From Ambition to Innovation

A closer look at the physical characteristics of innovation districts

P2 Report
Tuur Pluijmen
4089731
Pieter Lastmankade 163 Amsterdam
tuurpluijmen@gmail.com
0683202286
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Graduation lab: Next Generation Waterfronts

Preface

This report is a research proposal for the research I wish to conduct for my final graduation project during the master Management in the Built Environment at the University of Technology in Delft. I hope you will enjoy reading this report.

- Tuur

Summary

The increasing dynamics of globalization have caused for a growing importance of urban competitiveness. In an attempt to reach high levels of competitive advantage, cities are increasingly focusing on innovation as a means of achieving distinctiveness. In doing so, municipalities set up 'innovation districts' where innovation is claimed to be highly stimulated by different factors. One of these factors is the built environment. This research specifically focuses on the role of the built environment in these districts and therefore analyses the physical interventions by municipalities that are made in order to stimulate the process of innovation by firms, universities and institutions.

This report is divided into five chapters. The first chapter serves as an introduction, discussing a personal motivation and vision related to this research, as well as the relevance of this research from different points of view. The second chapter explains the theoretical framework that will be used to conduct this research. It first introduces a problem statement and explains the different research questions related to this research. Chapter 2 concludes with a conceptual model, which explains the relations between the different concepts as well as their definitions. Chapter 3 comprises the literature review. It is divided into five sub-chapters, each chapter aiming to answer a different sub-question. Chapter 4 explains the research design and the methods that will be used. It provides an overview of the different aspects of the research, as well as an explanation of the different research methods. Finally, chapter 5 gives an insight into the cases that will be analysed during this research. It briefly discusses the different actors that are involved in the case, as well as a short insight into how the cases will be further examined.

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1. Introduction

This chapter can be regarded as an introduction and addresses several issues that will ultimately lead to the theoretical framework of chapter 2. In different chapters, it gives an introduction to the research as well as an introduction to the theoretical framework. It includes a personal motivation for the research as well as the research questions that are central to this research. Furthermore, it addresses the objective of the research and gives a short explanation regarding the relevance and usefulness of this research.

1.1. Introduction of the research

The goal of this chapter is to give the reader an introduction to the research by giving a personal motivation as well as a personal vision on urban development. Furthermore, it positions the research by describing the context into which the research is placed.

1.1.1. Motivation

The increasing globalization and the contemporary branding of cities seem to lead cities into a search for distinctiveness. To me, it is intriguing to see how this goal of being distinctive ironically seems to lead many cities into the same direction. A recent trend has been the goal of becoming a leading city in the field of innovation. The well-known source of innovation of Silicon Valley in California appears to be an example for cities in achieving high levels of innovation. In the quest of setting up their own 'Silicon Valley', cities have announced their own innovation valleys (e.g. Robovalley Delft or Health Valley Nijmegen). Having a background in urbanism myself, I am interested in bottom-up approaches that take into account what is actually needed from the people using the space. This research will hopefully give me an insight into how such innovation strategies are being experienced by the people responsible for creating innovation and what it is that they truly need.

1.1.2. Vision on urban development

Having finished a bachelors in urbanism, as well as a pre-master that mostly revolved around design, I felt it was important to know what other forces and actors are in play in the creation of the built environment. This led me to choosing the master Management in the Built Environment. Over the course of this master, I have become aware of many important factors that have to be dealt with in the construction industry. This has further strengthened my perception that in order to become a successful urban planner, one has to be aware of the dynamics of the market and different actors involved.

1.1.3. Positioning the research

In 2013, Forbes released their list of "World's most inventive cities" (Forbes, 2013) and announced Eindhoven to be the most inventive city of the world at that point. The High-Tech campus in Eindhoven has significantly contributed to the development of innovation within the city and has become an example of how clustering can contribute to the creation of innovation. In an attempt to reach such levels of innovation, many cities and regions are announcing their own 'Innovation Districts' (Financieel Dagblad, 2016b). Recently, Rotterdam and The Hague have also announced their own innovation districts, respectively the Rotterdam Innovation District (RID) and the Central Innovation District (CID). In comparison with two other main regions in the Netherlands (Eindhoven and Amsterdam), the

province of South-Holland and the metropolitan region of Rotterdam and The Hague (MRDH) appear to be falling behind in terms of innovation (Gemeente Zuid-Holland, 2012). Although the potential is there, the region has up until now not been able to fully turn this potential into an asset. This research aims to contribute to the stimulation of innovation within the cities of the specific cases.

1.2 Research relevance

This chapter discusses the relevance of this research from different perspectives. First, it discusses the relevance of this research from a scientific point of view. Then, it discusses the societal relevance of the research. Finally, it discusses to which actors this research might be useful.

1.2.1 Scientific relevance

This research aims to contribute to research on the link between innovation and the built environment. It specifically focuses on the physical interventions that can be done in innovation districts in order to stimulate the process of innovation by innovative entities. The empirical analysis aims to contribute to research on how steering actors can stimulate innovative entities that are located in innovation districts. The final result of this research could prove useful for researchers that are conducting research on the link between innovation and the built environment, as well as researchers interested in the development of innovation districts.

1.2.2. Societal relevance

This research aims to produce an outcome that will provide a better understanding of how to translate an ambition for creating an innovation district into corresponding physical interventions. This will help create a link between the brand 'Innovation District' and the actual built environment, and aims to contribute to higher levels of innovation within the district. By performing an empirical analysis on the preferences of the end-user, the results of this research will provide municipalities with a better understanding of how to create an environment that matches the preferences of the users of innovation districts. In the long run, this could improve the competitiveness of the city in which the case is located and help stimulate its economy. Considering the high levels of infrastructural as well as institutional connections between cities within the Randstad, this could potentially prove beneficial for the development for the Randstad as a whole.

1.2.3 Research Usefulness

The end results of this research could be useful for municipalities in the Netherlands to better understand how to stimulate innovation in innovation districts through physical interventions. This could specifically help policymakers and urban planners/designers in making decisions regarding the development of innovation districts. Ultimately, the end users of innovation districts (firms, universities and institutions) could profit from these interventions by being able to take advantage of an environment that helps them be more innovative.

2. Theoretical Framework

This chapter comprises the theoretical framework of the research. It introduces a problem statement, which is used as a starting point for this research, as well as the research questions that will be used. Furthermore, it introduces a conceptual framework with a complementary list of definitions of the concepts that will be used throughout this research.

2.1 Problem Statement

A recent trend among Dutch municipalities as well as in other parts of the world has been to create districts where innovation is stimulated and knowledge is being shared in an urban context (Financieel Dagblad, 2016b). These so-called 'Innovation Districts' attempt to mimic the success of Silicon Valley, California, which is home to many highly innovative high-tech firms. However, although these new districts look at Silicon Valley as an example, they differ in setting. Katz and Wagner (2014) have described this 'rise of innovation districts' as the process of moving innovation from the secluded science park outside of the city to highly urban settings where innovation is openly shared. The idea is that people are no longer secretly working on new solutions, but instead are discussing their newest ideas in trendy coffee bars that are located in a buzzing urban context. Large firms, universities and start-ups come together in such a district to share knowledge and work on solutions for the future. At least, that seems to be the idea. It appears that not everyone agrees with the benefits of creating an innovation district. Recently, Boschma expressed his discontent with the growing number of such 'clubs' of innovation. Innovation districts, as Boschma argues, are good for creating a positive image, but the actual results are minimal (Financieel Dagblad, 2016a). Furthermore, Boschma (2005) has argued that 'simple' co-location is neither a prerequisite nor a sufficient condition for collaboration. Van Oort and Bosma (2013) further acknowledge the role of entrepreneurship as an important source of innovation. However, it seems that providing (affordable) space for entrepreneurship (e.g. start-ups or spin-offs) in an area with soaring rental prices requires a challenging balancing process.

These issues raise questions as to what creating an innovation district actually means. Are districts just given a new name to increase the image of the area? Or are there physical interventions being done that stimulate the process of innovation? And moreover, what is it that companies need from their built environment in order to be able to innovate? This research attempts to address this issue by looking deeper into the physical interventions in innovation districts as well as the needs of the actors responsible for innovation in relation to their built environment.

2.2 Research Questions

In order to address the issue that has been explained in the problem statement, the following question will be used as a main research question:

"What kind of physical interventions in the built environment of innovation districts are needed in order to stimulate the process of innovation of innovative entities?"

This question addresses several issues. Firstly, it is about the physical interventions in the built environment. These interventions could range from providing a high-quality infrastructure network to land-use plans that allow for a mixture of amenities. Secondly, it addresses how the built environment stimulates the process of innovation. This aspect is not only about what is done to stimulate the process of innovation by innovative entities, but also what 'stimulating innovation' means to municipalities. Is it just about attracting and co-locating the companies and institutions that are considered as 'innovative', or is there more to it. Finally, 'innovative entities' are considered as the sources of innovation. These actors can differ per case and will be further explained later on in this report.

In order to be able to answer the main research question, the following sub-questions will be used and linked to particular processes/phases of the research:

1. Why is urban competitiveness increasingly important for cities?
2. What is already known about innovation of firms and institutions and why is this important for cities?
3. What is already known about innovation districts?
4. What is already known about stimulating innovation through municipal policy?
5. What is already known about the general physical preferences of innovative entities located in innovation districts?
- **Literature review**

6. To what extent are the concepts in sub-questions 1, 2, 3, 4 and 5 aligned with the ambitions of the municipality where the case is located in?
– **Review of policy documents, semi-structured interviews**
7. What types of innovative entities are the innovation districts targeted at?
– **Review of policy documents, semi-structured interviews**
8. What are the goals and policies of actors operating on the steering side regarding the district?
– **Review of policy documents, semi-structured interviews**
9. How do innovative entities, located in the innovation districts, rate their current built environment and the current image in relation to their goals and needs?
– **Structured interviews**
10. To what extent are the goals and policies of the actors operating on the steering side in line with the demand of innovative entities operating in the innovation district?
– **Comparison of empirical results**

The different sub-questions will be answered in different chapters. A literature review will be performed to answer questions 1 to 5, while questions 6 to 10 will be answered by performing an

empirical analysis. The empirical analysis will include interviews with different actors and the review of policy documents. The methods of this research are further explained in chapter 4. The following chapter will go into further detail about the research by providing a conceptual model and explaining the different concepts that are applicable to this research.

