culture and identity of a location that helps to facilitate and integrate the migrants into the local CoPs. In addition, the findings show that for some migrants the creation of a place-related culture and identity can unfold a local attraction affection through their actual experience of the space and their work. Moreover, the findings indicated that the spatial concentrated space environment of a science park reflects what Ache (2000) described as a field of social interaction, in which knowledge and information are shared and transferred between the different actors of different CoPs through joint activities and discussions.

In addition, I found that a highly international space atmosphere, encouraging a metropolitan and multicultural buzz, is an influential factor that attracts and supports the facilitation of international knowledge migrants into physical space environments. Moreover, I found that migrants' possibilities to both establish distinctive scientific/work communities and to create local entanglements are both depending on a science park's embeddedness within a metropolitan infrastructure.

The results of my case study support my theoretical presumption of this thesis arguing that science parks can become social spaces where particular communities act and interact within different communities to achieve desirable goals, thereby creating a particular place-related local atmosphere that forms a science park's wider magnetic attraction in the global economy. To renew the question from the beginning of this thesis: if it is a particular magnetic force of a social space that attracts international knowledge migrants, how can policy-makers deliberately create physical spaces that attract and retain these migrants beyond the employment and career opportunities they offer? As this thesis shows, science parks should be understood as multidimensional and complex social architectures that may develop over time into local KCPs through their internal social dynamics, thereby creating both a social "magnetic infrastructure" for international knowledge migrants as well a local buzz for regional economic development and growth. However, the Kennispark example also shows that the deliberate construction of a science park with four operational effects is not a simple and controllable process. Some operational effects of science parks appear to be more controllable than others. For example, I argue that whereas policy-makers have the possibilities to direct a science parks' external recognition effect through their actions, it is rather difficult to control the internal social dynamics within a science park (e.g. the creation of a functional interactive space environment). Moreover, for example, with regard to a science parks' personal attraction effect, my empirical evidence shows that international knowledge migrants have a wide range of different expectations and demands from the science park they are moving to, from merging into the existing locality to wanting a locality to have a specific set of lifestyle amenities, e.g. international schools or food stores with similar products from their home country. This, however, is putting pressure on policy-makers in the 21st century to fulfil all these different expectations and demands through the creation of appealing regional and urban localities that have a more cosmopolitan identity. Policy-makers in the 21st century therefore need to think more carefully about the multidimensionality of science parks, as KBUD, in order to be able to provide the general framework conditions for this complex architectures to exert a wider external "magnetism".

The contribution of my case study to regional science literature is therefore of theoretical as well as practical nature. Regarding its theoretical contribution, the in this master thesis proposed theoretical

models fill a gap in "knowledge-based urban" theories, showing that additional social factors (besides primarily economic ones) are also relevant when considering a science parks' attraction effect for international knowledge migrants (popularity) in the global network economy. Furthermore, adding Wenger's (1998) concept of CoP to Yigitcanlar's (2010) KCP approach became an effective analytical tool to get a deeper initial understanding of the internal social dynamic processes within a science park. Although both proposed models provide an initial understanding of the complexity of science parks as social architectures, further investigations in KBUD theory are needed to further specify and explore these dynamics and operational effects as well as linkages between the operational effects. The practical contribution of my study is therefore twofold. My results show that regional studies need to pay more attention to the internal, place-related social (non-economical) dimensions of science parks in the 21st century magnetic effect, since science spaces seem to attract people not purely based on an economical dimension, but also based on their unique, place-related culture and identity which becomes embedded within the local KCP. Secondly, if it is a particular international atmosphere and cosmopolitanism of a specific regional or urban locality that supports the facilitation of international knowledge migrants within a specific space environment, policy-makers and further studies need to think more carefully about ways to establish science parks that command of both traditional economic factors (e.g. sufficient transportation routes, career opportunities) and social factors (e.g. lifestyle amenities, nature, and diverse cultural offers). For this purpose, future studies are advised to consider other ways more carefully, such as social dimensions (including psychological behavioural effects), that explain how and why international knowledge migrants get tied to particular regional localities. Finally, in order to evaluate the full international attraction effect of a science park, further studies might also take the influence of quantitative measurable factors into account (e.g. FDI, amount of international research activities/relationships).

Disclosure Statement

Errors or omissions remain under the author's personal responsibility.

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Appendix

Appendix I: Questionnaire (creators)

Background information:

1. Briefly(!)… what work are you engaged in here and what is your role?

2. Why did you come to work in X? Can you tell us a little about your career?

Efforts to create an attractive physical environment

3. What was your initial impression of X before you start working there?

4. What was your active role in establishing an attractive physical environment in X?

5. Which other actors got involved in the development of X's physical environment?

6. What were the underlying common goals during the development process?

7. What measures were taken by you (and/or other actors) to achieve these common goals?

8. How has the physical form of X changed with the years?

9. What is the profile of X internationally you wish to establish?

10. Why is X an attractive site for international knowledge migrants? (Why/why not?)

11. What do you say makes X different compared to other global science spaces?

12. Is X with regard to its physical form in your eyes a 'global' science space? (Why, why not?)

Achieved outcomes

13. Do you have many international colleagues/friends? - How is X perceived by these international colleagues/friends?

14. Is there a distinctive international scientific community being created in X? - What kind of forms does it take?

15. How does the existing physical form support the integration and facilitation of these international knowledge migrants?