2.3 Concepts

2.3.1 Conceptual Model

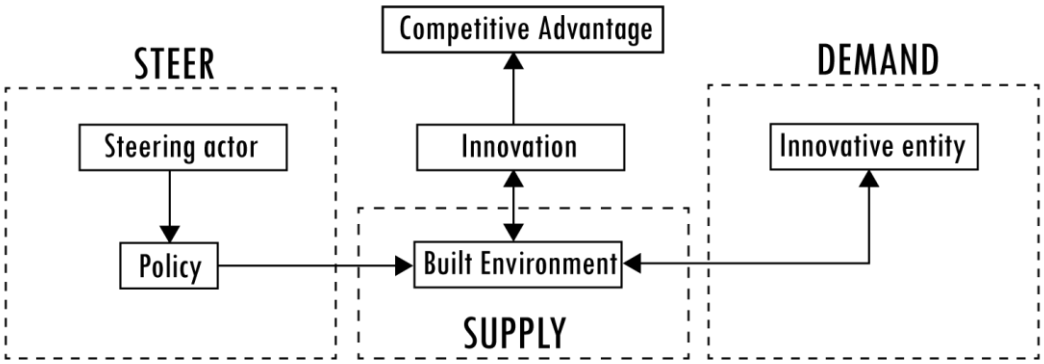

Figure 1. Conceptual Model

Figure 1 provides the conceptual model for this research. This research specifically focuses on the built environment as a means to stimulate innovation in innovation districts. By stimulating innovation, this could ultimately lead to a competitive advantage for municipalities. On the 'steer' side, steering actors have their own policies that have an effect on the built environment. Such actors include municipalities, but could also include developers or universities. These actors are the ones that have the power to steer and change the built environment. On the 'demand' side, innovative entities are the ones that use the built environment. Such entities include large firms or research institutions, but could also include start-ups or spin-offs. Depending on the case, the types of entities that are involved in creating innovation can vary. The 'demand' side makes use of the 'supply' (the built environment) as the location where they operate their business. This research will specifically focus on how the 'demand' side rates the built environment in relation to their needs and goals, and how the 'steer side' is shaping the built environment in a way that they feel will stimulate innovation. Ultimately this will lead to a comparison as to whether the goals and corresponding actions of the steering actors are in line with the needs and goals of the 'demand' side. The following chapter will further explain the definitions of the concepts in the model.

2.3.2 Concept Definitions

This chapter explains the different concepts that are mentioned in the conceptual model (figure 1) and aims to provide clear definitions for the concepts that will be used throughout this research.

Innovation

Increasing innovation is the main goal of an innovation district. But innovation can be viewed from different perspectives. This research uses the definition of innovation as described by Curvelo (2016) and therefore regards innovation as "the processes of knowledge creation, diffusion and its further application in the development of new and improved technologies".

Built Environment

Theories of architecture describe the built environment as consisting of built forms, created by humans, which provide shelter and define and protect activity (Curvelo, 2016). This research further regards the term built environment as a synonym of real estate, which according to theories in the management of the built environment is seen as an enabler of the activities performed by individuals, organizations and the society (Curvelo, 2016). This research specifically looks at the urban scale and regards this as the scale of the innovation district.

Innovative entity

The innovative entities regarded in this research are companies or research institutions that are located in innovation districts. Furthermore, a condition is that the municipality in which the innovation district is located regards the entity as being an important source of innovation for the district. The type of entity that will be used in this research can differ in scale, meaning that it could range from small start-ups to large, international firms.

Steering actor

The steering actors can be different per case, depending on who is responsible for the development and steering policy in the area. Winden and Carvalho (2015) mention developers, policymakers and managers as possible steering actors, while Curvelo (2016) also mentions universities as being possible actors involved as steering actors in the district.

Policy

Policy is regarded as the way in which the steering actors use their power in order to influence the built environment. This could take the form of regulations or zoning plans set up by municipalities, but could also be the type of office space provided by developers. The policy aspect focuses specifically on the types of actions that relate to the way in which the built environment is used in order to stimulate innovation in the district.

Competitive advantage

Competitive advantage is what the municipality ultimately strives for. Porter (2004) focuses on firms and argues that a firm's relative position within its industry determines whether a firm's profitability is above or below the industry average. Moreover, he emphasizes two main types of competitive advantage: low cost or differentiation. It is this final aspect, differentiation, that this research specifically focuses on. Therefore, this research regards competitive advantage as having unique characteristics that can be used to distinguish the city from other cities. This research specifically

focuses on innovation, which is used as a means in order to achieve a competitive advantage. This research does not specifically focus on what the relationship is between innovation and the competitive advantage this would create, but rather sees it as an end goal for stimulating innovation and using innovation districts in order to do so.

3. Literature review

The literature review aims to provide answers to the issues that are posed in sub-questions **1**, **2**, **3**, **4** and **5**. As these issues are set in an increasingly changing global context, the first chapter will explain some relevant global dynamics and the consequences these have for the contemporary development of cities.

3.1 A globalizing context

This chapter aims to provide an answer to the following sub-question:

1. *"Why is urban competitiveness increasingly important for cities?"*

First, it explains how urban competitiveness has come into play as a consequence of increasing globalization. Secondly, it discusses how this has caused cities to search for a distinctive identity and how they use place branding as a means of achieving higher levels of distinctiveness. Lastly, it discusses how these methods of place branding have an effect on the branding of districts, in particular innovation districts.

3.1.1 Urban Competitiveness

In the contemporary process of globalization, a shift of power can be recognized from central nation states to cities and regions. It appears that metropolitan areas are increasingly functioning as the centers and gateways of global business, culture and social relations. Segbers (2007) formulates two reasons for this. Firstly, he argues that many central state governments are overburdened with a growing task load and rising expectations and as a response are opting to devolve political authority and responsibilities to sub-state levels. Secondly, cities and regions are increasingly becoming sites of self-induced and self-centered economic activities, innovation, and growth independent from the national economic government. Urban regions will increasingly have to profile themselves on the global stage. This seems to lead to a trend in which more and more regions are actively investing in regional economic policy in order to increase their competitiveness and attract and retain their economic activities (Ni & Kresl, 2010). Cooke (2011) argues that the optimal local embeddedness of economic clusters lies within the combination of subcontracting and outsourcing, the composition and scope of the labour market, the housing market and living environment, the accessibility of urban facilities related to culture and services and in the small-scale dynamics of networks of entrepreneurship and spin-offs. As this can be an important distinctive factor for Dutch cities, there lies an opportunity here to profit from this by using appropriate policy. However, it seems that policymakers are generally not thinking enough about the possible benefits of serving as an international hub and are rather focusing on the advantages of clustering in their own hotspots (Van Oort et al., 2006). This reveals an opportunity for Dutch cities to profile themselves on a global stage.

With power comes responsibility. Nowadays, in order for cities to be promoted, they have to take matters into their own hands. Goess et al. (2016) emphasize this and argue that especially city regions – including polycentric urban regions – play an important role in leveraging national and even global competitiveness, while maintaining regional cohesion. In a country like the Netherlands, the competitiveness versus the cohesion between cities plays a significant part in the development of its main cities. Mayer et al. (2016) argue that capital cities play an important role in shaping the political, social and cultural identities of a nation capital. Furthermore, they argue that cities play their role as capitals not only through their symbolic architecture but also through the ways in which these capitals

develop a unique regional innovation system (RIS) and through the ways in which they position themselves in the national urban hierarchy through a set of locational policies formulated in local policy regimes. These topics address the need for a local government that is able to deal with these ambitions and can translate them into appropriate actions in order for the city to increase its global competitiveness. But what makes it important for city regions to market themselves? To be able to compete in an increasingly globalized world, cities are trying to form an identity that helps them to increase their competitiveness. Balancing their priorities, cities have to reinvent the essence of what defines them (Goess et al., 2016). To achieve this, cities and regions often turn to city/region-marketing as a way of forming an (international) identity that speaks to the public and try to form a brand for their city or region. As described here above, city regions are becoming increasingly independent of their national context and are bypassing their governments in their pursuit of placing themselves in a new global configuration (Segbers, 2007). City branding is an important tool for cities to lure new investors, businesses and inhabitants. Cities generally choose a profile that fits existing local factors and expresses how they wish to develop. In the particular case of polycentric urban regions, this revolves around the question how cities specialize in complementary ways, and how they distinguish themselves from their neighbours (Goess et al., 2016). Some go even further and argue that the way in which cities brand themselves and communicate their distinctiveness largely decides which cities succeed and which falter in the race for economic prosperity (CEOs for Cities, 2006). In this search for ways of promoting cities, it often happens that different messages emerge because of the various markets and audiences in cities. In the process of branding for different audiences and markets, it happens that a city brand gets diluted and loses its impact (Turok, 2009). This emphasizes the issue of adopting a brand that has a relation with lower levels of scale within the city. Furthermore, it addresses the issue of authenticity. Many cities around the world are currently promoting themselves as being an 'innovative city', but are they really?

3.1.2 Identity

A clear search for 'identity' can be seen amongst cities and regions in this globalizing context. An identity can be communicated by using place branding strategies. But why is this identity important? Proponents of city branding argue that a positive identity transforms how people think about a place and behave towards it (Anholt, 2006). Recently, the focus on less rational economic explanations for the identity of places has been growing. Verheul (2015) describes this as a 'sense of place', which is about the literal meaning of 'sense' as a 'feeling' as well as about the meaning of 'sense' as a 'human sense'. Zukin (2010) describes the importance of authenticity: "claiming authenticity becomes prevalent at a time when identities are unstable and people are judged by their performance rather than by their history or innate character". Furthermore, she states that "under these conditions, authenticity differentiates a person, a product or a group from its competitors; it confers an aura of moral superiority, a strategic advantage that each can use to its own benefit". This need for authenticity can be linked to the previously discussed critique on place branding and describes the need for a link between a storyline and the perceived environment. Furthermore, Verheul (2015) stresses that "by sharing and comparing experiences of groups of people that happen in different places, the relevant meaning of a place is created. These stories of places form our lives. Urban identity is being expressed through shared stories of individuals and groups". It seems that an identity of a place is very much related to the feeling one has about the place. Although this is a personal experience, places appear to be able to gain a certain reputation by storytelling amongst individuals.

3.1.3 Place branding

The concept of place branding has come into play as a tool for achieving a city's goal of urban competitiveness. Zenker and Braun (2010) have defined place branding as: "a network of associations in the consumers' mind based on the visual, verbal, and behavioural expression of a place, which is embodied through the aims, communication, values, and the general culture of the place's stakeholders and the overall place design". This "positioning" of cities/regions, as described in the previous chapters, forces cities to make a well-argued choice on which aspects of the brand-identity should be emphasized. These aspects should then be relevant to the (potential) target group and should set their brand apart from its competition (Hospers, 2011). Furthermore, there is a need for an area development strategy or vision for the future on a higher level, on a city- and regional level. Buhrs (2016) distinguishes two concepts central in this: specializing and collaborating. Recently however, several authors have expressed their discontent with the contemporary use of place branding in the development of cities. An example of such a critique on place branding is that it is an instrument that is being used by urban elites in order to legitimize their own strategic decision making (Kavaratzis & Kalandides, 2015). Furthermore, several authors address the need for a connection between the brand and the place and argue that successful place branding cannot be achieved without such a link. Therefore, a place branding image cannot be constructed as a tabula rasa narrative, but should be based on actual physical features and a local identity (Goess et al., 2016). Other authors also recognize this, and argue that the construction of 'fake brands' is destined to low credibility (Vanolo, 2008) and the importance of the physical recognizability, the associations people have related to an area and the connection between the existing identity of the area and the aimed image of the area are essential to be able to attract potential target groups (Dalmeijer, 2014). Hospers (2011) uses the following words: "You should not claim something you cannot prove". These authors all address the need for a sense of credibility. But how to achieve this? Kavaratzis and Kalandides (2015) state that place-branding should be a bottom-up process which complies with the feeling that citizens of the place have about their city or region. The same principle applies to regional place marketing, where cities create a joint image for the benefit of a regional development strategy (Goess et al., 2016). These issues related to place branding are also relevant when it comes to innovation districts. As has been explained in chapter 2.1, many cities are currently announcing their own innovation districts. But is there a connection between this brand and the physical environment?

3.1.4 Branding an innovation district

The above mentioned authors all seem to agree that a place brand needs physical evidence in order for the brand to be credible. We can link these principles to the main topic of this research; innovation districts. District branding has included the use of urban design elements such as gateway development, communicative digital displays, banners, etc. The recent trend of the 'Silicon Somewhere' (Verheul & Hospers, 2016) has created the perception of a concept that can be copied anywhere in the world. However, simply co-locating innovative firms and start-ups and naming it an 'Innovation District' appears to be insufficient for success in the creation of groundbreaking innovation. It is therefore important for municipalities to recognize this and act accordingly. As has been explained here above, the built environment should support the claim of innovation, otherwise the area is destined to low credibility and the brand will not last. A marketing strategy cannot make up for aspects of a city that are unattractive and discourage people from visiting, investing or moving there. Turok (2009) argues that the success of a place brand depends on improving material conditions, otherwise marketing amounts to a public relations exercise treating the symptoms of the problem rather than

the causes. Furthermore, he states that in order to achieve such a link between a brand and the built environment, city authorities have a vital role to play as intermediaries to facilitate these interactions and to help align policies and resources consistently across different elements of the strategy (Turok, 2009). Taking the above into account, it seems that municipalities can use their position to their advantage by stimulating innovation through a brand that has a relation with the physical environment of the area.

3.1.5 Conclusion

In conclusion, it appears that increasing dynamics of globalization are putting more pressure on cities to market themselves and distinguish themselves from their peers. Recently, there has been a growing focus on innovation as a means to achieve high levels of distinctiveness and increase the global competitiveness of these cities. Innovation districts are being put forward as important sources for such high levels of innovation. However, some authors address the issue that such brands should show a relation with the built environment. Municipalities have an important task at hand, as they usually have a significant role in steering the built environment.

3.2 Innovation

This chapter aims to provide an answer to the following sub-question:

2. *"What is already known about innovation of firms and institutions and why is this important for cities?"*

To be able to answer this, this chapter is divided into different sub-chapters that will explain the different aspects related to this question.

3.2.1 What is innovation?

In order to be able to understand why cities increasingly invest in innovation, it is important to first understand what innovation means. As has been described in the concept definitions, this research regards innovation as "the processes of knowledge creation, diffusion and its further application in the development of new and improved technologies" (Curvelo, 2016). However, different authors have described it in their own (similar) ways. Butzin and Widmaier (2016) describe innovation as a spatial and knowledge-intensive learning process that is generated through the interaction of different actors. Katz and Wagner (2014) define it as the situation where new or improved ideas, products, services, technologies, or processes create new market demand or cutting-edge solutions to economic, social and environmental challenges. A similarity between the different definitions seems to be that the authors all consider innovation to be a process where something new is created. However, innovation is not only defined in different ways, it is also measured by varying indicators. The following chapter will further elaborate on the different indicators used to measure innovation.

3.2.2 Measuring innovation

As can be seen by the different ways in which it is defined, the concept of innovation is not considered to be the same by everyone. This has consequences for the way in which innovation is measured. Different sources use different indicators of measuring innovation. Table 1 provides an overview of different indicators of innovation as described by different authors, composed by Curvelo (2016). Commonly used indicators of innovation are (1) R&D data, (2) data on patent applications, grants and bibliometric data and (3) non-R&D data. Although these indicators are commonly used in practice, they have been criticized for different reasons, as described by Curvelo (2016). The first indicator, R&D data, is criticized for focusing mainly on the measurement of an innovation input, leaving out many other supporting activities. The second indicator, patent data, is criticized for focusing too much on patents and excluding many firms (especially SMEs) and other organizations that carry out innovative activities. Bibliometric data is criticized for primarily focusing on the dynamics of science rather than innovation. Lastly, non-R&D data has received criticism because of the variety in definitional restrictions in relation to innovation inputs and outputs in the methods that are used to collect this type of data (Smith, 2005). This indicator was originally adopted for manufacturing, which leads to the question of the extent to which this indicator is also applicable to services. The other indicators focus more on output data, which has consequences for the significance of these indicators in the sense that these can differ in relation to the type of organization. Different organizations can use varying indicators to measure innovation, depending on their core processes and ambitions.

These different indicators of measuring innovation reveal the many perspectives of looking at the same concept. To be able to make clear what specific actors are striving for when they want to reach higher levels of innovation, it is important to understand what indicators of innovation they are using to measure it. These types of indicators can vary between different actors (e.g. municipalities and firms) while both are striving for higher levels of innovation.

Indicators	Description	Theoretical sources	Use in practice
1. R&D data	This indicator focuses on measuring inputs. Initially focused on the use of datasets resulted from the collection of economic indicators compatible with industrial datasets and the national accounts such as R&D intensity, R&D expenditure, R&D/Sales ratio, R&D/GDP ratio, R&D personnel.	Griffith, Redding, and Van Reenen (2004) Dowrick (2003)	OECD, 1992, 2001, 2002, 2005 European Commission 1992, 1993, 1996, 2011 Global Innovation Scoreboard (GIS), 2008
2. Data on patent applications, grants, and bibliometric data	This type of indicators focuses on measuring outputs. The latter refers to scientific publication and citation turning around the SCI-Science Citation Index.	Granstrand (2005) Kaloudis (1998)	OECD 2002, 2005 European Commission 1992, 1993, 1996, 2011 Global Innovation Scoreboard (GIS) 2008.
3. Non-R&D data (Subject approach)	This focuses on inputs able to pick up small-scale changes in product performance which might have major technologic and economic implications on 'innovation activities' besides R&D, such as design activities, engineering developments and experimentation, training, exploration of markets for new products, equipment acquisition and tooling-up, etc.	Kline and Rosenberg (1986) Smith (2005) Evangelista, Sandven, Sirilli, and Smith (1998)	OECD, 2005 European Commission 1992, 1993, 1996
4. Product innovations identified through exert appraisal and literature (Object approach)	Examples of these indicators are database about technical and business innovations covering sources and types of innovation, industry innovation patterns, cross-industry linkages, regional aspects and so on. These indicators are widely discussed in theory by scholars claiming that traditional measures miss 'the population of innovation outputs which are routine, incremental, part of the normal competitive activity of firms, yet not strikingly new enough to be reported' (OECD, 2005)	Acs and Audretsch (1990) Archibugi and Pianta (1996) Kleinknecht (1996) Pavitt (1984)	N.A.
5. Technometric indicators	These indicators explore the technical performance characteristics of products (output focus). If focuses on detailed ways of measuring technological change.	Saviotti (1996) Saviotti (2001) Grupp (1994) Coccia (2005)	European Commission 1997
6. Synthetic indicators	These indicators cover a large range of subjects that have been developed for scoreboard purposes (input-output focus). 'They take into account the various aspects which constitute the technological capability of a country and aggregate them into a single figure. They are typical macroeconomic indicators aiming at comparing the positions of different countries and their changes. Their merit is to provide a clear and immediate image of a country's ranking, while the drawback is to sacrifice the inherent complexity of the process of knowledge production and distribution'. (Archibugi, Denni, & Filippetti, 2009).	Archibugi et al. (2009)	World Economic Forum, 2003, 2004, 2005, 2006 The European Commission, 2007, 2008 The World Bank OECD, 2006, 2007
7. Databases on specific topics	Developed as research tools by individuals or groups such as collaboration data (output).	Pari Patel and Pavitt (1997) Patel and Pavitt (1999) Hagedoorn and Schakenraad (1990)	OECD, 2001

Table 2. Overview of different ways of measuring innovation (Curvelo, 2016)

3.2.3 Why is innovation important for cities?

In contemporary strategies of urban competitiveness, the topic of innovation seems to be playing an increasingly important role. Cities aim at promoting innovation by promoting themselves as being an 'innovative city' and lists such as the Forbes' 'Most Inventive Cities' (Forbes, 2013) are contributing to

this development. The well-known example of Silicon Valley as an area of innovation has led to cities around the world attempting to mimic this success. In doing so, cities have assigned several areas for the creation of innovation, leading to the development of the 'Silicon Somewhere' syndrome (Verheul & Hospers, 2016).