16. Do you have taken active measures to integrate and facilitate international knowledge migrants? (Why/ why not?)

17. Would you say that this place is genuinely cosmopolitan, genuinely transnational (Why/why not?)

18. How is X projected in the media and by government? Do you recognise and share this image of the place? (Why/why not?)

19. How would you project X in the media and by the government? – Do you have any efforts taken previously in this direction? (Why/ why not?)

20. Do you think that there are obstacles which prevent X of acquiring external recognition? – If yes, what are the biggest obstacles and why?

21. Which further steps could be taken in order to make X more attractive for international knowledge migrants?

22. In conclusion, what are your personal perceptions of, reactions to, this place?

Appendix II: Questionnaire (international knowledge migrants)

Background information:

1. Briefly(!)… what work are you engaged in here and what is your role?

2. Why did you come to work in X? Can you tell us a little about your career, and how you have moved internationally?

Attraction effect of the physical environment

3. What was your impression of X before you arrived here?

4. What was your impression of X after you arrived – and to what extent has this first impression changed with time?

5. What role does X play within the global context of your area of scientific activity? What is the profile of X internationally, would you say? Does the physical environment here differ from science spaces in your home country? In what ways?

6. Is X an attractive site for international knowledge migrants? Why/why not?

7. What would you say are the main differences between your experience of this place and other places you have worked?

Acquisition of particular connections and entanglements in X

8. How were you received into this community? How did you fit in?

9. What is important/distinct in how you operate here?

10. Are interactions with your colleagues different here? Where do they generally take place?

11. What would you say is the nature of the scientific community here? – are there shared ideas, certain ways of doing things?

12. Do you have a sense of working in 'Dutch science'? What is distinctive about this, would you say?

13. How is science/scientific research valued in your home country? Do you feel it is valued differently in this country or in X particularly?

14. Would you say that this place is genuinely cosmopolitan, genuinely transnational? (Why/why not?)

15. Is there a distinctive international scientific community being created here?

16. Whereabouts do you live? What cultural changes have you perceived from life in your home country?

17. What personal networks/social activities are important to you here in X? Do you have local links in/around X with colleagues/friends etc. from your home country or with individuals from other countries?

18. What work relations have you established or do you maintain with your home country?

19. What do you miss about working in your home country? Is your daily life/routine different? In what ways?

20. Do you plan to return there? How might your experience in X help you if you returned?

21. How is X projected in the media and by government? Do you recognise and share this image of the place? Why/why not?

22. In conclusion, what are your personal perceptions of, reactions to, this place?

Appendix III: Tables

Table 8. Description of unit of analysis: creators

Stakeholder	Number of interviews	Position	Gender
Kennispark Twente	1	cabinet member	male
Municipality of Enschede	1	mayor	male
University of Twente	2	cabinet member	male male
University of Twente	2	estate manager	male male
University of Twente	2	architect	male male
University of Twente	1	photographer	male
Enterprise located in BSP	1	human resource manager	female

Table 9. Description of unit of analysis: international knowledge migrants

Nationality	Number of interviews	Position	Gender
EU member countries			
Romanian	1	UT researcher	male
British	2	UT researcher	male
Finnish	1	UT researcher	female
German	2	company employee (BSP) professional doctorate researcher (UT)	male female
Non-EU member countries			
Cuban	1	UT researcher	male
Russian	1	postdoctoral researcher	female
Indian	2	professional doctorate researcher (UT) company employee (BSP)	male male

Table 10. List of Grey Literature Document Types

Document type	Author(s) + Year	Title
Book	Boer & Drukker (2011)	*High Tech, Human Touch: een beknopte geschiedenis van de Universiteit Twente-a concise history of the University of Twente, 1961-2011.* (English and Dutch version)
	Karnebeek (2001)	*Spin-offs and the University of Twente: Sixteen years of experience in incubating start-ups.* (English version)
	Mora, Detmer, & Vieira (2010)	*Good practices in university-enterprise partnerships.* (English version)
	Sorgdrager (1981)	*Een experiment in het bos: de eerste jaren van de Technische Hogeschool Twente, 1961-1972.* (Dutch version)
	Van den Kroonenberg (1996)	*Ondernemen met kennis.* (Dutch version)
Booklet/Brochure	Bakker & Timmerman (2011)	*A walking tour of the campus. Architecture & Art.* (English version)
	Twente Kennispark (2009)	*Masterplan Gebiedsontwikkeling Kennispark Twente.* (Dutch version)
	Van Leeuwen (2014)	***Elsevier/scienceworks.*** *Munt slaan uit kennis.* (Dutch version)
Reports	OECD (2014)	*OECD Territorial Reviews: Netherlands 2014.* (English version)
	OECD (2007)	*Higher Education and Regions: Globally Competitive, Locally Engaged.* (English version)
Online website/ online newspaper	UT News website (2016)	*UT launches living smart campus. Campus a 'living lab' with six pilot projects.* (English version)
	Kennispark Twente website (2016)	*TOP program.* (English verison)
	Turbantia website (2016)	*Werkloosheid daalt snel in Enschede; Hengelo en Almelo blijven achter.* (Dutch version)