Different sources suggest that cities and regions function as 'incubators' of creativity and innovation and that human capital factors in particular play an important role in spurring regional growth (Jacobs, 1961; Lucas, 1988; Park et al., 1925; Thompson, 1965). Lee et al. (2002) argue that entrepreneurial activity requires not only a productive and supportive business climate along with an educated population, but also a climate where creativity, diversity and innovation are encouraged and valued. This encouragement and valuation is where municipalities can play a role in supporting entrepreneurship. Jacobs (1961) explained how cities function as 'open systems' to attract talented people from various backgrounds and stimulate their creative capacities. Furthermore, she argued that open and diverse cities attract more talented people, thus spurring creativity and innovation, which are the underlying forces of entrepreneurship (Jacobs, 1961). This seems to be recognized by municipalities nowadays, as many examples of mixed living/working areas can be recognized in the contemporary urban development plans of large cities. The 'innovation district' that is currently an upcoming concept, also makes use of a mixed environment in order to facilitate growth. Chapter 3.3 will further explain the concept of the 'innovation district' and describes how the clustering of innovation has been subject to an evolution over the past decades.

The change of a global context that has been described in the previous chapters, has also changed the way in which economies work. In the contemporary global economy, innovation, knowledge workers, skills and creativity are important input factors (Van Oort et al., 2006). This brings with it a changing demand of firms for their locations, towards one which focuses more on knowledge milieus. Cities can have an important role in facilitating such a milieu. In the past, it has been assumed that such milieus were mainly to be found in the largest metropolitan regions. However, recently more research is showing that rather medium-sized cities in an urban network are the best places for economic growth (Barca et al., 2012; OECD, 2009, 2011). Medium-sized cities are defined here as urban regions with up to 2 million inhabitants (OECD, 2012). This is particularly relevant for the Netherlands, where its 'Randstad' can be regarded as a poly-centric region with medium-sized cities.

3.2.4 Entrepreneurship

Contemporary regional development strategies are increasingly considering innovative entrepreneurship and new venture creation as the driving forces of regional prosperity (Van Oort & Bosma, 2013). To facilitate the development of start-ups, policymakers are especially focusing on the establishment of regional clusters. It is argued that such agglomerations provide a fertile breeding ground for start-ups and nascent entrepreneurs (Pe'er & Keil, 2013). Such a breeding ground can be beneficial to start-ups in particular, because the entrepreneurs that are the driving force of start-ups create value through the absorption, the transfer and the application of knowledge as well as the corresponding transformation into new economic knowledge (Acs & Plummer, 2005). The creation of new ventures thus appears to be important for the development of the region. It is argued that without new venture creation, policy-induced and promoted cluster creation may lead to excessive tacit knowledge and thus crowding-out effects of private initiatives, leading to a "field of dreams without players" (OECD, 2015).

Several authors (Koster & van Stel, 2014; Luger & Koo, 2005) have written about the influence of start-ups on (regional) economic growth. Koster and van Stel (2014) argue that the effect of start-ups on employment change can be decomposed into an immediate effect and a long-term effect. The immediate effect is that the creation of new ventures creates a demand for employees. The long-term effect is a consequence of the growth of the start-up and the rearrangement process among the incumbent firms. The existing firms are challenged by the new firms and those able to adjust to this development are assumed to strengthen their position relative to other incumbents. As a consequence, this then leads to productivity and employment benefits for the regional economy.

3.2.5 Conclusion

An important conclusion to be drawn from this chapter is that innovation is an ambiguous concept. Different authors use different definitions of innovation, as well as different indicators of measuring it. Some authors are also considering entrepreneurship to be a driving force of prosperity and link this to the innovative power they have. The level of innovation in cities seems to play an increasingly important role in a globalizing world and this can be seen in the way contemporary urban strategies are increasingly considering innovation as a means of achieving a competitive advantage. However, because of the varying indicators that are used to measure innovation, it is important to bear in mind how each actor defines innovation when analyzing the strategies they use to achieve higher levels of innovation.

3.3 Innovation Clusters

This chapter aims to provide an answer to the following sub-question:

3. *"What is already known about innovation districts?"*

Firstly, it briefly discusses the history of innovation in relation to the agglomeration of business. Then, it explains how a shift can be recognized from secret, closed-off innovation towards a system where innovation is considered to have more of an 'open' character and is shared more freely. The chapter ends with a brief discussion about different forms of criticism that have recently been spurred in relation to innovation districts.

3.3.1 A brief history

The creation of innovation depends on the potential of firms. Moulaert and Sekia (2003) distinguish three functional spaces for a firm: the production space; the market space; and the support space. When facing uncertainty, it is the support space that should empower an enterprise and it is this space in particular that will determine the relations between corporate innovation and spatial development. The role of this support space can be recognized in the way in which firms agglomerate. Firms locate themselves in close proximity to other firms in order to be able to take advantage of agglomeration economies related to their production process (Clark, 2000). Firms then co-locate in districts (support space), where clusters of firms can be observed. An evolution of this support space can be recognized, starting with the industrial districts in the 19th and 20th century: areas with high concentrations of manufacturing enterprises commonly engaging in similar or complimentary work (Katz & Wagner, 2014). As the 20th century progressed, the nature of manufacturing activity changed and eventually dispersed. In the second half of the 20th century, collaborations of universities, private developers, and government designed and built clusters of labs and firms with the aim of increasing the commercialization of research and attracting entrepreneurially-oriented scientists from industry and academia (Katz & Wagner, 2014). It was in this period that a shift can be observed from industrial districts to science parks, of which there are still many examples left today (e.g. Amsterdam Science Park and Utrecht Science Park). Although highly focused on innovation, these districts (or 'parks') were not designed to evoke collaboration between different companies within the district itself. This development of frameworks such as industry clusters, learning regions and territorial innovation systems has gradually shifted the discussion from co-location of producers to co-location of innovators (Clark et al., 2010). Recently, this has evolved into a new perspective on the concept of co-location.

3.3.2 Open innovation

The contemporary idea of innovation has a much more open character. Rather than being located on the outskirts of cities, innovation districts are embedded within the city's network of transport and amenities. Katz and Wagner (2014) define the innovation district as follows: "Geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators. They are also physically compact, transit-accessible, and technically-wired and offer mixed-use housing, office, and retail". Apart from its location, the main difference with its predecessors is that the innovation district is an area with a mix of functions, including housing and retail. Furthermore, it aims to encourage horizontal contact between firms rather than creating an environment wherein firms mainly focus on themselves and the vertical connections within the firm.

This relates to the agglomerating force of informational spillovers. These spillovers relate to the spatial proximity of geographical location where the knowledge is being created. The argument is that it is easier to "rub shoulders" in a more populous area, as information travels via both formal and informal avenues and through the movement of employees from one firm to another (Sedgley & Elmslie, 2004). Boschma (2005) also recognizes this, and states that short distances bring people together, favouring information contacts and facilitating the exchange of tacit knowledge. Maskell (2001) further argues the role of transparency within clusters, which makes sure that successful experiments by other local firms do not remain unnoticed. Another significant factor of co-location is that firms have more face-to-face contacts and are able to build up trust more easily. This in turn leads to more personal and embedded relationships between firms (Harrison, 1992). The relations that are achieved through local contact are believed to be even more beneficial when supported by nonlocal relations that provide new impulses and ideas and bring new variety into the territory (Bathelt, 2005).

3.3.3 Criticism

A critical note has to be mentioned however. In the past twenty years, there has been an ongoing discussion about the benefits of agglomeration and whether this way of concentrating businesses and creating sectoral diversity in clusters is a good thing in terms of knowledge spillovers and economic growth. For this reason, Frenken et al. (2007) argue that the debate about specialization versus diversity is not appropriate and that the focus should rather be on the concept of related variety. This means that the types of businesses in a cluster should be diverse, but should have related characteristics that allow them to learn from one another. Furthermore, several authors have questioned the importance of geographical proximity in relation to collaboration and knowledge exchange (Boschma, 2005; Breschi et al., 2003; Gertler, 2003). The main argument that is being put forward is that 'simple' co-location is neither a prerequisite nor a sufficient condition for collaboration (Boschma, 2005). Although the geographical proximity of firms does facilitate interaction and cooperation, advanced information and communication technologies can create networks through which learning can also take place. The leading trend amongst municipalities, however, seems to be towards a co-location of firms and the creation of an innovative milieu.

3.3.4 Conclusion

Globally, a shift can be recognized from closed-off science parks outside the city towards more urban contexts as a source for innovation. Where in the past innovation was considered to be created in secretive environments, it now increasingly seems to be considered as having an open character. Such 'innovation districts' are characterized by urban settings and a high level of walkability. However, several authors have expressed their criticism and it is important to bear in mind these points of attention when conducting the research. As Boschma (2005) argues, simple co-location does not automatically stimulate the collaboration between firms. When analyzing the cases, it will be essential to see whether municipalities are recognizing this and are doing more than just co-locating innovative entities.

3.4 Policy towards innovation

This chapter aims to provide an answer to the following sub-question:

4. *" What is already known about stimulating innovation through municipal policy?"*

The first sub-chapter will explain the concept of the Regional Innovation System (RIS). The second sub-chapter goes more into depth about what is being done by municipalities in order to create an innovative milieu. The final sub-chapter explains the different roles that municipalities can adopt in the realization of an innovative milieu.

3.4.1 Regional Innovation System (RIS)

Due to the remarkable performance of high-tech clusters in the United States (e.g. Silicon Valley) and the growing importance of innovation in relation to urban competitiveness, policymakers are focusing more on industrial clusters and their geographical location. Rather than executing national policies, a trend can be recognized in which the strategic management of places has become the leading device in industrial public policy (Caiazza et al., 2015). As municipalities have a steering role in the development of the city, they have the possibility of adopting a strategy that fits the development of innovation. Therefore, cities aim to set up a well-functioning regional innovation system (RIS). An RIS can be seen as a regional system "in which firms and other organizations are systematically engaged in interactive learning through an institutional milieu characterized by embeddedness" (Cooke et al., 1998). Doloreux (2002) emphasizes the expression "interactive learning", the term "milieu" and the concept of "embeddedness" in the definition of the RIS. Furthermore, he argues that firms, institutions, knowledge structures and holistic innovation policies are the main elements that comprise the RIS (Doloreux, 2002).

3.4.2 Creating an innovative milieu

As has been mentioned in chapter 2.4.3, cities are increasingly aiming at mixed urban areas. It appears that it is becoming known that downtowns and their surrounding areas are becoming important breeding grounds for economic activities (Hutton, 2008). Therefore, it is not strange that in many contemporary urban regeneration projects, there is a clear aim for mixing living environments with business. By implementing this idea of mixing work and living, such a strategy could then serve an economic as well as a social purpose in the sense that it would improve the liveliness of the streets and the sense of safety in the area (Hospers, 2006). Katz and Wagner (2014) refer to the city of St. Louis as an example of where a city's or metropolitan area's distinctive economic strengths helped orient actors to the clusters that have the best chance of success rather than rely on a government's attempt to pick industry winners. This implies a strategy where an environment is created in which actors are attracted to the area for its characteristics, rather than attempting to manufacture an environment by picking the right firms for the area. This emphasizes the need to transform the physical landscape of innovation districts to create favored attributes of complexity, density, and mixed uses and activities (Katz & Wagner, 2014). Crevoisier (2011) puts it as follows: "Actors in interaction produce the territory, but one should not lose sight of the fact that the territory shapes the actors, including their rationality". However, Simmie (2005) emphasizes that "explanations slip too easily into the argument that the innovative milieu assist innovative firms while at the same time the presence of innovative firms creates the innovative milieu that is supposed to be assisting them". This clearly

indicates a lack of clarity within the creation of innovative districts and how to attract the actors that produce innovation.

According to Katz & Wagner (2014), these types of districts where innovation is shared amongst the actors located in the area, consist of three types of assets: Economic-, Networking- and Physical assets. The physical assets consist of the public and privately-owned spaces—buildings, open spaces, streets and other infrastructure—designed and organized to stimulate new and higher levels of connectivity, collaboration, and innovation. Innovation districts reach their potential when all three types of assets, combined with a supportive, risk-taking culture, are fully developed, creating an innovation ecosystem (Katz & Wagner, 2014).

3.4.3 Role of the municipality

The active engagement and involvement of government and states could accelerate the growth of districts, provided it respects the organic and differentiated nature of this trend. Katz and Wagner (2014) distinguish three important roles for municipalities: spurring innovation and entrepreneurial growth, financing land and infrastructure improvements, and boosting human capital. This type of policy is important in a time of rapid changes and competing cities, which makes it crucial to be able to adapt. This ability to adapt is also recognized by Clark et al. (2010), who argue that the resilience of regions and cities not only depends on endowments (producers, networks, skilled labour and strong institutions) but also on capacities (influenced by policy) to leverage innovation in response to changing technology, markets and resource environments. Innovation districts therefore require specific policy in order to achieve the innovative status it proclaims to be. For instance, municipalities could fulfil a facilitating role, in which they aim at bringing together the different types of organizations (Nooteboom & Stam, 2008). Casper (2007) further emphasizes a steering role by stating that different locations within cities are developing themselves as a consequence of the dynamics of the market and it is the government's job to steer these developments.

3.4.4 Conclusion

Municipalities have an important role to play in the development of innovation districts, as they often are able to facilitate development in the area and are responsible for the public space. However, because of the significant role of the market in innovation districts, it will be necessary for municipalities to find a balance between facilitating as well as steering the market. The physical assets (as described by Katz and Wagner, 2014) should stimulate innovation and facilitate firms, while at the same time zoning plans can be used to steer development in the area.

3.5 Innovative entities and physical preferences

This chapter aims to provide an answer to the following sub-question:

5. *"What is already known about the general physical preferences of innovative entities located in innovation districts?"*

The first chapter explains the different actors that have been mentioned by previous research as being regarded as sources for innovation. The second chapter further elaborates on the general physical preferences that such entities have in relation to their built environment.

3.5.1 Actors in innovation

As has been described in the previous chapters, a trend can be recognized in which innovative firms and institutions are moving towards urban locations, where a mixture of amenities and people is available. In order to be able to understand the dynamics in the creation and daily use of an innovation district, it is important to know which actors are 'involved' in an innovation district. Involved in this case means that the actors is either operating on the steering side, influencing the built environment, or on the demand side, making use of the built environment. Several authors (e.g. Curvelo, 2016; Winden & Carvalho, 2015, 2016) mention different actors involved in both sides of knowledge locations. On the steering side, the municipality plays an important role in setting up regulations and land-use plans in order to steer the built environment. As has been explained in chapter 3.4, the policy of municipalities is an important factor in the creation of innovation districts. However, not only municipalities are involved on the steering side of innovation districts. Municipalities, although in many cases the leading actor of the district, is often not the main land/building owner of the district. Therefore, the municipality is in many cases dependent on other actors for filling in the available land. Developers and managers are therefore also mentioned (Curvelo, 2016; Winden & Carvalho, 2015, 2016) as important actors in steering the built environment.

On the demand side of innovation districts, the users of the built environment, different actors are involved. Firms and universities are mentioned by Curvelo (2016) and Winden & Carvalho (2015, 2016) as being sources of innovation that are located in such knowledge locations. Firms, a general concept, could be anything from start-ups and spin-offs to large, international firms. Universities are also regarded as an important source of innovation. Within universities, different research groups can be distinguished that are responsible for a variety of innovative research. Another important actor regarded as a source of innovation is the group of research institutions that operate independently from universities. Actors operating on the demand side of innovation districts have specific demands regarding the built environment they use as a location where they operate their business. The following chapter will explain different topics that have been mentioned in previous research by such actors.

3.5.2 Physical preferences

Previous research (Curvelo, 2016; Winden & Carvalho, 2015, 2016) has revealed several aspects of the built environment that are mentioned by actors operating on the demand side as having an influence on the stimulation of innovation. Generally, we can distinguish the following categories: Infrastructure, Amenities, Proximity Resources, Design and Image. An example of a topic that is mentioned in the category of infrastructure, is the quality of public transport in and around the area. Because of the

urban setting of innovation districts, the quality of public transport could be an important issue as many workers don't use a car to reach their office or work location. Another example in the category of instrastructure is the 'walkability' of the area. This topic, also mentioned by Katz and Wagner (2014), is considered as an important factor for stimulating innovation as it increases the opportunity of random encounters with other people. An example of the category 'Amenities' is the mixture of different functions available in the area. This would mean that the presence of (coffee)bars and restaurants in combination with other functions (dwellings, offices etc.) is generally appreciated. 'Proximity of resources' refers to the proximity of high-skilled employees, as well the presence of people to do business with. The 'Design' of the district refers to the extent to which the built environment is made of materials or shapes that are inviting and welcoming, as well as to the modularity/flexibility of the built environment (e.g. flexible office space). Finally, the category of the 'Image' refers to the attractiveness of the area and the reputation (e.g. media coverage) the district has. These aspects are further explained in chapter 4.2.4.

3.5.3 Conclusion

This chapter has revealed several actors that are generally involved in innovation districts. Furthermore, it has mentioned several physical aspects of knowledge locations that are appreciated by innovative entities. These actors and aspects will act as a base from which data can be gathered by performing an empirical analysis on the different actors involved in the cases. Chapter 4 will further elaborate on this and will explain how the different aspects of the built environment will be used as topics that guide the empirical analysis.

4. Research Design & methodology

This chapter explains the design that will be used to conduct this research, as well as the different methods that will be used to gather data during the empirical analysis. Furthermore, it provides a set of criteria that will be used to select the cases for this research.

4.1 Research Design

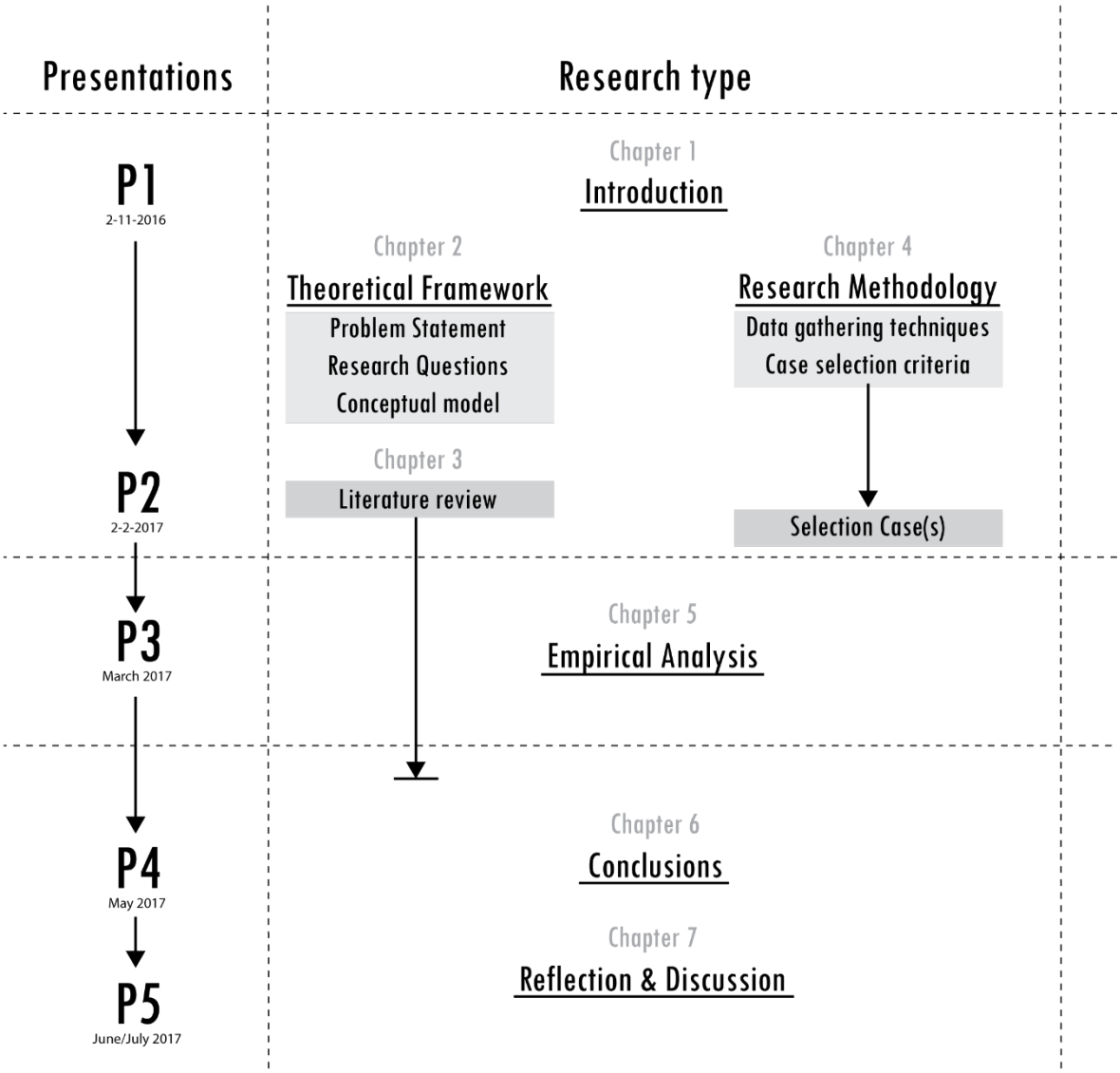

Figure 2. Research design

Figure 2 provides an overview of the research, as well as how the different parts of the research are related to different chapters of the report. The first chapter will serve as an introductory chapter, explaining the personal motivation and the relevance of the research. Chapter 2, the theoretical framework, discusses the problem statement, the research questions and the conceptual model. Chapter 3 comprises the literature review, which is considered to be an ongoing process and continues during the empirical analysis. Chapter 4 explains the research methods that will be used throughout the research, as well as the case selection criteria used to be able to choose a case. Chapter 5 will

explain the findings from the empirical analysis. Chapter 6 and 7 will put forward the conclusions of the research as well as a reflection and discussion.

4.2 Research Methods

This chapter explains the different methods that will be used to conduct the research. It explains the role of the literature review, as well as a motivation for using a case-study analysis.

4.2.1 Literature review

The first part of the literature review consists of an analysis of the main concepts that are relevant to this research. The objective of the literature review is to create an understanding of the different concepts and to provide a basis for the empirical part of the research. It is used to gain a set of topics that can be used throughout interviews with different actors that are involved in the cases. The literature does not end when the empirical part starts, but is rather meant to be a continuing process throughout the duration of the research. Firstly, it provides a basis for the research. Then, it will be used to compare the results of the empirical data with in order to come to a clear understanding of what the data means. Finally, the literature review will be used to be able to form conclusions of the research. Therefore, it can be regarded as an iterative process, guiding the research from start to finish.

4.2.2 Case study

For this research, a case study strategy has been chosen to obtain empirical data about the research questions. This research is particularly well-suited for a case study, because of municipalities' particular interest in innovation districts as being designated areas for innovation. Although there appears to be a significant amount of literature available on the topics that are relevant to this research, there appears to be less research available about the physical aspects of innovation districts.

Yin (2014, p. 18) defines case studies as "empirical inquiries that investigate a contemporary phenomenon (the "case") in depth and within its real-world context". This research attempts to create an understanding of the dynamics in the case, more specifically how the actors involved in the case respectively shape and rate the built environment in innovation districts.

Because of the limited time available for conducting this research, a decision had to be made regarding the balance between the scope versus the depth of this research. In order to be able to compare different approaches, while still being able to reach a certain amount of depth, this research will focus on two cases. Therefore, this research can be regarded as a multiple case study (Bryman, 2012), in which two cases will be explored in detail in order to be able to come to an in-depth understanding of the different approaches in the two cases. The objective is to gain an understanding of the different mechanisms that are being used to steer the built environment, as well as their effect on the rating of the built environment by the actors on the demand side.

4.2.3 Case Selection

This chapter provides a set of criteria that will be used in order to select the case(s) for this research.

Location

The significant amount of examples of innovation districts around the globe provide many options for research. Considering issues concerning the availability of data, language barriers and the availability of approachable actors, this research will specifically focus on innovation districts within the Netherlands.

Size

Although this research does not set up a specific requirement regarding the size of an innovation district, it does require the size of the district to be of an area level. Furthermore, it specifically looks at the district, rather than the city as a whole.

Actor involvement

Because of the structure of this research, the case to be used should show a strong involvement by the municipality in terms of steering the district. Furthermore, in order to be able to obtain empirical data about the built environment, there should be actors available in the area that are regarded by the municipality as sources of innovation.

Phase

The innovation district should either be in an advanced state, or in a phase where significant investments in the area are currently being done. In that sense, this criteria excludes districts that have been mentioned in policy documents, but where no actions have yet been undertaken.

Data availability

Considering the time frame of this research as well as the level of depth this research attempts to reach, an important criterion is the availability of data and actors to approach for interviews.

4.2.4 Data gathering techniques

To be able to obtain the necessary amount of empirical data for this research, interviews will be performed with different actors involved in the cases. A distinction can be made between actors operating on the steering side (see conceptual model, chapter 2.3) and actors operating on the demand side. This difference in actors also requires a different approach regarding the type of interviews that are to be conducted.

Actors operating on the steering side will be questioned by using a semi-structured interview. Bryman (2012, p.212) describes this type of interview as "a context in which the interviewer has a series of questions that are in the general form of an interview schedule but is able to vary the sequence of questions". This type of interviewing has been chosen because of its slightly more open character compared to the 'structured' interview (further explained below). Actors operating on the steering side will be asked about specific topics (explained in more detail below), but the interview will allow space for the interviewee to address specific actions regarding the physical environment of innovation districts that are important to them.

The other group of actors, the demand side, will be interviewed by using interviews with a more structured character. Bryman (2012) describes the aim of a structured or 'standardized' interview to be that all interviewees are given exactly the same context of questioning, meaning that each respondent receives exactly the same interview stimulus as any other. The goal of these interviews is to obtain an understanding of how actors operating on the demand side rate the current built environment of the innovation district they are located in.

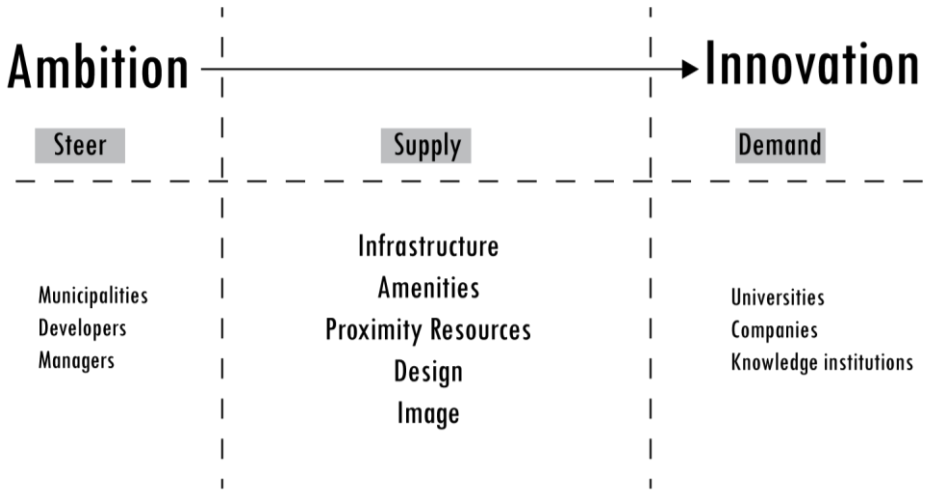

Figure 3. Operational model

Figure 3 provides an overview of how the above will be operationalized. The actors that are responsible for steering the built environment are located on the left, while the actors that are responsible for creating innovation are located on the right. The figure regards the situation as the presence of an ambition from the municipality to reach higher levels of innovation. Ultimately, the actors on the steering side are not the ones responsible for creating innovation however. In order to see how the demand side rates its current built environment, several aspects have been distilled from literature (Curvelo, 2016; Katz & Wagner, 2014; Winden & Carvalho, 2015, 2016) that have been mentioned by innovative entities as playing a role in the process of innovation. These aspects will be used as a list of topics during interviews with the demand side. Furthermore, the steering side will also be asked about

to what extent they are considering these aspects in their innovation district. The steering side will also be asked about what their current goals are in relation to the district and in what sense they steer the built environment in a way that complies with their goals. By asking both sides about their goals and needs, this research will be able to determine whether or not the different sides are in line with one another. Table 2 further specifies the different aspects that will be questioned in the different categories that have been mentioned here above.

Infrastructure	Amenities & Resources	Design	Image
Diversity of infrastructure	Flexible facilities	Design of built environment in terms of being inviting and welcoming (e.g. transparent and light materials)	Uniqueness of identity
Pedestrian oriented infrastructure	Access to diverse amenities/functions	Modularity, standardization and openness of buildings	Quality of place (attractiveness)
Public transportation	Public and semi-public meeting and working places		International reputation (media coverage)
Physical connectors	Mixed-use buildings		Geographic features
Linking anchor institutions to district	Exhibition and piloting space, showrooms		
Connection district with broader metro	Shared facilities		
	Venues for training & education, cultural events & entertainment		
	Small scale parks & plazas		
	Mixed-income housing		
	Neighbourhood-serving retail		
	Affordable space for start-ups		
	Micro-housing		
	Digital-accessibility		

Table 2. Categories and aspects of the built environment
(based on Curvelo, 2016; Katz & Wagner, 2014; Winden & Carvalho, 2015, 2016)

5. Case analysis

This chapter comprises the empirical analysis of this research and goes into depth about the chosen case; Central Innovation District The Hague. The analysis of this case aims to answer sub-questions 6, 7, 8, 9 and 10. The following chapter will explain how the different sub-questions will be answered.

5.1 Answering the sub-questions

This chapter provides an overview of the different sub-questions that will be answered by performing an empirical analysis, as well as an explanation regarding the methods that will be used to do this. This explanation not only includes the type of method, but also the specific documents and actors that have been identified up until this point as potentially being able to help answer the question.

5.1.1 Sub-question 6.

6. *"To what extent are the concepts in sub-questions 1, 2, 3, 4 and 5 aligned with the ambitions of the municipality where the case is located in?"*

This question will be answered by performing a review of policy documents of the specific municipalities, as well as semi-structured interviews (explained in sub-chapter 5.1.2). Table 3 provides an overview of the different documents that have been gathered up until this point.

Metropolitan Region Rotterdam and The Hague	The Hague	Other
Roadmap Next Economy	Central Innovation District 'Magazine'	De innovatieve stad – *Planbureau voor de Leefomgeving*
Rapport Weerbare Regio	Agenda Ruimte voor de Stad	Het nationale verdienvermogen en de cruciale rol van regio's – *Commissie Verdienvermogen en Vestigingsklimaat*

Table 3. Overview of policy documents

5.1.2 Sub-questions 7, 8, 9 and 10

This chapter explains how the following sub-questions will be answered and which actors will be used in this analysis:

7. *"What types of innovative entities are the innovation districts targeted at?*

8. "*What are the goals and policies of actors operating on the steering side regarding the district*?"

9. *"How do innovative entities, located in the innovation districts, rate their current built environment and the current image in relation to their goals and needs?"*

10. *"To what extent are the goals and policies of the actors operating on the steering side in line with the demand of innovative entities operating in the innovation district?"*

To answer these questions, several actors will be approached that are related to the case. Table 4 provides an overview of the different actors that have been identified in the different cases up until this point.

Central Innovation District The Hague

Steer		Demand			
Public	**Private**	**Universities**	**Companies**	**Start-up clusters**	**Knowledge Institutions**
Municipality The Hague	Provast	Leiden Universiteit	T-Mobile	Bink 36	TNO
	Heijmans	Haagse Hogeschool	Siemens	Caballero fabriek	ICTU
		ROC Mondriaan	Thales	De Besturing	Platform 31
		Royal Academy of Arts	Jacobs Engineering	HSD	NWO
			AT&T	LabS55	The Hague Institute for the Internationalization of Law (HiiL)
			KPN	Mooof Den Haag	
			Shell	New World Campus	

Table 4. Overview of actors in the Central Innovation District The Hague

Actors operating on the steering side will be approached by conducting semi-structured interviews (Bryman, 2012). This allows them to express topics that are important in their vision on the innovation district, while maintaining a structure in the interview regarding the topics that this research aims to address (see chapter 4.2.4). An important aspect of these interviews is how the actors on the steering side define innovation and which indicators they use to measure it. Actors on the demand side will be approached with interviews of a more structured type (Bryman, 2012). This makes sure that the actors address all of the topics that this research regards as relevant (see table 2, chapter 4.2.4, for an overview of these topics).

To be able to further specify what innovative entities the innovation district is targeted at (sub-question **7**), the research will first interview actors on the steering side. This will provide a clearer

overview of the specific actors that the innovation district aims to attract and maintain. Furthermore, these interviews aim to answer what the goals and policies are of actors operating on the steering side. This will help to answer sub-question **8**. By conducting structured interviews with actors on the demand side, sub-question **9** can be answered. Finally, a comparison of the results of questions 7, 8 and 9 will provide the basis for an answer to sub-question **10**.

5.2 Dutch context

In order to be able to understand the dynamics within the cities of the cases, it is important to understand the contemporary issues on a larger scale. In the Netherlands, in many regards a competitive country, being amongst the top competing European metropolitan regions is of high priority for many cities. It seems that cities do not want to fall behind in relation to their peers (nationally as well as internationally) and in many cases use urban area development as a means of achieving high levels of competiveness. Recently, many municipalities have announced their own "innovation districts" (Financieel Dagblad, 2016b). However, such districts are rather new and do not yet show the results that comply with their name. The struggle that governments in the Netherlands appear to be having regarding the link between the branding of areas and the implementation of corresponding policy further emphasizes this issue. Furthermore, it seems that policymakers are generally not thinking enough about the possible benefits of serving as an international hub and are rather focusing on the advantages of clustering in their own hotspots (Van Oort et al., 2006). Especially the province of South-Holland appears to be falling behind in this regard compared to its main competitors in the Netherlands (Noord-Holland and Noord-Brabant).

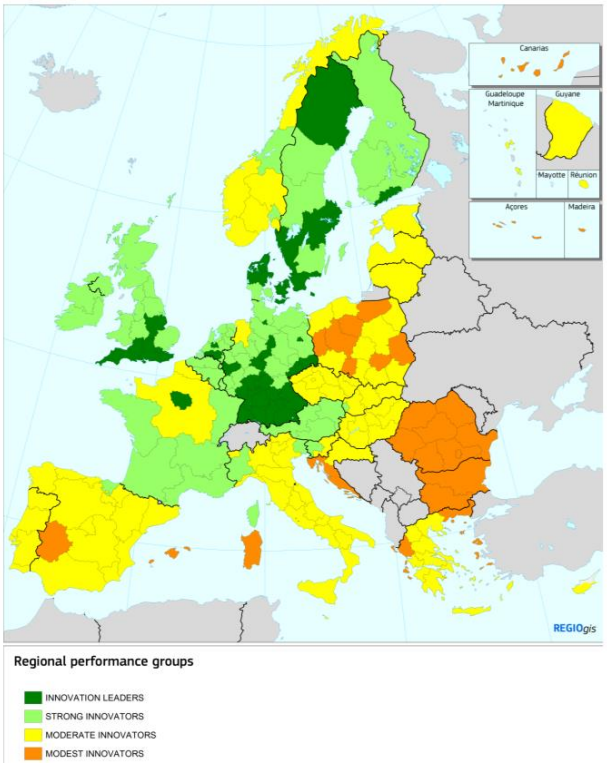

Figure 4. Innovation in Europe (European Commission, 2016)

Figure 5. Translation of innovation potential into results in NL (orange: above expectations; blue: below expectations) (ING Economisch Bureau 2014)

Several sectors in the industrial-logistic and knowledge-service sector seem to lack the option of significant growth in their current environment and the flexibility they need in order to be able to innovate is limited (Gemeente Zuid-Holland, 2012). Furthermore, the economic agenda of the European Union focuses on the globally shifting economic power-relations, which further emphasizes the need for innovation in order to achieve prosperity and employment and the role of urban regions

(MRDH, 2014). It appears that in the province of South-Holland, there is an overrepresentation of mature business sectors and a relative shortage in new, innovative sectors (Gemeente Zuid-Holland, 2012). Relating this to the spatial-economic policy trends in Europe ("smart specialization" strategies) and the Netherlands (top sector policy), this means that in order for agglomeration benefits to be able to take place, the regional economy of Zuid-Holland should evolve more into one that focuses on innovative and growing sectors (Gemeente Zuid-Holland, 2012). Looking at the division of innovation in Europe (figure 4), the regions of Noord-Brabant and Amsterdam currently take the lead in the Netherlands. In relation to its potential, the province of Zuid-Holland is underperforming (see figure 5). In an attempt to increase its competitiveness, Zuid-Holland is attempting to focus more on the 'knowledge economy', which can be defined as the use of knowledge in interactive relationships between market- and other parties in producing and using goods and services, from the first idea to the use of the end products (Oort & Lambooy, 2014).

5.3 The cases

5.3.1 Central Innovation District The Hague

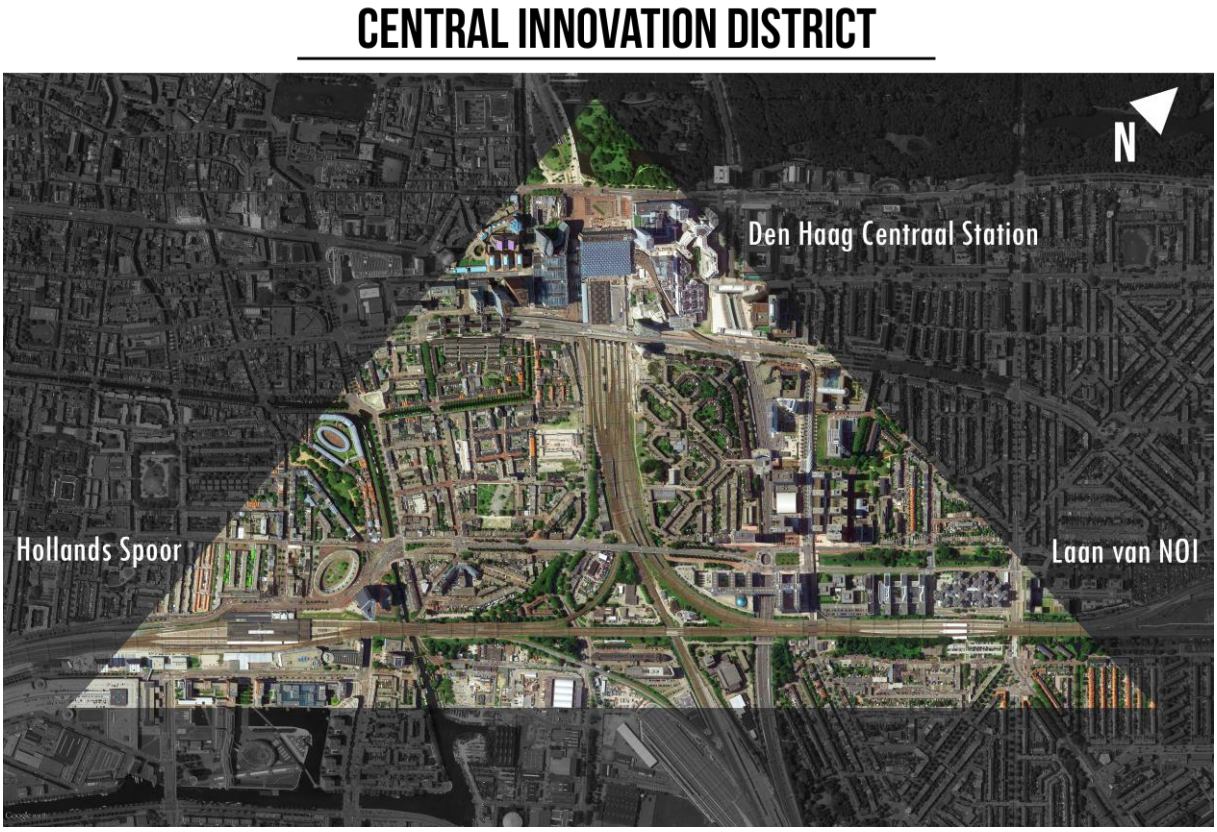

Figure 6. Central Innovation District The Hague

Aim of the district (*Peter Jägers, head of Urban Development Services The Hague):*

The CID does not aim at competing with technological hotspots, but mostly sees opportunities in the area of social and organizational innovation. This complies with the distinctive economic profile of the city: peace, justice and security. The CID suits the further intensification of the interaction between knowledge institutions, start-ups and international firms and institutions related to justice, governance, security and ICT.

Literature

Acs, Z. J., & Plummer, L. A. (2005). Penetrating the "knowledge filter" in regional economies. *Annals of Regional Science, 39*(3), 439-456. doi: 10.1007/s00168-005-0245-x

Anholt, S. (2006). *Competitive identity: The new brand management for nations, cities and regions*.

Barca, F., et al. (2012). The case for regional development intervention: Place-based versus place-neutral approaches. *Journal of Regional Science, 52*(1), 134-152. doi: 10.1111/j.1467-9787.2011.00756.x

Bathelt, H. (2005). Cluster relations in the media industry: Exploring the 'distanced neighbour' paradox in Leipzig. *Regional Studies, 39*(1), 105-127. doi: 10.1080/0034340052000320860

Boschma, R. (2005). Proximity and Innovation: A critical assessment. *Regional Studies, 39*(1), 61-74.

Breschi, S., et al. (2003). *Mobility and Social Networks: Localised Knowledge Spillovers Revisited*. Universita Boconi. Milano, Italy. Retrieved from http://ideas.repec.org/p/cri/cespri/wp142.html.

Bryman, A. (2012). *Social research methods*. Oxford: Oxford University Press.

Buhrs, M. (2016). *City- en gebiedsmarketing*. Schiedam: Scriptum.

Butzin, A., & Widmaier, B. (2016). Exploring Territorial Knowledge Dynamics through Innovation Biographies. *Regional Studies, 50*(2), 220-232.

Caiazza, R., et al. (2015). Knowledge effects on competitiveness: from firms to regional advantage. *Journal of Technology Transfer, 40*(6), 899-909. doi: 10.1007/s10961-015-9425-8

Casper, S. (2007). *Creating Silicon Valley in Europe. Public policy towards new technology industries*. Oxford: Oxford University.

CEOs for Cities. (2006). *Branding your city*. Chicago.

Clark, G. L. (2000). *The Oxford Handbook of Economic Geography*. Oxford, NY: Oxford University Press

Clark, J., et al. (2010). A typology of 'innovation districts': what it means for regional resilience. *Cambridge Journal of Regions, Economy and Society, 3*(1), 1-17.

Cooke, P. (2011). *Handbook of regional innovation and growth*. Cheltenham: Edward Elgar.

Cooke, P., et al. (1998). Regional systems of innovation: an evolutionary perspective. *Environment and Planning A, 30*(9), 1563-1584.

Crevoisier, O. (2011). *Beyond Territorial Innovation Models: The Pertinence of the Territorial Approach*. Groupe de recherche en économie territoriale.

Curvelo, F. M. (2016). *Technology Campuses: A study on the relation between innovation and the built environment at the urban area level.* Technische Universiteit Delft, Delft.

Dalmeijer, R. A. (2014). *Gebiedsbranding: Een bewuste keuze.* Retrieved from http://hdl.handle.net/2105/17095

Doloreux, D. (2002). What we should know about regional systems of innovation. *Technology in Society, 24*(3), 243-263. doi: 10.1016/S0160-791X(02)00007-6

Financieel Dagblad. (2016a). 'Innovatieclubjes zijn vooral goed voor het imago, niet voor het bedrijf'. Retrieved 21-1-2017

Financieel Dagblad. (2016b). Innovatiehotspots buitelen over elkaar heen. Retrieved 1-1-2017, 2017, from https://fd.nl/economie-politiek/1150690/innovatiehotspots-buitelen-over-elkaar-heen

Forbes. (2013). World's 15 Most Inventive Cities. Retrieved 30-1-2017, from http://www.forbes.com/sites/williampentland/2013/07/09/worlds-15-most-inventive-cities/#5af56c327e68

Frenken, K., et al. (2007). Related Variety, Unrelated Variety and Regional Economic Growth. *Regional Studies, 41*(5), 685-697.

Gemeente Zuid-Holland. (2012). *De Weerbare regio*.

Gertler, M. S. (2003). Tacit knowledge and the economic geography of context or, the undefinable tacitness of being (there). *Journal of Economic Geography, 1*, 75-99.

Goess, S., et al. (2016). City branding in polycentric urban regions: identification, profiling and transformation in the Randstad and Rhine-Ruhr. *European Planning Studies, 24*(11), 2036-2056. doi: 10.1080/09654313.2016.1228832

Harrison, B. (1992). Industrial Districts: Old Wine in New Bottles? *Regional Studies, 26*(5), 469-483. doi: 10.1080/00343409212331347121

Hospers, G. J. (2006). Jane Jacobs: her life and work. *European Planning Studies, 14*(6), 723-732. doi: 10.1080/09654310600779444

Hospers, G. J. (2011). *Er gaat niets boven citymarketing: hoe zet je een plaats op de kaart?* Zaltbommel: Haystock.
Hutton, T. A. (2008). *The new economy of the inner city*. New York: Routledge.
Jacobs, J. (1961). *The Death and Life of Great American Cities*. New York: Random House.
Katz, B., & Wagner, J. (2014). The Rise of Innovation Districts: A New Geography of Innovation in America. Retrieved from
Kavaratzis, M., & Kalandides, A. (2015). Rethinking the place brand: the interactive formation of place brands and the role of participatory place branding. *Environment and Planning A, 47*(6), 1368-1382. doi: 10.1177/0308518X15594918
Koster, S., & van Stel, A. (2014). The relationship between start-ups, market mobility and employment growth: An empirical analysis for Dutch regions. *Papers in Regional Science, 93*(1), 203-217. doi: 10.1111/pirs.12000
Lee, S., et al. (2002). *Innovation, Human Capital, and Creativity*. Carnegie Mellon University: Pittsburgh.
Lucas, R. (1988). On the mechanics of economic development. *Journal of Monetary Economics, 22*, 3-42.
Luger, M. I., & Koo, J. (2005). Defining and tracking business start-ups. *Small Business Economics, 24*(1), 17-28. doi: 10.1007/s11187-005-8598-1
Maskell, P. (2001). Towards a knowledge-based theory of the geographical cluster. *Industrial and Corporate Change, 10*(4), 921-943.
Mayer, H., et al. (2016). Capital city dynamics: Linking regional innovation systems, locational policies and policy regimes. *Cities, 51*, 11-20.
Moulaert, F., & Sekia, F. (2003). Territorial Innovation Models: A Critical Survey. *Regional Studies, 37*, 289-302.
MRDH. (2014). *Agenda Economich Vestigingsklimaat*. Retrieved from http://mrdh.nl/sites/mrdh.nl/files/files/Agenda%20Economisch%20Vestigingsklimaat%20MRDH%20AB141219.pdf.
Ni, P., & Kresl, P. K. (2010). *The global urban competitiveness report*. Cheltenham: Edward Elgar.
Nooteboom, B., & Stam, E. (2008). *Micro-Foundations for Innovation Policy*. Den Haag: WRR.
OECD. (2009). *Regions matter: Economic rescovery, innovation and sustainable growth* (Vol. 9789264076525).
OECD. (2011). *Regions at a glance 2011*. Paris: OECD.
OECD. (2012). *Redefining "urban". A new way to measure metropolitan areas*. Paris: OECD.
OECD. (2015). *OECD Innovation Strategy 2015 - An Agenda for Policy Action*. Paris: OECD Publishing.
Oort, V., & Lambooy. (2014). Cities, Knowledge, and Innovation. In M. M. Fischer & P. Nijkamp (Eds.), *Handbook of Regional Science* (pp. 475-488). Berlin, Heidelberg: Springer Berlin Heidelberg.
Park, R., et al. (1925). *The City*. Chicago: University of Chicago Press.
Pe'er, A., & Keil, T. (2013). Are all startups affected similarly by clusters? Agglomeration, competition, firm heterogeneity, and survival. *Journal of Business Venturing, 28*(3), 354-372. doi: 10.1016/j.jbusvent.2012.03.004
Sedgley, N., & Elmslie, B. (2004). The geographic concentration of knowledge: scale, agglomeration, and congestion in innovation across U.S. States. *International Regional Science Review, 27*(2), 111-137.
Segbers, K. (2007). *Global city regions*. Baltimore, USA: The Johns Hopkins University Press.
Simmie, J. (2005). Innovation and Space : A Critical Review of the Literature. *Regional Studies, 39*(6), 789-804.
Smith, K. (2005). Measuring Innovation. In J. Fagerberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford handbook of innovation* (pp. 148-177). Oxford: Oxford University Press.
Thompson, W. (1965). *A Preface to Urban Economics*. Baltimore: John Hopkins Press.
Turok, I. (2009). The distinctive city: Pitfalls in the pursuit of differential advantage. *Environment and Planning A, 41*(1), 13-30. doi: 10.1068/a37379
Van Oort, F., et al. (2006). Hubs en hotspots: het belang van de regio in de Nederlandse en de mondiale kenniseconomie. *Innovatieplatform*, 44-50.
Van Oort, F. G., & Bosma, N. S. (2013). Agglomeration economies, inventors and entrepreneurs as engines of European regional economic development. *Annals of Regional Science, 51*(1), 213-244. doi: 10.1007/s00168-012-0547-8
Vanolo, A. (2008). The image of the creative city: Some reflections on urban branding in Turin. *Cities, 25*(6), 370-382. doi: 10.1016/j.cities.2008.08.001

Verheul, W. J. (2015). Plaatsgebonden identiteit: het anker voor stedelijke ontwikkeling. *De stad kennen, de stad maken* (pp. 35-48).
Verheul, W. J., & Hospers, G. J. (2016). Branding a pluralistic region: lessons from the Southern Randstad.
Winden, W. v., & Carvalho, L. (2015). Synergy management at knowledge locations *Making 21st Century Industrial Complexes: Technopoles of the world revisited*. Abingdon: Routledge.
Winden, W. v., & Carvalho, L. (2016). Urbanize or Perish? Assessing the Urbanization of Knowledge Locations in Europe. *Journal of Urban Technology, 23*(1), 53-70.
Yin, R. K. (2014). *Case Study Research: Design and Methods* (5 ed.). Los Angeles: Sage.
Zenker, S., & Braun, E. (2010). *Branding a city: A conceptual approach for place branding and place brand management*. Copenhagen, Denmark.
Zukin, S. (2010). *The Naked City. The Life and Death of Urban Authentic Places*. Oxford: Oxford University Press.

Images
Cover: http://theofficialstudio.com/images/idbanner2.jpg

Figure 4: European Commission (2016)
https://www.greenovate-europe.eu/news/commission-releases-2016-european-innovation-scoreboard

Figure 5: ING Economisch Bureau (2014)
https://www.ing.nl/media/ING_innovatiepotentieel_niet_in_alle_provincies_benut_tcm162-43159.pdf